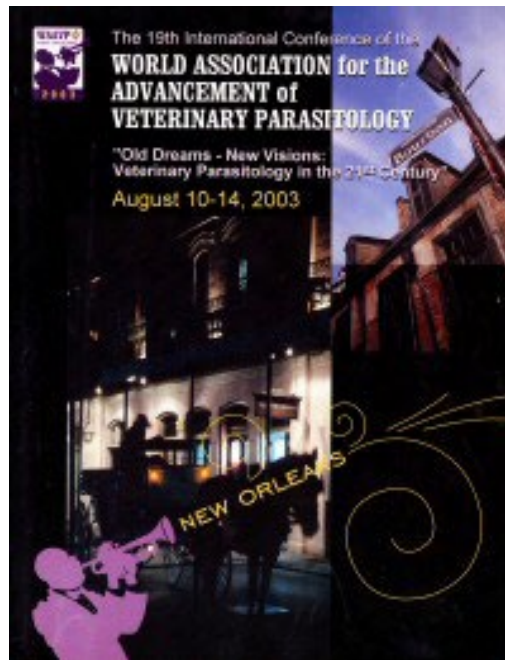


The 19th International Conference of the
**WORLD ASSOCIATION FOR THE
ADVANCEMENT OF VETERINARY
PARASITOLOGY**

“OLD DREAMS – NEW VISIONS: Veterinary
Parasitology in the 21st Century”

August 10-14, 2003

NEW ORLEANS, LOUISIANA, USA



**19th International Conference
World Association for the Advancement of Veterinary Parasitology**

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Proceedings of the 19th International Conference of the World Association for the
Advancement of Veterinary Parasitology
August 10th – 14th, 2003, Sheraton New Orleans Hotel,
New Orleans, Louisiana USA

Edited by:

Kathleen Story Harrington
Department of Pathobiological Sciences, School of Veterinary Medicine,
Louisiana State University
and
the WAAVP 2003 Local Organizing Committee

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Cover design by Michael Broussard

Welcome from the Local Organizing Committee

The Local Organizing Committee is pleased to welcome you to New Orleans for the 19th International Conference of the WAAVP. You will find the environment here in August tropical and casual. The theme of the conference “Old Dreams—New Visions: Veterinary Parasitology in the 21st Century” was an attempt to meld a discussion of new technologies with continuing basic and applied questions in the field. The program is extensive and, we feel, stimulating. The format was designed for maximal exchange of information and interactive discussion. More than 400 presentations are planned. These are in the format of plenary lectures, symposia, oral presentations, and poster sessions. Time was allotted for oral sessions in order to facilitate discussion. Poster sessions are scheduled with breakfast to promote individual interactions on Tuesday and Wednesday mornings. Personal and professional interactions will be further enhanced with evening social activities. Receptions will be held on Sunday, Monday and Tuesday with a cocktail party and closing banquet on Thursday evening. The two receptions during the week are complements of Bayer Animal Health and Merial respectively.

We hope the conference is professionally rewarding and that you will enjoy the culture of New Orleans. We thank everyone for attending and for your participation.

The Local Organizing Committee

Thomas R. Klei, Chair
Professor of Parasitology, School of Veterinary Medicine
and the Department of Veterinary Science,
Louisiana Agricultural Experiment Station
Louisiana State University

David G. Baker
Professor of Laboratory Animal Medicine
School of Veterinary Medicine
Louisiana State University

John B. Malone
Professor of Veterinary Parasitology
School of Veterinary Medicine
Louisiana State University

James E. Miller
Professor of Epidemiology
School of Veterinary Medicine
Louisiana State University

T. Bonner Stewart
Professor Emeritus
School of Veterinary Medicine
Louisiana State University

Scientific Program Committee

John B. Malone (Chair)
Akira Arakawa
Philippe Dorchie

Froylan Ibarra
Thomas R. Klei
Tammi Krecek
Nicholas C. Sangster

Special Appreciation

The organizers gratefully acknowledge the assistance provided by Rosemary Klei and Rama Ramachandran in the preparation of this program.

WAAVP Executive Committee*

President	RC (Tammi) Krecek (2007) krecek@icon.co.za
1st Vice President	Peter J. Waller (2003) peter.waller@sva.se
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*Numbers in brackets indicate expiring date for each person

Ex-Officio Members:

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Editor, Veterinary Parasitology

Stuart M. Taylor – stuart_m.taylor@virgin.net

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Editorial Members:	Hemant Dadhich – hdadhich@rediffmail.com Silvina Fernandez – alsife2@aol.com Marcello Otake Sato – marcello@asahikawa-med.ac.jp

WAAVP 2005 Information



From Science to Solutions

Christchurch, New Zealand 16-20th October

Venue

Your 2005 conference will be held in Christchurch, New Zealand from 16 – 20th October, 2005 (<http://www.christchurch.org.nz/>). Christchurch is a city of 300,000 people located in the South Island of New Zealand. It is renowned for its gardens and friendly nature. The conference will be held in the Christchurch Convention Centre (<http://www.convention.co.nz>). This modern facility is centrally located, being only a short walk from the centre of the city, parks, a wide variety of restaurants and several hotels and motels.

Program and Registration

The second mailing with further information on the scientific program, call for abstracts and registration will occur at the end of 2004. For those interested in co-ordinating a workshop please contact Nick Sangster (Scientific Contact). Visit the website below for updates on the conference. ABOVE ALL, PLAN TO COME AND MEET YOUR COLLEAGUES.

Local Organising Committee

Bill Pomroy (Chair) *email:* w.pomroy@massey.ac.nz

Scientific Contact

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Organising Secretariat

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Web: <http://www.waavp2005.org.nz>

Sponsors and Exhibitors List

Sponsors

The quality of the scientific and social programs arranged for this conference would not have been possible without the generous support and cooperation of a number of pharmaceutical companies engaged in the animal health industry and others. As with other WAAVP conferences this support has been essential. The Local Organizing Committee and the Scientific Program Committee of the 19th Conference of the WAAVP wish to acknowledge the support of these sponsors and we urge all attendees to visit the exhibits of the Major Sponsors in Napoleon Rooms, A 1, 2, and 3.

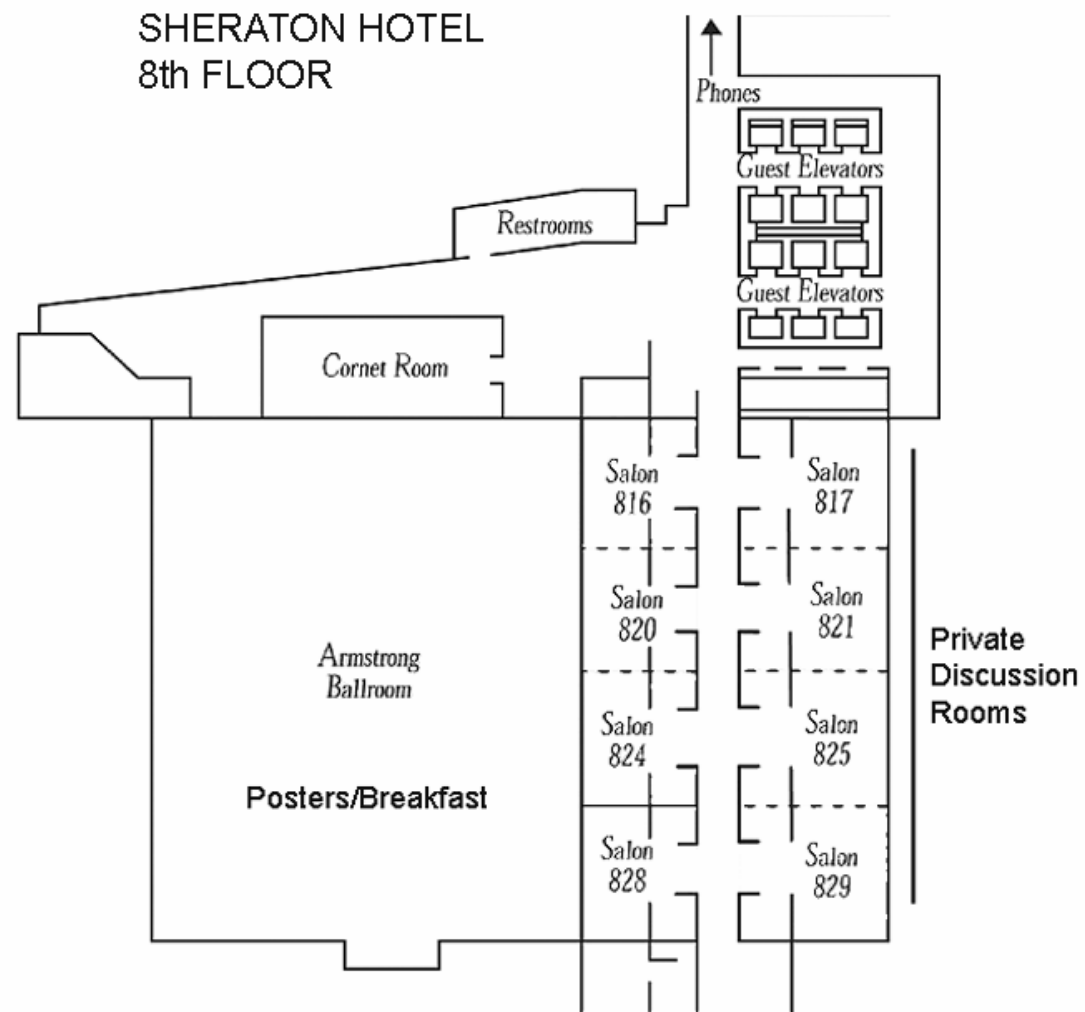
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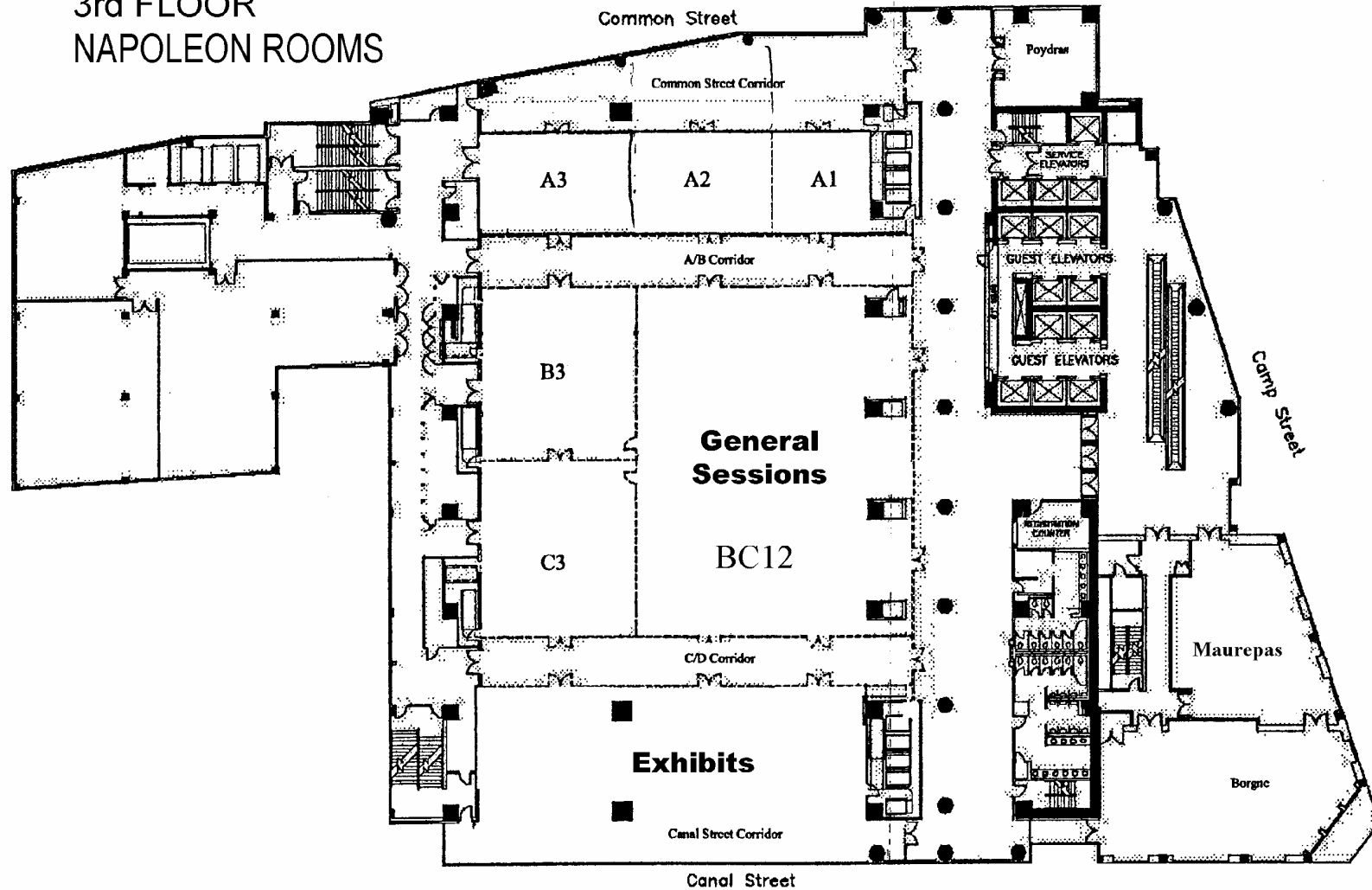
Contributors:

United States Department of Agriculture, NRI Conference Grant
Lilly
Farnam
Audubon Aquarium of the Americas
American Association of Veterinary Parasitologists
LSU Faculty of Parasitology

Hotel Floor Plans



SHERATON HOTEL - NEW ORLEANS
3rd FLOOR
NAPOLEON ROOMS



Social Activities

All the social events outlined below are open to registered conferees. Please plan to attend and greet old friends, renew acquaintances and make new ones.

Sunday August 10, 7:00-9:00pm

Welcoming Reception
Armstrong Ballroom, 8th Floor Sheraton Hotel

Monday August 11, 7:45 pm

Cash Bar in preparation for the March to the Aquarium

Bayer Reception
Audubon Aquarium of the Americas

Tuesday August 12, 8:00 PM

Merial Reception,
Rhythms Ball Room, 2nd Floor Sheraton Hotel

Thursday August 14

6:30-7:30 Cocktails
Location to Be Announced

7:30 Closing Banquet and Dance

Scientific Program

MONDAY, AUGUST 11, 2003

8:00AM–9:00AM **Opening Ceremony**
 WAAVP History – Lord Soulsby
Room: Napoleon BC12

9:00AM–9:45AM **Plenary 1: The Livestock Revolution.**
Speaker: H. Steinfield
Room: Napoleon BC12

9:45AM–10:00AM Break

10:00AM–10:45AM **Plenary 2: Control of Tsetse and Trypanosomes Using**
 Molecular Genetics.
Speaker: S. Aksoy
Room: Napoleon BC12

10:45AM–12:15PM **Workshop on organic farming and novel approaches to control**
 of parasites.
Moderators: S.M. Thamsborg, J.E. Miller, M. Larsen, P.J. Waller
Room: Napoleon BC12

PART A: ORGANIC FARMING AND PARASITE PROBLEMS

Introduction to organic farming and parasite control.
S.M. Thamsborg, M. Larsen

PIGS

Parasites in organic swine production in DK and options for control.
H. Mejer, A. Roepstorff

A survey of parasite infections on organic, free range and conventional pig farms in the Netherlands.

F.H.M. Borgsteede^{a*}, I.A.J.M. Eijck^b

^aInstitute for Animal Science and Health (ID-Lelystad), Lelystad, the Netherlands; ^bResearch Institute for Animal Husbandry, Lelystad, the Netherlands

Summary
A. Roepstorff

DAIRY CATTLE

Parasite control measures in organic dairy production in Sweden.

J. Höglund

How to deal with lungworm infections in organic dairy cattle.

H. Ploeger*, M. Eysker

Division of Parasitology and Tropical Veterinary Medicine, Utrecht University, Utrecht, The Netherlands

Summary

M. Larsen

SHEEP AND GOATS

Survey of parasites on organic sheep/dairy farms in UK.

F. Jackson

Parasite problems on organic sheep/goat farms in Germany.

C. Epe

Gastrointestinal nematode infections on organic goat farms in the Netherlands.

M. Eysker^{a*}, N. van Eekeren^b

^aDivision of Parasitology and Tropical Veterinary Medicine, Utrecht University, Utrecht, The Netherlands;

^bLouis Bolk Institute, Driebergen, The Netherlands

Parasite control and production in four experimental sheep meat flocks in Auvergne (France) during conversion to organic farming.

J. Cabaret, M. Benoit, V. Laignel

Summary

J.E. Miller

Gastrointestinal nematode control through direct and indirect effects of host nutrition.

J.G.M. Houdijk*, S. Athanasiadou, I. Kyriazakis

Animal Nutrition and Health Department, Scottish Agricultural College, Edinburgh, UK

Overall discussion and conclusions

S.M. Thamsborg

PART B: NOVEL APPROACHES TO CONTROL OF PARASITES

Introduction

P.J. Waller

European experiences

S.M. Thamsborg

Australian/NZ experiences

M. Knox

African experiences

R. Peters

North American experiences

J.E. Miller

Latin American experiences

M.B. Molento

Asia experiences

G. Hood

GENERAL DISCUSSION

10:45AM–12:15PM **SYMPOSIUM: MOLECULAR SYSTEMATICS AND DIAGNOSIS**

Moderators: R.B. Gasser, D.S. Zarlenga

Room: Maurepas

**Advances in the diagnosis and systematics of parasites of veterinary importance—
new and exciting prospects.**

R.C.A. Thompson*

WHO Collaborating Centre for the Molecular Epidemiology of Parasitic Infections and Western Australian Biomedical Research Institute, Division of Veterinary and Biomedical Sciences, Murdoch University, Western Australia

**Identification and classification within the genus, *Trichinella*, with special emphasis
on non-encapsulated species.**

D.S. Zarlenga^{*a}, G. La Rosa^b, E. Pozio^b, B. Rosenthal^a

^aUS Department of Agriculture, ARS, ANRI, Beltsville, Maryland 20705, USA; ^bLaboratorio di Parassitologia, Istituto Superiore di Sanita, Viale Regina Elena 299, 00161 Rome, Italy

Filarial nematodes and *Wolbachia*: a veterinary perspective.

C. Bandi*, M. Mortarino, M. Casiraghi, C. Genchi

Università di Milano, DIPAV, Sezione di Patologia Generale e Parassitologia, Italy

**Mitochondrial genomics of parasitic nematodes—recent progress and implications
for systematics and population genetics studies.**

R.B. Gasser, M. Hu, N. B. Chilton

Department of Veterinary Science, The University of Melbourne, 250 Princes Highway, Werribee, Victoria 3030, Australia

Progress in the molecular diagnosis of cyathostomins—implications and prospects.

J.B. Matthews, J.E. Hodgkinson

Department of Veterinary Clinical Science and Department of Veterinary Parasitology, Faculty of Veterinary Science, University of Liverpool, UK.

Methodological advances in the characterizing the population genetics and molecular systematics of veterinary tissue cyst-forming coccidia.

B.M. Rosenthal

Agricultural Research Service, US Dept. of Agriculture, Beltsville, MD USA.

10:45AM–12:15PM **EQUINE PARASITES**

Moderator: G.C. Coles

Room: Napoleon B3

10:45AM–11:00AM **Helminth parasites of horses in the UK: a changing scene.**

S. Jones^a, S. Yue^b, G.C. Coles^{b*}

Department of Anatomy, University of Bristol, Southwell Street, Bristol BS2 8EJ, UK;

^bDepartment of Clinical Veterinary Science, University of Bristol, Langford House, Bristol BS40 5DU, UK

11:00AM–11:15AM **Prevalence of major gastrointestinal parasites in equids from Spanish abattoirs.**

A. Meana*, R. Martin, A. Mateos, N.F. Pato, M. Luzón

Facultad de Veterinaria, Madrid, Spain

11:15AM–11:30AM **Safety study on pregnant mares orally treated with a combination of ivermectin praziquantel.**

P. Mercer^{a*}, F. Alves-Branco^b, C.R. White^c

^aVirbac SA, Medical Dept., Carros, France; ^bConsultorio Medico Veterinario, Bagé, RS, Brazil, ^cVirbac do Brazil, Sao-Paulo, SP, Brazil

11:30AM–11:45AM **System to test products against mosquitoes infesting horses.**

A.A. Pérez de León*

Stillmeadow, Inc., Sugar Land, Texas, USA

11:45AM–12:00PM **Reappearance of eggs in feces of horses after treatment with moxidectin and aversectin.**

O.I. Starovir*

Schmalhausen Institute of Zoology NAS of Ukraine, 15, D. Khmelnytsky Street, Kiev—30, 01601, Ukraine

12:00PM–12:15PM **Methods of identification of the 4th stage larvae of horse strongylids to mature worms.**

V.A. Kharchenko*

I.I. Schmalhausen Institute of Zoology of NAS of Ukraine, Kyiv, Ukraine

10:45AM–12:00PM **PROTOZOA 1**

Moderator: J.B. Tierney

Room: Napoleon A1

10:45AM–11:00AM **Development of an avian ionophore-tolerant *Eimeria* vaccine for the control of coccidiosis in chickens.**

G.Q. Li*, S. Kanu, F.Y. Xian, S.M. Xiao

South China Agricultural University, College of Veterinary Medicine, Guangzhou 510642, P.R. China

11:00AM–11:15AM **The role of intestinal mucin on *Eimeria tenella* infection *in vitro*.**

J.B. Tierney^{a*}, L. Matthews^b, S.D. Carrington^b, G. Mulcahy^a

^aDepartment of Veterinary Microbiology & Parasitology; ^bDepartment of Veterinary Anatomy, Faculty of Veterinary Medicine and ^{ab}Conway Institute of Biomolecular and Biomedical Research, University College Dublin, Belfield Dublin 4, Ireland

11:15AM–11:30AM **Population dynamics and intra-litter transmission patterns of *Isospora suis* under on-farm farrowing conditions.**

S. Sotiraki^{a*}, A. Roepstorff^a, K.D. Murrell^a, J.P. Nielson^a, C. Maddox-Hyttel^b

^aThe Royal Veterinary & Agricultural University; ^bDanish Veterinary Institute, Copenhagen, Denmark

11:30AM–11:45AM **Characterization of Zimbabwean *Toxoplasma gondii* isolates with stage-specific monoclonal antibodies.**

T. Hove^{a*}, P. Lind^b, S. Mukaratirwa^a

^aParaclinical Veterinary Studies, University of Zimbabwe, P.O. Box MP167, Mount Pleasant, Harare, Zimbabwe; ^bDanish Veterinary Institute, Bulowsvej 27, DK-1790, Copenhagen V, Denmark

11:45AM–12:00PM **Infection of *Meriones unguiculatus* and *Cavia aperea pamparum* with *Neospora caninum* oocysts from naturally infected dogs from Argentina.**

W. Basso*, L. Venturini, M.C. Venturini, D. Bacigalupe, J. Unzaga, A. Larsen

Parasitología y E. Parasitarias, Laboratorio de Inmunoparasitología, Facultad de Veterinaria, U.N.L.P. 60 y 118 (1900), Argentina

12:00 PM–12:15PM **First case report of dogs infected naturally with *Babesia canis vogeli* in South Africa.**

P.T. Matjila^{*ab}, F. Jongejan^{ab}, B.L. Penzhorn^a, C.P.J. Bekker^b, A.M. Nijhof^b.

^aDepartment of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Private Bag x04, 0110, Onderstepoort, South Africa, ^bDivision of Parasitology and Tropical Veterinary Medicine, Faculty of Veterinary Science, Utrecht University, The Netherlands.

10:45AM–12:15PM **WILDLIFE, AQUATIC AND AVIAN PARASITES**

Moderator: S. Mukaratirwa

Room: Napoleon A3

10:45AM–11:00AM ***Toxocara canis* in experimentally infected foxes.**

I. Saeed^{*}, K. Taira, C.M.O. Kapel

Danish Centre for Experimental Parasitology, Department of Veterinary Microbiology, The Royal Veterinary and Agricultural University, Dyrlægevej 100, DK-1870 Frederiksberg D, Denmark

11:00AM–11:15AM ***Pseudoloma neurophilia* (Microsporidia) and *Pseudocapillaria tomentosa* (Nematoda) in zebrafish (*Danio rerio*) held in research facilities.**

M.L. Kent^{*ab}, J.M. Matthews^b, J.K. Bishop-Stewart^{ab}, J.M. Spitsbergen^{bc}

^aCenter for Fish Disease Research, Department of Microbiology, 220 Nash Hall, Corvallis, Oregon 97331 USA; ^bZebrafish International Resource Center 5274 University of Oregon, Eugene, Oregon 97403-5274 USA; ^cDepartment of Environmental and Molecular Toxicology, 1007 Agricultural and Life Sciences Building, Oregon State University, Corvallis, Oregon 97333 USA

11:15AM–11:30AM **Characterisation of PCR-SSCP analysis of *Benedeniines* (Monogenea: Capsalidae) from marine fish in China by rDNA sequence.**

X.Y. Wu^a, A.X. Li^{a*}, X.J. Ding^b, X.Q. Zhu^c

^aThe School of Life Science, Zhongshan (Sun Yat-sen) University, Guangzhou, China; ^bDepartment of Biology, South China Normal University, Guangzhou, China; ^cCollege of Veterinary Medicine, South China Agricultural University, Guangzhou, China

11:30AM–11:45AM **Effect of *Tetrameres americana* (Cram, 1927) in chickens fed with high and low protein diets.**

H.B. Magwisha^{a*}, M. Fink^b, A. Permin^c, N.C. Kyvsgaard^d, A.A. Kassuku^a

^aDepartment of Veterinary Microbiology and Parasitology, Sokoine University of Agriculture, P. O. Box 3019, Morogoro, Tanzania; ^bDepartment of Zoology, University of Copenhagen, Denmark; ^cNetwork of Smallholder Poultry Production, Dyrlægevej 2, The Royal Veterinary and Agricultural University, Grønnegårdsvej 5, Frederiksberg C, Denmark; and; ^dDepartment of Animal Science and Animal Health, The Royal Veterinary and Agricultural University, Grønnegårdsvej 5, Frederiksberg C, Denmark

11:45AM–12:00PM **First report of a field outbreak of the oriental eye-fluke, *Philophthalmus gralli* (Mathis & Leger, 1910), in commercially reared ostriches (*Struthio camelus*) in Zimbabwe.**

S. Mukaratirwa^{*}, T. Hove, Z.M. Cindzi, D.B. Maononga, M. Taruvinga, E. Matenga

Department of Paraclinical Veterinary Studies, Faculty of Veterinary Science, P. O. Box MP, 167 Mount Pleasant, Harare, Zimbabwe

12:00PM–12:15PM **Prevalence and pathology of gastrointestinal infections in poultry in Punjab state (India). B.S. Sandhu^{*a}, L.D. Singla^b, R.S. Brar^a, A.P.S.**

Brar^a, C.K. Singh^a

^aDepartment of Veterinary Pathology and ^bParasitology, Punjab Agricultural University, Ludhiana 1412 004, India

10:45AM–12:15PM **ARTHROPODS AND ARTHROPOD-BORNE DISEASES**

Moderator: C. Genchi

Room: Napoleon A2

10:45AM–11:00AM **Characterisation of Recombinant Immunoreactive Antigens from the scab mite *Saracoptes scabiei*.**

C.V. Witzendorff^{a*}, H.-F. Matthes^b, R. Lucius^a, B. Beich^a, B. Kalinna^a

^aDepartment of Molecular Parasitology, Institute for Biology, Humboldt-University, Berlin, Germany; ^bLouis-Pasteur, Str. 17, 14943 Luckenwalde

11:00AM–11:15AM **A PCR-based comparative survey of arthropod-transmitted infections in dogs, cats and ticks in southern France.**

S.E. Shaw^{a*}, F. Beugnet^b, M.J. Day^a, M.J. Kenny^a

^aUniversity of Bristol, Langford, Somerset, UK; ^bMerial, Lyon, France

11:15AM–11:30AM **Biological and environmental factors affecting the survival of *Otodectes cynotis* (Acarina, Psoroptidae) off the host in natural and laboratory conditions.**

P. Milillo^{a*}, P. Mesto^a, C. Cafarchia^a, G. Capelli^b, D. Otranto^a

^aDepartment of Health and Animal Welfare, Faculty of Veterinary Medicine, University of Bari, Italy; ^bDepartment of Experimental Veterinary Sciences, Faculty of Veterinary Medicine, University of Padua, Italy

11:30AM–11:45AM **Use of standardized inoculum of *Anaplasma marginale* and chemoprophylaxis to control bovine anaplasmosis.**

M.F.B. Ribeiro^a, E.J. Facury-Filho^b, L.M.F. Passos^{b*}, H.M. Saturnino^b, M.A.F. Malacco^c

^aDepartment of Parasitology, Federal University of Minas Gerais State, Belo Horizonte, Brazil; ^bSchool of Veterinary Medicine, Federal University of Minas Gerais State, Belo Horizonte, Brazil; ^cVeterinarian

11:45AM–12:00PM **Experimental infection of dairy calves with *Borrelia burgdorferi* by exposure to field collected Ixodid ticks.**

T.L. Cyr^{*}

Agricultural Research Services, USDA, Animal and Natural Resources Institute, Parasite Biology, Epidemiology and Systematics Laboratory, Beltsville, MD USA

12:00PM–12:15PM **Efficacy of Selamectin sopt-on for the control of *Myobia musculi* and *Myocoptes musculinus* infections in mice.**

P.J. Bourdeau^{*}, L. Houdre, A.M. Marchand

Ecole Nationale Veterinaire de Nantes, France

10:45AM–12:15PM **VACCINE 1**

Moderator: D.P. Knox

Room: Napoleon C3

10:45AM–11:00AM **Characterization of potentially host-protective material from *Teladorsagia circumcincta*.**

H. Craig^{*}, D.P. Knox, D. Redmond

Moredun Research Institute, Bush Loan, Penicuik, Midlothian, Scotland

11:00AM–11:15AM **Vaccination against the rodent intestinal nematode *Nippostrongylus brasiliensis*.**

G. Ball^{a*}, R.M. Maizels^b, D.P. Knox^a

^aMoredun Research Institute, Bush Loan, Penicuik, Scotland EH26 OPZ; ^bICAPD, University of Edinburgh, Kings Buildings, Edinburgh, Scotland

11:15AM–11:30AM **Validation of the protective capacity of the *Ostertagia ostertagi* ES-thiol antigens with different adjuvantia.**

P. Geldhof^a, E. Claerebout^{a*}, I. Vercauteren^a, D.P. Knox^b, J. Vercruysse^a

^aLaboratory of Parasitology, Faculty of Veterinary Medicine, Ghent University, Belgium;

^bMoredun Research Institute, Penicuik, UK

11:30AM–11:45AM **Protection in sheep using a purified cysteine protease fraction of adult *Haemonchus contortus*.**

D.P. Knox^{*}, D.L. Redmond, D. Pettit, W.D. Smith

Moredun Research Institute, Pentland Science Park, Bush Loan, Penicuik, Scotland, UK EH27 OPZ

11:45AM–12:00PM **Comparison of antibody isotypes and lymphocyte subsets responses in rats immunised with protein or cDNA of s-Glutathione Transferase (GST) of *Fasciola hepatica*.**

L. Jedlina-Panasiuk^{*a}, H. Wedrychowicz^{ab}

^aW. Stefanski Institute of Parasitology PAS; ^bWarsaw Agricultural University, Poland

12:00PM–12:15PM **A field-trial of an experimental recombinant vaccine for the control of *Fasciola hepatica* infection in sheep.**

J. Fanning^a, J. P. Dalton^{bd}, S. Hanrahan^c, B. Good^c, G. Mulcahy^{*ad}

^aDepartment of Veterinary Microbiology and Parasitology and Conway Institute, University College, Dublin, Ireland; ^bSchool of Viotechnology, Dublin City University, Dublin 9, Ireland; ^cTeagasc Sheep Research Centre, Athenry, Co. Galway, Ireland;

^dIldana Biotechnology, Dublin, Ireland

12:15PM–1:30PM **LUNCH: ON YOUR OWN**

1:30PM–3:00PM **Workshop: Organic Farming and Novel Approaches to Parasite Control (*Continued*)**

Moderators: S. Thamsborg, J.E. Miller, M. Larsen, P.J. Waller

Room: Napoleon BC12

1:30PM–3:00PM **SYMPOSIUM: MOLECULAR SYSTEMATICS AND DIAGNOSIS (*CONTINUED*)**

Moderators: R.B. Gasser, D.S. Zarlenga

Room: Maurepas

1:30PM–3:00PM **SYMPOSIUM: DONKEYS: HERO OR VILLAIN OF THE PARASITE WORLD? PAST, PRESENT AND FUTURE**

Moderators: E. Svendsen, A.F. Trawford

Room: Napoleon B3

The value of donkeys (*Equus asinus*) in parasitology.

A.F. Trawford*, C.J. Morriss

The Donkey Sanctuary, Sidmouth, Devon, EX10 0NU, UK

Experiences with field studies on parasites in donkeys.

M.V.Z. Aline S. de Aluja*

Programme “Donkey Sanctuary—International League for the Protection of Horses—National Autonomous University of Mexico (DS-ILPH-UNAM)”, School of Veterinary Medicine, Circuito Exterior S/N, Ciudad Universitaria, CP 04510 México

***Rhinoestrus usbekistanikus* (Gan 1947): its prevalence and pathological effect in donkeys.**

Ph. Dorchies^{a*}, F. Gebreab^b, L.J. Pangui^c

^aEcole Nationale Vétérinaire, Toulouse, France; ^bVeterinary Faculty, Debre Zeit, Ethiopia; ^cEcole Inter Etats des Sciences et Médecine Vétérinaires, Dakar, Sénégal

Best practice worm management for equids in Africa.

R.C. Krecek*

P.O. Box 12832, Onderstepoort 0110, South Africa

1:30PM–2:45PM **DIAGNOSIS OF PARASITIC INFECTIONS**

Moderators: D. Strauss-Ayali

Room: Napoleon A1

1:30PM–1:45PM **Non-invasive PCR for the detection of *Leishmania infantum* infection in dogs.**

D. Strauss-Ayali^{ab*}, C.L. Jaffe^b, O. Burshtain^a, L. Schnur^b, G. Baneth^a

^aKoret School of Veterinary Medicine; ^bKuvin Center for the Study of Tropical and Infectious Diseases, The Hebrew University of Jerusalem, Israel

1:45PM–2:00PM **Identification of *Habronema microstoma* and *Habronema muscae* (Spirurida, Habronematidae) by a specific PCR-based assay using markers in the ITS2 rDNA and its implications.**

A. Giangaspero, D. Traversa^{*}, P. Galli, B. Paoletti

University of Teramo, Italy

2:00PM–2:15PM **Photography and staining techniques for helminth specimens, particularly with “Carmine staining and acetic-acid treatment.”**

N. Taira^{a*}, Y. Ando^a, S. Ura^b, K. Taira^c, J.C. Williams^d

^aNational Institute of Animal Health, Japan; ^bKyodoken Institute, Kyoto, Japan; ^cThe Royal Veterinary and Agricultural University, Frederiksberg, Denmark; ^dLouisiana State University, Baton Rouge, LA USA

2:15PM–2:30PM **Detection of circulating immune complexes (CIC) of trypanosomosis suspected cattle and buffaloes of Haryana (India) using sandwich-ELISA.**

L. Jeyabal^{*}, S.S. Chaudry, K. Devender, C.C.S. Haryana

Agricultural University, Hisar, India

2:30PM–2:45PM **Detecting the antigen-antibody reactions of *Fasciola gigantica* by using electrochemical immunosensor.**

C. Han-Zhong^{ab}, J. Jin-Shu^{a*}

^aCollege of Veterinary Medicine, China Agricultural University, Beijing 100094, P.R. China; ^bCollege of Animal Science and Technology, Guangxi University, Nanning 530005, P.R. China

1:30PM–3:00PM **ZOONOSIS 1**

Moderator: A. Cruz-Reyes

Room: Napoleon C3

1:30PM–1:45PM **Detection of *Cryptosporidium parvum* in polluted stream water.**

J.A. Higgins^{*a}, K. Belt^b, C. Hohn^a, D. Shelton^a

^aUSDA-ARS, Beltsville, MD USA; ^bUS Forest Service, Catonsville, MD USA

1:45PM–2:00PM ***Giardia* spp. and *Cryptosporidium* spp. in clams (*Chamelea gallina*) of the Adriatic coast (Italy).**

A. Giangaspero^{*a}, U. Molini^a, R. Iorio^a, D. Nardinocci^a, D. Traversa^a, C. Giansante^b

^aUniversity of Teramo, Italy; ^bIstituto Zooprofilattico dell’Abruzzo e del Molise, Teramo, Italy

2:00PM–2:15PM **Host cell tropism underlies species restriction of human and bovine genotypes of *Cryptosporidium parvum* genotypes.**

A. Hashim^{*}, M. Clyne. B. Bourke, G. Mulcahy

Paediatrics Dept. and Dept. of Microbiology and Parasitology, University College, The Children’s Research Centre, Dublin 12, Ireland

2:15PM–2:30PM **Humans, dogs and parasite zoonoses—unravelling the relationships in a remote endemic community in northeast India using molecular tools.**

R.J. Traub^{*a}, I.D. Robertson^a, P. Irwin^a, N. Mencke^b, P. Monis^c, R.C.A. Thompson^a

^aSchool of Veterinary and Biomedical Sciences, Murdoch University, Western Australia; ^bBayer AG, BHC-Business Group Animal Health, Leverkusen, Germany; ^cAustralian Water Quality Centre, Bolivar, South Australia

2:30PM–2:45PM **Current situation of Chagas’ disease in Mexico.**

A. Cruz-Reyes^{*a}, J.M. Pickering^a, J.B. Malone^b, L. Chias^a

^aInstituto de Biología, Universidad Nacional Autónoma de México, México;

^bPathobiological Sciences, Louisiana State University, Baton Rouge, LA 70803 USA

2:45PM–3:00PM **Congenital Transmission of *Schistosoma japonicum*.**

Q. Baozhen^{*}

Institute of Bioengineering, Zhejiang Academy of Medical Sciences, Hangzhou, Zhejiang 310013 China

1:30PM–3:00PM **NEMATODE MOLECULAR BIOLOGY**

Moderator: J.B. Matthews

Room: Napoleon A2

- 1:30PM–1:45PM ***Caenorhabditis elegans* as a surrogate expression system to study parasite transcription factor function.**
J. Gilleard^{*}, A. Couithier, P. McGarr, J. Smith
Dept. of Veterinary Parasitology, Faculty of Veterinary medicine, University of Glasgow, UK
- 1:45PM–2:00PM **RNAi to study post-embryonic GATA factor function in *Caenorhabditis elegans*: a model for parasitic nematodes?**
J. Smith^{*}, P. McGarr, J. Gilleard
Dept. of Veterinary Parasitology, University of Glasgow, UK
- 2:00PM–2:15PM **Isolation of carbonic anhydrase during exsheathment of *Ostertagia ostertagi* infective third-stage larvae.**
A.A. DeRosa^{*ab}, S.R. Chirgwin^b, J.C. Williams^a, T.R. Klei^{ab}
^aLouisiana State University, Agricultural Experiment Station, Baton Rouge, LA USA;
^bLouisiana State University, School of Veterinary Medicine, Baton Rouge, LA USA
- 2:15PM–2:30PM **Antioxidant enzyme systems in *Haemonchus contortus*: cDNA cloning of antioxidant genes, and role of enzyme induction in protection against oxidative stress.**
A.C. Kotze^{*}, N.H. Bagnall
CSIRO Livestock Industries, Queensland Bioscience Precinct, St. Lucia, QLD 4068, Australia
- 2:30PM–2:45PM **Cloning and expression of acetylcholinesterase genes from *Dictyocaulus viviparus*.**
J.B. Matthews^{*a}, O. Lazari^a, A.S. Hussain^b, M.E. Selkirk^b
^aDepartment of Veterinary Clinical Science, University of Liverpool, South Wirral, UK;
^bDepartment of Biochemistry, Imperial College, London, UK
- 2:45PM–3:00PM **Cloning and characterization of a TGF- β homologue within populations of *Ascaris suum* 4th Stage larvae (L4): regulated transcription and multiple splicing differentiate L4 in the jejunum and ileum during spontaneous cure.**
D.S. Zarlenga^{*a}, M. Morimoto^b, J.F. Urban, Jr.^b, J.P. McCarter^c
^aUSDA-ARS Immunology and Disease Resistance Lab, ANRI; ^bNutrient Requirements and Functions Lab, BHNRC, Beltsville, MD 20705 USA; ^cWashington University School of Medicine, St. Louis, MO USA

1:30PM–2:45PM **HOST RESPONSE/IMMUNITY 1**

Moderator: J.H. Hoglund

Room: Napoleon A3

1:30PM–1:45PM **Assessing the benefit of the immune response toward *Trichostrongylus colubriformis* in sheep.**

A.W. Greer^{*}, M. Stankiewicz, A.R. Sykes

Animal and Food Sciences Division, Lincoln University, New Zealand

1:45PM–2:00PM **Eprinomectin treatment of lungworms in early patency and its influence on development of immunity in young cattle.**

J.H. Hoglund^{*a}, C.G. Nheim^b, S. Alenius^b

^aDepartment of Parasitology (SWEPAR), National Veterinary Institute and Swedish University of Agricultural Sciences, Uppsala, Sweden; ^bDepartment of Ruminant Medicine and Veterinary Epidemiology, Swedish University of Agricultural Sciences, Uppsala, Sweden

2:00PM–2:15PM **Canine demodicosis—A pathological study.**

R. Khanna^{*}, H. Dadhich

Department of Veterinary Pathology, College of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner 334001 (Rajasthan) India

2:15PM–2:30PM **Clinical, Histopathological and immunological aspects of *Neosporosis* in experimentally infected dogs.**

S. Lasri^{*}, C. Rettigner, K. Onclin, F. De Meerschman, C. Focant, B. Mignon, J. Verstegen, B. Losson

Faculty of Veterinary Medicine, University of Liège, Liège, Belgium

2:30PM–2:45PM **Pathological observations on canine sarcopticosis.**

H. Dadhich^{*}, R. Khanna

Department of Veterinary Pathology, College of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner 334001 (Rajasthan) India

3:00PM–3:15PM Break

3:15PM–4:15PM **HOST/PARASITE GENETICS 1**

Moderator: G. von Samson-Himmelstjerna

Room: Napoleon A3

3:15PM–3:30PM **Pyrosequencing analysis identifies discrete populations of *Haemonchus* from small ruminants.**

K. Troell^{*}, J.G. Mattsson, J. Höglund

Department of Parasitology (SWEPAR), Swedish University of Agricultural Sciences and The National Veterinary Institute, Uppsala, Sweden

- 3:30PM–3:45PM **Genes involved in hypobiosis in bovine lungworm.**
C. Strube*, G. von Samson-Himmelstjerna
Thomas Schnieder Institute for Parasitology, Hannover School of Veterinary Medicine, Germany
- 3:45PM–4:00PM **Gene expression patterns in the sheep gastrointestinal nematodes, *Haemonchus* and *Teladorsagia*.**
P.J. Skuce^{a*}, R.H. Somepalli^b, J. Parkinson^c, M. Blaxter^c, D.P. Knox^a
^aMoredun Research Institute, Edinburgh, UK; ^bAbertay University, Dundee, UK; ^cUniversity of Edinburgh, UK
- 4:00PM–4:15PM **Development of population genetic tools for the parasitic nematode *Teladorsagia (Ostertagia) circumcincta*.**
V. Grillo^{a*}, F. Jackson^b, J.S. Gilleard^a
^aDepartment Veterinary Parasitology, University of Glasgow, Glasgow, G61 1QH; ^bMoredun Institute, Edinburgh, Scotland
- 3:15PM–4:15PM **PROTOZOA 2**
Moderator: G. Baneth
Room: Napoleon A2
- 3:15PM–3:30PM **Molecular detection of equine babesia DNA in vector ticks.**
B. Battsetseg^{a*}, X. Xuan^a, N. Inoue^a, B. Byambaa^b, B. Battur^b, D. Boldbaatar^b, I. Igarashi^a, H. Nagasawa^a, J. Fujisaki^a
^aNational Research Center for Protozoan Diseases, Obihiro University, Japan; ^bInstitute of Veterinary Medicine, Mongolia
- 3:30PM–3:45PM **Investigation of the life cycle of *Hepatozoon canis* in the dog and tick *Rhipicephalus sanguineus*.**
G. Baneth^{a*}, V. Shkap^b, M. Samish^b
^aSchool of Veterinary Medicine, The Hebrew University of Jerusalem, Israel; ^bDivision of Parasitology, Kimron Veterinary Institute, Israel
- 3:45PM–4:00PM **Clinico-therapeutic studies in theileriosis in crossbred cattle of thar in India.**
A.P. Singh^{*}, A.K. Gahlot
Department of Clinical Veterinary Medicine, Ethics and Jurisprudence, College of Veterinary and Animal Science, Bikaner 334001, Raj, India
- 4:00PM–4:15PM **Canine trypanosomosis due to *Trypanosoma evansi*: clinical studies.**
G.S. Aulakh^{*}, L.D. Singla, A.C. Sood, S. Kumar, H. Paul, J. Singh
Punjab Agricultural University, Ludhiana 141004, IVRI, Izatnagar, India

3:15PM–4:15PM **CHEMOTHERAPY 1/FELINE**

Moderator: R.G. Arther

Room: Napoleon B3

3:15PM–3:30PM **The Efficacy of two anthelmintics against ascarids and hookworms in naturally infected cats.**

D.G. Catton^{*}, P.C. van Schalkwyk.

P. C. Veterinary Consultants, P. O. Box 1247, Rivonia 2128, Republic of South Africa

3:30PM–3:45PM **Imidacloprid + moxidectin topical solution as a monthly treatment of prevention of heartworm infection (*Dirofilaria immitis*) and control of fleas (*Ctenocephalides felis*) on cats.**

R.G. Arther^{*a}, D.D. Bowman^b, J.W. McCall^c, O. Hensen^d, D.R. Young^c

^aBayer HealthCare, Shawnee Mission, Kansas, USA; ^bCHK, Stanwood, Michigan, USA;

^cTRS Athens, Georgia, USA; ^dBayer A, Monheim, Germany; ^eYVRS, Turlock, California, USA

3:45PM–4:00PM **The anthelmintic efficacy and the safety of a combination of imidacloprid and moxidectin spot-on in cats and dogs under field conditions in Europe.**

K. Hellmann^a, T. Knoppe^a, I. Radeloff^a, J. Heine^{b*}

^aKlifovet AG, Munich, Germany; ^bBayer AG, BHC, AH RD Parasitocides, Leverkusen, Germany

4:00PM–4:15PM **The activity of selamectin (Revolution[®]) and imidacloprid (Advantage[®]) against cat flea (*Ctenocephalides felis*) in carpeting.**

V. Cracknell^a, P. Doherty^b, M. Murphy^b, T. McTier^{*c}, N. Evans^d

^aPfizer Animal Health Group (PAHG), Sandwich, UK; ^bRBK House, Irishtown, Athlone, Co. West Meath, Ireland; ^cPfizer Inc. PAHG, Croton, CT USA; ^dPfizer Inc. PAHG, New York, NY USA

3:15PM–4:15PM **HOST RESPONSE/IMMUNITY 2**

Moderator: J. Poot

Room: Napoleon C3

3:15PM–3:30PM **Studies on the antigenicity of invariant surface proteins of *Trypanosoma evansi*.**

J. Cai^{a*}, Z. Wang^b, Y. Shen^b

^aLaboratory of Veterinary Parasitology, Institute of Veterinary Science, Guangdong Academy of Agricultural Sciences, Guangzhou 510640, China; ^bDepartment of Veterinary Parasitology, School of Veterinary Science, Nanjing Agricultural University, Nanjing 210095, China

3:30PM–3:45PM **Optimization of a *Leishmania infantum* challenge model in hamsters.**

J. Poot^{*a}, E.M. Kuhn^a, H. Denise^b, J.C. Mottram^b, G.H. Coombs^b, A.N. Vermeulen^a

^aIntervet International BV, Boxmeer The Netherlands; ^bUniversity of Glasgow, Glasgow, UK

3:45PM–4:00PM **Sheep scab: Immunosuppression with Cyclosporin A reduces mite numbers and lesion area.**
J.F. Huntley^{*a}, A. Van den Broek^a, W.D. Smith^a, D. Pettit^a, J. Machell^a, A. Mackellar^a, L. Neikle^a, B.B. Thind^b, H.L. Ford^b, M. Taylor^b
^aMoredun Research Institute, Edinburgh, Scotland; ^bCentral Science Laboratory, York, England

4:00PM–4:15PM **The reactivation of *Neospora caninum* chronic infection in pregnant mice.**
C. Rettigner^{*}, F. DeMeerschman, C. Focant, B. Losson
Laboratory of Parasitology and Pathology of Parasitic Disease, Faculty of Veterinary Medicine, Department of Infectious Parasitic Diseases, University of Liège, Boulevard de Colonster, 20, 4000, Liège, Belgium

3:15PM–4:00PM **CHEMOTHERAPY 2/ECTOPARASITES**
Moderator: L. Cramer
Room: Maurepas

3:15PM–3:30PM **Efficacy of FRONTLINE[®] Plus (fipronil/(S)-methoprene) for cats against developing stages and adult fleas (*C. felis*).**
P.C. Jeannin^a, S.E. Green^{b*}, A. Boeckh^b
^aMerial France; ^bMerial USA

3:30PM–3:45PM **Study to compare the efficacy and safety of FRONTLINE[®] Plus (fipronil/(S)-methoprene) and FRONTLINE[®] Spot-On ticks in dogs under field conditions in Japan.**
Y. Yamane^a, K. Takashima^a, G. Kinoshita^b, T. Nagata^b, A. Boeckh^c, L. Cramer^{c*}
^aAnimal Research Foundation, Japan; ^bMerial Japan; ^cMerial USA

3:45PM–4:00PM **Efficacy of FRONTLINE[®] Plus (fipronil/(S)-methoprene) for dogs against developing stages and adult fleas (*C. felis*).**
D. Young^a, P.C. Jeannin^b, A. Boeckh^{c*}, M. Soll^c
^aYoung Veterinary Research Services, CA USA; ^bMerial France; ^cMerial USA

4:15PM–5:45PM **NOVARTIS SYMPOSIUM: NONCOMPLIANCE IN PARASITE CONTROL.**
Moderator: D.G. Stansfield, Novartis Animal Health
Room: Napoleon BC12

What you don't know can hurt you.
B. Blagburn
Auburn University

Liability Costs Associated with Noncompliance.
C.A. LaCroix

5:45PM–6:00PM **BAYER RESEARCH AWARD**

Room: Napoleon BC12

6:00PM–7:30PM **BAYER ANIMAL HEALTH SYMPOSIUM: PETS, PARASITES, PRODUCT SOLUTIONS**

Moderator: B. Blagburn

Room: Napoleon BC12

Evaluation of a combination containing imidacloprid and permethrin for prevention of *Borrelia burgdorferi* transmission from black-legged ticks (*Ixodes scapularis*) to *Borrelia burgdorferi*-free dogs.

B.L. Blagburn*, J.A. Spencer , J.M. Butler, C.C. Dykstra, K.C. Stafford, M.B. Pough, S.A. Levy , D.L. Bledsoe

Repellent efficacy of a combination containing imidacloprid and permethrin against the sand fly *Phlebotomus papatasi* on dogs.

P. Volf, V. Volf, D. Stanneck, N. Mencke*

Evaluation of the efficacy of an Imidacloprid 10% / Moxidectin 1% Spot-on against *Otodectes cynotis* in cats.

L.J. Fourie*, D.J. Kok, J. Heine

Larvicidal and adulticidal efficacy of an imidacloprid and moxidectin topical formulation against endoparasites in cats and dogs.

G. von Samson-Himmelstjerna*, C. Epe, A. Schimmel, J. Heine

7:45PM–8:00PM **MARCH TO BAYER RECEPTION — Hotel Lobby**

8:00PM– **BAYER RECEPTION — Aquarium of the Americas**

TUESDAY, AUGUST 12, 2003

7:30AM–8:45PM POSTER SESSION 1—CONTINENTAL BREAKFAST

Room: Armstrong

Posters will be exhibited Tuesday and Wednesday. Odd numbered posters will be tended by authors on Tuesday. Even numbered posters will be tended by authors on Wednesday. Note – When referring to poster abstracts, they are listed in alphabetical order by the presenter (*).

1. **Comparative resistance to *Haemonchus* parasites and efficiency of Red Maasai and Dorper sheep in a sub-humid and a semi-arid environment in Kenya.**
J.M. Mugambi^{a*}, R.L. Baker^a, J.O. Audho^a, A.B. Carles^b, W. Thorpe^a
^aInternational Livestock Research Institute (ILRI), P.O. Box 30709, Nairobi, Kenya; ^bP.O. Box 23220, Nairobi, Kenya
2. **Characterization of microneme-rhoptry associated protein of *Theileria orientalis*.**
J.-Y. Kim*, N. Yokoyama, S. Kumar, N. Inoue, K. Fujisaki, C. Sugimoto
National Research Center for Protozoan Diseases, Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan
3. **Responses of West African Dwarf goats to abbreviated escalating infections with *Haemonchus contortus*.**
B.B. Fakae^{a*}, S.N. Chiejina^a, G.A. Musongong^b, L.A. Ngongeh^a, J.M. Behnke^c, D. Wakelin^c
^aFaculty of Veterinary Medicine, University of Nigeria, Nsukka, Nigeria; ^bWakwa Regional Centre for Agricultural Research for Development, Ngaoundere, Cameroon; ^cSchool of Life and Environmental Sciences, University of Nottingham, Nottingham NG7 2RD, UK
4. **Morphological identification of *Rhinoestrus purpureus* vs. *Rhinoestrus usbekistanicus* nasal bot flies of horses: more doubts than evidences.**
D. Otranto*, P. Milillo, R. Lia
Department of Animal Health and Welfare, Faculty of Veterinary Medicine, University of Bari, Italy
5. **Echinococcosis in Sardinia (Italy).**
A. Varcasia^a, R. Malgor^b, G. Poglayen^c, G. Garippa^a, A. Scala^{a*}
^aDipartimento di Biologia Animale, Sezione di Parassitologia e Malattie Parassitarie, Università di Sassari, Italy; ^bUnidad de Biología Parassitaria, Facultad de Ciencias, Montevideo, Uruguay; ^cUniversità degli Studi di Messina, Italy
6. **Effect of worm burdens in goats on the livelihoods of smallholder farmers.**
G.M. Hood^{a*}, A.M.P. Alo^b
^aInternational Livestock Research Institute, Los Baños, Philippines; ^bPhilippine Council for Agriculture, Forestry and Natural Resources Research and Development, Los Baños, Philippines

7. **Treatment of cattle with an abamectin pour on had no adverse effect on dung beetle populations in Australia.**
P.J. Martin^{a*}, M. Friend^b, L. Lawrence^{a*}
^aVirbac (Australia) Pty Limited, Locked Bag 1000, Peakhurst NSW 2210; ^bVeterinary Health Research Pty Ltd Trevenna Rd, West Armidale NSW, 2350, Australia

8. **Effect of three levels of artificial *Haemonchus contortus* infection on the pathophysiology and worm populations of Criollo kids in Yucatan, Mexico.**
A.J. Aguilar-Caballero*, J.F. Torres-Acosta, H. Hoste, C. Sandoval-Castro, M. May-Martínez
Facultad de Medicina Veterinaria y Zootecnia, Universidad Autonoma de Yucatan, Merida, Yucatan, Mexico

9. **Ocurrence of *Thelazia callipaeda* (Spirurida, Thelaziidae) in dogs in the Basilicata region (Southern, Italy): an epidemiological puzzle?**
D. Otranto, R. Lia, N. Leone*, P. Milillo
Department of Animal Health and Welfare, Faculty of Veterinary Medicine, University of Bari, Italy

10. **Ticks, tick-borne pathogens and maps: the challenge of forecasting habitat suitability for stable populations.**
A. Estrada-Peña*
Dept. of Parasitology, Veterinary Faculty, Miguel Servet 177. 50013-Zaragoza, Spain

11. ***Echinococcus multilocularis* in Wallonia (Southern Belgium): spatial distribution of a carriage by the red fox (*Vulpes vulpes*) and preliminary results in the musk rat (*Ondatra zibethicus*), a potentially important intermediate host.**
R.V. Hanosset^{a*}, B. Brochier^b, B.R. Mignon^a, B.J. Losson^a
^aParasitology and Parasitic Diseases, Faculty of Veterinary Medicine, University of Liège, Belgium;
^bSection of Virology of the Scientific Institute of Public Health

12. **Prevalence and intensity of *Haemonchus* species from bull fighting animals at the Plaza Mexico.**
M.C. Guerrero*, M.B. Vargas
Departamento de Parasitología, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Ciudad Universitaria, C:P: 04510, México D.F

13. ***Haemonchus contortus* genome map.**
J. Gilleard^{a*}, J. Smith^a, F. Jackson^b, B. Barrell^c, N. Hall^c, A. Ivens^c, P. Dear^d
^aFaculty of Veterinary Medicine, University of Glasgow, U.K.; ^bMoredun Research Institute, Edinburgh, U.K.; ^cPathogen Sequencing Unit, Sanger Centre, Cambridge, U.K.; ^dMRC-LMB, Cambridge, U.K.

14. **Prevalence of *Giardia* spp. in dogs and humans in northern and central Italy.**
G. Capelli^b, A.F. di Regalbono^b, R. Iorio^a, M. Pietrobelli^b, B. Paoletti^a, P. Bianciardi^c, A. Giangaspero^{a*}
^aUniversity of Teramo, Italy; ^bUniversity of Padua, Italy; ^cBayer S.P.A., Animal Health Division

15. **Association between *Ascaris suum* and *Salmonella enterica* in finisher herds.**
J. Boes*, C. Enøe

The National Committee for Pig Production, Danish Bacon & Meat Council, Axeltorv 3, DK-1609 Copenhagen, Denmark

16. **Statistics of sickness of larval echinococcosis of the population and agricultural animals in the Russian Federation in 1989-2001.**
F.P. Kovalenko^a, N.I. Perchun^b, N.N. Darchenkova^a, V.B. Yastreba^b, A.S. Bessonov^{b*}, E.A. Chernikova^a
^aI.M. Sechenov Moscow Medical Academy, Moscow, Russia; ^bK.I. Skryabin Institute of Helminthology, Moscow, Russia
17. **The relationship between larval length and larval mass of a reference strain of *Lucilia sericata* (sheep blowfly).**
M.R. Rankin*
Parasitology Section, Scientific Services Unit, Veterinary Laboratory Agency (Weybridge), United Kingdom
18. **Detection and identification of *Cryptosporidium* species in dairy farms in southern China.**
G.Q. Li*, F.Y. Xiang, S.M. Xiao, S. Kanu, X.Q. Zhu
South China Agricultural University, College of Veterinary Medicine, Guangzhou 510642, P.R. China
19. **Diagnosis and prevalence of tapeworms in horses in the southwestern USA. G. Howard, K. Snowden***
College of Veterinary Medicine, Texas A&M University, College Station, Texas USA
20. **Examination of the strongylid community of brood horses in Ukraine by the diagnostocal deworming method.**
T.A. Kuzmina*, A.I. Starovir
Institute of Zoology, NAS of Ukraine, 15, B. Khmelnytsky Str., Kyiv, 01601, Ukraine
21. **Improved diagnosis of isosporosis in suckling piglets.**
A. Joachim^{a*}, A. Dauschies^b, B. Ruttowski^b, H.C. Mundt^c
^aInstitute for Parasitology and Zoology, University of Veterinary Medicine Vienna, Austria; ^bInstitute of Parasitology, University of Leipzig, Germany; ^cBayer AG, Leverkusen, Germany
22. **Treatment of *Neotrombicula*-associated dermatitis in dogs using topical permethrin-pyriproxyfen combination.**
D. Smal^a, P. Jasmin^{b*}, P. Mercier^b
^aDVM, Veterinary Clinic, 59 450 Siin Le Noble, France; ^bDVM, Medical Department, Virbac S.A., 06 511 Carros, France
23. **Effects of long-term storage on Brazilian nematode trapping fungi isolates.**
M.A. Mota^{a*}, A.K. Campos^a, M.P. Guimarães^a, J.V. Araújo^b
^aDepartamento de Parasitologia, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil; ^bDepartamento de Veterinária, Universidade Federal de Viçosa, Viçosa, Brazil
24. **Premunization of Criollo kids by use of a single viable dose of *Haemonchus contortus* before natural infection with gastrointestinal nematodes.**

- A. Aguilar Caballero, J.F. Torres-Acosta*, N. Ojeda-Robertos, L. Canul-Ku, L. Cob-Galera, J. Vargas-Magaña
FMVZ-Universidad Autonoma de Yucatan, Merida, Yucatan, Mexico
25. **Evaluation of non-chemotherapeutic approaches to the control of pasture borne parasites in cattle.**
A. Larsson*, J. Höglund, P.J. Waller, S-O. Dimander, A. Uggla
Department of Parasitology (SWEPAR), SE- 751 89 Uppsala, Sweden
26. **Study to compare the efficacy and safety of FRONTLINE® Plus (fipronil/(S)-methoprene) and FRONTLINE® Spot-On against ticks in cats under field conditions in Japan.**
Y. Yamane^a, K. Takashima^a, G. Kinoshita^b, T. Nagata^b, A. Boeckh^c, L. Cramer^{c*}
^aAnimal Clinical Research Foundation, Japan; ^bMerial Japan; ^cMerial USA
27. **Modulation of blood uptake by horn flies (*Haematobia irritans irritans*) following vaccination with recombinant thrombostasin.**
M.S. Cupp^{a*}, E.W. Cupp^a, N. Wisniewski^b, D. Zhang^a, C. Navvare^c, V. Panangala^c
^aDepartment of Entomology and Plant Pathology, Auburn University, Alabama USA; ^bHeska Corporation, Fort Collins, Colorado USA; ^cCollege of Veterinary Medicine, Auburn University, Alabama USA
28. **What horse owners do to control internal parasites: time for more veterinary involvement?**
E.M. Abbott*
Abbott Associates, Lutterworth, UK
29. ***In vitro* measurements of anthelmintic effects of tanniferous plants on third stage larvae of parasitic nematodes of the gastrointestinal tract.**
V. Paolini^a, I. Fouraste^b, Ph. Dorchie^{a*}, H. Hoste^a
^aUMR 1225 INRA/DGER, Toulouse, France; ^bUniversité P. Sabatier, Toulouse, France
30. **A survey of anthelmintic drench efficacy in U.K. goat farms.**
V. Grillo^{a*}, F. Jackson^b, J.S. Gilleard^a
^aDepartment Veterinary Parasitology, University of Glasgow, Glasgow, G61 1QH; ^bMoredun Institute, Edinburgh, Scotland
31. ***In vitro* evaluation of inhibitory potential of plant nematode biocontrol agents and plant pathogenic fungi against *Arthrobotrys musiformis*.**
H.A. Prajapato^{a*}, J.B. Chauhan^a, R.B. Subramanian^a, P.K. Sanyal^b
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32. **Expression and identification of *Eimeria tenella* gene TA4.**
S.Q. Wu, J.J. Jiang*, Q. Liu, Y.J. Zhu
College of Veterinary Medicine, China Agricultural University, Beijing, China
33. **Clone and sequence analysis of gene Et1A of *Eimeria tenella* BJ strain.**

S.Q. Wu, J.J. Jiang*

College of Veterinary Medicine, China Agricultural University, Beijing, China

34. **Molecular characterization of *Giardia* from Italian dogs at the β -giardin locus.**
S.M. Cacciò^a, G. Capelli^{b*}, M. Lalle^a, L. Gnoato^b, E. Pozio^a
^aInstituto Superiore di Sanità, Rome, Italy; ^bUniversità di Padova, Italy

35. **Insecticidal activity of haircoat of dogs treated by their owners with fipronil spot-on spray.**
P. Bourdeau*, B. Larhantec, A.M. Marchand
Ecole Nationale Vétérinaire de Nantes

36. **The status of resistance to chemical ixodicides of the tick *Rhipicephalus sanguineus* (Acari: Ixodidae) in Spain.**
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Dept. of Parasitology, Veterinary Faculty, Miguel Servet, 177, 50013-Zaragoza, Spain

37. **Efficacy of toltrazuril against artificial infections with *Eimeria bovis* in calves.**
H.C. Mundt^{a*}, A. Dauschies^b, F. Uebe^a, M. Rinke^c
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38. **Diffusion and residual activity of insecticide formulations in haircoat of dogs: An example with fipronil spot-on and spray.**
P. Bourdeau*, B. Larhantec, A.M. Marchand
Ecole Nationale Vétérinaire de Nantes

39. **A reproductive safety study with EQIMAXTM Paste (1.87% ivermectin / 14.03% praziquantel) in mares.**
L.R. Cruthers^a, R.L. Slone^a, B.C. Tu^b, F.W. Goodman^{b*}, S.V. Radecki^c
^aProfessional Laboratory and Research Services, Inc., Corapeake, North Carolina USA; ^bVirbac A.H., Inc., Fort Worth, Texas USA; ^cStatistical Consultant, Fort Collins, Colorado USA

40. **In vitro ovicidal activity of extracts *Annona squamosa* Linn against *Haemonchus contortus*.**
M.M.C. Souza, C.M.L. Bevilaqua*, C.T.C. Costa, S.M. Morais, A.R.A. Silva
Pos-graduação em Ciências Veterinárias Universidade Estadual do Ceará, Brazil

41. **Changes of enzymes activity in urine of cotton rats infected with larval *Echinococcus multilocularis* at radical chemotherapy of experimental infection.**
F.P. Kovealenko^a, E.A. Chernikova^a, G.N. Dubinina^a, A.S. Bessonov^{b*}, N.I. Perchun^b
^aI.M. Sechenov Moscow Medical Academy, Moscow, Russia; ^bK.I. Skrjabin Institute of Helminthology, Moscow, Russia

42. **Comparison of serum pharmacokinetics and weight gain after administration of macrocyclic lactones via transdermal and subcutaneous delivery methods.**
S.R. Barber^{a*}, M. Alvinerie^b, P.I. Veale^c, G.A. Anderson^d, V.M. Bowles^a
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43. **Safety of ivermectin and praziquantel on the reproductive performance of stallions.**
E.L. Squires^a, B.C. Tu^b, I.C. Villard^{b*}
^aColorado State University, Fort Collins, Colorado 80523 USA; ^bVirbac A.H. Inc, Fort Worth, TX 76137 USA
44. **Efficacy of an experimental fasciolicide against immature and mature *Fasciola hepatica* in artificially infected calves.**
Y. Vera^{a*}, F. Ibarra^a, H. Quiroz^a, E. Liébano^b, A. Hernández^c, R. Castillo^c, P. Ochoa^c
^aDepto. De Parasitología, Fac. de Med. Vet. Y Zoot., UNAM. Cd. Universitaria 04510, México, D.F.
45. **Putative predication of macrocyclic lactones *in vivo*-disposition using an original pharmacological parameter [Vp50] obtained from transport experiments in P-glycoprotein-expressing cells.**
A. Roulet^{a*}, A. Bousquet-Mélou^b, D. Concordelet^b, J. Dupuy^a, A. Lespine^a, M. Alvinerie^a, T. Pineau^a
^aLaboratory of Pharmacology and Toxicology, I.N.R.A., Toulouse, France; ^bUMR 181 I.N.R.A.-Ecole Nationale Vétérinaire, Toulouse, France
46. **Effect of the weight gain and egg elimination in calves treated with ivermectin.**
H. Quiroz^{a*}, F. Ibarra^a, E. Liébano^b, J. Cruz^a, E. Ramos^a, P. Ochoa^a
^aFacultad de Medicina Veterinaria y Zootecnia, UNAM, 04510, México, D.F.
47. **Treatment of *Toxoplasma gondii* infections in Pallas's Cat (*Otocolobus manul*) kittens with clindamycin.**
H. Prosl^{a*}, W. Basso^b, R. Edelhofer^a, W. Zenker^c
^aInstitute for Parasitology and Zoology, University of Veterinary Medicine Vienna, Austria; ^bFaculty of Veterinary Sciences, University of La Plata, Argentina; ^cSchoenbrunn Zoo, Vienna, Austria
48. **Efficacy of oxyclozanide (Zanil[®]) on natural ovine fasciolosis.**
A. Paz-Silva^{*}, R. Sánchez-Andrade, J.L. Suárez, J. Pedreira, C. Lomba, P. Díaz, R. Panadero, P. Díez-Baños, P. Morondo
Parasitología y Enfermedades Parasitarias, Dpto. Patología Animal. Facultad de Veterinaria, Universidad de Santiago de Compostela, 27002-Lugo, Spain
49. **Efficacy of Nilzan Plus[®] on the bovine parampsitosis.**
A. Paz-Silva^{*}, R. Sánchez-Andrade, J.L. Suárez, J. Pedreira, M. Arias, P. Díaz, C. López, P. Díez-Baños, P. Morondo
Parasitología y Enfermedades Parasitarias, Dpto. Patología Animal. Facultad de Veterinaria, Universidad de Santiago de Compostela, 27002-Lugo, Spain
50. **Synergistic effects of pyrantel and the febantel metabolite fenbendazole on adult *Toxocara canis* worms.**
H. Mehlhorn^{a*}, E. Hanser^a, O. Hansen^b, A. Harder^b, N. Mencke^b, R. Schaper^b
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51. Determination of the effective dose of an experimental fasciolicide in experimentally infected cattle.

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52. Progress of the international work of the “Imidacloprid Flea Susceptibility Monitoring Team.”

I. Schroeder^a, B.L. Blagburn^b, D.L. Bledsoe^c, R. Bond^d, I. Denholm^d, M.W. Dryden^e, D.E. Jacobs^f, H. Mehlhorn^g, N. Mencke^a, P. Payne^e, M.K. Rust^h, M.B. Vaughn^{c*}

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53. Selective changes in cholinergic receptor subtypes associated with levamisole resistance in *Oesophagostomum dentatum*.

R.J. Martin^{*}, C.L. Clarke, A.P. Robertson

Department of Biomedical Sciences, Iowa State University, Ames, IA 50011 USA

54. Oxibendazole efficiency against fenbendazole-resistant horse strongyles in Lithuania.

A. Vyšniauskas, S. Petkevičius, A. Pereckienė, V. Kaziūnaitė^{*}

Laboratory of Parasitology, Institute of Veterinary, Lithuanian Veterinary Academy, Vilnius, Lithuania

55. In vitro breeding and testing of *Ctenocephalides felis* for insecticide resistance.

K.A. Stafford, G.C. Coles^{*}

Department of Clinical Veterinary Science, University of Bristol, Langford House, Bristol, BS40 5DU, UK

56. Isolation and characterization of a Diclazuril resistant strain of *Eimeria acervulina*.

C.M. Brown^{*}, J.S. Mathew, T. Tama, T. Biftu, D.R. Thompson

Merck & Co., Somerville, New Jersey USA

57. Influence of management in benzimidazole anthelmintic resistance dissemination in sheep flocks.

A.C.F.L. Melo, F.C.M. Rondon, I.F. Reis, C.M.L. Bevilacqua^{*}

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58. Transmission of anthelmintic resistance in sheep in West Java, Indonesia.

Berijaya^{a*}, D. Haryuningtyas^a, A. Husein^a, G.M. Hood^b, G.D. Gray^b

^aResearch Institute for Veterinary Science, Bogor, Indonesia; ^bInternational Livestock Research Institute, Los Baños, Philippines

59. Flea allergy dermatitis (FAD) in the cat: Establishment of a functional in vitro test (FIT).

K. Stuke^a, G. von Samson-Himmelstjerna^{a*}, N. Mencke^b, O. Hansen^c, T. Schnieder^a, W. Leibold^d

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^bBayer AG, BHC Business Group Animal Health, Monheim Germany; ^cBayer Vital, Monheim Germany

60. **Skin immune response in cattle after primary and secondary infections with *Hypoderma lineatum* (Diptera: Oestridae) larvae.**
C. López^{a*}, D.D. Colwell^b, R. Panadero^a, A. Paz^a, J. Perez^b, P. Morrondo^a, P. Díez^a, A. Bravo^c
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61. **Protein supply to lactating ewes affects *in vitro* larval establishment of abomasal nematodes.**
J.G.M. Houdijk^{a*}, Q. Versteegh^a, I. Kyriazakis^a, L. Stenhouse^b, F. Jackson^b, R.L. Coop^b
^aAnimal Nutrition and Health Department, Scottish Agricultural College, Edinburgh, UK; ^bMoredun Research Institute, Penicuik, UK
62. **Tissue immune response to *Toxoplasma gondii* infection in pigs.**
S.M. Nishi^{a*}, H. Dawson^b, J.P. Dubey^c, J.F. Urban^b, J.K. Lunney^a
^aImmunology and Disease Resistance Lab; ^bNutrient Requirements and Functions Lab, BHNRC, ARS, USDA, Beltsville, MD 20705 USA; ^cParasite Biology, Epidemiology and Systematics Lab, ANRI, Beltsville, MD USA
63. **Detection of anti-Ex *Toxocara vitulorum* IgG antibodies in colostrum and serum of buffalo calves and cows by immunoblotting.**
W.A. Starke-Buzetti^{*}, F.P. Ferreira
Departamento de Biologia e Zootecnia, UNESP-Campus de Ilha Solteira, SP, Brazil
64. **Cloning and expression of the major secreted cathepsin B from juvenile *Fasciola hepatica* and analysis of immunogenicity following liver fluke infection.**
R.H.P. Law^{ab}, P.M. Smooker^c, J.A. Irving^a, R. Ponting^b, D. Piedrafita^a, N.J. Kennedy^{ab}, J.C. Whisstock^a, R.N. Pike^a, T.W. Spithill^{abd*}
^aMonash University, Clayton, Australia; ^bCooperative Research Centre for Vaccine Technology, Brisbane, Australia; ^cRMIT University, Bundoora, Australia; ^dMcGill University, Montreal, Canada
65. **No increase in serum acute phase proteins in subclinical *Trichinella* infection in reindeer (*Rangifer t. tarandus*).**
T. Soveri^{a*}, T. Orro^a, A. Oksanen^b
^aUniversity of Helsinki, Finland; ^bNational Veterinary and Food Research Institute, EELA, Finland
66. **Estimation of protective activity of specific and nonspecific antigens at experimental secondary alveolar echinococcosis of laboratory rodents.**
F.P. Kovalenko^a, E.A. Chernikova^a, N.E. Ballad^a, N.I. Perchun^b, A.S. Bessonov^{b*}
^aI.M. Sechenov Moscow Medical Academy, Moscow, Russia; ^bK.I. Skrjabin Institute of Helminthology, Moscow, Russia
67. **Morphological studies on the extra-cellular structure of the midgut of a tick, *Haemaphysalis longicornis* (Acari: Ixodidae).**
T. Matsuo^{*}, M. Sato, N. Inoue, N. Yokoyama, D. Taylor, K. Fujisaki

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68. Withdrawn.

69. Hints for transmission of feline leukemia virus (FeLV) by the cat flea (*Ctenocephalides felis*).

M. Vobis^{a*}, J. D'Haese^a, H. Mehlhorn^a, N. Mencke^b

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70. Tick-transmitted infections in New Caledonian dogs: a geographically isolated canine and tick population.

S.E. Shaw^{a*}, F. Beugnet^b, M.J. Day^a, M.J. Kenny^a

^aUniversity of Bristol, Langford, Somerset, UK; ^bMerial, Lyon, France

71. Hard ticks (Acarina, Ixodidae) found on domestic carnivores in Belgium: a survey conducted during three consecutive years.

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72. *Anaplasma (Ehrlichia) phagocytophilum* infection in a UK fallow deer (*Dama dama*) herd.

M.J. Kenny^{a*}, I. Parsons^b, S.E. Shaw^a, F. Beugnet^c

^aDept. Of Clinical Veterinary Sciences, University of Bristol, Langford, Somerset, UK; ^bPeninsula Forest District, Forest Enterprise, Kennford, Devon, UK; ^cMerial Lyon, France

73. Treatment of sarcoptic mange in cattle with topical eprinomectin: effects on productivity and behaviour.

S. Rehbein^{a*}, M. Visser^a, S. Hoy^b, M. Ziron^b, R. Winter^a, A.E. Maciel^c, S.E. Marley^c

^aMerial GmbH, Katherinehof RC, Rohrdorf, Germany; ^bUniversity of Gießen, Gießen, Germany; ^cMerial, Duluth, GA, USA

74. Frequency of Oestrus ovis in goats sacrificed in the municipal slaughterhouse of Culiacán, Sinaloa, México.

C.S. Gaxiola^{a*}, I.J. Borbolla^a, M.M. Quintero^b, del C.N. Castro^a, R.M. Rubio^a

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^bMéxico Autonomous National University-FMVZ

75. The effect of *Amblyomma cajennense* and *Rhipicephalus sanguineus* saliva on the *in vitro* proliferative responses of T lymphocytes from BALB/c mice.

M. Hlatshwayo^{a*}, B.R. Ferreira^b, P.A. Mbato^a

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Phuthaditjhaba, 9866, South Africa; ^bDepartment of Immunology and Biochemistry, School of Medicine of Ribeirao Preto, University of Sao Paulo, 14049-900, Ribeirao Preto-SP, Brazil

76. Monthly prevalence of strongylid infection thoroughbred horses from four farms in the states of Aragua and Carabobo, Venezuela.

- A. Pérez Mata*
Parasitology Department, School of Vet. Sciences, Universidad Central de Venezuela Maracay, Edo. Aragua, Venezuela, Apdo 4563
77. ***Wolbachia* in sucking lice.**
G. Kyei-Poku, D.D. Colwell*, P. Coghlin, K. Floate
Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB., Canada
78. **Experimental production of necrotic enteritis and its use for studies on the relationship between necrotic enteritis and coccidiosis in chickens.**
R.N. Marshall^{a*}, R.B. Williams^b, R.M. La Ragione^a, J.A. Marshall^a
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79. **Population biology studies on *Isospora suis* in piglets.**
H.C. Mundt^{a*}, A. Joachim^b, A. Dauschies^c, M. Zimmermann^c
^aBayer AG, Animal Health Business Group, Clinical Development, Leverkusen, Germany; ^bInstitute for Parasitology and Zoology, University of Veterinary Medicine, Vienna, Austria; ^cInstitute for Parasitology, Faculty of Veterinary Medicine, University of Leipzig, Leipzig, Germany
80. **Use of different antiparasitic drugs in the treatment of experimental murine encephalitozoonosis.**
J.M. Castro, M.A. Lallo*, E.F. Bondan
University Paulista (UNIP), São Paulo, Brazil
81. **Detection of *Cryptosporidium* oocysts in stools of opossums from a deforestation area around São Paulo (Brazil).**
M.A. Lallo*, F. Bastos, S. Favorito, E.F. Bondan
University Bandeirante of São Paulo (UNIBAN), São Paulo, Brazil
82. **Seroprevalence of *Toxoplasma gondii* antibodies in the rodent capybara (*Hydrochoeris hydrochoeris*) from Brazil.**
S.M. Gennari^{a*}, W.A. Cañon-Franco^a, L.E.O. Yai^b, A.M. Joppert^c, C.E. Souza^d, S.R.N. D'Auria^c, J.P. Dubey^e
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83. **Seasonal variations in the growth and maturation of *Acanthocephalus anguillae* (Muller 1780) in fishes from the Vistula river with particular reference to the *Leucisus idus* (L.) and bream *Abramis brama* (L.).**
A. Kamara*
W. Stefanski Institute of Parasitology, Polish Academy of Sciences, UI, Twarda 51/55, 00-818 Warsaw, Poland
84. **Presence of *Polygenis gwyni* (Fox 1941, Siphonaptera Rhopalopsyllidae) on *Ototylomys phyllotis* (Rodentia Muridae) in Yucatan, México.**

M.M.T. Quintero^{a*}, S. Hernández^b, P. García^b, N.J. Otero^a, V.G. Juárez^a

^aFacultad de Medicina Veterinaria y Zootecnia, UNAM, México, D.F. C.P. 04510; ^bFacultad de Medicina Veterinaria y Zootecnia Universidad Autónoma de Yucatan, México

85. Expression of *Babesia equi* EMA-1 and EMA-2 during merozoite developmental stages in erythrocyte and their erythrocytic binding affinity.

S. Kumar^{*}, N. Yokoyama, J-Y. Kim, X. Huang, N. Inoue, X. Xuan, I. Igarashi, C. Sugimoto

National Research Center for Protozoan Diseases, Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Hokkaido, Japan

86. Importation of exotic reptile ticks, and associated pathogens, into the UK.

M.J. Kenny^a, A.B. Forbes^b, S.E. Shaw^a

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87. On the biology *Eimeria macusaniensis*, an intestinal parasite of South American camelids.

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88. Recombinant chicken IFN- γ inhibits broiler coccidiosis and enhances immunity of coccidial vaccine.

Y. Xiuhua, W. Zhiguang, W. Ming^{*}

College of Veterinary Medicine, China Agricultural University, Beijing, P.R. China

89. Mites of the mange in dogs of Culiacán, Sinaloa, Mexico.

C.S. Gaxiola^{a*}, I.J. Borbolla^a, M.M. Quiintero^b, del C.N. Castro^a, R.M. Rubio^a

^aVeterinary Faculty of Medicine and Zootecnia of the Sinaloa Autonomous University, Sinaloa, México;

^bMéxico Autonomous National University-FMVZ

90. A case of imported *Spirocerca lupi* infection in a dog from Italy: histological and immunohistochemical report.

L. Kramer^{a*}, L.E. Calvi^a, B. Passeria, C. Vernasconi^b, R. Capitelli^b

^aUniversity of Parma Veterinary School; ^bClinica Veterinaria “San Siro”, Italy

91. Parasitism prevalence in breeding puppies around weaning.

H. André^a, B. Polack^{a*}, P. Pierson^b

^aEcole Nationale Vétérinaire d'Alfort, Maisons-Alfort, France; ^bRoyal Canin, Aimargues, France

92. Endoparasites in dogs and cats in Germany 1999–2002.

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^aVeterinary Laboratory Freiburg, Postfach 100120, D 79120 Freiburg i.Br., Germany; ^bBayer Health, D 51368 Leverkusen, Germany

93. **Molecular detection of *Anaplasma (Ehrlichia) phagocytophilum* comb. nov. (Rickettsiales, Anaplasmataceae) in dogs and ticks.**
A. Giangaspero^a, B. Paoletti^a, D. Traversa^{a*}, O.A.E. Sparagano^b
^aDipartimento di Scienze Biomediche Compare, University of Teramo, Italy; ^bSchool of Agriculture, University of Newcastle, UK
94. **Prevalence of and factors associated with shedding *Cryptosporidium* spp in domestic cats.**
L.G. Rickard*, R. Vasilopoulos, A. Mackin, C. Huston, C. Panuska, G.T. Pharr
College of Veterinary Medicine, Mississippi State University, Mississippi State, MS USA
95. **Some data about *in vitro* culture of *Polygyra* sp intermediate host of *Muellerius capillaris*.**
A. Huesca^{a*}, M. Quintero^a, E. Naranjo^b
^aFMVZ, UNAM 04510, México, D.F.; ^bInstituto de Biología, UNAM; 04510, México D.F.
96. **Ked (*Melophagus ovinus*) transmission: burden on lambs from affected flocks and remnant populations after shearing.**
F.V. Olaechea*, J. Corley
National Institute for Agricultural Technology (INTA), cc. 277, (8400) Bariloche, Argentina
97. **Tegumental surface in adult flukes by scanning electron microscopy following treatment in sheep with an experimental compound.**
N. Rivera^{a*}, F. Ibarra^a, A. Zepeda^b, R. Castillo^c, A. Hernández^c
^aFacultad de Medicina Veterinaria y Zootecnia, UNAM, México, D.F.; ^bFacultad de Medicina, UNAM, México, D.F.; ^cFac. de Química, UNAM, México, D.F.
98. **Resistance of Santa Ines, Suffolk and Ile de France lambs to naturally acquired gastrointestinal nematode infections.**
A.F.T. Amarante^{a*}, P.A. Bricarello^b, R.A. Rocha^a, S.M. Gennari^b
^aUniversidade Estadual Paulista, C.P. 510, Botucatu- SP, CEP 18618-000, Brzil; ^bUniversidade de São Paulo, Brazil
99. **A comparison of the periparturient rise in fecal egg counts of Santa Ines and Ile de France ewes.**
R.A. Rocha^a, A.F.T. Amarante^{a*}, P.A. Bricarello^{ab}
^aUniversidade Estadual Paulista, C.P. 510, Botucatu- SP, CEP 18618-000, Brazil; ^bUniversidade de São Paulo, Brazil
100. **Safety study on pregnant mares treated with a combination of ivermectin praziquantel.**
P. Mercier^{a*}, F. Alves-Branco^b, C.R. White^c
^aVirbac SA, Medical Dpt, Carros, France; ^bConsultorio Medico Veterinario, Bagé, RS, Brazil, ^cVirbac do Brazil, Sao-Paulo, SP, Brazil
101. **Mechanical recovery of cyathostome larvae from the mucosa of the caecum of horses.**
I.D. Glover, G.M. Henry, N.B. Townsend, G.C. Coles*
Department of Clinical Veterinary Science, University of Bristol, Langford House, Britol BS40 5DU, UK

102. **Identification of stage specific transcripts from reactivated cyathostomin fourth stage larvae.**
J.B. Matthews^{a*}, D.R. Johnson^a, K.R. Matthews^b
^aDepartment of Veterinary Clinical Science, University of Liverpool, South Wirral, UK; ^bDepartment of Biochemistry, University of Manchester, Manchester, UK

103. **Larvicidal activity of an ivermectin praziquantel combination against migrating *Strongylus vulgaris* larvae in equids.**
L. Frayssinet^{a*}, P. Mercier^a, L. Grisi^b, I.V.F. Martins^b, C.R. White^c
^aVirbac SA, Carros, France; ^bUniversidade Federal Rural do Rio de Janeiro, RJ, Brazil; ^cVirbac do Brasil, Sao-Paulo, SP, Brazil

104. **Are older horses more wormy?**
C. Wright^a, A.C. Rhodes^b, G.C. Coles^{b*}
^aBushy Equine Clinic, Breadstone, Berkley, Glos GL13 9HG, UK; ^bDept. Clinical Veterinary Science, University of Bristol, Langford House, Bristol BS40 5DU, UK

105. **The role of *Isospora suis* in the ethiology of diarrhoea in suckling piglets.**
V. Gualdi^a, F. Vezzoli^a, M. Luini^a, L. Nisoli^{b*}
^aInstituto Zooprofilattico Sperimentale della Lombardia e dell' Emilia Romagna "B. Ubertini" Lodi Section, Italy; ^bBayer HealthCare, Animal Health Division, Italy

106. **Evaluation of the growth of *Trypanosoma cruzi* in different culture media.**
L. Calderón^{a*}, J. Taya, D. Ruíz^a, J. Sánchez^a, F. Ibarra^b
^aDepartamento de Microbiología y Parasitología, Facultad de Medicina, Universidad Nacional Autónoma de México; ^bDepartamento de Parasitología, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México

107. **The ability of *Brugia pahangi* to migrate is not limited to life cycle stage.**
S.R. Chirgwin^{*}, K.H. Porterhouse, S.U. Coleman, W.T. Wile, T.R. Klei
Department of Pathobiological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA, 70803 USA

108. **Prevalence of enteric and external parasites in bees (*Apis mellifera*) in Culiacán, Sinaloa, México.**
C.S. Gaxiola^{*}, I.J. Borbolla, del C.N. Castro, R.M. Rubio
Veterinary Faculty of Medicine and Zootecnia of the Sinaloa Autonomous Univeristy, Sinaloa, México

109. **Treatment of varroosis with oxalic acid: effectiveness and toxic consequences.**
M. Higes^a, R. Martin^b, A. Mateos^b, M.J. Nozal^c, L. Gómez^c, A. Meana^{b*}
^aCentro Apícola Regional, Guadalajara Spain; ^bFacultad de Veterinaria UCM, Madrid, Spain; ^cFacultad de Ciencias, Valladolid, Spain

110. **The prevalence of anthelmintic resistance in nematode parasites of cattle in São Paulo State, Brazil.**
R.V.G. Soutello^{ab*}, A.F.T. Amarante^b, M.C. Zocoller-Seno^b
^aFaculdade de Ciências Agrárias de Andradina—SP; ^bUniversidade Estadual Paulista, Brazil

111. ***Dirofilaria immitis*: humoral response and cytokine mRNA expression in chronically infected dogs.**
J. Lópe-Belmonte^a, R. Morchón^a, C. Genchi^{b*}, C. Bazzocchi^b, G. Traldi^c, R. Martín-Pacho^a, C. Marcos-Atxutegi^a, M. Silva^{ac}, W. Blasini^{ad}, F. Simón^a
^aUniversity of Salamanca Medical School, Spain; ^bUniversity of Milan Veterinary School, Italy; ^cUniversity of Camerino Veterinary School, Italy; ^dUniversity of Puerto Rico Medical School, Puerto Rico
112. **Population dynamics of *Toxocara canis* in pigs receiving a single or multiple infection.**
K. Taira^{a*}, I. Saeed^a, P. Lind^b, K.D. Murrell^a, C.M.O. Kapel^a
^aDanish Centre for Experimental Parasitology, Department of Veterinary Microbiology, The Royal Veterinary and Agricultural University, Dyrlægevej 100, DK-1870 Frederiksberg C, Denmark; ^bDanish Veterinary Laboratory, Department of Immunology and Biochemistry, Bülowsvej 27, DK-1790 Copenhagen V, Denmark
113. **The proteome of *Toxoplasma gondii* rhoptries: composition, function and comparative proteomics.**
J.M. Wastling^{a*}, C. Ward^a, A.R. Pitt^a, G.H. Bradley^b, J.C. Boothroyd^b
^aDivision of Infection and Immunity, Institute of Biomedical and Life Sciences, University of Glasgow, Glasgow, G12 8QQ, United Kingdom; ^bMicrobiology and Immunology, Stanford University School of Medicine, 300 Pasteur Dr., Stanford, CA USA
114. **An overview of past, present and future research into donkey parasitism.**
C.J. Morriss*, A.F. Trawford
The Donkey Sanctuary, Sidmouth, Devon, EX10 0NU, UK
115. **Using Geographic Information System (GIS) to determine the risk to human health from canine fecal contamination in Baton Rouge, LA.**
E. Brianti^{a*}, S. Giannetto^a, G. Poglayen^a, J.B. Malone^b
^aFacoltà di Medicina Veterinaria, Messina, Sicilia Italia; ^bLouisiana State University, Baton Rouge, Louisiana USA
116. **The fish disease (*Ligulosis*) in the Kyiv Reservoir (after the Chernobyl catastrophic).**
O.N. Davydov*, R.E. Bazeev
Kyiv, Ukraine
117. **Evaluation of a general situation of an invagination of fishes metacercariae of *Opisthorchidae* of some reservoirs of Ukraine.**
R.E. Bazeev*, O.N. Davydov
Kyiv, Ukraine

8:45AM–9:00AM **HUGH GORDON INTRODUCTION**

Speaker: R.K. Prichard

Room: Napoleon BC12

9:00AM–9:45AM **PLENARY 3: HUGH GORDON LECTURE; ANTHELMINTIC VACCINES THAT WORK**

Speaker: M. Lightowlers

Room: Napoleon BC12

9:45AM–10:00AM **PETER NANSEN AWARD**

Room: Napoleon BC12

10:00AM–10:15AM Break

10:15AM–11:45AM **SYMPOSIUM: MAPPING THE PARASITE WORLD**

Moderator: J.B. Malone, A. Estrada-Peña

Room: Maurepas

Geospatial tools for veterinary parasites and zoonoses: A new standard for use of maps in epidemiology.

J.B. Malone

School of Veterinary Medicine, Baton Rouge, LA USA

The next step in forecasting *Ixodes scapularis* habitat suitability: The 1 km model for the United States of America.

A. Estrada-Peña*, C.S. Acedo, J.Q. Cinca

Dept. of Parasitology, Veterinary Faculty, 50013-Zaragoza, Spain

Use of geo-processing technologies to delimit spatial distribution of emerging zoonosis in Bahia, Brazil.

M.E. Bavia^{*a}, C.E. Pinto da Silva^b, R. Reis^a, M.G. Barbosa^a, P. Oliveira^a, I. Novaes^a, C. Rosendo^a

^aFederal University of Bahia, Salvador, Brazil; ^bState University of Feira de Santana, Feira de Santana, Brazil

Parasitological maps—an Italian experience.

G. Cringoli*, L. Rinaldi

Dipartimento Patologia e Sanita Animale, Settore di Parassitologia Veterinaria, Universita di Napoli, Italy

The spatial and temporal distribution of West Nile Virus in Louisiana in 2002.

K. Gruszynski^{a*}, A. Roy^a, J. Malone^a, G. Balsamo^b

^aLSU School of Veterinary Medicine, Baton Rouge, LA USA; ^bLouisiana Department of Health and Hospitals Office of Public Health, New Orleans, LA USA

Use of medical information systems for risk prediction and control of *Schistosoma haematobium* in Kenya.

K. McNally*, J.B. Malone

Department of Pathobiological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA USA

DISCUSSION AND SUMMARY

10:15PM–11:45PM **SYMPOSIUM: RECENT ADVANCES IN HEARTWORM DISEASE**

Moderators: J.W. McCall, J. Guerrero

Room: Napoleon BC12

American Heartworm Society guidelines for the diagnosis, prevention, and management of heartworm infection in dogs and cats.

J. Guerrero

Comparison of the “safety-net” and “soft-kill” effects of macrocyclic lactone products used for heartworm prevention.

J.W. McCall

***Wolbachia* endosymbionts and the immunopathogenesis of filarial disease.**

L. Kramer

***Wolbachia* endosymbionts in *Dirofilaria immitis*.**

C. Genchi

10:15AM–11:45AM **SYMPOSIUM: CURRENT STATUS AND FUTURE PROSPECT OF MYIASIS CONTROL**

Moderators: P. Dorchies, D.D. Colwell

Room: Napoleon B3

Attractants and traps for myiasis-causing flies.

R. Cepeda-Palacios

Departamento de Zootecnia, La Paz, B.C.S. México

Economics aspects of myiasis: A tale of complexity and neglect.

D.D. Colwell

Agriculture and Agri-Food Canada, Lethbridge, AB., Canada

Growth regulators in control of myiasis.

J-F. Graf

Novartis Animal Health Inc. CH-4002 Basel, Switzerland

Can host genetics be useful in the fight against myiasis?

Ph. Jacquiet

UMR INRA / DGER 1225 Interactions Hôtes -Agents Pathogènes, Ecole Nationale Vétérinaire de Toulouse, Toulouse, France

Progress in eradication of hypodermosis from the European Union.

B. Losson^{a*}, C. Boulard^b

^aLaboratory of Parasitology and Parasitic Diseases, Faculty of Veterinary Medicine, University of Liège, Belgium; ^bUnité d'Immunopathologie des Maladies Parasitaires, INRA 37380 Nouzilly, France

Molecular tools for the identification of Oestridae.

D. Otranto

Department of Health and Animal Welfare, Faculty of Veterinary Medicine, University of Bari, Italy

New developments in sero-diagnosis of hypodermosis.

R. Panadero-Fontán

Parasitología y Enfermedades parasitarias. Dpto Patología Animal. Universidad de Santiago de Compostela. Facultad de Veterinaria, 27002. Lugo, Spain

Vaccination against myiasis flies—where to next?

V.M. Bowles^a, R.M. Sandeman^{b*}

^aCentre for Animal Biotechnology The University of Melbourne Parkville 3010, Vic, Australia; ^bThe Department of Agricultural Sciences, La Trobe University, Bundoora Vic. Australia 3086

Antiparasitic drugs and myiasis.

P.J. Scholl

USDA/ARS/MLIRU, U. of Nebraska-E. Campus, Lincoln, Nebraska USA

Supermodel hits the bottle (modelling ovine cutaneous myiasis).

R. Wall^{a*}, I. Cruickshank^a, K.E. Smith^a, N.P. French^b

^aSchool of Biological Sciences, University of Bristol, UK, ^bDepartment of Veterinary Clinical Science and Animal Husbandry, University of Liverpool, UK

10:15AM–11:45AM **ZOONOSIS 2**

Moderator: G. Poglayen

Room: Napoleon C3

10:15AM–10:30AM **Seroprevalence and transmission risk factors of porcine in rural pig of eastern and southern provinces of Zambia.**

C.S. Sikasunge^{a*}, I.K. Phiri^a, S. Siziya^a, A. Phiri^a, P. Dorny^b, A.L. Willingham III^c

^aUniversity of Zambia, Lusaka, Zambia; ^bPrince Leopold Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp, Belgium; ^cDanish Centre for Experimental Parasitology, Denmark

10:30AM–10:45AM **Old dreams, new visions: Cystic echinococcosis in Sicily.**

G. Poglayen*, E. Brianti, A. Rusoo, G. Gaglio, C. Sorgi, S. Giannetto
Department of Veterinary Public Health, Messina, Italy

10:45AM–11:00AM **Number distribution and viability of *Taenia solium* cysticerci in Zambian village pigs.**

I.K. Phiri^{*a}, P. Dorny^{bc}, S. Gabriel^a, A.L. Willingham III^d, C. Sikasunge^a, S. Siziya^a, J. Vercruysse^c

^aUniversity of Zambia, Lusaka, Zambia; ^bInstitute of Tropical Medicine, Antwerp, Belgium; ^cGhent University, Belgium; ^dRoyal Veterinary and Agricultural University, Denmark

- 11:00AM–11:15AM **Infectivity and reproduction of *Echinococcus multilocularis* in cat, dog, fox and raccoon dogs.**
C.M.O. Kapel^{a*}, A.R.C. Thompson^b, P. Deplazes^c
^aDanish Centre for Experimental Parasitology, Department of Veterinary Microbiology, The Royal Veterinary and Agricultural University, Denmark; ^bDivision of Veterinary and Biomedical Science, Murdoch University, Australia; ^cInstitute for Parasitology, University of Zurich, Switzerland
- 11:15AM–11:30AM **Prevalence of porcine and risk factors for *Taenia solium* taeniosis in Funyula Division of Busia District Kenya.**
S.M. Githigia^{*a}, K. Murekefu^b, S.M. Ngesa^b, R.O. Otieno^a, R. Kahai^b
^aDepartment of Veterinary Pathology, Microbiology & Parasitology Faculty of Veterinary Medicine, University of Nairobi, P.O. Box 29053, Kangemi, 00625 Nairobi; ^bMinistry of Agriculture & Rural Development, Busia District Veterinary Office, P.O. Box 261, Busia Kenya
- 11:30AM–11:45AM **The role of Australian wild dogs (dingoes and dingo/domestic dog hybrids) in the transmission of *Echinococcus granulosus* from the bush to surburbia in Australia.**
D.J. Jenkins^{*}
Australian Hydatid Research Centre, 12, Mildura Street, Fyshwick ACT 2609, Australia
- 10:15AM–11:30AM **HOST/PARASITE GENETICS 2**
Moderator: G. Mulcahy
Room: Napoleon A1
- 10:15AM–10:30AM **The effects of sheep breed on the progress of *Lucilia sericata* larvae infestations (blowfly strike).**
M. Rankin^{*}, P. Bates
Parasitology Section, Scientific Services Unit, Veterinary Laboratories Agency (Weybridge), United Kingdom
- 10:30AM–10:45AM **The responsiveness of the Nigerian Dwarf goat in concurrent *Trypanosoma brucei*-*Haemonchus contortus* infection.**
S.N. Chiejina^{*a}, B.B. Fakae^a, G.A. Musongong^b, J.M. Behnke^c, L.A. Ngongeh^a, D. Wakelin^c
^aFaculty of Veterinary Medicine, University of Nigeria, Nsukka Nigeria; ^bWakwa Regional Centre for Agricultural Research for Development, Cameroon; ^cDepartment of Life and Environmental Sciences, University of Nottingham, NG7 2RD, UK
- 10:45AM–11:00AM **Variation of host and isolate response following experimental transmission of human *Cryptosporidium hominis* isolates into non-human hosts.**
M. Giles^{*}, D.M. West, J.A. Marshall, J. Catchpole, R.N. Marshall
Veterinary Laboratories Agency, Newhaw, Addlestone, Surrey, KT153NB, UK

- 11:00AM–11:15AM **A kinesin-related protein of *Babesia divergens*.**
H. Skerrett^{a*}, C. Norris^a, A. Zintl^a, J. Gray^b, G. Mulcahy^a
^aDepartment of Veterinary Microbiology and Parasitology and Conway Institute of Biomolecular and Biomedical Research, University College Dublin, Ireland; ^bDepartment of Environmental Resource Management, University College Dublin, Ireland
- 11:15AM–11:30AM **Genetic activity of *Toxoplasma gondii* from free ranging chickens from many countries.**
J.P. Dubey^a, T. Lehmann^{b*}
^aUnited States Department of Agriculture, Agricultural Research Service, Animal and Natural Resources Institute, Parasite Biology, Epidemiology & Systematics Laboratory, Beltsville, Maryland USA; ^bDivision of Parasitic Diseases, Centers for Disease Control and Prevention, Chamblee, Georgia USA
- 10:15AM–11:30AM **EPIDEMIOLOGY 1**
Moderator: R.M. Kaplan
Room: Napoleon A2
- 10:15AM–10:30AM **About the epidemiology of human cryptosporidiosis.**
J. Euzeby*
Parasitologie, Ecole Veterinaire de Lyon, Marcy L'Etoile, France
- 10:30AM–10:45AM **Estimating the prevalence and intensity of *Schistosoma japonicum* infection in animal reservoir hosts in the Philippines.**
T. Fernandez^{*a}, E. Balolong, Jr.^b, H. Carabin^c, A.L. Willingham III^d, R. Olveda^b, S.T. McGarvey^c
^aLeyte State University, Baybay, Philippines; ^bResearch Institute for Tropical Medicine, Alabang, Philippines; ^cOklahoma University Health Sciences Center, Oklahoma USA; ^dRoyal Veterinary and Agricultural University, Frederiksberg, Denmark; ^eBrown University, Rhode Island USA
- 10:45AM–11:00AM **Prevalence of otacariosis in French goats.**
M. Cojan^a, B. Polack^{*a}, C. Chartier^b
^aEcole Nationale Vétérinaire d'Alfort, Maisons-Alfort, France; ^bLaboratoire d'Etude et de Recherche Caprine AFSSA, Niort, France
- 11:00AM–11:15AM **Epidemiology of goat gastrointestinal nematodes in Georgia.**
T.H. Terrill^{*a}, J.E. Miller^b, R.M. Kaplan^c, M. Larsen^d, R.A. Kircher^a, O.M. Samples^a, S. Gelaye^a
^aFort Valley State University, Georgia USA; ^bLouisiana State University, Louisiana USA; ^cUniversity of Georgia, Georgia USA; ^dRoyal Veterinary and Agricultural University, Denmark
- 11:15AM–11:30AM **Gastrointestinal nematode infections in sheep on communal grazing land in Nyandarua District of central Kenya.**
N. Maingi*
Department of Veterinary Pathology, Microbiology and Parasitology, Faculty of Veterinary Medicine, University of Nairobi, P. O. Box 29053, Kangemi, 00625, Nairobi, Kenya

10:15AM–12:00PM **BIOCHEMISTRY MOLECULAR BIOLOGY**

Moderator: D.M. Witcombe

Room: Napoleon A3

10:15AM–10:30AM **Purification and analysis of *Fasciola gigantica* glutathione S-transferases.**

H. Weiyi*, Z. Weiyu

College of Animal Science and Technology, Guangxi University, 530005 Nanning, China

10:30AM–10:45AM **Neuropeptides and the anterior sensory neuroanatomy of gastrointestinal nematodes.**

L. Halferty*, N.J. Marks, G.P. Brennan, D.W. Halton

Parasitology Research Group, Queen's University Belfast, Belfast BT9 7BL, Ireland

10:45AM–11:00AM **Electrophysiological analysis of neuropeptide and classical transmitter modulation of pharyngeal pumping in sheep nematodes.**

J. Song^a, N. Sangster^{*a}, N.J. Marks^b, T. Geary^c

^aFaculty of Vet Science, University of Sydney; ^bSchool of Biology and Biochemistry, Queen's University Belfast, UK; ^cPharmacia Animal Health, Kalamazoo, MI USA

11:00AM–11:15AM **Stage-specific biochemical changes during the life cycle of *Oesophagostomum* spp.**

A. Joachim^{a*}, A. Dauschies^b, B. Ruttkowski^b

^aInstitute for Parasitology and Zoology, University of Veterinary Medicine Vienna, Austria; ^bInstitute of Parasitology, University of Leipzig, Germany

11:15AM–11:30AM **EmTFP250: A TRAP family microneme protein in *Eimeria maxima*.**

D.M. Witcombe^{a*}, D.J.P. Ferguson^b, S.I. Belli^a, M.G. Wallach^a, N.C. Smith^a

^aInstitute for the Biotechnology of Infectious Diseases, University of Technology, Sydney, Westbourne Street, Gore Hill, NSW, 2065, Australia; ^bNuffield Department of Pathology, Oxford University, John Radcliffe Hospital, Oxford, OX3 9DU, UK

11:30AM–11:45AM **Characterization of differentially expressed genes in unsporulated and sporulated oocysts of *Eimeria tenella*.**

K.B. Miska*, R.C. Barfield, R.H. Fetterer

USDA/ARS, PBESL, BARC-East 10300 Baltimore Ave, Beltsville, MD 20705 USA

11:45AM–12:00PM **Single Nucleotide Polymorphism analysis of the parasitic nematode *Cooperia oncophora*.**

M. van der Veer*, E. de Vries

Division of Parasitology and Tropical Veterinary Medicine, Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands

11:45AM–1:00PM **LUNCH: ON YOUR OWN**

1:00PM–3:30PM **SYMPOSIUM: CURRENT STATUS AND FUTURE PROSPECT OF MYIASIS
CONTROL (*CONTINUED*)**

Moderators: P. Dorchies, D.D. Colwell

Room: Napoleon B3

1:00PM–2:30PM **SYMPOSIUM: EMERGING PROTOZOAN DISEASES**

Moderators: P.A. Conrad, A.M. Tenter

Room: Napoleon C3

Babesiosis and theileriosis

Chair: A.M. Tenter

Perplexing *Piroplasma* (*Babesia*/*Theileria*) parasites: Old controversies and new discoveries.

P.A. Conrad

What role do *Babesia bicornis* and *Theileria bicornis* play in causing mortality in black rhinoceroses?

B.L. Penzhorn

DISCUSSION

TOXOPLASMOSIS

Chair: P.A. Conrad

“The emergence of toxoplasmosis in mammalian host species newly exposed to the parasite by human movements over the past centuries.”

A.M. Tenter

“Toxoplasmosis in captive raised Pallas’ Cats (*Otocolobus manul*, Pallas 1776).”

R. Edelhofer

DISCUSSION

LEISHMANIASIS

Chair: P.A. Conrad

“Canine leishmaniasis: Results of 1-year experimental infection of beagles with an American isolate of *Leishmania infantum*.”

A.C. Rosypal

“Serological and entomological surveillance of a new autochthonous focus of canine leishmaniasis in north-eastern Italy.”

G. Capelli

Status of leishmaniasis in other parts of Europe.

A.M. Tenter

DISCUSSION

1:00PM–2:30PM **SYMPOSIUM: FACTORS THAT INFLUENCE THE PREVALENCE OF
ACARICIDE RESISTANCE AND TICK-BORNE DISEASES**

Moderators: Chair: L. Foil, **Co-Chair:** F. Guerrero

Room: Maurepas

Tick resistance and hemoparasitic problems in Mexico.

H. Fragoso

Acaricide resistance mechanisms present in southern cattle ticks, *Boophilus microplus*, from Mexico.

R.J. Miller

Tsetse control in Africa: a threat to enzootic stability for tick-borne diseases?

S.J. Torr

Synthetic pyrethroid resistance in *Boophilus microplus* in Australia: association with the use of synthetic pyrethroid products to control *Haematobia irritans exigua*.

N.N. Jonsson

Applications of molecular biology in diagnosis of pesticide resistance in cattle ectoparasites.

F. Guerrero

1:00PM–2:30PM **AAVP SYMPOSIUM: “NEW APPROACHES FOR PARASITIC
NEMATODES”**

Moderator: J. Urban, Immediate Past-President AAVP

Room: Napoleon BC12

THE PARASITE

The interaction of *Wolbachia*, nematodes, and their hosts.

T.R. Klei

The molecular basis of anthelmintic resistance.

R.K. Prichard

THE HOST

The impact of probiotics on the immunobiology of nematode infections.

G. Solano-Aguilar

A genomic approach to nematode infections

L.C. Gasbarre

1:00PM–2:30PM **CONTROL STRATEGIES 1/ECTOPARASITES**

Moderator: M. Sandeman

Room: Napoleon A2

1:00PM–1:15PM **Biological control of *Musca domestica* using entomopathogenic fungi.**

S. Gomathinayagam^{*}, A. Rajagopal, L. John

Department of Veterinary Parasitology, Madras Veterinary College, Chennai, India

1:15PM–1:30PM **Field trial to assess the productivity advantages of a pour-on tick development inhibitor in comparison to an amitraz tickicide in fattening beef cattle.**

J-F. Graf^{*a}, A. Strizek^b, B. Baxter^b, B. Hosking^b

^aNovartis Animal Health, Inc., CH-4002 Basel, Switzerland; ^bNovartis Animal Health Australia Pty Ltd, Sydney, NSW 2145, Australia

1:30PM–1:45PM **Mange (*Sarcoptes scabiei*) eradication through sow treatment with ivermectin and validation by slaughter checks and ELISA assays.**

C. Cargill^a, R. Garcia^{*b}, D. Homer^c, M. Sandeman^d

^aSARDI, University of Adelaide, Roseworthy, SA, Australia; ^bMerial Limited, Duluth, GA USA; ^cMerial Limited, Sydney, Australia; ^dLaTrobe University, Victoria, Australia

1:45PM–2:00PM Withdrawn

2:00PM–2:15PM **Potential biological control of *Psoroptes* mites with the fungal pathogen *Metarhizium anisopliae*.**

A.J. Brooks^{*a}, M. Aquino de Muro^b, D. Moore^b, R. Wall^a

^aSchool of Biological Sciences, The University of Bristol, Woodland Road, Bristol, BS8 1UG, UK; ^bCABI Bioscience, Bakeham Lane, Egham TW20 9TY, UK

2:15PM–2:30PM **Neem extract as an effective risk-free insecticide in dogs.**

A.K. Singh^{*}

Government Veterinary Hospital, Khedi, Betul, M.P. India

1:00PM–2:15PM **EPIDEMIOLOGY 2**

Moderator: C. Epe

Room: Napoleon A3

1:00PM–1:15PM **Prevalence of helminth parasites in free range domestic fowl in Nairobi and its environs, Kenya.**

W.K. Munyua*

Department of Veterinary Pathology, Microbiology and Parasitology, Faculty of Veterinary Medicine, University of Nairobi, P.O. Box 29053, Nairobi, Kenya

1:15AM–1:30AM **Treatment of cattle with an abamectin pour-on had no averse effect on dung beetle populations in Australia.**

P.J. Martin^a, M. Friend^b, L. Lawrence^{a*}

^aVirbac (Australia) Pty Limited, Locked Bag 1000, Peakhurst NSW 2210; ^bVeterinary Health Research Pty Ltd Trevenna Rd, West Armidale NSW, 2350, Australia

1:30AM–1:45AM **Prevalence of tongue worm infection in stray dogs of Shahrekord, Iran.**

B. Meshgi^{a*}, R. Asgarian^b

^aDepartment of Parasitology, Faculty of Veterinary Medicine Tehran University, P.O. Box: 14155-6453 Tehran, Iran; ^bDepartment of Environment, Shahrekord, Iran

1:45AM–2:00PM **Recent investigation on the prevalence of gastrointestinal nematodes in cats from France and Germany.**

N. Coati^{*a}, K. Hellmann^b, N. Mencke^c, C. Epe^a

^aInstitute of Parasitology, Hannover School of Veterinary Medicine, Hannover Germany;

^bKlifovet AG, Munich, Germany; ^cBayer AG, BHC-Business Group Animal Health, Leverkusen, Germany

2:00 PM–2:15 PM **Fascioloidosis of red deer and roe deer in Hungary (1997-2002)**

B. Egri*, E. Giczi

University of West Hungary, Mosonmagyaróvár, Hungary

2:30PM–2:45PM Break

2:45PM–4:15PM **SYMPOSIUM: FACTORS THAT INFLUENCE THE PREVALENCE OF ACARICIDE RESISTANCE AND TICK-BORNE DISEASES (*CONTINUED*)**

Moderators: Chair: L. Foil, **Co-Chair:** F. Guerrero

Room: Maurepas

2:45PM–4:15PM **SYMPOSIUM: VETERINARY PARASITES IN THE MARINE ENVIRONMENT: A THREAT TO AQUATIC MAMMALS AND PUBLIC HEALTH.**

Moderators: R. Fayer, D. Lindsay

Room: Napoleon B3

Atlantic and Gulf Coast Study of *Cryptosporidium* in shellfish.

R. Fayer

An update on *Toxoplasma gondii* infections in California sea otters.

M. Miller^{ab*}, P. Conrad^a, I. Gardner^a, C. Kreuder^a, J. Mazet^a, D. Jessup^b, E. Dodd^b, M. Harris^b, J. Ames^b, K. Worcester^c, D. Paradies^c, M. Grigg^d

^aSchool of Vet. Med., UC Davis, Davis, CA USA; ^bCDFG, Santa Cruz, CA USA; ^cWater Quality Board, San Luis Obispo, CA USA; ^dStanford Medical School, Palo Alto, CA USA

***Giardia duodenalis* and *Cryptosporidium parvum* infections in pinnipeds.**

M.E. Olson^a, A. Appelbee^a, L. Measures^b

^aUniversity of Calgary, Calgary, Alberta, Canada; ^bFisheries and Oceans Canada, Maurice Lamontagne Institute, Mont-Joli, Quebec, Canada

***Toxoplasma gondii* in California sea otters (*Enhydra lutris nereis*): past and present.**

R.A. Cole^{*a}, D.S. Lindsay^b, J.P. Dubey^c and N.J. Thomas^a

^aUSGS, NWHC, Madison, Wisconsin USA; ^bVirginia Tech, Blacksburg, Virginia USA; ^cUSDA, ARS, Beltsville, Maryland USA

2:45PM–4:15PM **ZOONOSIS 3**

Moderator: A.L. Willingham III

Room: Napoleon A1

2:45PM–3:00PM **Population dynamics of *Toxocara canis* in pigs receiving a single or multiple infection.**

K. Taira^{*a}, I. Saeed^a, P. Lind^b, K.D. Murrell^a, C.M.O. Kapel^a

^aDanish Centre for Experimental Parasitology, Department of Veterinary Microbiology, The Royal Veterinary and Agricultural University, Dyrøgevej 100 DK-1870, Frederiksberg C, Denmark; ^bDanish Veterinary Laboratory, Department of Immunology and Biochemistry, Bülowsvej 27, DK-1790, Copenhagen V, Denmark

3:00PM–3:15PM **Survival of *Trichinella spiralis* in animal feeds.**

L. Oivanen^{ab}, T. Mikkonen^a, L. Haltia^a, H. Karhula^a, H. Saloniemi^a, A. Sukura^{*a}

^aFaculty of Veterinary Medicine, University of Helsinki, Finland; ^bNational Food Agency, Helsinki, Finland

- 3:15PM–3:30PM **The source of human *Ascaris* infections in Denmark.**
P. Nejsum^{*a}, E.D. Parker, Jr.^a, J. Frydenberg^a, J. Prag^b, U.S. Sørensen^c, A. Roepstorff^d, D. Murrell^d, J. Boes^c
^aDepartment of Genetics and Ecology, University of Aarhus, DK 8000, Aarhus C, Denmark; ^bDepartment of Clinical Microbiology, Vigorg-Kjellerup Hospital; ^cDepartment of Medical Microbiology and Immunology, University of Aarhus; ^dDanish Center for Experimental Parasitology, The Royal Veterinarian and Agricultural University, Copenhagen; ^eDanish Bacon and Meat Council, Copenhagen, Denmark
- 3:30PM–3:45PM **Comparison of infectivity of *Trichinella zimbabwensis* in indigenous Zimbabwean pig (Mukota) and Large White.**
E. Matenga^{*a}, S. Mukaratirwa^a, A. L. Willingham^b
^aDepartment of Paraclinical Veterinary Studies, University of Zimbabwe, P. O. Box MP167, Mt. Pleasant, Harare, Zimbabwe; ^bDanish Center for Experimental Parasitology, Royal Veterinary and Agricultural College, Ridebanevej3, 1870 Fredriksberg C, Denmark
- 3:45PM–4:00PM **Transmission of *Toxocara canis* infection: A pilot study in Estonia.**
H. Talvik^{*a}, E. Moks^b
^aEstonian Agricultural University; ^bUniversity of Tartu, Estonia
- 4:00PM–4:15PM **Study of human cutaneous dirofilariosis in Caspian territories of Iran in 2001.**
M.R. Siavashi
Pasteur Institute of Iran, Tehran, Iran
- 2:45PM–4:15PM **HOST RESPONSE/IMMUNITY 3**
Moderator: J.G.M. Houdijk
Room: Napoleon C3
- 2:45PM–3:00PM **Sequential analysis of mucosal inflammatory responses during abomasal nematode infection in ewes.**
R.L. Coop^{a*}, A. Donnan^a, J.F. Huntley^a, D. Bartley^a, E. Jackson^a, J.G.M. Houdijk^b, F. Jackson^a
^aMoredun Research Institute, Edinburgh, UK; ^bScottish Agricultural College, Edinburgh, UK
- 3:00PM–3:15PM **Local immune responses in calves infected with the lungworm *Dictyocaulus viviparus*.**
F.N.J. Kooyman^{*}, M. Eysker, H.W. Ploeger
Div. Parasitology and Tropical Veterinary Medicine, Dept. Infectious Diseases and Immunology, Utrecht University, The Netherlands
- 3:15PM–3:30PM **Protective responses against cyathostome infections.**
M.A. Baudena^{*}, M.R. Chapman, D.W. Horohov, T.R. Klei
Dept. of Pathobiological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70803 USA

- 3:30PM–3:45PM **A study of IL-4, IL-8, INF- γ And TNF- α in pigs infected with *Ascaris suum*.**
B. Lassen^{a*}, A. Roepstorff^b, N.R. Steenhard^b, B. Aasted^c, K.D. Murrell^b
^aCopenhagen University, Denmark; ^bDanish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University; ^cLaboratory of Virology and Immunology, The Royal Veterinary and Agricultural University, Denmark
- 3:45PM–4:00PM **The effect of polyunsaturated fatty acids (PUFA) on FEC, mucosal and mast cells and eosinophil numbers in calves infected with *Ostertagia ostertagi* and *Cooperia onchophora*.**
K.N. Nuituri^{*a}, M. Wallace^a, J. Struthers^a, J.R. Scaife^a, M.A. Lomax^a, F. Jackson^b, E. Jackson^b, A. Mackellar^b, J.F. Huntley^b, R.L. Coop^b
^aDepartment of Agriculture and Forestry, University of Aberdeen, Aberdeen, AB24 5UA, UK; ^bMoredun Research Institute, Pentlands Science Park, Pentcui, Edinburgh, EH26 OPZ, UK
- 4:00PM–4:15PM **Antigen-specific IgG(T) responses as markers for larval cyathostomin infection in horses.**
S.M.J. Dowdall^{*}, C.J. Proudman, R.J. Beynon, J.B. Matthews
Veterinary Clinical Sciences, University of Liverpool, Leahurst, Neston, Wirral, UK. CH64 7TE
- 2:45PM–4:15PM **EPIDEMIOLOGY 3**
Moderator: A.M. Zajac
Room: Napoleon A2
- 2:45PM–3:00PM ***Oesophagostomum dentatum* does exhibit thermotaxis.**
A.S. Freeman^{*}, F.T. Ashton, I.J. Driben, M. Larsen, G.A. Schad
University of Pennsylvania School of Veterinary Medicine, Department of Pathobiology, Philadelphia, Pennsylvania USA
- 3:00PM–3:15PM **Macroparasites of reindeer in Fennoscandia: parasite population dynamics, control options, and environmental impact implications.**
J.T. Hrabok^{*}, P.J. Waller
Department of Parasitology, National Veterinary Institute, SE-75189 Uppsala, Sweden
- 3:15PM–3:30PM **A digital map database for South America: A tool to predict environmental risk of parasitic diseases.**
P. Nieto^{a*}, M.E. Bavia^b, R. Amaral^c, M. Fuentes^d, J.B. Malone^a
^aLouisiana State University, Baton Rouge, LA USA; ^bUniversidade Federal da Bahia, Salvador, Brazil; ^cMinistry of Health, Brazilia, Brazil; ^dUniversidad de València, Valencia, Spain
- 3:30PM–3:45PM **Internal parasitism in feral island horses.**
A.N. Wack^{a*}, A.M. Zajac^a, S. Stuska^b
^aVirginia-Maryland Regional College of Veterinary Medicine, Blacksburg, Virginia USA; ^bNational Park Service, Cape Lookout National Seashore, Harkers Island, North Carolina USA

- 3:45PM–4:00PM **A prevalence survey of antibodies to *Anoplocephala perfoliata* in horses from the United States.**
C.R. Reinemeyer^{a*}, A.W. Farley^a, S.A. Kania^b, B.W. Rohrbach^b, R.H. Dressler^c
^aEast Tennessee Clinical Research, Inc., Knoxville, Tennessee USA; ^bUniversity of Tennessee College of Veterinary Medicine, Knoxville, Tennessee USA; ^cPfizer Animal Health, Barksdale, Texas USA
- 4:00PM–4:15PM **Prevalence and distribution of *Fasciola gigantica* and *Paramphistomum microbothrium* in Iringa district, Tanzania.**
J.D. Keyyu^{a*}, A.A. Kassuku^a, N.C. Kyvsgaard^b, A.L. Willingham III^b, J. Monrad^b
^aSokoine University of Agriculture, P.O. Box 3019, Morogoro, Tanzania; ^bThe Royal Veterinary and Agricultural University, Dyrølægevej 100, DK-1870 Frederiksberg C, Denmark
- 2:45PM–4:15PM **DRUG RESISTANCE 1**
Moderator: L.F. LeJambre
Room: Napoleon A3
- 2:45PM–3:00PM **The effect of moxidectin and ivermectin on the larval viability and recovery of resistant *Ostertagia circumcincta*.**
K.L. Tyrrell*, L.F. LeJambre
CSIRO Livestock Industries, Locked Bag 1, Armidale, NSW 2350, Australia
- 3:00PM–3:15PM **Evaluation of strategies to control anthelmintic resistance in nematodes of sheep.**
M.A. Taylor^{a*}, K.R. Hunt^b, S.K. Leask^b, F. Kennedy^c, R. Keatinge^c
^aCentral Science Laboratory, Sand Hutton, York, UK; ^bVeterinary Laboratories Agency, Weybridge, UK; ^cADAS Redesdale, Otterburn, Northumberland, UK
- 3:15PM–3:30PM **A New Zealand perspective on anthelmintic resistance.**
A.W. Murphy
Fort Dodge, New Zealand Limited
- 3:30PM–3:45PM **Characterization of moxidectin resistant *Trichostrongylus colubriformis* and *Haemonchus contortus*.**
L.F. LeJambre^{a*}, J. Geoghegan^b, M. Lyndal-Murphy^c
^aCSIRO Livestock Industries, Locked bag 1, Armidale, NSW 2350 Australia; ^bVirbac, 15 Pritchard Place, Peakhurst, NSW, Australia; ^cQueensland Department of Primary Industries, Locked Mail Bag 4, Moorooka, Qld 4105, Australia

3:45PM–4:00PM **Prevalence of anthelmintic resistance on horse farms in the southern United States.**

R.M. Kaplan^{a*}, T.R. Klei^b, E.T. Lons^c, G.D. Lester^d, D.D. French^b, S.C. Tollover^c, C.H. Courtney^d

^aColl. Vet. Med., Univ. Georgia, Athens, GA USA; ^bSchool Vet. Med., Louisiana State Univ., Baton Rouge, LA USA; ^cGluck Equine Research Center, Univ. Kentucky, Lexington, KY USA; ^dColl. Vet. Med., Univ. Florida, Gainesville, FL USA

4:00PM–4:15PM **Characterisation of a multiple resistant field isolates of *Teladorsagia circumcincta* from Scottish lowland sheep farms.**

D.J. Bartley^{a*}, F. Jackson^a, E. Jackson^a, L. Stenhouse^a, N. Sargison^b

^aMoredun Research Institute, Pentland Science Park, EH26 OPZ, UK; ^bLAPTU, Easter Bush Veterinary Centre, Royal Dick School Veterinary Studies, EH25 9RG, UK

4:15PM–5:45PM **VIRBAC SYMPOSIUM : EQUIMAX, UPDATES ON THE DIAGNOSTICS, BIOLOGY AND CONTROL OF CESTODES IN HORSES**

Moderator: T.R. Klei, School of Veterinary Medicine, Louisiana State University

Room: Napoleon BC12

A prevalence survey of antibodies to *Anoplocephala perfoliata* in horses from the United States.

C. Reinemeyer.

East Tennessee Clinical Research, Knoxville, Tennessee USA

Clinical aspects of tapeworm infection in the UK.

C. Proudman

Senior Lecturer in Equine Surgery, University of Liverpool, UK

Epidemiological studies on equine cestodes in warm climates: infection pattern, population dynamics and associated pathology.

A. Meana

Associate Professor in Veterinary Parasitology, University of Madrid, Spain

Efficacy and safety studies with Equimax (ivermectin –praziquantel)

Virbac SA

R&D—Virbac Corp R&D

CONCLUSIONS: Interest of a combination product in the control of concomitant infections in horses.

G.C. Coles.

5:45PM–7:15PM **MERIAL SYMPOSIUM: CURRENT CONCEPTS IN VETERINARY
PARASITOLOGY**

Moderator: M. Soll, Merial

Room: Napoleon BC12

The use of acaracides in dogs to prevent the transmission of tick-borne pathogens.

E.B. Breitschwerdt

Anthelmintic resistance in equine cyathostomins: Issues and implications for control.

R.M. Kaplan

The importance of parasite-induced behavioural changes in veterinary parasitology.

A.B. Forbes

8:00PM **MERIAL RECEPTION**

Room: Rhythm Ball Room, Second Floor

WEDNESDAY, AUGUST 13, 2003

7:30AM–9:00AM POSTER SESSION 2—CONTINENTAL BREAKFAST

Room: Armstrong

Posters will be exhibited Tuesday and Wednesday. Odd numbered posters will be tended by authors on Tuesday. Even numbered posters will be tended by authors on Wednesday.

9:00AM–9:45AM PLENARY 4—RECENT ORIGINS ON ANCIENT PARASITES—*TOXOPLASMA*.

Speaker: D. Sibley

Room: Napoleon BC12

9:45AM–10:30AM PLENARY 5—MODELING HOST GENETICS, RESISTANCE TO INFECTIOUS DISEASE.

Speaker: S.C. Bishop

Room: Napoleon BC12

10:30AM–10:45AM Break

10:45AM–12:15PM INTERVET SYMPOSIUM: BOVINE NEOSPOROSIS

Moderator: T. Schetters, Parasitological R&D—Intervet International

Room: Napoleon BC12

Bovine neosporosis, a serious obstacle to cattle breeding and a challenge for scientists.

J.P. Dubey.

USDA, Parasite Biology and Epidemiology Laboratory

Immune response to *Neospora caninum*.

A. Adrianarivo

University of California, Department of Pathology, Microbiology and Immunology

A controlled study with Bovilis Neoguard in New Zealand dairy herds.

C. Heuer

Massey University, Institute of Veterinary, Animal and Biomedical Sciences

A case/control study with Bovilis Neoguard in Costa Rican dairy herds.

K. Frankena

Wageningen University and Research Centre, Quantitative Veterinary Epidemiology Group.

12:15PM - AFTERNOON FREE

THURSDAY, AUGUST 14, 2003

7:30AM–8:15AM CONTINENTAL BREAKFAST

Place: Foyer outside Napoleon BC12

8:15AM–9:00AM **PLENARY 6—ANTIPARASITIC DRUGS IN THE 21ST CENTURY**

Speaker: T.G. Geary

Room: Napoleon BC12

9:00AM–10:30AM **SYMPOSIUM: ASSESSING THE BURDEN OF *TAENIA SOLIUM* CYSTICERCOSIS AND ECHINOCOCCOSUS**

Moderator: A.L. Willingham III, P.M. Schantz

Room: Napoleon B3

Assessing the burden and impact of cysticercosis and echinococcosus to justify global initiatives for combating these neglected parasitic zoonoses (Introduction).

A.L. Willingham III (9:00-9:10)

Assessing the burden of cysticercosis.

H. Carabin (9:10-9:35)

How does cysticercosis impact resource-poor communities in South Africa?

T. Krecek (9:35-9:50)

Taeniosis-cysticercosis in man and pigs in Ecuador.

P. Dorny (9:50-10:05)

Assessing the burden of echinococcosis.

P. Torgerson (10:05-10:30)

Break (10:30-10:45)

The burden and impact of echinococcosus in Australia.

D. Jenkins (10:45-11:00)

Cysticercosis and echinococcosis – Potential linkage with FAO activities and FAO support possibilities.

C. Eddi (11:00-11:15)

DISCUSSION (11:15- 12:00)

9:00AM–10:30AM **EQUINE CYATHASTOME WORKSHOP**

Moderator: R.M. Kaplan

Room: Napoleon BC12

9:00AM–10:30AM **CONTROL STRATEGIES 2/SHEEP**

Moderator: M.B. Molento

Room: Napoleon C3

9:00AM–9:15AM **Biological control of nematode parasites of sheep in Malaysia using the nematophagous fungus *Duddingtonia flagrans*.**

P. Chandrawathani^a, O. Jamnah^a, P.J. Waller^{b*}, M. Larsen^c, A.T. Gillespie^d

^aVRI, Ipoh, Malaysia; ^bSWEPAR, SVA, Uppsala, Sweden; ^cDCEP, KVL, Copenhagen, Denmark; ^dChr. Hansen A/S, Hørsholm, Denmark

9:15AM–9:30AM **Famacha method for decision making in the treatment of endoparasitic infection in small ruminants in Brazil.**

M.B. Molento*, C. Tasca, A.K. Gallo, M.J. Ferreira, R.R. Bononi, E. Stecca

Universidade Paranaense, Umuarama, PR, Brazil. *New address: Universidade Federal de Santa Maria, Santa Maria, RS, Brazil

9:30AM–9:45AM **Influence of different forages on gastrointestinal nematode infections in grazing lambs.**

S.M. Thamsborg*, H. Mejer, M. Bandier, M. Larsen

Danish Centre for Experimental Parasitology, Royal Veterinary & Agricultural University, Denmark

9:45AM–10:00AM **Farm evaluation of biological control of sheep parasites on the island of Gotland, Sweden.**

P.J. Waller^{a*}, O. Schwan^b, B-L. Ljungström^c

^aSWEPAR, SVA, Uppsala, Sweden; ^bSvDHV, Visby, Sweden; ^cVidilab, Enköping, Sweden

10:00AM–10:15AM **Efficacy of *Duddingtonia flagrans* chlamydospores against naturally acquired gastrointestinal nematode infections in Blackface ewes and lambs.**

F. Jackson^{a*}, Y. Gordon^a, R.L. Coop^a, D.J. Bartley^a, E. Jackson^a, A. Gillespie^b

^aMoredun Research Institute, EH26 OPZ, UK; ^bChr. Hansen, Animal Health Development, 2970 Hoersholm, Denmark

10:15AM–10:30AM **Reducing the degree of protein scarcity rapidly improves expression of immunity to abomasal nematodes in ewes.**

J.G.M. Houdijk^{a*}, I. Kyriazakis^a, F. Jackson^b, R.L. Coop^b

^aAnimal Nutrition and Health Department, Scottish Agricultural College, Edinburgh, UK;

^bMoredun Research Institute, Penicuik, UK

9:00AM–10:30AM **Chemotherapy 2**

Moderator: D.S. Lindsay

Room: Napoleon A1

9:00AM–9:15AM **Ponazuril is highly effective in the prevention and treatment of toxoplasmosis in mice.**

S.M. Mitchell^a*, A.M. Zajac^a, W.L. Davis^b, D.S. Lindsay^a

^aVirginia Tech, Blacksburg, Virginia USA; ^bBayer HealthCare, Animal Health Division, Shawnee, Kansas USA

9:15AM–9:30AM **Use of reversing agents of P-glycoprotein to increase the systematic availability of macrocyclic lactones: a promising tool.**

M. Alvinerie* J. Dupuy, J.F. Sutra, A. Lespine

Laboratoire de Pharmacologie Toxicologie, INRA 180 Chemin de Tournefeuille, 31931, Toulouse, France

9:30AM–9:45AM **Studies on the efficacy of toltrazuril, diclazuril and sulphadimidine against artificial infections with *Isospora suis* in piglets.**

H.C. Mundt^a*, A. Dauschies^b, S. Wüstenberg^a, M. Zimmermann^b

^aBayer AG, Animal Health Business Group, Clinical Development, Leverkusen, Germany; ^bInstitute for Parasitology, Faculty of Veterinary medicine, University of Leipzig, Leipzig, Germany

9:45AM–10:00AM **The effects of paraherquamide and 2-deoxy-paraherquamide on cholinergic receptor subtypes in *A. suum*.**

R.J. Martin*, C.L. Clarke, A.P. Robertson

Department of Biomedical Sciences, Iowa State University, Ames, IA 50011, USA

10:00AM–10:15AM **The effects of a imidacloprid and permethrin combination against developmental stages of *Ixodes ricinus* ticks.**

H. Mehlhorn^a*, G. Schmahl^a, N. Mencke^b, T. Bach^b

^aDepartment of Parasitology, Heinrich Heine University, Düsseldorf, Germany; ^bBayer AG, BHC-Business Group Animal Health, Leverkusen, Germany

10:15AM–10:30AM **The anthelmintic efficacy of the plant, *Albizia anthelmintica*, against the nematode parasites *Haemonchus contortus* of sheep and *Heligmosomoides polygyrus* of mice.**

J.B. Githiori^{ab}*, J. Höglund^b, P.J. Waller^b, R.L. Baker^a

^aInternational Livestock Research Institute (ILRI), P.O. Box 30709, Nairobi; ^bDepartment of Parasitology (SWEPAR), National Veterinary Institute and Swedish University of Agricultural Sciences, P.O. Box 7073, S-751 89 Uppsala, Sweden

9:00AM–10:30AM **RUMINANT PARASITES**

Moderator: M. Eysker

Room: Napoleon A2

9:00AM–9:15AM **Effect of gender on susceptibility to *Haemonchus contortus* infection in lambs.**

M. Gauly*, M. Schackert, G. Erhardt

Institute of Animal Breeding and Genetics, Justus Liebig University Giessen, D-35398 Giessen, Germany

9:15AM–9:30AM **Prevalence of *Fasciola gigantica* in Zambia.**

A.M. Phiri^{a*}, I.G.K. Phiri^a, C.S. Sikasunge^a, J. Monrad^b

^aSchool of Veterinary Medicine, University of Zambia, Lusaka, Zambia; ^bDanish Centre for Experimental Parasitology, Frederiksberg, Denmark

9:30AM–9:45AM ***In vivo* transfer of *Dictyocaulus viviparus*.**

H.W. Ploeger*, C. ten Cate, M. Eysker

Div. Parasitology & Tropical Veterinary Medicine, Dept. of Infectious Diseases and Immunology, Utrecht University, The Netherlands

9:45AM–10:00AM **Production effects of *Cooperia oncophora* infections in cattle.**

W.E. Pomroy^a, D.M. West^a, D.M. Leathwick^b, S.T. Morris^a

^aInstitute of Veterinary, Animal and Biomedical Sciences, Massey University;

^bAgResearch Grasslands, Palmerston North, New Zealand

10:00AM–10:15AM **Effect of gastro-intestinal nematodes on the productivity of goats in smallholder farms in Mozambique.**

A. Atanásio^{a*}, J. Boomker^b

^aDepartment of Diagnostics and Research, National Veterinary Research Institute, P.O. Box 1922, Maputo, Mozambique; ^bDepartment of Veterinary Tropical Diseases, University of Pretoria, Private Bag X04, Onderstepoort 0110, Republic of South Africa

10:15AM–10:30AM **A model for ruminant gastric worms: Intraspecific differences between cottontail & woodchuck isoates of *Obeliscoides cuniculi*.**

N. Samuel^{a*}, D.E. Worley^b

^aCalifornia Baptist University, Riverside CA USA; ^bVeterinary Molecular Biology Laboratory, Montana State University, Bozeman, Montana USA

9:00AM–10:30AM **PHYLOGENY AND SYSTEMATICS**

Moderator: R.B. Gasser

Room: Napoleon A3

9:00AM–9:15AM **SSCP-based identification of members within the *Contracaecum rudolphii* complex (Nematoda: Ascaridoidea: Anisakidae) using ribosomal DNA markers.**

X.Q. Zhu^{a*}, S. D'Amelio^b, F. He^a, R.Q. Lin^a, L. Paggi^b, R.B. Gasser^c, Z. Cao^a, H.Q. Song^a

^aSouth China Agricultural University, Guangzhou, Guangdong Province, China;

^bUniversità di Roma "La Sapienza", Rom, Italy; ^cThe University of Melbourne, Melbourne, Victoria, Australia

9:15AM–9:30AM **Molecular phylogeny of filarial nematodes and the evolution of the association between filariae and *Wolbachia pipientis*.**

M. Casiraghi^{a*}; L. Baldo^a, M. Mortarino^a, O. Bain^b

^aUniversità di Milano, DIPAV, Sezione di Patologia Generale e Parassitologia; ^b Muséum National d'Histoire Naturelle, Paris, France

9:30AM–9:45AM **Detection of *Hammondia heydorni*-like organisms and their differentiation from *Neospora caninum* using RAPD-PCR.**

C. Sreekumar^{a*}, D.E. Hill^a, V.M. Fournet^a, B.M. Rosenthal^a, D.S. Lindsay^b, J.P. Dubey^a

^aParasite Biology, Epidemiology and Systematics Laboratory, Animal and Natural Resources Institute, Agricultural Research Service, United States Department of Agriculture, Beltsville, Maryland 20705 USA; ^bCenter for Molecular Medicine and Infectious Diseases, Department of Biomedical Sciences and Pathobiology, Virginia-Maryland College of Veterinary Medicine, Virginia Tech, 1410 Prices Fork Road, Blacksburg, Virginia 24061 USA

9:45AM–10:00AM **Multilocus microsatellite genotyping of *Cryptosporidium parvum*.**

J.M. Wastling^a, M. Mallon^b, H.V. Smith^c, W.J. Reilly^d, A. Tait^b

^aDivision of Infection and Immunity, Joseph Black Building, IBLS, University of Glasgow, Glasgow G12 8QQ, United Kingdom; ^bWellcome Centre for Molecular Parasitology, University of Glasgow, UK; ^cScottish Parasite Diagnostic Laboratory, Glasgow, UK; ^dScottish Centre for Infection and Environmental Health, Glasgow, UK

10:00AM–10:15AM **Natural circulation of capsule-forming *Trichinella*, problems of taxonomy and hybridization.**

A.S. Bessonov^{*}

K. I. Skryabin. Institute of Helminthology, Moscow 117218, Russia

10:15AM–10:30AM **Genetic diversity in *Neospora caninum*.**

S.M. Latham^{a*}, E.A. Innes^a, J.M. Wastling^b

^aMoredun Research Institute, Pentlands Science Park, Edinburgh, UK; ^bDivision of Infection and Immunity, Institute of Biomedical and Life Sciences, University of Glasgow, Glasgow G12 8QQ, United Kingdom

10:30AM–10:45AM **BREAK**

10:45AM–12:15PM **SYMPOSIUM: CYSTICERCOSIS (*CONTINUED*)**

Moderator: A.L. Willingham III, P.M. Schantz

Room: Napoleon B3

10:45AM–12:15AM **WORKSHOP: VETERINARY PARASITE EDUCATION**

Moderator: C. Monahan

Room: Napoleon A1

10:45AM–12:15PM **CHEMOTHERAPY 3**

Moderator: F.V. Olaechea

Room: Napoleon BC12

10:45AM–11:00AM **Evaluation of the period of protection of 10% Moxidectin Catle Long-Acting against *Dictyocaulus viviparus*, *Haemonchus placei*, *Trichostrongylus axei* and *Oesophagostomum radiatum* infection in cattle.**

S. Ranjan*, E. Szewczyk, R. Search, R. Pollet, D. Amodie, R. DeLay
Fort Dodge Animal Health, Princeton, New Jersey USA

11:00AM–11:15AM **Comparison of the anthelmintic persistence of doramectin, ivermectin, moxidectin and eprinomectin in weaned beef cattle in Australia against natural infections of nematodes.**

S.R. Barber^{a*}, M. Alvinerie^b, P.I. Veale^c, G.A. Anderson^d, V.M. Bowles^a

^aCentre for Animal Biotechnology, University of Melbourne, Australia; ^bLaboratoire de Pharmacologie-Toxicologie, INRA, Toulouse, France; ^cPara-Site Diagnostic Services, Benalla, Australia; ^dVeterinary Clinical Centre, University of Melbourne, Australia

11:15AM–11:30AM **Effect of urea-molasses block supplementation on goats naturally infected with gastrointestinal nematodes.**

R.M. Waruiru*, J.W. Ngotho, M.N. Mutune

Department of Veterinary Pathology, Microbiology & Parasitology, Faculty of Veterinary Medicine, University of Nairobi, P.O. Box 29053, Kangemi, Kenya

11:30AM–11:45AM **Eprinomectin pour-on at single and at double dose against gastrointestinal nematode infections in goats.**

L. Rinaldi^{a*}, V. Veneziano^a, G. Capelli^b, R. Rubino^c, G. Cringoli^a

^aDip. Patologia e Sanita Animale, Università di Napoli, Italy; ^bDip. Scienze Sperimentali Veterinarie, Università di Padova, Italy; ^cIstituto Sperimentale per la Zootecnia, Bella Scalo-Potenza, Italy

11:45AM–12:00AM **Efficacy of jetting and 2 pour-on formulations containing spinosad against *Melophagus ovinus*.**

F.V. Olaechea^{a*}, J. Corley^a, H. Perez Monti^b, F. Raffo^a, J. Rothwell^b

^aNational Institute for Agricultural Technology (INTA), CC. 277, (8400) Bariloche, Argentina; ^bElanco Animal Health, 123 Epping Rd, Macquarie Park NSW 2113, Australia

12:00AM–12:15PM **Control effects of closantel limposomes on sheep experimentally infected with *Fasciola hepatica*.**

H.E. Hongxuan^{ab}, Q. Ximing^a, Z. Qiangzhe^a, D. Mingxing^{a*}

^aState Key Laboratory of Biomembrane & Membrane Biotechnology, Department of Biological Sciences and Biotechnology, Tsinghua University, Beijing 100084, P.R. China; ^bDepartment of Animal Science, Henan Vocation-Technical Teachers College, Xinxiang, Henan 450003, P.R. China

10:45AM–12:15PM **DRUG RESISTANCE 2**

Moderator: R.K. Prichard

Room: Napoleon A2

10:45AM–11:00AM **Studies on drug-resistance of *Eimeria tenella* in China.**

W. Ming^{a*}, A. Jian^b, Y. Liyun^a, G. Depei^a, Y. Yonglan^a

^aCollege of Veterinary Medicine, China Agricultural University, Beijing, P.R. China;

^bDepartment of Animal Science and Technology, Beijing Agricultural College, Beijing, P.R. China

11:00AM–11:15AM **Detection of primaquine resistant *Theileria sergenti* parasites by flow cytometry and some biochemical properties of the parasites.**

Y. Yagi^{a*}, A. Ohnuma^b, M. Yamanaka^c, H. Shiono^a, Y. Chikayama^a, A. Kumar^a

^aHokkaido Research Station, National Institute of Animal Health, Sapporo, Japan;

^bGraduate School of Science, Hokkaido University, Sapporo, Japan; ^cHokkaido Hidaka Livestock Hygiene Service Center, Shizunai, Japan

11:15AM–11:30AM **Sequencing of exon 4 of the (insert square)-tubulin isotype 1 gene from 12 cyathostomin species.**

J.E. Hodgkinson*, A.J. Davidson, J.B. Matthews

Department of Veterinary Parasitology, University of Liverpool, UK

11:30AM–11:45AM **Heterologous expression of glutamate gated chloride channel subunits from the cattle nematode *Cooperia oncophora*.**

A.I. Njue*, R.K. Prichard

Institute of Parasitology, McGill University, 21, 111 Lakeshore Road, Ste-Anne-de-Bellevue, Quebec, H9X 3V9, Canada

- 11:45AM–12:00PM **Importance of the beta-tubulin codon 200 polymorphism for the mechanism of benzimidazole resistance in cyathostomes investigated by quantitative real time PCR.**
G. von Samson-Himmelstjerna*, N. Wirtherle, M. Pape, S. Buschbaum, T. Schneider
Institute of Parasitology, Hannover School of Veterinary Medicine, Germany
- 12:00PM–12:15PM **Steps in characterization of allelic variation of an ivermectin sensitive GluCL gene in *C. nassatus*.**
R. Tandon*, R.M. Kaplan
Department of Medical Microbiology and Parasitology. College of Veterinary Medicine, University of Georgia, Athens, GA USA
- 10:45AM–12:15PM **CONTROL STRATEGIES 3**
Moderator: S. Petkevicius
Room: Napoleon A3
- 10:45AM–11:00AM **Dietary carbohydrates introduce changes in the metabolism in the large intestine that influence the population of *Oesophagostomum dentatum* in pigs.**
K.E. Bach Knudsen^{a*}, S. Petkevicius^b, H. Jørgensen^a, K.D. Murrell^b
^aDanish Institute of Agricultural Sciences, Tjele, Denmark; ^bThe Royal Veterinary & Agricultural University, Copenhagen, Denmark
- 11:00AM–11:15AM **Inactivation of *Cryptosporidium parvum* oocysts by the composting of cattle feces.**
K. Shimura*, T. Tsutsui, T. Kamio, M. Ohta, K. Kanehira, I. Yamane
National Institute of Animal Health, Tsukuba, Ibaraki, Japan
- 11:15AM–11:30AM **The effects of carbohydrates on the establishment of *Trichuris suis* in the large intestine of pigs.**
L.E. Thomsen^{a*}, K.E. Bach Knudsen^b, A. Roepstorff^a
^aDanish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University, Dyrølægevej 100, DK-1870 Frederiksberg C, Denmark; ^bDepartment of Animal Nutrition and Physiology, Danish Institute of Agricultural Sciences, Research Centre Foulum, P.O. Box 50, DK-8830 Tjele, Denmark
- 11:30AM–11:45AM **A meta-analysis of the milk production response after anthelmintic treatment in adult dairy cattle.**
J. Sanchez^{*a}, I. Dohoo^a, J. Carrier^b, L. DesCôteaux^b
^aDepartment of Health Management, Atlantic Veterinary College, University of Prince Edward Island, 550 University Avenue, Charlottetown PEI, C1A 4P3, Canada; ^bFaculté de médecine vétérinaire, Université de Montréal, Sciences Cliniques, St-Hyacinthe, Quebec, J2S 7C6, Canada

- 11:45AM–12:00PM **Behavioral mechanisms underlying production responses in dairy cows treated with eprinomectin.**
A.B. Forbes^{a*}, C.A. Huckle^b, M.J. Gibb^b
^aMerial, Sandringham House, Harlow, Essex, CM19 5TG, UK; ^bInstitute of Grassland & Environmental Research (IGER), North Wyke, Devon, EX20 2SB, UK
- 12:00PM–12:15PM **Practical implementation of a strategic endoparasite control program in a commercial riding stable.**
E.M. Abbott^{a*}, D.J. Baker^b, J.P. Barley^c
^aAbbott Associates, Lutterworth, UK; ^bPriors Marston, UK; ^cHuntingdon Life Sciences, Huntingdon, UK
- 10:45AM–12:30PM **EPIDEMIOLOGY 4**
Moderator: E. Claerebout
Room: Napoleon C3
- 10:45AM–11:00AM **A sero-epidemiological survey of parasites in cattle in the north eastern Free State, South Africa.**
M.S. Mtshali^{a*}, P.A. Mbatia^a, D.T. de Waal^b
^aParasitology Research Program, Qwa-Qwa Campus, University of the Free State, South Africa; ^bParasitology Division, Onderstepoort Veterinary Institute, South Africa
- 11:00AM–11:15AM ***Cryptosporidium* and *Giardia*: epidemiology and control on California dairy farms.**
W.A. Smith^{*}, E.R. Atwill, K. Tate, D.J. Lewis, M. Lennox, M. Pereira, P.A. Conrad
University of California, Davis, CA USA
- 11:15AM–11:30AM **Epidemiology of subclinical nematode infections in dairy cows on five farms in England: 1978/9 & 2002.**
M.T. Fox^{a*}, M. Hutchinson^a, A. Riddle^a, R. Bond^a, A.B. Forbes^b
^aRoyal Veterinary College, London, UK; ^bMerial Animal Health, Harlow, UK
- 11:30AM–11:45AM **Seroprevalence and associated risk factors of neosporosis in beef and dairy cattle in southern Italy.**
P. Paradies^{a*}, G. Testini^a, N. Leone^a, R. Lia^a, G. Capelli^b, D. Otranto^a
^aDepartment of Health and Animal Welfare, Faculty of Veterinary Medicine, University of Bari, Italy; ^bDepartment of Experimental Veterinary Sciences, Faculty of Veterinary Medicine, University of Padua, Italy
- 11:45AM–12:00PM **Epidemiology of amphistomes in cattle in the Highveld and Lowveld Communal grazing areas of Zimbabwe.**
D.M. Pfukenyi^{a*}, S. Mukaratirwa^b, J. Monrad^c
^aCentral Veterinary Laboratory, Diagnostic and Research Branch, P.O. Box CY 551, Causeway, Harare, Zimbabwe; ^bUniversity of Zimbabwe, Faculty of Veterinary Science, Paraclinical Veterinary Studies, P.O. Box MP 167, Mt Pleasant, Harare, Zimbabwe; ^cDanish Centre for Experimental Parasitology, Dyrlægevej 100, DK-1870, Frederiksberg, Denmark

- 12:00PM–12:15PM **Epidemiological survey of *Cryptosporidium parvum* and *Giardia duodenalis* in dairy calves in Belgium.**
T. Geurden^a, E. Claerebout^a, D. Berkens^b, P. Geldof^a, J. Vercruysse^a
^aLaboratory of Parasitology, Ghent University, Merelbeke, Belgium; ^bPrince Leopold Institute of Tropical Medicine, Antwerp, Belgium
- 12:15PM–12:30PM ***Neospora caninum* abortion in a dairy and beef herd: use of horizontal and vertical transmission parameters to assess the sensitivity and the specificity of an Indirect Immuno-Fluorescence Antibody Test.**
F. De Meerschman^a, N. Speybroeck^b, D. Berkvens^b, C. Focant^a, J. Detry^a, C. Rettigner^a, B. Losson^a
^aLaboratory of Parasitology, Department of Infectious and Parasitic Diseases, Faculty of Veterinary Medicine, University of Liege, Boulevard de Colonster, 20, 4000, Liege, Belgium; ^bDepartment of Animal Health, Unit of Epidemiology and Applied Statistics, Prince Leopold Institute of Tropical Medicine, 2000, Antwerp, Belgium
- 12:15AM–1:30PM **LUNCH: ON YOUR OWN**
- 1:30PM–2:30PM **VACCINE 2**
Moderator: G.M. Faubert
Room: Napoleon A1
- 1:30PM–1:45PM **The immuno-protective effect of DNA vaccine against experimental inoculation of chickens with *Eimeria tenella*.**
S.Q. Wu, J.J. Jiang*, Q. Liu, Y.J. Zhu
College of Veterinary Medicine, China Agricultural University, Beijing, China
- 1:45PM–2:00PM **Development of a recombinant vaccine against *Babesia divergens* in cattle.**
Th.P.M. Schetters^a*, E. Precigout^b, S. Delbecq^b, J. Kleuskens^a, J. van de Crommert^a, L. Janssen^a, A. Gorenflot^b
^aIntervet International, Boxmeer, The Netherlands; ^bUniversity of Montpellier I, Montpellier, France
- 2:00PM–2:15PM **Oral immunizations of BALB/c mice with *Giardia duodenalis* recombinant cyst wall protein (rCWP2) impedes cyst output.**
G.M. Faubert^a*, R. Larocque^a, K. Nakagaki^b, P. Lee^a, A. Abdul-Wahid^a
^aInstitute of Parasitology, McGill University, Montreal, Qc. Canada; ^bCollaborate Laboratories for Wildlife Health, Gentle, Nippon Jui Chikusan University, Yokyo, Japan.
- 2:15PM–2:30PM **The vaccine for prevention of echinococcosis of animals.**
M. Aminjonov*, Sh. Rasulov, Sh. Aminjonov
Uzbek Research Institute of Veterinary after named acad. K.I. Skryabin, Samarkand, Uzbekistan

1:30PM–3:15PM **CONTROL STRATEGIES 4**

Moderator: T.H. Terrill

Room: Napoleon BC12

1:30PM–1:45PM **Seasonal dynamics and overwintering survival of cattle GI nematodes using *Duddingtonia flagrans*.**

S-O. Dimander*, J. Höglund, P.J. Waller
SWEPAR, Uppsala, Sweden

1:45PM–2:00PM **Effectiveness of copper-oxide wire particles on the control of *Haemonchus contortus* in sheep.**

A.D. Watkins^{a*}, J.E. Miller^a, T.H. Terrill^b, M. Larsen^c, R.M. Kaplan^d
Department of Pathological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70803 USA; ^bFort Valley State University, Fort Valley, GA USA; ^cRoyal Veterinary & Agricultural University, Denmark; ^dUniversity of Georgia, Athens, Georgia USA

2:00PM–2:15PM **Supplementation and/or single anthelmintic (AH) treatment of browsing kids naturally infected with gastrointestinal nematodes (GIN) during the wet season in tropical Mexico.**

J.F. Torres-Acosta^{a*}, A. Aguilar Caballero^a, L. Canul-Ku^a, L. Cob-Galera^a, J. Vargas-Magaña^a

^aFMVZ-Universidad Autonoma de Yucatan, Merida, Yucatan, Mexico

2:15PM–2:30PM **Potential of the fungus *Duddingtonia flagrans* to control nematodes in goats in southeastern United States: a dose-titration and dose-timing study.**

M. Larsen^{a*}, T.H. Terrill^b, O. Samples^b, S. Husted^a, J.E. Miller^c, R.M. Kaplan, S. Gelaye^b

^aRoyal Veterinary & Agricultural University, Denmark; ^bFort Valley State University,

^cUniversity of Georgia, Georgia USA; ^dLouisiana State University, Louisiana USA

2:30PM–2:45PM **Potential and limitations of the use of evasive grazing for prevention of parasitic gastroenteritis in small ruminants under temperate conditions.**

M. Eysker*, N. Bakker, Y.A. van der Hall, I. Van Hecke, F.N.J. Kooyman, H.W. Ploeger

Division of Parasitology and Tropical Veterinary Medicine, Utrecht University, Utrecht, The Netherlands

2:45PM–3:00PM **Successful substitution on pastures of a resistant nematode (*Teladorsagia circumcincta*) population with a susceptible strain.**

M.N. Moussavou-Boussougou, C. Sauvé, J. Cabaret*
INRA, BASE, 37380 Nouzilly, France

- 3:00PM–3:15PM **Screening and characterization of an Indian isolate of nematophagous fungi for its use in IPM as a biocontrol agent against nematode parasites of ruminants.**
J.B. Chauhan*, R.B. Subramanian, P.K. Sanyal
Lab No. 109, Department of Biosciences, Sardar Patel University, SPU Campus, Vallabh Vidyanagar- 388120, Gujarat, India; Biotechnology Laboratory (R&D), National Dairy Development Board (NDDB), Anand- 388001, Gujarat, India
- 1:30PM–2:45PM **EPIDEMIOLOGY 5/SWINE**
Moderator: TBA
Room: Napoleon A2
- 1:30PM–1:45PM **Factors associated with prevention of porcine cysticercosis in Mgeta Division, an area in a highly endemic country, Tanzania: Analysis of focus groups discussion and in-depth interviews of 251 informants and meat inspection.**
M.E. Boa^{*a}, A.A. Kassuku^a, A.L. Willingham^b
^aDepartment of Veterinary Microbiology and Parasitology, Sokoine University of Agriculture, P. O. Box 3019, Morogoro, Tanzania; ^bDanish Centre for Experimental Parasitology, Royal Veterinary and Agricultural University, Ridebanevej 3, DK-1870 Frederiksberg C, Denmark
- 1:45PM–2:00PM **A Bayesian approach for prevalence estimation and test validation of porcine cysticercosis in Zambia.**
P. Dorny^{ab*}, I.K. Phiri^c, D. Berkvens^a, A.L. Willingham III^d, S. Gabriel^b, J. Vercruysse^b
^aInstitute of Tropical Medicine, Antwerp, Belgium; ^bGhent University, Merelbeke, Belgium; ^cUniversity of Zambia, Lusaka, Zambia; ^dRoyal Veterinary and Agricultural University, Frederiksberg, Denmark
- 2:00PM–2:15PM **Disease surveillance of lesions in pigs at slaughterhouses during period 1996-2002 in the Czech Republic.**
M. Zizlavsky, D. Lukesova*, Z. Smitka, L. Svobodova, D. Tydlitát
Sevaron Consulting Ltd., Brno, Czech Republic
- 2:15PM–2:30PM **Transmission of *Ascaris suum* to piglets born on contaminated pastures.**
A. Roepstorff*, H. Mejer, N.P.K. Hansen
Danish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University, Frederiksberg C, Denmark
- 2:30PM–2:45PM **Effectiveness of health education intervention for reducing the risk of porcine cysticercosis in Mbulu District, Tanzania.**
H.A. Ngowi^{a*}, A.A. Kassuku^a, M.R.S. Mlozi^a, J.E.D. Mlangwa^a, H. Carabin^b, E.L. Tolma^b, A.L. Willingham III^c
^aSokoine University of Agriculture, Morogoro, Tanzania; ^bCollege of Public Health, Oklahoma City, OK USA; ^cWHO/FAO Collaborating Center for Parasitic Zoonoses,

Danish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University, Frederiksberg, Denmark

1:30PM–3:00PM **HOST RESPONSE/IMMUNITY 4**

Moderator: T.W. Spithill

Room: Napoleon A3

- 1:30PM–1:45PM **The bovine gut cellular responses following primary and challenge infection with *Calicophoron microbothrium metacercariae*.**
M. Mavenyengwa^{a*}, S. Mukaratirwa^a, M. Obwolo^a, J. Monrad^b
^aDepartment of Paraclinical Veterinary Studies, University of Zimbabwe, P.O. Box MP 167, Mt Pleasant, Harare, Zimbabwe; ^bDanish Centre for Experimental Parasitology, Royal Veterinary and Agricultural University, Dyrølægevej 100, DK-1870, Frederiksberg C, Copenhagen, Denmark
- 1:45PM–2:00PM **Comparison of humoral response to *Fasciola hepatica* and *Fasciola gigantica* experimental infection in sheep.**
Z. Weiyu^{ab*}, M. Emmanuelle^b, H. Weiyl^a, C. Alain^b
^aCollege of Animal Science and Technology, Guangxi University, 530005 Nanning, China; ^bUMR INRA/ENVN Interactions, Hôte-parasite-Milieu, Ecole Nationale Vétérinaire de Nantes, BP 40706, F-44307 Nantes Cedex 03, France
- 2:00PM–2:15PM **Peritoneal lavage cells of Indonesian thin tail sheep mediate antibody-dependent superoxide radical cytotoxicity to newly excysted juvenile *Fasciola gigantica* but not *F. hepatica*.**
D. Piedraftia^a, S.E. Estuningsih^b, Suharyanta^b, S. Widjajanti^b, S. Partoutomo^b, H.W. Raadsma^c, T.W. Spithill^{ad*}
^aMonash University, Clayton Australia; ^bResearch Institute for Veterinary Science, Bogor, Indonesia; ^cUniversity of Sydney, Camden, Australia; ^dMcGill University, Montreal, Canada
- 2:15PM–2:30PM **Maternal to foetal transfer of immunoglobulins in *Schistosoma mattheei* infected cows.**
S. Gabriël^{ab*}, J. Vercruysse^b, I.K. Phiri^a, B. Goddeeris^b
^aSchool of Veterinary Medicine, Lusaka, Zambia; ^bFaculty of Veterinary Medicine, Ghent, Belgium
- 2:30PM–2:45PM **How the intestinal microflora of the pigs helps regulate the population dynamics of *Oesophagostomum dentatum*.**
S. Petkevicius^{ac*}, K.E. Bach Knudsen^b, K.D. Murrell^a, H. Jørgensen^b, A. Roepstorff^a
^aThe Royal Veterinary & Agricultural University, Copenhagen, Denmark; ^bDanish Institute of Agricultural Sciences, Tjele, Denmark; ^cVeterinary Institute of Lithuanian Veterinary Academy, Kaišiadorys, Lithuania
- 2:45PM–3:00PM **Predisposition to *Ascaris suum* infections in neonatally exposed pigs.**
H. Mejer^{a*}, A. Roepstorff^a, L. Eriksen^a
^aThe Royal Veterinary and Agricultural University, Frederiksberg, Denmark

1:30PM–3:00PM **CHEMOTHERAPY 4/CANINE**

Moderator: F. Beugnet

Room: Napoleon B3

- 1:30PM–1:45PM **Treatment of *Neotrombicula* associated dermatitis in dogs using topical permethrin-pyriproxyfen combination.**
D. Smal^a, P. Jasmin^{b*}, P. Mercier^b
^aDVM, Veterinary Clinic, 59 450 Sin Le Noble, France; ^bDVM, Medical Department, Virbac S.A., 06 511 Carros, France
- 1:45PM–2:00PM **Assay of fipronil efficacy to prevent canine monocytic ehrlichiosis in endemic areas.**
B. Davoust^a, F. Beugnet^{b*}
^aDirection du Service de Santé des Armées, BP16, Lyon 69998, France; ^bMerial, 29 Av T. Garnier, 69348 Lyon, France
- 2:00PM–2:15PM **Efficacy of a compound preparation containing imidacloprid 8.8% w/w and permethrin 44% w/w against ticks (*I. ricinus*, *R. sanguineus*) and fleas (*Ct. felis*) on dogs.**
C. Epe^{*a}, N. Coati^a, D. Stanneck^b
^aInstitute of Parasitology, Hannover School of Veterinary Medicine, Buenteweg 17, D-30559 Hannover, Germany; ^bBayer AG, BHC-BG Animal Health, D-51368 Leverkusen, Germany
- 2:15PM–2:30PM **Evaluation of the efficacy of an imidacloprid 10% / moxidectin 2.5% spot-on against *Sarcoptes scabiei* var *canis* on dogs.**
L.J. Fourie^{a*}, C. Du Rand^b, J. Heine^c
^aUniversity of the Free State, Bloemfontein, Republic of South Africa; ^bClinVet International (Pty) Ltd, Bloemfontein, Republic of South Africa; ^cBayer, BHC AH RD Parasitocides, Leverkusen, Germany
- 2:30PM–2:45PM **European multicenter field trial on the efficacy and safety of a topical formulation of imidacloprid and permethrin (AdvantixTM) in dogs naturally infected with ticks and/or fleas.**
K. Hellmann^a, T. Knoppe^a, K. Krieger^{b*}, D. Stanneck^b
^aKlifovet AG Munich, Germany; ^bBayer AG, BHC AH RD Parasitocides, Leverkusen, Germany
- 2:45PM–3:00PM **Evaluation of K9 AdvantixTM vs Frontline[®] Plus topical treatments to repel brown dog ticks (*Rhipcephalus sanguineus*) on dogs.**
D.R. Young^{*a}, R.G. Arther^b, W.L. Davis^b
^aYoung Veterinary Research Services, Turlock, California USA; ^bBayer HealthCare, Shawnee Mission, Kansas USA

1:30PM–2:45PM **CHEMOTHERAPY 5/EQUINE**

Moderator: J.O.D. Slocombe

Room: Napoleon C3

1:30PM–1:45PM ***Parascaris* resistance to macrocyclic lactones.**

J.O.D. Slocombe^{a*}, R. de Gannes^b, M.C. Lake^a

^aDepartment of Pathobiology, Ontario Veterinary College, University of Guelph, Guelph, ON, Canada; ^bEquine Veterinary Services, Schomberg, ON, Canada

1:45PM–2:00PM **Field efficacy of ivermectin plus praziquantel oral paste against naturally acquired, gastrointestinal nematodes and cestodes of horses in North America and Europe.**

S. Rehbein^{a*}, J.E. Holste^b, M.Y. Doucet^c, C. Fenger^d, A. Paul^e, C.R. Reinemeyer^f, L.L. Smith^g, S. Yoon^h, S.E. Marley^h

^aMerial GmbH, Kathrinehof RC, Rohrdorf, Germany; ^bMerial, Missouri RC, Fulton, MO USA; ^cFac. Méd. Vét., Univ. Montréal, Saint-Hyacinthe, Canada; ^dEquine Internal Medicine Consulting, Georgetown, KY USA; ^eUniversity of Illinois, Urbana, IL USA; ^fEast Tennessee Clinical Res. Inc., Knoxville, TN USA; ^gSmith R&D, Lodi, WI USA; ^hMerial, Duluth, GA USA

2:00PM–2:15PM **Efficacy of an ivermectin (0.2 mg/kg) and praziquantel (1.0 mg/kg) combination paste against cestodes, nematodes, and bots when administered as a single oral dose to horses.**

S.E. Marley^a, D.E. Hutchens^b, C.R. Reinemeyer^c, J.E. Holste^d, A.J. Paul^b, S. Rehbein^e

^aMerial, Duluth, GA, USA; ^bUniv. of Illinois, Urbana, IL USA; ^cEast TN Clinical Research, Inc., Knoxville, TN USA; ^dMerial, Missouri RC, Fulton, MO USA; ^eMerial GmbH, KathrinehofRC, Rohrdorf, Germany

2:15PM–2:30PM **Efficacy of aversectin preparations against intestinal nematodes of horses.**

T.A. Kuzmina, A.I. Starovir*

Institute of Zoology, NAS of Ukraine, 15, B. Khmelnytskyi Str., Kyiv, 01601, Ukraine

2:30PM–2:45PM **Larvicidal activity of an ivermectin praziquantel combination against migrating *Strongylus vulgaris* larvae in equids.**

L. Frayssinet^{a*}, P. Mercier^a, L. Grisi^b, I.V.F. Martins^b, C.R. White^c

^aVirbac SA, Carros, France; ^bUniversidade Federal Rural do Rio de Janeiro, RJ, Brazil; ^cVirbac do Brasil, Sao-Paulo, SP, Brazil

3:00PM–3:15PM **BREAK**

**3:15PM–4:45PM FORT DODGE ANIMAL HEALTH SYMPOSIUM: MOXIDECTIN: NEW PRODUCT
RESEARCH UPDATE**

Moderator: D. Rock, Ft Dodge Animal Health

Room: Napoleon BC12

PROHEART® 6 and PROHEART SR-12 Research update: A summary of recent studies on hookworm persistent efficacy, 3-month retroactive activity and safety in puppies.

K. Heaney^{a*}, T. Rock^a, D. Amodie^a, R.D. Rulli^a, D.D. Bowman^b, N. Neumann^b, M. Ulrich^b, J.W. McCall^c, R. Lindahl^d.

^aFort Dodge Animal Health, Princeton, NJ USA; ^bCHK-R&D, Stanwood, MI USA; ^cTRS Labs, INC., Athens, GA USA; ^dMPI Research, Mattawan, MI USA

CYDECTIN® moxidectin long-acting injectable solution for cattle: A novel parenteral moxidectin formulation providing extended protection for cattle against parasites.

R. DeLay*, W. Steber

Fort Dodge Animal Health, Princeton, New Jersey USA

Interest of a new combination of moxidectin and praziquantel in the control of mixed tapeworm infections and heavy strongyle challenge in horses.

F. Blond-Riou*, A. Flochlay

Fort Dodge Animal Health, Tours, France

Control of gastrointestinal parasitism in sheep in New Zealand by pre-lambing treatment of ewes with a 0.5% moxidectin injectable formulation (EWEGUARD).

A.W. Murphy*

Fort Dodge, New Zealand Limited

4:45PM–5:45PM GENERAL ASSEMBLY—CLOSING CEREMONY

Room: Napoleon BC12

6:30PM–7:30PM COCKTAILS

Room: TBA

7:30PM–10:00PM BANQUET—DANCE BAND

Room: TBA

Scientific Session Overview

Sunday, August 10, 2003							
Noon-7:00	Registration						
8:00-5:00	WAAVP Executive Committee						
7:00-9:00	Welcome Reception, Jazz						
Monday, August 11, 2003							
8:00-9:00	Napoleon BC12 Opening Ceremony - Band WAAVP History (20 minutes)						
9:00-9:45	Napoleon BC12 Plenary: The Livestock Revolution – Steinfeld, FAO						
9:45-10:00	BREAK						
10:00-10:45	Napoleon BC12 Plenary: Control of Tse Tse and Trypanosomes using Molecular Genetics – Aksoy						
10:45-12:15	Napoleon B3	Napoleon C3	Napoleon A1	Napoleon A2	Napoleon A3	BC12	Maurepas
	Oral	Oral	Oral	Oral	Oral	Workshop	Symposium
	Equine	Vaccine 1	Protozoa 1	Arthropod	Wild/Aq/Av	Org/Novel	Systematics/Diagnosis
12:15-1:30	LUNCH						
1:30-3:00	B3	C3	A1	A2	A3	BC12	Maurepas
	Symposium	Oral	Oral	Oral	Oral	Workshop	Symposium
	Donkey	Zoonosis 1	Diagnosis	NemMolBiol	HostResp 1	Org/Novel (Cont'd)	Syst/Diag (Cont'd)
3:00-3:15	BREAK						
3:15-4:15	B3	C3	A1	A2	A3	BC12	Maurepas
	Oral	Oral	Vacant	Oral	Oral	Vacant	Symposium
	Chemol1/Cat	HostResp2		Protozoa2	HostGenet1		Chemo 2/Ecto
4:15-5:45	Napoleon BC12 Novartis Symposium						
5:45-6:00	Bayer Research Award - Napoleon BC12						
6:00-7:30	Bayer Symposium - Napoleon BC12						
7:45 -	Aquarium of Americas – Bayer Reception						

Tuesday August 12, 2003							
7:30-8:45	Poster 1 – Continental Breakfast - Armstrong Room						
8:45-9:45	Hugh Gordon Memorial Lecture: Anthelmintic Vaccines that Work – Lightowlers - BC12						
9:45-10:00	Nansen Award - BC12						
10:00-10:15	BREAK						
10:15-11:45	B3	C3	A1	A2	A3	BC12	Maurepas
	Symposium	Oral	Oral	Oral	Oral	Symposium	Symposium
	Myiasis	Zoonosis 2	Host Genet 2	Epid1	BioMolBiol	Heartworms	Mapping
11:45-1:00	LUNCH						
1:00-2:30	B3	C3	A1	A2	A3	BC12	Maurepas
	Symposium	Symposium	Vacant	Oral	Oral	Symposium	Symposium
	Myiasis (Cont'd)	Emerg Prot		Control 1/ Ecto	Epid 2	AAVP	Acaracide Resistance
2:30-2:45	BREAK						
2:45-4:15	B3	C3	A1	A2	A3	BC12	Maurepas
	Symposium	Oral	Oral	Oral	Oral	Vacant	Symposium
	AqPstHazard	HostResp 3	Zoonosis 3	Epi 3/ Swine	Drug Resist 1		Acaracide Resistance (Cont'd)
4:15-5:45	Equimax Symposium (Virbac) - BC12						
5:45-7:30	Merial Symposium – BC12						
8:00	Merial Reception – Rhythm Ballroom, 2 nd Floor						
Wednesday, August 13, 2003							
7:30-9:00	Poster 2 – Continental Breakfast – Armstrong Room						
9:00-9:45	Plenary: Recent Origins on Ancient Parasites – <i>Toxoplasma</i> – Sibley – BC12						
9:45-10:30	Plenary: Modeling Host Genetics, Resistance to Infectious Diseases-Bishop – BC12						
10:30-10:45	BREAK						
10:45-12:15	Intervet Symposium – BC12						
12:15-1:30	LUNCH						
	AFTERNOON FREE						

Thursday, August 14, 2003						
7:30-8:15	Continental Breakfast (3rd Floor Foyer)					
8:15-9:00	Plenary: Antiparasitic Drugs 21 st Century – Geary - BC12					
9:00-10:30	B3	C3	A1	A2	A3	BC12
	Symposium	Oral	Oral	Oral	Oral	Workshop
	Cysticercosis	Control 2/Sh	Chemo2	RuminParasites	Systematics	Equine Cyathostomes
10:30-10:45	BREAK					
10:45-12:15	B3	C3	A1	A2	A3	BC12
	Symposium	Oral	Workshop	Oral	Oral	Oral
	Cysticercosis (Cont'd.)	Epid 4	Vet Educ	Drug Resistance 2	Control3	Chemo 3
12:15-1:30	LUNCH					
1:30-3:00	B3	C3	A1	A2	A3	BC12
	Oral	Oral	Oral	Oral	Oral	Oral
	Chemo 4/Dog	Chemo 5/Eq	Vaccine 2	Epid 5/Swine	Host Response 4	Control 4
3:00- 3:15	BREAK					
3:15-4:45	Ft. Dodge Symposium – BC12					
4:45-5:45	General Assembly — Closing Ceremony – BC12					
6:30-7:30	Cocktails					
7:30-10:00	Banquet, Dance Band					

Scientific Program

MONDAY, AUGUST 11, 2003

8:00AM–9:00AM **Opening Ceremony**
 WAAVP History – Lord Soulsby
Room: Napoleon BC12

9:00AM–9:45AM **Plenary 1: The Livestock Revolution.**
Speaker: H. Steinfield
Room: Napoleon BC12

9:45AM–10:00AM Break

10:00AM–10:45AM **Plenary 2: Control of Tsetse and Trypanosomes Using Molecular Genetics.**
Speaker: S. Aksoy
Room: Napoleon BC12

10:45AM–12:15PM **Workshop on organic farming and novel approaches to control of parasites.**
Moderators: S.M. Thamsborg, J.E. Miller, M. Larsen, P.J. Waller
Room: Napoleon BC12

PART A: ORGANIC FARMING AND PARASITE PROBLEMS

Introduction to organic farming and parasite control.
S.M. Thamsborg, M. Larsen

PIGS

Parasites in organic swine production in DK and options for control.
H. Mejer, A. Roepstorff

A survey of parasite infections on organic, free range and conventional pig farms in the Netherlands.

F.H.M. Borgsteede^{a*}, I.A.J.M. Eijck^b

^aInstitute for Animal Science and Health (ID-Lelystad), Lelystad, the Netherlands; ^bResearch Institute for Animal Husbandry, Lelystad, the Netherlands

Summary
A. Roepstorff

DAIRY CATTLE

Parasite control measures in organic dairy production in Sweden.

J. Höglund

How to deal with lungworm infections in organic dairy cattle.

H. Ploeger*, M. Eysker

Division of Parasitology and Tropical Veterinary Medicine, Utrecht University, Utrecht, The Netherlands

Summary

M. Larsen

SHEEP AND GOATS

Survey of parasites on organic sheep/dairy farms in UK.

F. Jackson

Parasite problems on organic sheep/goat farms in Germany.

C. Epe

Gastrointestinal nematode infections on organic goat farms in the Netherlands.

M. Eysker^{a*}, N. van Eekeren^b

^aDivision of Parasitology and Tropical Veterinary Medicine, Utrecht University, Utrecht, The Netherlands; ^bLouis Bolk Institute, Driebergen, The Netherlands

Parasite control and production in four experimental sheep meat flocks in Auvergne (France) during conversion to organic farming.

J. Cabaret, M. Benoit, V. Laignel

Summary

J.E. Miller

Gastrointestinal nematode control through direct and indirect effects of host nutrition.

J.G.M. Houdijk*, S. Athanasiadou, I. Kyriazakis

Animal Nutrition and Health Department, Scottish Agricultural College, Edinburgh, UK

Overall discussion and conclusions

S.M. Thamsborg

PART B: NOVEL APPROACHES TO CONTROL OF PARASITES

Introduction

P.J. Waller

European experiences

S.M. Thamsborg

Australian/NZ experiences

M. Knox

African experiences

R. Peters

North American experiences

J.E. Miller

Latin American experiences

M.B. Molento

Asia experiences

G. Hood

GENERAL DISCUSSION

10:45AM–12:15PM **SYMPOSIUM: MOLECULAR SYSTEMATICS AND DIAGNOSIS**

Moderators: R.B. Gasser, D.S. Zarlenga

Room: Maurepas

Advances in the diagnosis and systematics of parasites of veterinary importance—new and exciting prospects.

R.C.A. Thompson*

WHO Collaborating Centre for the Molecular Epidemiology of Parasitic Infections and Western Australian Biomedical Research Institute, Division of Veterinary and Biomedical Sciences, Murdoch University, Western Australia

Identification and classification within the genus, *Trichinella*, with special emphasis on non-encapsulated species.

D.S. Zarlenga^a, G. La Rosa^b, E. Pozio^b, B. Rosenthal^a

^aUS Department of Agriculture, ARS, ANRI, Beltsville, Maryland 20705, USA; ^bLaboratorio di Parassitologia, Istituto Superiore di Sanita, Viale Regina Elena 299, 00161 Rome, Italy

Filarial nematodes and *Wolbachia*: a veterinary perspective.

C. Bandi*, M. Mortarino, M. Casiraghi, C. Genchi

Università di Milano, DIPAV, Sezione di Patologia Generale e Parassitologia, Italy

Mitochondrial genomics of parasitic nematodes—recent progress and implications for systematics and population genetics studies.

R.B. Gasser, M. Hu, N. B. Chilton

Department of Veterinary Science, The University of Melbourne, 250 Princes Highway, Werribee, Victoria 3030, Australia

Progress in the molecular diagnosis of cyathostomins—implications and prospects.

J.B. Matthews, J.E. Hodgkinson

Department of Veterinary Clinical Science and Department of Veterinary Parasitology, Faculty of Veterinary Science, University of Liverpool, UK.

Methodological advances in the characterizing the population genetics and molecular systematics of veterinary tissue cyst-forming coccidia.

B.M. Rosenthal

Agricultural Research Service, US Dept. of Agriculture, Beltsville, MD USA.

10:45AM–12:15PM **EQUINE PARASITES**

Moderator: G.C. Coles

Room: Napoleon B3

10:45AM–11:00AM **Helminth parasites of horses in the UK: a changing scene.**

S. Jones^a, S. Yue^b, G.C. Coles^{b*}

Department of Anatomy, University of Bristol, Southwell Street, Bristol BS2 8EJ, UK;

^bDepartment of Clinical Veterinary Science, University of Bristol, Langford House, Bristol BS40 5DU, UK

11:00AM–11:15AM **Prevalence of major gastrointestinal parasites in equids from Spanish abbatoirs.**

A. Meana*, R. Martin, A. Mateos, N.F. Pato, M. Luzón

Facultad de Veterinaria, Madrid, Spain

11:15AM–11:30AM **Safety study on pregnant mares orally treated with a combination of ivermectin praziquantel.**

P. Mercer^{a*}, F. Alves-Branco^b, C.R. White^c

^aVirbac SA, Medical Dept., Carros, France; ^bConsultorio Medico Veterinario, Bagé, RS, Brazil, ^cVirbac do Brazil, Sao-Paulo, SP, Brazil

11:30AM–11:45AM **System to test products against mosquitoes infesting horses.**

A.A. Pérez de León*

Stillmeadow, Inc., Sugar Land, Texas, USA

11:45AM–12:00PM **Reappearance of eggs in feces of horses after treatment with moxidectin and aversectin.**

O.I. Starovir*

Schmalhausen Institute of Zoology NAS of Ukraine, 15, D. Khmelnytsky Street, Kiev—30, 01601, Ukraine

12:00PM–12:15PM **Methods of identification of the 4th stage larvae of horse strongylids to mature worms.**

V.A. Kharchenko*

I.I. Schmalhausen Institute of Zoology of NAS of Ukraine, Kyiv, Ukraine

10:45AM–12:00PM **PROTOZOA 1**

Moderator: J.B. Tierney

Room: Napoleon A1

10:45AM–11:00AM **Development of an avian ionophore-tolerant *Eimeria* vaccine for the control of coccidiosis in chickens.**

G.Q. Li*, S. Kanu, F.Y. Xian, S.M. Xiao

South China Agricultural University, College of Veterinary Medicine, Guangzhou 510642, P.R. China

11:00AM–11:15AM **The role of intestinal mucin on *Eimeria tenella* infection *in vitro*.**

J.B. Tierney^{a*}, L. Matthews^b, S.D. Carrington^b, G. Mulcahy^a

^aDepartment of Veterinary Microbiology & Parasitology; ^bDepartment of Veterinary Anatomy, Faculty of Veterinary Medicine and ^{ab}Conway Institute of Biomolecular and Biomedical Research, University College Dublin, Belfield Dublin 4, Ireland

11:15AM–11:30AM **Population dynamics and intra-litter transmission patterns of *Isospora suis* under on-farm farrowing conditions.**

S. Sotiraki^{a*}, A. Roepstorff^a, K.D. Murrell^a, J.P. Nielson^a, C. Maddox-Hyttel^b

^aThe Royal Veterinary & Agricultural University; ^bDanish Veterinary Institute, Copenhagen, Denmark

11:30AM–11:45AM **Characterization of Zimbabwean *Toxoplasma gondii* isolates with stage-specific monoclonal antibodies.**

T. Hove^{a*}, P. Lind^b, S. Mukaratirwa^a

^aParaclinical Veterinary Studies, University of Zimbabwe, P.O. Box MP167, Mount Pleasant, Harare, Zimbabwe; ^bDanish Veterinary Institute, Bulowsvej 27, DK-1790, Copenhagen V, Denmark

11:45AM–12:00PM **Infection of *Meriones unguiculatus* and *Cavia aperea pamparum* with *Neospora caninum* oocysts from naturally infected dogs from Argentina.**

W. Basso*, L. Venturini, M.C. Venturini, D. Bacigalupe, J. Unzaga, A. Larsen

Parasitología y E. Parasitarias, Laboratorio de Inmunoparasitología, Facultad de Veterinaria, U.N.L.P. 60 y 118 (1900), Argentina

12:00 PM–12:15PM **First case report of dogs infected naturally with *Babesia canis vogeli* in South Africa.**

P.T. Matjila^{*ab}, F. Jongejan^{ab}, B.L. Penzhorn^a, C.P.J. Bekker^b, A.M. Nijhof^b.

^aDepartment of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Private Bag x04, 0110, Onderstepoort, South Africa, ^bDivision of Parasitology and Tropical Veterinary Medicine, Faculty of Veterinary Science, Utrecht University, The Netherlands.

10:45AM–12:15PM **WILDLIFE, AQUATIC AND AVIAN PARASITES**

Moderator: S. Mukaratirwa

Room: Napoleon A3

10:45AM–11:00AM ***Toxocara canis* in experimentally infected foxes.**

I. Saeed^{*}, K. Taira, C.M.O. Kapel

Danish Centre for Experimental Parasitology, Department of Veterinary Microbiology, The Royal Veterinary and Agricultural University, Dyrlægevej 100, DK-1870 Frederiksberg D, Denmark

11:00AM–11:15AM ***Pseudoloma neurophilia* (Microsporidia) and *Pseudocapillaria tomentosa* (Nematoda) in zebrafish (*Danio rerio*) held in research facilities.**

M.L. Kent^{*ab}, J.M. Matthews^b, J.K. Bishop-Stewart^{ab}, J.M. Spitsbergen^{bc}

^aCenter for Fish Disease Research, Department of Microbiology, 220 Nash Hall, Corvallis, Oregon 97331 USA; ^bZebrafish International Resource Center 5274 University of Oregon, Eugene, Oregon 97403-5274 USA; ^cDepartment of Environmental and Molecular Toxicology, 1007 Agricultural and Life Sciences Building, Oregon State University, Corvallis, Oregon 97333 USA

11:15AM–11:30AM **Characterisation of PCR-SSCP analysis of Benedeniines (Monogenea: Capsalidae) from marine fish in China by rDNA sequence.**

X.Y. Wu^a, A.X. Li^{a*}, X.J. Ding^b, X.Q. Zhu^c

^aThe School of Life Science, Zhongshan (Sun Yat-sen) University, Guangzhou, China;

^bDepartment of Biology, South China Normal University, Guangzhou, China; ^cCollege of Veterinary Medicine, South China Agricultural University, Guangzhou, China

11:30AM–11:45AM **Effect of *Tetrameres americana* (Cram, 1927) in chickens fed with high and low protein diets.**

H.B. Magwisha^{a*}, M. Fink^b, A. Permin^c, N.C. Kyvsgaard^d, A.A. Kassuku^a

^aDepartment of Veterinary Microbiology and Parasitology, Sokoine University of Agriculture, P. O. Box 3019, Morogoro, Tanzania; ^bDepartment of Zoology, University of Copenhagen, Denmark; ^cNetwork of Smallholder Poultry Production, Dyrlægevej 2, The Royal Veterinary and Agricultural University, Grønnegårdsvej 5, Frederiksberg C, Denmark; and; ^dDepartment of Animal Science and Animal Health, The Royal Veterinary and Agricultural University, Grønnegårdsvej 5, Frederiksberg C, Denmark

11:45AM–12:00PM **First report of a field outbreak of the oriental eye-fluke, *Philophthalmus gralli* (Mathis & Leger, 1910), in commercially reared ostriches (*Struthio camelus*) in Zimbabwe.**

S. Mukaratirwa^{*}, T. Hove, Z.M. Cindzi, D.B. Maononga, M. Taruvinga, E. Matenga

Department of Paraclinical Veterinary Studies, Faculty of Veterinary Science, P. O. Box MP, 167 Mount Pleasant, Harare, Zimbabwe

12:00PM–12:15PM **Prevalence and pathology of gastrointestinal infections in poultry in Punjab state (India).** B.S. Sandhu^{*a}, L.D. Singla^b, R.S. Brar^a, A.P.S. Brar^a, C.K. Singh^a

^aDepartment of Veterinary Pathology and ^bParasitology, Punjab Agricultural University, Ludhiana 1412 004, India

10:45AM–12:15PM **ARTHROPODS AND ARTHROPOD-BORNE DISEASES**

Moderator: C. Genchi

Room: Napoleon A2

10:45AM–11:00AM **Characterisation of Recombinant Immunoreactive Antigens from the scab mite *Saracoptes scabiei*.**

C.V. Witzendorff^{a*}, H.-F. Matthes^b, R. Lucius^a, B. Beich^a, B. Kalinna^a

^aDepartment of Molecular Parasitology, Institute for Biology, Humboldt-University, Berlin, Germany; ^bLouis-Pasteur, Str. 17, 14943 Luckenwalde

11:00AM–11:15AM **A PCR-based comparative survey of arthropod-transmitted infections in dogs, cats and ticks in southern France.**

S.E. Shaw^{a*}, F. Beugnet^b, M.J. Day^a, M.J. Kenny^a

^aUniversity of Bristol, Langford, Somerset, UK; ^bMerial, Lyon, France

11:15AM–11:30AM **Biological and environmental factors affecting the survival of *Otodectes cynotis* (Acarina, Psoroptidae) off the host in natural and laboratory conditions.**

P. Milillo^{a*}, P. Mesto^a, C. Cafarchia^a, G. Capelli^b, D. Otranto^a

^aDepartment of Health and Animal Welfare, Faculty of Veterinary Medicine, University of Bari, Italy; ^bDepartment of Experimental Veterinary Sciences, Faculty of Veterinary Medicine, University of Padua, Italy

11:30AM–11:45AM **Use of standardized inoculum of *Anaplasma marginale* and chemoprophylaxis to control bovine anaplasmosis.**

M.F.B. Ribeiro^a, E.J. Facury-Filho^b, L.M.F. Passos^{b*}, H.M. Saturnino^b, M.A.F. Malacco^c

^aDepartment of Parasitology, Federal University of Minas Gerais State, Belo Horizonte, Brazil; ^bSchool of Veterinary Medicine, Federal University of Minas Gerais State, Belo Horizonte, Brazil; ^cVeterinarian

11:45AM–12:00PM **Experimental infection of dairy calves with *Borrelia burgdorferi* by exposure to field collected Ixodid ticks.**

T.L. Cyr^{*}

Agricultural Research Services, USDA, Animal and Natural Resources Institute, Parasite Biology, Epidemiology and Systematics Laboratory, Beltsville, MD USA

12:00PM–12:15PM **Efficacy of Selamectin sopt-on for the control of *Myobia musculi* and *Myocoptes musculus* infections in mice.**

P.J. Bourdeau^{*}, L. Houdre, A.M. Marchand

Ecole Nationale Veterinaire de Nantes, France

10:45AM–12:15PM **VACCINE 1**

Moderator: D.P. Knox

Room: Napoleon C3

10:45AM–11:00AM **Characterization of potentially host-protective material from *Teladorsagia circumcincta*.**

H. Craig^{*}, D.P. Knox, D. Redmond

Moredun Research Institute, Bush Loan, Penicuik, Midlothian, Scotland

11:00AM–11:15AM **Vaccination against the rodent intestinal nematode *Nippostrongylus brasiliensis*.**

G. Ball^{a*}, R.M. Maizels^b, D.P. Knox^a

^aMoredun Research Institute, Bush Loan, Penicuik, Scotland EH26 OPZ; ^bICAPD, University of Edinburgh, Kings Buildings, Edinburgh, Scotland

11:15AM–11:30AM **Validation of the protective capacity of the *Ostertagia ostertagi* ES-thiol antigens with different adjuvantia.**

P. Geldhof^a, E. Claerebout^{a*}, I. Vercauteren^a, D.P. Knox^b, J. Vercruysse^a

^aLaboratory of Parasitology, Faculty of Veterinary Medicine, Ghent University, Belgium;

^bMoredun Research Institute, Penicuik, UK

11:30AM–11:45AM **Protection in sheep using a purified cysteine protease fraction of adult *Haemonchus contortus*.**

D.P. Knox^{*}, D.L. Redmond, D. Pettit, W.D. Smith

Moredun Research Institute, Pentland Science Park, Bush Loan, Penicuik, Scotland, UK EH27 OPZ

11:45AM–12:00PM **Comparison of antibody isotypes and lymphocyte subsets responses in rats immunised with protein or cDNA of s-Glutathione Transferase (GST) of *Fasciola hepatica*.**

L. Jedlina-Panasiuk^{*a}, H. Wedrychowicz^{ab}

^aW. Stefanski Institute of Parasitology PAS; ^bWarsaw Agricultural University, Poland

12:00PM–12:15PM **A field-trial of an experimental recombinant vaccine for the control of *Fasciola hepatica* infection in sheep.**

J. Fanning^a, J. P. Dalton^{bd}, S. Hanrahan^c, B. Good^c, G. Mulcahy^{*ad}

^aDepartment of Veterinary Microbiology and Parasitology and Conway Institute, University College, Dublin, Ireland; ^bSchool of Viotechnology, Dublin City University, Dublin 9, Ireland; ^cTeagasc Sheep Research Centre, Athenry, Co. Galway, Ireland; ^dIldana Biotechnology, Dublin, Ireland

12:15PM–1:30PM **LUNCH: ON YOUR OWN**

1:30PM–3:00PM **Workshop: Organic Farming and Novel Approaches to Parasite Control (*Continued*)**

Moderators: S. Thamsborg, J.E. Miller, M. Larsen, P.J. Waller

Room: Napoleon BC12

1:30PM–3:00PM **SYMPOSIUM: MOLECULAR SYSTEMATICS AND DIAGNOSIS (*CONTINUED*)**

Moderators: R.B. Gasser, D.S. Zarlenga

Room: Maurepas

1:30PM–3:00PM **SYMPOSIUM: DONKEYS: HERO OR VILLAIN OF THE PARASITE WORLD? PAST, PRESENT AND FUTURE**

Moderators: E. Svendsen, A.F. Trawford

Room: Napoleon B3

The value of donkeys (*Equus assinus*) in parasitology.

A.F. Trawford*, C.J. Morriss

The Donkey Sanctuary, Sidmouth, Devon, EX10 0NU, UK

Experiences with field studies on parasites in donkeys.

M.V.Z. Aline S. de Aluja*

Programme “Donkey Sanctuary—International League for the Protection of Horses—National Autonomous University of Mexico (DS-ILPH-UNAM)”, School of Veterinary Medicine, Circuito Exterior S/N, Ciudad Universitaria, CP 04510 México

***Rhinoestrus usbekistanikus* (Gan 1947): its prevalence and pathological effect in donkeys.**

Ph. Dorchies^{a*}, F. Gebreab^b, L.J. Pangui^c

^aEcole Nationale Vétérinaire, Toulouse, France; ^bVeterinary Faculty, Debre Zeit, Ethiopia; ^cEcole Inter Etats des Sciences et Médecine Vétérinaires, Dakar, Sénégal

Best practice worm management for equids in Africa.

R.C. Krecek*

P.O. Box 12832, Onderstepoort 0110, South Africa

1:30PM–2:45PM **DIAGNOSIS OF PARASITIC INFECTIONS**

Moderators: D. Strauss-Ayali

Room: Napoleon A1

1:30PM–1:45PM **Non-invasive PCR for the detection of *Leishmania infantum* infection in dogs.**

D. Strauss-Ayali^{ab*}, C.L. Jaffe^b, O. Burshtain^a, L. Schnur^b, G. Baneth^a

^aKoret School of Veterinary Medicine; ^bKuvin Center for the Study of Tropical and Infectious Diseases, The Hebrew University of Jerusalem, Israel

1:45PM–2:00PM **Identification of *Habronema microstoma* and *Habronema muscae* (Spirurida, Habronematidae) by a specific PCR-based assay using markers in the ITS2 rDNA and its implications.**

A. Giangaspero, D. Traversa^{*}, P. Galli, B. Paoletti

University of Teramo, Italy

2:00PM–2:15PM **Photography and staining techniques for helminth specimens, particularly with “Carmin staining and acetic-acid treatment.”**

N. Taira^{a*}, Y. Ando^a, S. Ura^b, K. Taira^c, J.C. Williams^d

^aNational Institute of Animal Health, Japan; ^bKyodoken Institute, Kyoto, Japan; ^cThe Royal Veterinary and Agricultural University, Frederiksberg, Denmark; ^dLouisiana State University, Baton Rouge, LA USA

2:15PM–2:30PM **Detection of circulating immune complexes (CIC) of trypanosomosis suspected cattle and buffaloes of Haryana (India) using sandwich-ELISA.**

L. Jeyabal^{*}, S.S. Chaudry, K. Devender, C.C.S. Haryana

Agricultural University, Hisar, India

2:30PM–2:45PM **Detecting the antigen-antibody reactions of *Fasciola gigantica* by using electrochemical immunosensor.**

C. Han-Zhong^{ab}, J. Jin-Shu^{a*}

^aCollege of Veterinary Medicine, China Agricultural University, Beijing 100094, P.R. China;

^bCollege of Animal Science and Technology, Guangxi University, Nanning 530005, P.R. China

1:30PM–3:00PM **ZOONOSIS 1**

Moderator: A. Cruz-Reyes

Room: Napoleon C3

1:30PM–1:45PM **Detection of *Cryptosporidium parvum* in polluted stream water.**

J.A. Higgins^{*a}, K. Belt^b, C. Hohn^a, D. Shelton^a

^aUSDA-ARS, Beltsville, MD USA; ^bUS Forest Service, Catonsville, MD USA

1:45PM–2:00PM ***Giardia* spp. and *Cryptosporidium* spp. in clams (*Chamelea gallina*) of the Adriatic coast (Italy).**

A. Giangaspero^{*a}, U. Molini^a, R. Iorio^a, D. Nardinocci^a, D. Traversa^a, C. Giansante^b

^aUniversity of Teramo, Italy; ^bIstituto Zooprofilattico dell'Abruzzo e del Molise, Teramo, Italy

2:00PM–2:15PM **Host cell tropism underlies species restriction of human and bovine genotypes of *Cryptosporidium parvum* genotypes.**

A. Hashim^{*}, M. Clyne. B. Bourke, G. Mulcahy

Paediatrics Dept. and Dept. of Microbiology and Parasitology, University College, The Children's Research Centre, Dublin 12, Ireland

2:15PM–2:30PM **Humans, dogs and parasite zoonoses—unravelling the relationships in a remote endemic community in northeast India using molecular tools.**

R.J. Traub^{*a}, I.D. Robertson^a, P. Irwin^a, N. Mencke^b, P. Monis^c, R.C.A. Thompson^a

^aSchool of Veterinary and Biomedical Sciences, Murdoch University, Western Australia; ^bBayer AG, BHC-Business Group Animal Health, Leverkusen, Germany;

^cAustralian Water Quality Centre, Bolivar, South Australia

2:30PM–2:45PM **Current situation of Chagas' disease in Mexico.**

A. Cruz-Reyes^{*a}, J.M. Pickering^a, J.B. Malone^b, L. Chias^a

^aInstituto de Biología, Universidad Nacional Autónoma de México, México; ^bPathobiological Sciences, Louisiana State University, Baton Rouge, LA 70803 USA

2:45PM–3:00PM **Congenital Transmission of *Schistosoma japonicum*.**

Q. Baozhen^{*}

Institute of Bioengineering, Zhejiang Academy of Medical Sciences, Hangzhou, Zhejiang 310013 China

1:30PM–3:00PM **NEMATODE MOLECULAR BIOLOGY**

Moderator: J.B. Matthews

Room: Napoleon A2

1:30PM–1:45PM ***Caenorhabditis elegans* as a surrogate expression system to study parasite transcription factor function.**

J. Gilleard^{*}, A. Couithier, P. McGarr, J. Smith

Dept. of Veterinary Parasitology, Faculty of Veterinary medicine, University of Glasgow, UK

1:45PM–2:00PM **RNAi to study post-embryonic GATA factor function in *Caenorhabditis elegans*: a model for parasitic nematodes?**

J. Smith^{*}, P. McGarr, J. Gilleard

Dept. of Veterinary Parasitology, University of Glasgow, UK

2:00PM–2:15PM **Isolation of carbonic anhydrase during exsheathment of *Ostertagia ostertagi* infective third-stage larvae.**

A.A. DeRosa^{*ab}, S.R. Chirgwin^b, J.C. Williams^a, T.R. Klei^{ab}

^aLouisiana State University, Agricultural Experiment Station, Baton Rouge, LA USA;

^bLouisiana State University, School of Veterinary Medicine, Baton Rouge, LA USA

2:15PM–2:30PM **Antioxidant enzyme systems in *Haemonchus contortus*: cDNA cloning of antioxidant genes, and role of enzyme induction in protection against oxidative stress.**

A.C. Kotze^{*}, N.H. Bagnall

CSIRO Livestock Industries, Queensland Bioscience Precinct, St. Lucia, QLD 4068, Australia

2:30PM–2:45PM **Cloning and expression of acetylcholinesterase genes from *Dictyocaulus viviparus*.**

J.B. Matthews^{*a}, O. Lazari^a, A.S. Hussain^b, M.E. Selkirk^b

^aDepartment of Veterinary Clinical Science, University of Liverpool, South Wirral, UK;

^bDepartment of Biochemistry, Imperial College, London, UK

2:45PM–3:00PM **Cloning and characterization of a TGF- β homologue within populations of *Ascaris suum* 4th Stage larvae (L4): regulated transcription and multiple splicing differentiate L4 in the jejunum and ileum during spontaneous cure.**

D.S. Zarlenga^{*a}, M. Morimoto^b, J.F. Urban, Jr.^b, J.P. McCarter^c

^aUSDA-ARS Immunology and Disease Resistance Lab, ANRI; ^bNutrient Requirements and Functions Lab, BHNRC, Beltsville, MD 20705 USA; ^cWashington University School of Medicine, St. Louis, MO USA

1:30PM–2:45PM **HOST RESPONSE/IMMUNITY 1**

Moderator: J.H. Hoglund

Room: Napoleon A3

1:30PM–1:45PM **Assessing the benefit of the immune response toward *Trichostrongylus colubriformis* in sheep.**

A.W. Greer^{*}, M. Stankiewicz, A.R. Sykes

Animal and Food Sciences Division, Lincoln University, New Zealand

1:45PM–2:00PM **Eprinomectin treatment of lungworms in early patency and its influence on development of immunity in young cattle.**

J.H. Hoglund^{*a}, C.G. Nheim^b, S. Alenius^b

^aDepartment of Parasitology (SWEPAR), National Veterinary Institute and Swedish University of Agricultural Sciences, Uppsala, Sweden; ^bDepartment of Ruminant Medicine and Veterinary Epidemiology, Swedish University of Agricultural Sciences, Uppsala, Sweden

2:00PM–2:15PM **Canine demodicosis—A pathological study.**

R. Khanna^{*}, H. Dadhich

Department of Veterinary Pathology, College of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner 334001 (Rajasthan) India

2:15PM–2:30PM **Clinical, Histopathological and immunological aspects of *Neosporosis* in experimentally infected dogs.**

S. Lasri^{*}, C. Rettigner, K. Onclin, F. De Meerschman, C. Focant, B. Mignon, J. Verstegen, B. Losson

Faculty of Veterinary Medicine, University of Liège, Liège, Belgium

2:30PM–2:45PM **Pathological observations on canine sarcopticosis.**

H. Dadhich^{*}, R. Khanna

Department of Veterinary Pathology, College of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner 334001 (Rajasthan) India

3:00PM–3:15PM Break

3:15PM–4:15PM **HOST GENETICS 1**

Moderator: G. von Samson-Himmelstjerna

Room: Napoleon A3

3:15PM–3:30PM **Pyrosequencing analysis identifies discrete populations of *Haemonchus* from small ruminants.**

K. Troell^{*}, J.G. Mattsson, J. Höglund

Department of Parasitology (SWEPAR), Swedish University of Agricultural Sciences and The National Veterinary Institute, Uppsala, Sweden

- 3:30PM–3:45PM **Genes involved in hypobiosis in bovine lungworm.**
C. Strube*, G. von Samson-Himmelstjerna
Thomas Schnieder Institute for Parasitology, Hannover School of Veterinary Medicine,
Germany
- 3:45PM–4:00PM **Gene expression patterns in the sheep gastrointestinal nematodes, *Haemonchus* and *Teladorsagia*.**
P.J. Skuce^{a*}, R.H. Somepalli^b, J. Parkinson^c, M. Blaxter^c, D.P. Knox^a
^aMoredun Research Institute, Edinburgh, UK; ^bAbertay University, Dundee, UK; ^cUniversity of Edinburgh, UK
- 4:00PM–4:15PM **Development of population genetic tools for the parasitic nematode *Teladorsagia (Ostertagia) circumcinta*.**
V. Grillo^{*a}, F.Jackson^b, J.S. Gilleard^a
^aDepartment Veterinary Parasitology, University of Glasgow, Glasgow, G61 1QH;
^bMoredun Institute, Edinburgh, Scotland
- 3:15PM–4:15PM **PROTOZOA 2**
Moderator: G. Baneth
Room: Napoleon A2
- 3:15PM–3:30PM **Molecular detection of equine babesia DNA in vector ticks.**
B. Battsetseg^{a*}, X. Xuan^a, N. Inoue^a, B. Byambaa^b, B. Battur^b, D. Boldbaatar^b, I. Igarashi^a, H. Nagasawa^a, J. Fujisaki^a
^aNational Research Center for Protozoan Diseases, Obihiro University, Japan; ^bInstitute of Veterinary Medicine, Mongolia
- 3:30PM–3:45PM **Investigation of the life cycle of *Hepatozoon canis* in the dog and tick *Rhipicephalus sanguineus*.**
G. Baneth^{a*}, V. Shkap^b, M. Samish^b
^aSchool of Veterinary Medicine, The Hebrew University of Jerusalem, Israel; ^bDivision of Parasitology, Kimron Veterinary Institute, Israel
- 3:45PM–4:00PM **Clinico-therapeutic studies in theileriosis in crossbred cattle of thar in India.**
A.P. Singh^{*}, A.K. Gahlot
Department of Clinical Veterinary Medicine, Ethics and Jurisprudence, College of Veterinary and Animal Science, Bikaner 334001, Raj, India
- 4:00PM–4:15PM **Canine trypanosomosis due to *Trypanosoma evansi*: clinical studies.**
G.S. Aulakh^{*}, L.D. Singla, A.C. Sood, S. Kumar, H. Paul, J. Singh
Punjab Agricultural University, Ludhiana 141004, IVRI, Izatnagar, India

3:15PM–4:15PM **CHEMOTHERAPY 1/FELINE**

Moderator: R.G. Arther

Room: Napoleon B3

3:15PM–3:30PM **The Efficacy of two anthelmintics against ascarids and hookworms in naturally infected cats.**

D.G. Catton^{*}, P.C. van Schalkwyk.

P. C. Veterinary Consultants, P. O. Box 1247, Rivonia 2128, Republic of South Africa

3:30PM–3:45PM **Imidacloprid + moxidectin topical solution as a monthly treatment of prevention of heartworm infection (*Dirofilaria immitis*) and control of fleas (*Ctenocephalides felis*) on cats.**

R.G. Arther^{*a}, D.D. Bowman^b, J.W. McCall^c, O. Hensen^d, D.R. Young^e

^aBayer HealthCare, Shawnee Mission, Kansas, USA; ^bCHK, Stanwood, Michigan, USA;

^cTRS Athens, Georgia, USA; ^dBayer A, Monheim, Germany; ^eYVRS, Turlock, California, USA

3:45PM–4:00PM **The anthelmintic efficacy and the safety of a combination of imidacloprid and moxidectin spot-on in cats and dogs under field conditions in Europe.**

K. Hellmann^a, T. Knoppe^a, I. Radeloff^a, J. Heine^{b*}

^aKlifovet AG, Munich, Germany; ^bBayer AG, BHC, AH RD Parasitocides, Leverkusen, Germany

4:00PM–4:15PM **The activity of selamectin (Revolution[®]) and imidacloprid (Advantage[®]) against cat flea (*Ctenocephalides felis*) in carpeting.**

V. Cracknell^a, P. Doherty^b, M. Murphy^b, T. McTier^{*c}, N. Evans^d

^aPfizer Animal Health Group (PAHG), Sandwich, UK; ^bRBK House, Irishtown, Athlone, Co. West Meath, Ireland; ^cPfizer Inc. PAHG, Croton, CT USA; ^dPfizer Inc. PAHG, New York, NY USA

3:15PM–4:15PM **HOST RESPONSE/IMMUNITY 2**

Moderator: J. Poot

Room: Napoleon C3

3:15PM–3:30PM **Studies on the antigenicity of invariant surface proteins of *Trypanosoma evansi*.**

J. Cai^{a*}, Z. Wang^b, Y. Shen^b

^aLaboratory of Veterinary Parasitology, Institute of Veterinary Science, Guangdong Academy of Agricultural Sciences, Guangzhou 510640, China; ^bDepartment of Veterinary Parasitology, School of Veterinary Science, Nanjing Agricultural University, Nanjing 210095, China

3:30PM–3:45PM **Optimization of a *Leishmania infantum* challenge model in hamsters.**

J. Poot^{*a}, E.M. Kuhn^a, H. Denise^b, J.C. Mottram^b, G.H. Coombs^b, A.N. Vermeulen^a

^aIntervet International BV, Boxmeer The Netherlands; ^bUniversity of Glasgow, Glasgow, UK

- 3:45PM–4:00PM **Sheep scab: Immunosuppression with Cyclosporin A reduces mite numbers and lesion area.**
J.F. Huntley^{*a}, A. Van den Broek^a, W.D. Smith^a, D. Pettit^a, J. Machell^a, A. Mackellar^a, L. Neikle^a, B.B. Thind^b, H.L. Ford^b, M. Taylor^b
^aMoredun Research Institute, Edinburgh, Scotland; ^bCentral Science Laboratory, York, England
- 4:00PM–4:15PM **The reactivation of *Neospora caninum* chronic infection in pregnant mice.**
C. Rettigner^{*}, F. DeMeerschman, C. Focant, B. Losson
Laboratory of Parasitology and Pathology of Parasitic Disease, Faculty of Veterinary Medicine, Department of Infectious Parasitic Diseases, University of Liège, Boulevard de Colonster, 20, 4000, Liège, Belgium
- 3:15PM–4:00PM **CHEMOTHERAPY 2/ECTOPARASITES**
Moderator: L. Cramer
Room: Maurepas
- 3:15PM–3:30PM **Efficacy of FRONTLINE[®] Plus (fipronil/(S)-methoprene) for cats against developing stages and adult fleas (*C.felis*).**
P.C. Jeannin^a, S.E. Green^{b*}, A. Boeckh^b
^aMerial France; ^bMerial USA
- 3:30PM–3:45PM **Study to compare the efficacy and safety of FRONTLINE[®] Plus (fipronil/(S)-methoprene) and FRONTLINE[®] Spot-On ticks in dogs under field conditions in Japan.**
Y. Yamane^a, K. Takashima^a, G. Kinoshita^b, T. Nagata^b, A. Boeckh^c, L. Cramer^{c*}
^aAnimal Research Foundation, Japan; ^bMerial Japan; ^cMerial USA
- 3:45PM–4:00PM **Efficacy of FRONTLINE[®] Plus (fipronil/(S)- methoprene) for dogs against developing stages and adult fleas (*C. felis*).**
D.Young^a, P.C. Jeannin^b, A. Boeckh^{c*}, M. Soll^c
^aYoung Veterinary Research Services, CA USA; ^bMerial France; ^cMerial USA
- 4:15PM–5:45PM **NOVARTIS SYMPOSIUM: NONCOMPLIANCE IN PARASITE CONTROL.**
Moderator: D.G. Stansfield, Novartis Animal Health
Room: Napoleon BC12
- What you don't know can hurt you.**
B. Blagburn
Auburn University
- Liability Costs Associated with Noncompliance.**
C.A. LaCroix

5:45PM–6:00PM **BAYER RESEARCH AWARD**
Room: Napoleon BC12

6:00PM–7:30PM **BAYER ANIMAL HEALTH SYMPOSIUM: PETS, PARASITES, PRODUCT SOLUTIONS**
Moderator: B. Blagburn
Room: Napoleon BC12

Evaluation of a combination containing imidacloprid and permethrin for prevention of *Borrelia burgdorferi* transmission from black-legged ticks (*Ixodes scapularis*) to *Borrelia burgdorferi*-free dogs.

B.L. Blagburn*, J.A. Spencer, J.M. Butler, C.C. Dykstra, K.C. Stafford, M.B. Pough, S.A. Levy, D.L. Bledsoe

Repellent efficacy of a combination containing imidacloprid and permethrin against the sand fly *Phlebotomus papatasi* on dogs.

P. Volf, V. Volf, D. Stanneck, N. Mencke*

Evaluation of the efficacy of an Imidacloprid 10% / Moxidectin 1% Spot-on against *Otodectes cynotis* in cats.

L.J. Fourie*, D.J. Kok, J. Heine

Larvicidal and adulticidal efficacy of an imidacloprid and moxidectin topical formulation against endoparasites in cats and dogs.

G. von Samson-Himmelstjerna*, C. Epe, A. Schimmel, J. Heine

7:45PM–8:00PM **MARCH TO BAYER RECEPTION** — Hotel Lobby

8:00PM– **BAYER RECEPTION** — Aquarium of the Americas

TUESDAY, AUGUST 12, 2003

7:30AM–8:45PM POSTER SESSION 1—CONTINENTAL BREAKFAST

Room: Armstrong

Posters will be exhibited Tuesday and Wednesday. Odd numbered posters will be tended by authors on Tuesday. Even numbered posters will be tended by authors on Wednesday. Note – When referring to poster abstracts, they are listed in alphabetical order by the presenter (*).

1. **Comparative resistance to *Haemonchus* parasites and efficiency of Red Maasai and Dorper sheep in a sub-humid and a semi-arid environment in Kenya.**
J.M. Mugambi^{a*}, R.L. Baker^a, J.O. Audho^a, A.B. Carles^b, W. Thorpe^a
^aInternational Livestock Research Institute (ILRI), P.O. Box 30709, Nairobi, Kenya; ^bP.O. Box 23220, Nairobi, Kenya
2. **Characterization of microneme-rhoptry associated protein of *Theileria orientalis*.**
J.-Y. Kim*, N. Yokoyama, S. Kumar, N. Inoue, K. Fujisaki, C. Sugimoto
National Research Center for Protozoan Diseases, Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan
3. **Responses of West African Dwarf goats to abbreviated escalating infections with *Haemonchus contortus*.**
B.B. Fakae^{a*}, S.N. Chiejina^a, G.A. Musongong^b, L.A. Ngongeh^a, J.M. Behnke^c, D. Wakelin^c
^aFaculty of Veterinary Medicine, University of Nigeria, Nsukka, Nigeria; ^bWakwa Regional Centre for Agricultural Research for Development, Ngaoundere, Cameroon; ^cSchool of Life and Environmental Sciences, University of Nottingham, Nottingham NG7 2RD, UK
4. **Morphological identification of *Rhinoestrus purpureus* vs. *Rhinoestrus usbekistanicus* nasal bot flies of horses: more doubts than evidences.**
D. Otranto*, P. Milillo, R. Lia
Department of Animal Health and Welfare, Faculty of Veterinary Medicine, University of Bari, Italy
5. **Echinococcosis in Sardinia (Italy).**
A. Varcasia^a, R. Malgor^b, G. Poglayen^c, G. Garippa^a, A. Scala^{a*}
^aDipartimento di Biologia Animale, Sezione di Parassitologia e Malattie Parassitarie, Università di Sassari, Italy; ^bUnidad de Biología Parassitaria, Facultad de Ciencias, Montevideo, Uruguay; ^cUniversità degli Studi di Messina, Italy
6. **Effect of worm burdens in goats on the livelihoods of smallholder farmers.**
G.M. Hood^{a*}, A.M.P. Alo^b
^aInternational Livestock Research Institute, Los Baños, Philippines; ^bPhilippine Council for Agriculture, Forestry and Natural Resources Research and Development, Los Baños, Philippines

7. **Treatment of cattle with an abamectin pour on had no adverse effect on dung beetle populations in Australia.**
P.J. Martin^{a*}, M. Friend^b, L. Lawrence^{a*}
^aVirbac (Australia) Pty Limited, Locked Bag 1000, Peakhurst NSW 2210; ^bVeterinary Health Research Pty Ltd Trevenna Rd, West Armidale NSW, 2350, Australia

8. **Effect of three levels of artificial *Haemonchus contortus* infection on the pathophysiology and worm populations of Criollo kids in Yucatan, Mexico.**
A.J. Aguilar-Caballero*, J.F. Torres-Acosta, H. Hoste, C. Sandoval-Castro, M. May-Martínez
Facultad de Medicina Veterinaria y Zootecnia, Universidad Autonoma de Yucatan, Merida, Yucatan, Mexico

9. **Ocurrence of *Thelazia callipaeda* (Spirurida, Thelaziidae) in dogs in the Basilicata region (Southern, Italy): an epidemiological puzzle?**
D. Otranto, R. Lia, N. Leone*, P. Milillo
Department of Animal Health and Welfare, Faculty of Veterinary Medicine, University of Bari, Italy

10. **Ticks, tick-borne pathogens and maps: the challenge of forecasting habitat suitability for stable populations.**
A. Estrada-Peña*
Dept. of Parasitology, Veterinary Faculty, Miguel Servet 177. 50013-Zaragoza, Spain

11. ***Echinococcus multilocularis* in Wallonia (Southern Belgium): spatial distribution of a carriage by the red fox (*Vulpes vulpes*) and preliminary results in the musk rat (*Ondatra zibethicus*), a potentially important intermediate host.**
R.V. Hanosset^{a*}, B. Brochier^b, B.R. Mignon^a, B.J. Losson^a
^aParasitology and Parasitic Diseases, Faculty of Veterinary Medicine, University of Liège, Belgium; ^bSection of Virology of the Scientific Institute of Public Health

12. **Prevalence and intensity of *Haemonchus* species from bull fighting animals at the Plaza Mexico.**
M.C. Guerrero*, M.B. Vargas
Departamento de Parasitología, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Ciudad Universitaria, C:P: 04510, México D.F

13. ***Haemonchus contortus* genome map.**
J. Gilleard^{a*}, J. Smith^a, F. Jackson^b, B. Barrell^c, N. Hall^c, A. Ivens^c, P. Dear^d
^aFaculty of Veterinary Medicine, University of Glasgow, U.K.; ^bMoredun Research Institute, Edinburgh, U.K.; ^cPathogen Sequencing Unit, Sanger Centre, Cambridge, U.K.; ^dMRC-LMB, Cambridge, U.K.

14. **Prevalence of *Giardia* spp. in dogs and humans in northern and central Italy.**
G. Capelli^b, A.F. di Regalbono^b, R. Iorio^a, M. Pietrobelli^b, B. Paoletti^a, P. Bianciardi^c, A. Giangaspero^{a*}
^aUniversity of Teramo, Italy; ^bUniversity of Padua, Italy; ^cBayer S.P.A., Animal Health Division

15. **Association between *Ascaris suum* and *Salmonella enterica* in finisher herds.**
J. Boes*, C. Enøe
The National Committee for Pig Production, Danish Bacon & Meat Council, Axeltorv 3, DK-1609 Copenhagen, Denmark

16. **Statistics of sickness of larval echinococcosis of the population and agricultural animals in the Russian Federation in 1989-2001.**
 F.P. Kovalenko^a, N.I. Perchun^b, N.N. Darchenkova^a, V.B. Yastreba^b, A.S. Bessonov^{b*},
 E.A. Chernikova^a
^aI.M. Sechenov Moscow Medical Academy, Moscow, Russia; ^bK.I. Skryabin Institute of Helminthology,
 Moscow, Russia
17. **The relationship between larval length and larval mass of a reference strain of *Lucilia sericata* (sheep blowfly).**
 M.R. Rankin*
 Parasitology Section, Scientific Services Unit, Veterinary Laboratory Agency (Weybridge), United Kingdom
18. **Detection and identification of *Cryptosporidium* species in dairy farms in southern China.**
 G.Q. Li*, F.Y. Xiang, S.M. Xiao, S. Kanu, X.Q. Zhu
 South China Agricultural University, College of Veterinary Medicine, Guangzhou 510642, P.R. China
19. **Diagnosis and prevalence of tapeworms in horses in the southwestern USA.** G. Howard,
 K. Snowden*
 College of Veterinary Medicine, Texas A&M University, College Station, Texas USA
20. **Examination of the strongylid community of brood horses in Ukraine by the diagnostocal deworming method.**
 T.A. Kuzmina*, A.I. Starovir
 Institute of Zoology, NAS of Ukraine, 15, B. Khmelnytskyi Str., Kyiv, 01601, Ukraine
21. **Improved diagnosis of isosporosis in suckling piglets.**
 A. Joachim^{a*}, A. Dauschies^b, B. Ruttowski^b, H.C. Mundt^c
^aInstitute for Parasitology and Zoology, University of Veterinary Medicine Vienna, Austria; ^bInstitute of
 Parasitology, University of Leipzig, Germany; ^cBayer AG, Leverkusen, Germany
22. **Treatment of *Neotrombicula*-associated dermatitis in dogs using topical permethrin-pyriproxyfen combination.**
 D. Smal^a, P. Jasmin^{b*}, P. Mercier^b
^aDVM, Veterinary Clinic, 59 450 Siin Le Noble, France; ^bDVM, Medical Department, Virbac S.A., 06 511
 Carros, France
23. **Effects of long-term storage on Brazilian nematode trapping fungi isolates.**
 M.A. Mota^{a*}, A.K. Campos^a, M.P. Guimarães^a, J.V. Araújo^b
^aDepartamento de Parasitologia, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil; ^bDepartamento
 de Veterinária, Universidade Federal de Viçosa, Viçosa, Brazil
24. **Premunization of Criollo kids by use of a single viable dose of *Haemonchus contortus* before natural infection with gastrointestinal nematodes.**
 A. Aguilar Caballero, J.F. Torres-Acosta*, N. Ojeda-Robertos, L. Canul-Ku, L. Cob-Galera,
 J. Vargas-Magaña
 FMVZ-Universidad Autonoma de Yucatan, Merida, Yucatan, Mexico

25. **Evaluation of non-chemotherapeutic approaches to the control of pasture borne parasites in cattle.**
A. Larsson*, J. Höglund, P.J. Waller, S-O. Dimander, A. Uggla
Department of Parasitology (SWEPAR), SE- 751 89 Uppsala, Sweden

26. **Study to compare the efficacy and safety of FRONTLINE® Plus (fipronil/(S)-methoprene) and FRONTLINE® Spot-On against ticks in cats under field conditions in Japan.**
Y. Yamane^a, K. Takashima^a, G. Kinoshita^b, T. Nagata^b, A. Boeckh^c, L. Cramer^{c*}
^aAnimal Clinical Research Foundation, Japan; ^bMerial Japan; ^cMerial USA

27. **Modulation of blood uptake by horn flies (*Haematobia irritans irritans*) following vaccination with recombinant thrombostasin.**
M.S. Cupp^{a*}, E.W. Cupp^a, N. Wisniewski^b, D. Zhang^a, C. Navvare^c, V. Panangala^c
^aDepartment of Entomology and Plant Pathology, Auburn University, Alabama USA; ^bHeska Corporation, Fort Collins, Colorado USA; ^cCollege of Veterinary Medicine, Auburn University, Alabama USA

28. **What horse owners do to control internal parasites: time for more veterinary involvement?**
E.M. Abbott*
Abbott Associates, Lutterworth, UK

29. ***In vitro* measurements of anthelmintic effects of tanniferous plants on third stage larvae of parasitic nematodes of the gastrointestinal tract.**
V. Paolini^a, I. Fouraste^b, Ph. Dorchies^{a*}, H. Hoste^a
^aUMR 1225 INRA/DGER, Toulouse, France; ^bUniversité P. Sabatier, Toulouse, France

30. **A survey of anthelmintic drench efficacy in U.K. goat farms.**
V. Grillo^{a*}, F. Jackson^b, J.S. Gilleard^a
^aDepartment Veterinary Parasitology, University of Glasgow, Glasgow, G61 1QH; ^bMoredun Institute, Edinburgh, Scotland

31. ***In vitro* evaluation of inhibitory potential of plant nematode biocontrol agents and plant pathogenic fungi against *Arthrobotrys musiformis*.**
H.A. Prajapati^{a*}, J.B. Chauhan^a, R.B. Subramanian^a, P.K. Sanyal^b
^aLab No. 109, Department of Biosciences, Sardar Patel University, Vallabh Vidyanagar-388120, Gujarat, India; ^bBiotechnology Laboratory (R&D), National Dairy Development Board (NBBD), Anand-388001, Gujarat, India

32. **Expression and identification of *Eimeria tenella* gene TA4.**
S.Q. Wu, J.J. Jiang*, Q. Liu, Y.J. Zhu
College of Veterinary Medicine, China Agricultural University, Beijing, China

33. **Clone and sequence analysis of gene Et1A of *Eimeria tenella* BJ strain.**
S.Q. Wu, J.J. Jiang*
College of Veterinary Medicine, China Agricultural University, Beijing, China

34. **Molecular characterization of *Giardia* from Italian dogs at the β -giardin locus.**
S.M. Cacciò^a, G. Capelli^{b*}, M. Lalle^a, L. Gnoato^b, E. Pozio^a
^aInstituto Superiore di Sanità, Rome, Italy; ^bUniversità di Padova, Italy
35. **Insecticidal activity of haircoat of dogs treated by their owners with fipronil spot-on spray.**
P. Bourdeau*, B. Larhantec, A.M. Marchand
Ecole Nationale Vétérinaire de Nantes
36. **The status of resistance to chemical ixodicides of the tick *Rhipicephalus sanguineus* (Acari: Ixodidae) in Spain.**
A. Estrada-Peña*
Dept. of Parasitology, Veterinary Faculty, Miguel Servet, 177, 50013-Zaragoza, Spain
37. **Efficacy of toltrazuril against artificial infections with *Eimeria bovis* in calves.**
H.C. Mundt^{a*}, A. Dauschies^b, F. Uebe^a, M. Rinke^c
^aBayer AG, Animal Health Business Group, Clinical Development, Leverkusen, Germany; ^bInstitute for Parasitology, Faculty of Veterinary Medicine, University of Leipzig, Leipzig, Germany; ^cBayer AG, BHC Toxicology, Wuppertal, Germany
38. **Diffusion and residual activity of insecticide formulations in haircoat of dogs: An example with fipronil spot-on and spray.**
P. Bourdeau*, B. Larhantec, A.M. Marchand
Ecole Nationale Vétérinaire de Nantes
39. **A reproductive safety study with EQIMAX™ Paste (1.87% ivermectin / 14.03% praziquantel) in mares.**
L.R. Cruthers^a, R.L. Slone^a, B.C. Tu^b, F.W. Goodman^{b*}, S.V. Radecki^c
^aProfessional Laboratory and Research Services, Inc., Corapeake, North Carolina USA; ^bVirbac A.H., Inc., Fort Worth, Texas USA; ^cStatistical Consultant, Fort Collins, Colorado USA
40. **In vitro ovicidal activity of extracts *Annona squamosa* Linn against *Haemonchus contortus*.**
M.M.C. Souza, C.M.L. Bevilaqua*, C.T.C. Costa, S.M. Morais, A.R.A. Silva
Pos-graduação em Ciências Veterinárias Universidade Estadual do Ceará, Brazil
41. **Changes of enzymes activity in urine of cotton rats infected with larval *Echinococcus multilocularis* at radical chemotherapy of experimental infection.**
F.P. Kovealenko^a, E.A. Chernikova^a, G.N. Dubinina^a, A.S. Bessonov^{b*}, N.I. Perchun^b
^aI.M. Sechenov Moscow Medical Academy, Moscow, Russia; ^bK.I. Skrjabin Institute of Helminthology, Moscow, Russia
42. **Comparison of serum pharmacokinetics and weight gain after administration of macrocyclic lactones via transdermal and subcutaneous delivery methods.**
S.R. Barber^{a*}, M. Alvinerie^b, P.I. Veale^c, G.A. Anderson^d, V.M. Bowles^a
^aCentre for Animal Biotechnology, University of Melbourne, Australia; ^bLaboratoire de Pharmacologie-Toxicologie, INRA, Toulouse, France; ^cPara-Site Diagnostic Services, Benalla, Australia; ^dVeterinary Clinical Centre, University of Melbourne, Australia

43. **Safety of ivermectin and praziquantel on the reproductive performance of stallions.**
E.L. Squires^a, B.C. Tu^b, I.C. Villard^{b*}
^aColorado State University, Fort Collins, Colorado 80523 USA; ^bVirbac A.H. Inc, Fort Worth, TX 76137 USA

44. **Efficacy of an experimental fasciolicide against immature and mature *Fasciola hepatica* in artificially infected calves.**
Y. Vera^{a*}, F. Ibarra^a, H. Quiroz^a, E. Liébano^b, A. Hernández^c, R. Castillo^c, P. Ochoa^c
^aDepto. De Parasitología, Fac. de Med. Vet. Y Zoot., UNAM. Cd. Universitaria 04510, México, D.F.

45. **Putative predication of macrocyclic lactones *in vivo*-disposition using an original pharmacological parameter [Vp50] obtained from transport experiments in P-glycoprotein-expressing cells.**
A. Roulet^{a*}, A. Bousquet-Mélou^b, D. Concorde^b, J. Dupuy^a, A. Lespine^a, M. Alvinerie^a, T. Pineau^a
^aLaboratory of Pharmacology and Toxicology, I.N.R.A., Toulouse, France; ^bUMR 181 I.N.R.A.-Ecole Nationale Vétérinaire, Toulouse, France

46. **Effect of the weight gain and egg elimination in calves treated with ivermectin.**
H. Quiroz^{a*}, F. Ibarra^a, E. Liébano^b, J. Cruz^a, E. Ramos^a, P. Ochoa^a
^aFacultad de Medicina Veterinaria y Zootecnia, UNAM, 04510, México, D.F.

47. **Treatment of *Toxoplasma gondii* infections in Pallas's Cat (*Otocolobus manul*) kittens with clindamycin.**
H. Prosl^{a*}, W. Basso^b, R. Edelhofer^a, W. Zenker^c
^aInstitute for Parasitology and Zoology, University of Veterinary Medicine Vienna, Austria; ^bFaculty of Veterinary Sciences, University of La Plata, Argentina; ^cSchoenbrunn Zoo, Vienna, Austria

48. **Efficacy of oxyclozanide (Zanil[®]) on natural ovine fasciolosis.**
A. Paz-Silva^{*}, R. Sánchez-Andrade, J.L. Suárez, J. Pedreira, C. Lomba, P. Díaz, R. Panadero, P. Díez-Baños, P. Morrondo
Parasitología y Enfermedades Parasitarias, Dpto. Patología Animal. Facultad de Veterinaria, Universidad de Santiago de Compostela, 27002-Lugo, Spain

49. **Efficacy of Nilzan Plus[®] on the bovine parampsitosis.**
A. Paz-Silva^{*}, R. Sánchez-Andrade, J.L. Suárez, J. Pedreira, M. Arias, P. Díaz, C. López, P. Díez-Baños, P. Morrondo
Parasitología y Enfermedades Parasitarias, Dpto. Patología Animal. Facultad de Veterinaria, Universidad de Santiago de Compostela, 27002-Lugo, Spain

50. **Synergistic effects of pyrantel and the febantel metabolite fenbendazole on adult *Toxocara canis* worms.**
H. Mehlhorn^{a*}, E. Hanser^a, O. Hansen^b, A. Harder^b, N. Mencke^b, R. Schaper^b
^aInstitute for Parasitology, Heinrich-Heine-University Düsseldorf, 40225 Düsseldorf, Germany; ^bBayer AG, 51368 Leverkusen Bayerwerk, Germany

51. **Determination of the effective dose of an experimental fasciolicide in experimentally infected cattle.**
F. Ibarra^{a*}, Y. Vera^a, J. Cantó^b, R. Castillo^c, A. Hernández^c, P. Ochoa^a
^aFacultad de Medicina Veterinaria y Zootecnia, UNAM, México, D.F.; ^bUniversidad Autónoma de Querétaro, Qro. México.; ^cFacultad de Química, UNAM, 04510, México, D.F.
52. **Progress of the international work of the “Imidacloprid Flea Susceptibility Monitoring Team.”**
I. Schroeder^a, B.L. Blagburn^b, D.L. Bledsoe^c, R. Bond^d, I. Denholm^d, M.W. Dryden^e, D.E. Jacobs^f, H. Mehlhorn^g, N. Mencke^a, P. Payne^e, M.K. Rust^h, M.B. Vaughn^{c*}
^aBayer AG, BHC-Business Group Animal Health, Leverkusen, Germany; ^bAuburn University, Auburn, AL USA; ^cBayerHealthCare, Shawnee Mission, Kansas USA; ^dIACR-Rothamsted, UK; ^eKansas State University, Manhattan, KS USA; ^fRoyal Vet College, London, UK; ^gHeinrich-Heine University, Düsseldorf, Germany; ^hUniveristy of California, Riverside CA USA
53. **Selective changes in cholinergic receptor subtypes associated with levamisole resistance in *Oesophagostomum dentatum*.**
R.J. Martin^{*}, C.L. Clarke, A.P. Robertson
Department of Biomedical Sciences, Iowa State University, Ames, IA 50011 USA
54. **Oxibendazole efficiency against fenbendazole-resistant horse strongyles in Lithuania.**
A. Vyšniauskas, S. Petkevičius, A. Pereckienė, V. Kaziūnaitė^{*}
Laboratory of Parasitology, Institute of Veterinary, Lithuanian Veterinary Academy, Vilnius, Lithuania
55. **In vitro breeding and testing of *Ctenocephalides felis* for insecticide resistance.**
K.A. Stafford, G.C. Coles^{*}
Department of Clinical Veterinary Science, University of Bristol, Langford House, Bristol, BS40 5DU, UK
56. **Isolation and characterization of a Diclazuril resistant strain of *Eimeria acervulina*.**
C.M. Brown^{*}, J.S. Mathew, T. Tama, T. Biftu, D.R. Thompson
Merck & Co., Somerville, New Jersey USA
57. **Influence of management in benzimidazole anthelmintic resistance dissemination in sheep flocks.**
A.C.F.L. Melo, F.C.M. Rondon, I.F. Reis, C.M.L. Bevilaqua^{*}
Pos-graduação em Ciências Veterinárias. Universidade Estadual do Ceará, Brazil
58. **Transmission of anthelmintic resistance in sheep in West Java, Indonesia.**
Berijaya^{a*}, D. Haryuningtyas^a, A. Husein^a, G.M. Hood^b, G.D. Gray^b
^aResearch Institute for Veterinary Science, Bogor, Indonesia; ^bInternational Livestock Research Institute, Los Baños, Philippines
59. **Flea allergy dermatitis (FAD) in the cat: Establishment of a functional in vitro test (FIT).**
K. Stuke^a, G. von Samson-Himmelstjerna^{a*}, N. Mencke^b, O. Hansen^c, T. Schnieder^a, W. Leibold^d
^aInstitute of Parasitology and ^dImmunology Unit, Hannover School of Veterinary Medicine, Germany; ^bBayer AG, BHC Business Group Animal Health, Monheim Germany; ^cBayer Vital, Monheim Germany

60. **Skin immune response in cattle after primary and secondary infections with *Hypoderma lineatum* (Diptera: Oestridae) larvae.**
C. López^{a*}, D.D. Colwell^b, R. Panadero^a, A. Paz^a, J. Perez^b, P. Morondo^a, P. Díez^a, A. Bravo^c
^aParasitología y Enfermedades Parasitarias. Dpto. de Patología Animal. Facultad de Veterinaria. Universidad de Santiago de Compostela, 27002-Lugo, Spain; ^bLethbridge Research Centre. Alberta, Canada; ^cAnatomía Patológica, Facultad de Veterinaria, Universidad de Santiago de Compostela, Lugo, Spain
61. **Protein supply to lactating ewes affects *in vitro* larval establishment of abomasal nematodes.**
J.G.M. Houdijk^{a*}, Q. Versteegh^a, I. Kyriazakis^a, L. Stenhouse^b, F. Jackson^b, R.L. Coop^b
^aAnimal Nutrition and Health Department, Scottish Agricultural College, Edinburgh, UK; ^bMoredun Research Institute, Penicuik, UK
62. **Tissue immune response to *Toxoplasma gondii* infection in pigs.**
S.M. Nishi^{a*}, H. Dawson^b, J.P. Dubey^c, J.F. Urban^b, J.K. Lunney^a
^aImmunology and Disease Resistance Lab; ^bNutrient Requirements and Functions Lab, BHNRC, ARS, USDA, Beltsville, MD 20705 USA; ^cParasite Biology, Epidemiology and Systematics Lab, ANRI, Beltsville, MD USA
63. **Detection of anti-Ex *Toxocara vitulorum* IgG antibodies in colostrum and serum of buffalo calves and cows by immunoblotting.**
W.A. Starke-Buzetti^{*}, F.P. Ferreira
Departamento de Biologia e Zootecnia, UNESP-Campus de Ilha Solteira, SP, Brazil
64. **Cloning and expression of the major secreted cathepsin B from juvenile *Fasciola hepatica* and analysis of immunogenicity following liver fluke infection.**
R.H.P. Law^{ab}, P.M. Smooker^c, J.A. Irving^a, R. Ponting^b, D. Piedrafitá^a, N.J. Kennedy^{ab}, J.C. Whisstock^a, R.N. Pike^a, T.W. Spithill^{abd*}
^aMonash University, Clayton, Australia; ^bCooperative Research Centre for Vaccine Technology, Brisbane, Australia; ^cRMIT University, Bundoora, Australia; ^dMcGill University, Montreal, Canada
65. **No increase in serum acute phase proteins in subclinical *Trichinella* infection in reindeer (*Rangifer t. tarandus*).**
T. Soveri^{a*}, T. Orro^a, A. Oksanen^b
^aUniversity of Helsinki, Finland; ^bNational Veterinary and Food Research Institute, EELA, Finland
66. **Estimation of protective activity of specific and nonspecific antigens at experimental secondary alveolar echinococcosis of laboratory rodents.**
F.P. Kovalenko^a, E.A. Chernikova^a, N.E. Ballard^a, N.I. Perchun^b, A.S. Bessonov^{b*}
^aI.M. Sechenov Moscow Medical Academy, Moscow, Russia; ^bK.I. Skryabin Institute of Helminthology, Moscow, Russia
67. **Morphological studies on the extra-cellular structure of the midgut of a tick, *Haemaphysalis longicornis* (Acari: Ixodidae).**
T. Matsuo^{*}, M. Sato, N. Inoue, N. Yokoyama, D. Taylor, K. Fujisaki
Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Hokkaido, Japan; Kyushu Research Station, National Institute of Animal Health, Kagoshima, Japan; University of Tsukuba, Ibaraki, Japan

68. **Withdrawn.**

69. **Hints for transmission of feline leukemia virus (FeLV) by the cat flea (*Ctenocephalides felis*).**

M. Vobis^{a*}, J. D'Haese^a, H. Mehlhorn^a, N. Mencke^b

^aInstitut für Zoomorphologie, Zellbiologie und Parasitologie. Heinrich-Heine Universität, D-40225 Düsseldorf, Germany; ^bBayer AG, BHC-Business Group Animal Health, D-51368 Leverkusen, Germany

70. **Tick-transmitted infections in New Caledonian dogs: a geographically isolated canine and tick population.**

S.E. Shaw^{a*}, F. Beugnet^b, M.J. Day^a, M.J. Kenny^a

^aUniversity of Bristol, Langford, Somerset, UK; ^bMerial, Lyon, France

71. **Hard ticks (Acarina, Ixodidae) found on domestic carnivores in Belgium: a survey conducted during three consecutive years.**

B.J. Losson*, D. Baar, F. Maréchal, M. Barbé, B. Mignon

Laboratory of Parasitology and Parasitic Disease, Dept. of Infectious and Parasitic Diseases, Faculty of Veterinary Medicine, University of Liège, Liège, Belgium

72. ***Anaplasma (Ehrlichia) phagocytophilum* infection in a UK fallow deer (*Dama dama*) herd.**

M.J. Kenny^{a*}, I. Parsons^b, S.E. Shaw^a, F. Beugnet^c

^aDept. Of Clinical Veterinary Sciences, University of Bristol, Langford, Somerset, UK; ^bPeninsula Forest District, Forest Enterprise, Kennford, Devon, UK; ^cMerial Lyon, France

73. **Treatment of sarcoptic mange in cattle with topical eprinomectin: effects on productivity and behaviour.**

S. Rehbein^{a*}, M. Visser^a, S. Hoy^b, M. Ziron^b, R. Winter^a, A.E. Maciel^c, S.E. Marley^c

^aMerial GmbH, Katherinehof RC, Rohrdorf, Germany; ^bUniversity of Gießen, Gießen, Germany; ^cMerial, Duluth, GA, USA

74. **Frequency of Oestrus ovis in goats sacrificed in the municipal slaughterhouse of Culiacán, Sinaloa, México.**

C.S. Gaxiola^{a*}, I.J. Borbolla^a, M.M. Quintero^b, del C.N. Castro^a, R.M. Rubio^a

^aVeterinary Faculty of Medicine and Zootecnia of the Sinaloa Autonomous University, Sinaloa, México;

^bMéxico Autonomous National University-FMVZ

75. **The effect of *Amblyomma cajennense* and *Rhipicephalus sanguineus* saliva on the *in vitro* proliferative responses of T lymphocytes from BALB/c mice.**

M. Hlatshwayo^{a*}, B.R. Ferreira^b, P.A. Mbato^a

^aParasitology Research Program, Qwa-Qwa Campus, University of the Free State, Private Bag X13, Phuthaditjhaba, 9866, South Africa; ^bDepartment of Immunology and Biochemistry, School of Medicine of Ribeirão Preto, University of São Paulo, 14049-900, Ribeirão Preto-SP, Brazil

76. **Monthly prevalence of strongylid infection thoroughbred horses from four farms in the states of Aragua and Carabobo, Venezuela.**

A. Pérez Mata*

Parasitology Department, School of Vet. Sciences, Universidad Central de Venezuela Maracay, Edo. Aragua, Venezuela, Apdo 4563

77. ***Wolbachia* in sucking lice.**
G. Kyei-Poku, D.D. Colwell*, P. Coghlin, K. Floate
Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB., Canada
78. **Experimental production of necrotic enteritis and its use for studies on the relationship between necrotic enteritis and coccidiosis in chickens.**
R.N. Marshall^{a*}, R.B. Williams^b, R.M. La Ragione^a, J.A. Marshall^a
^aVeterinary Laboratories Agency (Weybridge) New Haw, Addlestone, Surrey, KT15 3NB; ^bSchering-Plough Animal Health, Breakspere Road South, Harefield, Uxbridge, Middlesex UB9 6LS, UK
79. **Population biology studies on *Isospora suis* in piglets.**
H.C. Mundt^{a*}, A. Joachim^b, A. Dauschies^c, M. Zimmermann^c
^aBayer AG, Animal Health Business Group, Clinical Development, Leverkusen, Germany; ^bInstitute for Parasitology and Zoology, University of Veterinary Medicine, Vienna, Austria; ^cInstitute for Parasitology, Faculty of Veterinary Medicine, University of Leipzig, Leipzig, Germany
80. **Use of different antiparasitic drugs in the treatment of experimental murine encephalitozoonosis.**
J.M. Castro, M.A. Lallo*, E.F. Bondan
University Paulista (UNIP), São Paulo, Brazil
81. **Detection of *Cryptosporidium* oocysts in stools of opossums from a deforestation area around São Paulo (Brazil).**
M.A. Lallo*, F. Bastos, S. Favorito, E.F. Bondan
University Bandeirante of São Paulo (UNIBAN), São Paulo, Brazil
82. **Seroprevalence of *Toxoplasma gondii* antibodies in the rodent capybara (*Hydrochoeris hydrochoeris*) from Brazil.**
S.M. Gennari^{a*}, W.A. Cañon-Franco^a, L.E.O. Yai^b, A.M. Joppert^c, C.E. Souza^d, S.R.N. D'Auria^c, J.P. Dubey^c
^aFaculdade de Medicina Veterinária e Zootecnia, Universidade de São Paulo, SP, Brazil; ^bCentro de Controle de Zoonosis, São Paulo, SP, Brazil; ^cDivisão Técnica de Medicina Veterinária e Manejo da Fauna Silvestre, São Paulo, SP, Brazil; ^dSuperintendência do Controle de Endemias, São João da Boa Vista, SP, Brazil; ^eAnimal and Natural Resources Institute, Agriculture Research Service, United States Department of Agriculture, Beltsville, Maryland USA
83. **Seasonal variations in the growth and maturation of *Acanthocephalus anguillae* (Muller 1780) in fishes from the Vistula river with particular reference to the *Leuciscus idus* (L.) and bream *Abramis brama* (L.).**
A. Kamara*
W. Stefanski Institute of Parasitology, Polish Academy of Sciences, UI, Towara 51/55, 00-818 Warsaw, Poland
84. **Presence of *Polygenis gwyni* (Fox 1941, Siphonaptera Rhopalopsyllidae) on *Ototylomys phyllotis* (Rodentia Muridae) in Yucatan, México.**
M.M.T. Quintero^{a*}, S. Hernández^b, P. García^b, N.J. Otero^a, V.G. Juárez^a
^aFacultad de Medicina Veterinaria y Zootecnia, UNAM, México, D.F. C.P. 04510; ^bFacultad de Medicina Veterinaria y Zootecnia Universidad Autónoma de Yucatan, México

85. **Expression of *Babesia equi* EMA-1 and EMA-2 during merozoite developmental stages in erythrocyte and their erythrocytic binding affinity.**
S. Kumar^{*}, N. Yokoyama, J-Y. Kim, X. Huang, N. Inoue, X. Xuan, I. Igarashi, C. Sugimoto
National Research Center for Protozoan Diseases, Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Hokkaido, Japan

86. **Importation of exotic reptile ticks, and associated pathogens, into the UK.**
M.J. Kenny^a, A.B. Forbes^b, S.E. Shaw^a
^aDept. Of Clinical Veterinary Sciences, University of Bristol, Langford, Somerset, UK; ^bMerial UK, Harlow, Essex, UK

87. **On the biology *Eimeria macusaniensis*, an intestinal parasite of South American camelids.**
S. Rohbeck^{ab}, M. Gauly^{a*}, C. Bauer^b
^aInstitute of Animal Breeding and Genetics; ^bInstitute of Parasitology, Justus Liebig University Giessen, D-35398 Giessen, Germany

88. **Recombinant chicken IFN- γ inhibits broiler coccidiosis and enhances immunity of coccidial vaccine.**
Y. Xiuhua, W. Zhiguang, W. Ming^{*}
College of Veterinary Medicine, China Agricultural University, Beijing, P.R. China

89. **Mites of the mange in dogs of Culiacán, Sinaloa, Mexico.**
C.S. Gaxiola^{a*}, I.J. Borbolla^a, M.M. Quiñtero^b, del C.N. Castro^a, R.M. Rubio^a
^aVeterinary Faculty of Medicine and Zootechnia of the Sinaloa Autonomous University, Sinaloa, México; ^bMéxico Autonomous National University-FMVZ

90. **A case of imported *Spirocerca lupi* infection in a dog from Italy: histological and immunohistochemical report.**
L. Kramer^{a*}, L.E. Calvi^a, B. Passeria, C. Vernasconi^b, R. Capitelli^b
^aUniversity of Parma Veterinary School; ^bClinica Veterinaria “San Siro”, Italy

91. **Parasitism prevalence in breeding puppies around weaning.**
H. André^a, B. Polack^{a*}, P. Pierson^b
^aEcole Nationale Vétérinaire d’Alfort, Maisons-Alfort, France; ^bRoyal Canin, Aimargues, France

92. **Endoparasites in dogs and cats in Germany 1999–2002.**
D. Barutzki^{a*}, R. Schaper^{a*}
^aVeterinary Laboratory Freiburg, Postfach 100120, D 79120 Freiburg i.Br., Germany; ^bBayer Health, D 51368 Leverkusen, Germany

93. **Molecular detection of *Anaplasma (Ehrlichia) phagocytophilum* comb. nov. (Rickettsiales, Anaplasmataceae) in dogs and ticks.**
A. Giangaspero^a, B. Paoletti^a, D. Traversa^{a*}, O.A.E. Sparagano^b
^aDipartimento di Scienze Biomediche Comparate, University of Teramo, Italy; ^bSchool of Agriculture, University of Newcastle, UK
94. **Prevalence of and factors associated with shedding *Cryptosporidium* spp in domestic cats.**
L.G. Rickard*, R. Vasilopoulos, A. Mackin, C. Huston, C. Panuska, G.T. Pharr
College of Veterinary Medicine, Mississippi State University, Mississippi State, MS USA
95. **Some data about *in vitro* culture of *Polygyra* sp intermediate host of *Muellerius capillaris*.**
A. Huesca^{a*}, M. Quintero^a, E. Naranjo^b
^aFMVZ, UNAM 04510, México, D.F.; ^bInstituto de Biología, UNAM; 04510, México D.F.
96. **Ked (*Melophagus ovinus*) transmission: burden on lambs from affected flocks and remnant populations after shearing.**
F.V. Olaechea*, J. Corley
National Institute for Agricultural Technology (INTA), cc. 277, (8400) Bariloche, Argentina
97. **Tegumental surface in adult flukes by scanning electron microscopy following treatment in sheep with an experimental compound.**
N. Rivera^{a*}, F. Ibarra^a, A. Zepeda^b, R. Castillo^c, A. Hernández^c
^aFacultad de Medicina Veterinaria y Zootecnia, UNAM, México, D.F.; ^bFacultad de Medicina, UNAM, México, D.F.; ^cFac. de Química, UNAM, México, D.F.
98. **Resistance of Santa Ines, Suffolk and Ile de France lambs to naturally acquired gastrointestinal nematode infections.**
A.F.T. Amarante^{a*}, P.A. Bricarello^b, R.A. Rocha^a, S.M. Gennari^b
^aUniversidade Estadual Paulista, C.P. 510, Botucatu- SP, CEP 18618-000, Brzil; ^bUniversidade de São Paulo, Brazil
99. **A comparison of the periparturient rise in fecal egg counts of Santa Ines and Ile de France ewes.**
R.A. Rocha^a, A.F.T. Amarante^{a*}, P.A. Bricarello^{ab}
^aUniversidade Estadual Paulista, C.P. 510, Botucatu- SP, CEP 18618-000, Brazil; ^bUniversidade de São Paulo, Brazil
100. **Safety study on pregnant mares treated with a combination of ivermectin praziquantel.**
P. Mercier^{a*}, F. Alves-Branco^b, C.R. White^c
^aVirbac SA, Medical Dpt, Carros, France; ^bConsultorio Medico Veterinario, Bagé, RS, Brazil, ^cVirbac do Brazil, Sao-Paulo, SP, Brazil
101. **Mechanical recovery of cyathostome larvae from the mucosa of the caecum of horses.**
I.D. Glover, G.M. Henry, N.B. Townsend, G.C. Coles*
Department of Clinical Veterinary Science, University of Bristol, Langford House, Britol BS40 5DU, UK

102. **Identification of stage specific transcripts from reactivated cyathostomin fourth stage larvae.**
J.B. Matthews^{a*}, D.R. Johnson^a, K.R. Matthews^b
^aDepartment of Veterinary Clinical Science, University of Liverpool, South Wirral, UK; ^bDepartment of Biochemistry, University of Manchester, Manchester, UK
103. **Larvicidal activity of an ivermectin praziquantel combination against migrating *Strongylus vulgaris* larvae in equids.**
L. Frayssinet^{a*}, P. Mercier^a, L. Grisi^b, I.V.F. Martins^b, C.R. White^c
^aVirbac SA, Carros, France; ^bUniversidade Federal Rural do Rio de Janeiro, RJ, Brazil; ^cVirbac do Brasil, Sao-Paulo, SP, Brazil
104. **Are older horses more wormy?**
C. Wright^a, A.C. Rhodes^b, G.C. Coles^{b*}
^aBushy Equine Clinic, Breadstone, Berkley, Glos GL13 9HG, UK; ^bDept. Clinical Veterinary Science, University of Bristol, Langford House, Bristol BS40 5DU, UK
105. **The role of *Isospora suis* in the ethiology of diarrhoea in suckling piglets.**
V. Gualdi^a, F. Vezzoli^a, M. Luini^a, L. Nisoli^{b*}
^aIstituto Zooprofilattico Sperimentale della Lombardia e dell' Emilia Romagna "B. Ubertini" Lodi Section, Italy; ^bBayer HealthCare, Animal Health Division, Italy
106. **Evaluation of the growth of *Trypanosoma cruzi* in different culture media.**
L. Calderón^{a*}, J. Taya, D. Ruíz^a, J. Sánchez^a, F. Ibarra^b
^aDepartamento de Microbiología y Parasitología, Facultad de Medicina, Universidad Nacional Autónoma de México; ^bDepartamento de Parasitología, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México
107. **The ability of *Brugia pahangi* to migrate is not limited to life cycle stage.**
S.R. Chirgwin^{*}, K.H. Porterhouse, S.U. Coleman, W.T. Wile, T.R. Klei
Department of Pathobiological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA, 70803 USA
108. **Prevalence of enteric and external parasites in bees (*Apis mellifera*) in Culiacán, Sinaloa, México.**
C.S. Gaxiola^{*}, I.J. Borbolla, del C.N. Castro, R.M. Rubio
Veterinary Faculty of Medicine and Zootecnia of the Sinaloa Autonomous Univeristy, Sinaloa, México
109. **Treatment of varroosis with oxalic acid: effectiveness and toxic consequences.**
M. Higes^a, R. Martin^b, A. Mateos^b, M.J. Nozal^c, L. Gómez^c, A. Meana^{b*}
^aCentro Apícola Regional, Guadalajara Spain; ^bFacultad de Veterinaria UCM, Madrid, Spain; ^cFacultad de Ciencias, Valladolid, Spain
110. **The prevalence of anthelmintic resistance in nematode parasites of cattle in São Paulo State, Brazil.**
R.V.G. Soutello^{ab*}, A.F.T. Amarante^b, M.C. Zocoller-Seno^b
^aFaculdade de Ciências Agrárias de Andradina—SP; ^bUniversidade Estadual Paulista, Brazil

111. ***Dirofilaria immitis*: humoral response and cytokine mRNA expression in chronically infected dogs.**
J. Lópe-Belmonte^a, R. Morchón^a, C. Genchi^{b*}, C. Bazzocchi^b, G. Traldi^c, R. Martín-Pacho^a, C. Marcos-Atxutegi^a, M. Silva^{ac}, W. Blasini^{ad}, F. Simón^a
^aUniversity of Salamanca Medical School, Spain; ^bUniversity of Milan Veterinary School, Italy; ^cUniversity of Camerino Veterinary School, Italy; ^dUniversity of Puerto Rico Medical School, Puerto Rico
112. **Population dynamics of *Toxocara canis* in pigs receiving a single or multiple infection.**
K. Taira^{a*}, I. Saeed^a, P. Lind^b, K.D. Murrell^a, C.M.O. Kapel^a
^aDanish Centre for Experimental Parasitology, Department of Veterinary Microbiology, The Royal Veterinary and Agricultural University, Dyrlægevej 100, DK-1870 Frederiksberg C, Denmark; ^bDanish Veterinary Laboratory, Department of Immunology and Biochemistry, Bülowsvej 27, DK-1790 Copenhagen V, Denmark
113. **The proteome of *Toxoplasma gondii* rhoptries: composition, function and comparative proteomics.**
J.M. Wastling^{a*}, C. Ward^a, A.R. Pitt^a, G.H. Bradley^b, J.C. Boothroyd^b
^aDivision of Infection and Immunity, Institute of Biomedical and Life Sciences, University of Glasgow, Glasgow, G12 8QQ, United Kingdom; ^bMicrobiology and Immunology, Stanford University School of Medicine, 300 Pasteur Dr., Stanford, CA USA
114. **An overview of past, present and future research into donkey parasitism.**
C.J. Morriss*, A.F. Trawford
The Donkey Sanctuary, Sidmouth, Devon, EX10 0NU, UK
115. **Using Geographic Information System (GIS) to determine the risk to human health from canine fecal contamination in Baton Rouge, LA.**
E. Brianti^{a*}, S. Giannetto^a, G. Poglajen^a, J.B. Malone^b
^aFacoltà di Medicina Veterinaria, Messina, Sicilia Italia; ^bLouisiana State University, Baton Rouge, Louisiana USA
116. **The fish disease (*Ligulosis*) in the Kyiv Reservoir (after the Chernobyl catastrophic).**
O.N. Davydov*, R.E. Bazeev
Kyiv, Ukraine
117. **Evaluation of a general situation of an invagination of fishes metacercariae of *Opisthorchidae* of some reservoirs of Ukraine.**
R.E. Bazeev*, O.N. Davydov
Kyiv, Ukraine

8:45AM–9:00AM **HUGH GORDON INTRODUCTION**

Speaker: R.K. Prichard

Room: Napoleon BC12

9:00AM–9:45AM **PLENARY 3: HUGH GORDON LECTURE; ANTHELMINTIC VACCINES THAT WORK**

Speaker: M. Lightowers

Room: Napoleon BC12

9:45AM–10:00AM **PETER NANSEN AWARD**

Room: Napoleon BC12

10:00AM–10:15AM Break

10:15AM–11:45AM **SYMPOSIUM: MAPPING THE PARASITE WORLD**

Moderator: J.B. Malone, A. Estrada-Peña

Room: Maurepas

Geospatial tools for veterinary parasites and zoonoses: A new standard for use of maps in epidemiology.

J.B. Malone

School of Veterinary Medicine, Baton Rouge, LA USA

The next step in forecasting *Ixodes scapularis* habitat suitability: The 1 km model for the United States of America.

A. Estrada-Peña*, C.S. Acedo, J.Q. Cinca

Dept. of Parasitology, Veterinary Faculty, 50013-Zaragoza, Spain

Use of geo-processing technologies to delimit spatial distribution of emerging zoonosis in Bahia, Brazil.

M.E. Bavia^{*a}, C.E. Pinto da Silva^b, R. Reis^a, M.G. Barbosa^a, P. Oliveira^a, I. Novaes^a, C. Rosendo^a

^aFederal University of Bahia, Salvador, Brazil; ^bState University of Feira de Santana, Feira de Santana, Brazil

Parasitological maps—an Italian experience.

G. Cringoli*, L. Rinaldi

Dipartimento Patologia e Sanita Animale, Settore di Parassitologia Veterinaria, Universita di Napoli, Italy

The spatial and temporal distribution of West Nile Virus in Louisiana in 2002.

K. Gruszynski^{a*}, A. Roy^a, J. Malone^a, G. Balsamo^b

^aLSU School of Veterinary Medicine, Baton Rouge, LA USA; ^bLouisiana Department of Health and Hospitals Office of Public Health, New Orleans, LA USA

Use of medical information systems for risk prediction and control of *Schistosoma haematobium* in Kenya.

K. McNally*, J.B. Malone

Department of Pathobiological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA USA

DISCUSSION AND SUMMARY

10:15PM–11:45PM **SYMPOSIUM: RECENT ADVANCES IN HEARTWORM DISEASE**

Moderators: J.W. McCall, J. Guerrero

Room: Napoleon BC12

American Heartworm Society guidelines for the diagnosis, prevention, and management of heartworm infection in dogs and cats.

J. Guerrero

Comparison of the “safety-net” and “soft-kill” effects of macrocyclic lactone products used for heartworm prevention.

J.W. McCall

***Wolbachia* endosymbionts and the immunopathogenesis of filarial disease.**

L. Kramer

***Wolbachia* endosymbionts in *Dirofilaria immitis*.**

C. Genchi

10:15AM–11:45AM **SYMPOSIUM: CURRENT STATUS AND FUTURE PROSPECT OF MYIASIS CONTROL**

Moderators: P. Dorchies, D.D. Colwell

Room: Napoleon B3

Attractants and traps for myiasis-causing flies.

R. Cepeda-Palacios

Departamento de Zootecnia, La Paz, B.C.S. México

Economics aspects of myiasis: A tale of complexity and neglect.

D.D. Colwell

Agriculture and Agri-Food Canada, Lethbridge, AB., Canada

Growth regulators in control of myiasis.

J-F. Graf

Novartis Animal Health Inc. CH-4002 Basel, Switzerland

Can host genetics be useful in the fight against myiasis?

Ph. Jacquet

UMR INRA / DGER 1225 Interactions Hôtes -Agents Pathogènes, Ecole Nationale Vétérinaire de Toulouse, Toulouse, France

Progress in eradication of hypodermosis from the European Union.

B. Losson^{a*}, C. Boulard^b

^aLaboratory of Parasitology and Parasitic Diseases, Faculty of Veterinary Medicine, University of Liège, Belgium; ^bUnité d'Immunopathologie des Maladies Parasitaires, INRA 37380 Nouzilly, France

Molecular tools for the identification of Oestridae.

D. Otranto

Department of Health and Animal Welfare, Faculty of Veterinary Medicine, University of Bari, Italy

New developments in sero-diagnosis of hypodermosis.

R. Panadero-Fontán

Parasitología y Enfermedades parasitarias. Dpto Patología Animal. Universidad de Santiago de Compostela. Facultad de Veterinaria, 27002. Lugo, Spain

Vaccination against myiasis flies—where to next?

V.M. Bowles^a, R.M. Sandeman^{b*}

^aCentre for Animal Biotechnology The University of Melbourne Parkville 3010, Vic, Australia; ^bThe Department of Agricultural Sciences, La Trobe University, Bundoora Vic. Australia 3086

Antiparasitic drugs and myiasis.

P.J. Scholl

USDA/ARS/MLIRU, U. of Nebraska-E. Campus, Lincoln, Nebraska USA

Supermodel hits the bottle (modelling ovine cutaneous myiasis).

R. Wall^{a*}, I. Cruickshank^a, K.E. Smith^a, N.P. French^b

^aSchool of Biological Sciences, University of Bristol, UK, ^bDepartment of Veterinary Clinical Science and Animal Husbandry, University of Liverpool, UK

10:15AM–11:45AM **ZOONOSIS 2**

Moderator: G. Poglayen

Room: Napoleon C3

10:15AM–10:30AM **Seroprevalence and transmission risk factors of porcine in rural pig of eastern and southern provinces of Zambia.**

C.S. Sikasunge^{a*}, I.K. Phiri^a, S. Siziya^a, A. Phiri^a, P. Dorny^b, A.L. Willingham III^c

^aUniversity of Zambia, Lusaka, Zambia; ^bPrince Leopold Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerp, Belgium; ^cDanish Centre for Experimental Parasitology, Denmark

10:30AM–10:45AM **Old dreams, new visions: Cystic echinococcosis in Sicily.**

G. Poglayen*, E. Brianti, A. Rusoo, G. Gaglio, C. Sorgi, S. Giannetto
Department of Veterinary Public Health, Messina, Italy

10:45AM–11:00AM **Number distribution and viability of *Taenia solium* cysticerci in Zambian village pigs.**

I.K. Phiri^{*a}, P. Dorny^{bc}, S. Gabriel^a, A.L. Willingham III^d, C. Sikasunge^a, S. Siziya^a, J. Vercruysse^c

^aUniversity of Zambia, Lusaka, Zambia; ^bInstitute of Tropical Medicine, Antwerp, Belgium; ^cGhent University, Belgium; ^dRoyal Veterinary and Agricultural University, Denmark

- 11:00AM–11:15AM **Infectivity and reproduction of *Echinococcus multilocularis* in cat, dog, fox and raccoon dogs.**
C.M.O. Kapel^{a*}, A.R.C. Thompson^b, P. Deplazes^c
^aDanish Centre for Experimental Parasitology, Department of Veterinary Microbiology, The Royal Veterinary and Agricultural University, Denmark; ^bDivision of Veterinary and Biomedical Science, Murdoch University, Australia; ^cInstitute for Parasitology, University of Zurich, Switzerland
- 11:15AM–11:30AM **Prevalence of porcine and risk factors for *Taenia solium* taeniosis in Funyula Division of Busia District Kenya.**
S.M. Githigia^{*a}, K. Murekefu^b, S.M. Ngesa^b, R.O. Otieno^a, R. Kahai^b
^aDepartment of Veterinary Pathology, Microbiology & Parasitology Faculty of Veterinary Medicine, University of Nairobi, P.O. Box 29053, Kangemi, 00625 Nairobi; ^bMinistry of Agriculture & Rural Development, Busia District Veterinary Office, P.O. Box 261, Busia Kenya
- 11:30AM–11:45AM **The role of Australian wild dogs (dingoes and dingo/domestic dog hybrids) in the transmission of *Echinococcus granulosus* from the bush to suburbia in Australia.**
D.J. Jenkins^{*}
Australian Hydatid Research Centre, 12, Mildura Street, Fyshwick ACT 2609, Australia
- 10:15AM–11:30AM **HOST GENETICS 2**
Moderator: G. Mulcahy
Room: Napoleon A1
- 10:15AM–10:30AM **The effects of sheep breed on the progress of *Lucilia sericata* larvae infestations (blowfly strike).**
M. Rankin^{*}, P. Bates
Parasitology Section, Scientific Services Unit, Veterinary Laboratories Agency (Weybridge), United Kingdom
- 10:30AM–10:45AM **The responsiveness of the Nigerian Dwarf goat in concurrent *Trypanosoma brucei*-*Haemonchus contortus* infection.**
S.N. Chiejina^{*a}, B.B. Fakae^a, G.A. Musongong^b, J.M. Behnke^c, L.A. Ngongeh^a, D. Wakelin^c
^aFaculty of Veterinary Medicine, University of Nigeria, Nsukka Nigeria; ^bWakwa Regional Centre for Agricultural Research for Development, Cameroon; ^cDepartment of Life and Environmental Sciences, University of Nottingham, NG7 2RD, UK
- 10:45AM–11:00AM **Variation of host and isolate response following experimental transmission of human *Cryptosporidium hominis* isolates into non-human hosts.**
M. Giles^{*}, D.M. West, J.A. Marshall, J. Catchpole, R.N. Marshall
Veterinary Laboratories Agency, Newhaw, Addlestone, Surrey, KT153NB, UK

- 11:00AM–11:15AM **A kinesin-related protein of *Babesia divergens*.**
H. Skerrett^{a*}, C. Norris^a, A. Zintl^a, J. Gray^b, G. Mulcahy^a
^aDepartment of Veterinary Microbiology and Parasitology and Conway Institute of Biomolecular and Biomedical Research, University College Dublin, Ireland; ^bDepartment of Environmental Resource Management, University College Dublin, Ireland
- 11:15AM–11:30AM **Genetic activity of *Toxoplasma gondii* from free ranging chickens from many countries.**
J.P. Dubey^a, T. Lehmann^{b*}
^aUnited States Department of Agriculture, Agricultural Research Service, Animal and Natural Resources Institute, Parasite Biology, Epidemiology & Systematics Laboratory, Beltsville, Maryland USA; ^bDivision of Parasitic Diseases, Centers for Disease Control and Prevention, Chamblee, Georgia USA
- 10:15AM–11:30AM **EPIDEMIOLOGY 1**
Moderator: R.M. Kaplan
Room: Napoleon A2
- 10:15AM–10:30AM **About the epidemiology of human cryptosporidiosis.**
J. Euzeby^{*}
Parasitologie, Ecole Veterinaire de Lyon, Marcy L'Etoile, France
- 10:30AM–10:45AM **Estimating the prevalence and intensity of *Schistosoma japonicum* infection in animal reservoir hosts in the Philippines.**
T. Fernandez^{*a}, E. Balolong, Jr.^b, H. Carabin^c, A.L. Willingham III^d, R. Olveda^b, S.T. McGarvey^c
^aLeyte State University, Baybay, Philippines; ^bResearch Institute for Tropical Medicine, Alabang, Philippines; ^cOklahoma University Health Sciences Center, Oklahoma USA; ^dRoyal Veterinary and Agricultural University, Frederiksberg, Denmark; ^eBrown University, Rhode Island USA
- 10:45AM–11:00AM **Prevalence of otacariosis in French goats.**
M. Cojan^a, B. Polack^{*a}, C. Chartier^b
^aEcole Nationale Vétérinaire d'Alfort, Maisons-Alfort, France; ^bLaboratoire d'Etude et de Recherche Caprine AFSSA, Niort, France
- 11:00AM–11:15AM **Epidemiology of goat gastrointestinal nematodes in Georgia.**
T.H. Terrill^{*a}, J.E. Miller^b, R.M. Kaplan^c, M. Larsen^d, R.A. Kircher^a, O.M. Samples^a, S. Gelaye^a
^aFort Valley State University, Georgia USA; ^bLouisiana State University, Louisiana USA; ^cUniversity of Georgia, Georgia USA; ^dRoyal Veterinary and Agricultural University, Denmark
- 11:15AM–11:30AM **Gastrointestinal nematode infections in sheep on communal grazing land in Nyandarua District of central Kenya.**
N. Maingi^{*}
Department of Veterinary Pathology, Microbiology and Parasitology, Faculty of Veterinary Medicine, University of Nairobi, P. O. Box 29053, Kangemi, 00625, Nairobi, Kenya

10:15AM–12:00PM **BIOCHEMISTRY MOLECULAR BIOLOGY**

Moderator: D.M. Witcombe

Room: Napoleon A3

10:15AM–10:30AM **Purification and analysis of *Fasciola gigantica* glutathione S-transferases.**

H. Weiyi*, Z. Weiyu

College of Animal Science and Technology, Guangxi University, 530005 Nanning, China

10:30AM–10:45AM **Neuropeptides and the anterior sensory neuroanatomy of gastrointestinal nematodes.**

L. Halferty*, N.J. Marks, G.P. Brennan, D.W. Halton

Parasitology Research Group, Queen's University Belfast, Belfast BT9 7BL, Ireland

10:45AM–11:00AM **Electrophysiological analysis of neuropeptide and classical transmitter modulation of pharyngeal pumping in sheep nematodes.**

J. Song^a, N. Sangster^{*a}, N.J. Marks^b, T. Geary^c

^aFaculty of Vet Science, University of Sydney; ^bSchool of Biology and Biochemistry, Queen's University Belfast, UK; ^cPharmacia Animal Health, Kalamazoo, MI USA

11:00AM–11:15AM **Stage-specific biochemical changes during the life cycle of *Oesophagostomum* spp.**

A. Joachim^{a*}, A. Dauschies^b, B. Ruttkowski^b

^aInstitute for Parasitology and Zoology, University of Veterinary Medicine Vienna, Austria;

^bInstitute of Parasitology, University of Leipzig, Germany

11:15AM–11:30AM **EmTFP250: A TRAP family microneme protein in *Eimeria maxima*.**

D.M. Witcombe^{a*}, D.J.P. Ferguson^b, S.I. Belli^a, M.G. Wallach^a, N.C. Smith^a

^aInstitute for the Biotechnology of Infectious Diseases, University of Technology, Sydney, Westbourne Street, Gore Hill, NSW, 2065, Australia; ^bNuffield Department of Pathology, Oxford University, John Radcliffe Hospital, Oxford, OX3 9DU, UK

11:30AM–11:45AM **Characterization of differentially expressed genes in unsporulated and sporulated oocysts of *Eimeria tenella*.**

K.B. Miska*, R.C. Barfield, R.H. Fetterer

USDA/ARS, PBESL, BARC-East 10300 Baltimore Ave, Beltsville, MD 20705
USA

11:45AM–12:00PM **Single Nucleotide Polymorphism analysis of the parasitic nematode *Cooperia oncophora*.**

M. van der Veer*, E. de Vries

Division of Parasitology and Tropical Veterinary Medicine, Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands

11:45AM–1:00PM **LUNCH: ON YOUR OWN**

1:00PM–3:30PM **SYMPOSIUM: CURRENT STATUS AND FUTURE PROSPECT OF MYIASIS
CONTROL (*CONTINUED*)**

Moderators: P. Dorchies, D.D. Colwell

Room: Napoleon B3

1:00PM–2:30PM **SYMPOSIUM: EMERGING PROTOZOAN DISEASES**

Moderators: P.A. Conrad, A.M. Tenter

Room: Napoleon C3

Babesiosis and theileriosis

Chair: A.M. Tenter

Perplexing *Piroplasma* (*Babesia*/*Theileria*) parasites: Old controversies and new discoveries.

P.A. Conrad

What role do *Babesia bicornis* and *Theileria bicornis* play in causing mortality in black rhinoceroses?

B.L. Penzhorn

DISCUSSION

TOXOPLASMOSIS

Chair: P.A. Conrad

“The emergence of toxoplasmosis in mammalian host species newly exposed to the parasite by human movements over the past centuries.”

A.M. Tenter

“Toxoplasmosis in captive raised Pallas’ Cats (*Otocolobus manul*, Pallas 1776).”

R. Edelhofer

DISCUSSION

LEISHMANIASIS

Chair: P.A. Conrad

“Canine leishmaniasis: Results of 1-year experimental infection of beagles with an American isolate of *Leishmania infantum*.”

A.C. Rosypal

“Serological and entomological surveillance of a new autochthonous focus of canine leishmaniasis in north-eastern Italy.”

G. Capelli

Status of leishmaniasis in other parts of Europe.

A.M. Tenter

DISCUSSION

1:00PM–2:30PM **SYMPOSIUM: FACTORS THAT INFLUENCE THE PREVALENCE OF
ACARICIDE RESISTANCE AND TICK-BORNE DISEASES**

Moderators: Chair: L. Foil, **Co-Chair:** F. Guerrero

Room: Maurepas

Tick resistance and hemoparasitic problems in Mexico.

H. Fragoso

**Acaricide resistance mechanisms present in southern cattle ticks, *Boophilus microplus*,
from Mexico.**

R.J. Miller

Tsetse control in Africa: a threat to enzootic stability for tick-borne diseases?

S.J. Torr

**Synthetic pyrethroid resistance in *Boophilus microplus* in Australia: association with the
use of synthetic pyrethroid products to control *Haematobia irritans exigua*.**

N.N. Jonsson

**Applications of molecular biology in diagnosis of pesticide resistance in cattle
ectoparasites.**

F. Guerrero

1:00PM–2:30PM **AAVP SYMPOSIUM: “NEW APPROACHES FOR PARASITIC
NEMATODES”**

Moderator: J. Urban, Immediate Past-President AAVP

Room: Napoleon BC12

THE PARASITE

The interaction of *Wolbachia*, nematodes, and their hosts.

T.R. Klei

The molecular basis of anthelmintic resistance.

R.K. Prichard

THE HOST

The impact of probiotics on the immunobiology of nematode infections.

G. Solano-Aguilar

A genomic approach to nematode infections

L.C. Gasbarre

1:00PM–2:30PM **CONTROL STRATEGIES 1/ECTOPARASITES**

Moderator: M. Sandeman

Room: Napoleon A2

- 1:00PM–1:15PM **Biological control of *Musca domestica* using entomopathogenic fungi.**
S. Gomathinayagam^{*}, A. Rajagopal, L. John
Department of Veterinary Parasitology, Madras Veterinary College, Chennai, India
- 1:15PM–1:30PM **Field trial to assess the productivity advantages of a pour-on tick development inhibitor in comparison to an amitraz tickicide in fattening beef cattle.**
J-F. Graf^{*a}, A. Strizek^b, B. Baxter^b, B. Hosking^b
^aNovartis Animal Health, Inc., CH-4002 Basel, Switzerland; ^bNovartis Animal Health Australia Pty Ltd, Sydney, NSW 2145, Australia
- 1:30PM–1:45PM **Mange (*Sarcoptes scabiei*) eradication through sow treatment with ivermectin and validation by slaughter checks and ELISA assays.**
C. Cargill^a, R. Garcia^{*b}, D. Homer^c, M. Sandeman^d
^aSARDI, University of Adelaide, Roseworthy, SA, Australia; ^bMerial Limited, Duluth, GA USA; ^cMerial Limited, Sydney, Australia; ^dLaTrobe University, Victoria, Australia
- 1:45PM–2:00PM Withdrawn
- 2:00PM–2:15PM **Potential biological control of *Psoroptes* mites with the fungal pathogen *Metarhizium anisopliae*.**
A.J. Brooks^{*a}, M. Aquino de Muro^b, D. Moore^b, R. Wall^a
^aSchool of Biological Sciences, The University of Bristol, Woodland Road, Bristol, BS8 1UG, UK; ^bCABI Bioscience, Bakeham Lane, Egham TW20 9TY, UK
- 2:15PM–2:30PM **Neem extract as an effective risk-free insecticide in dogs.**
A.K. Singh^{*}
Government Veterinary Hospital, Khedi, Betul, M.P. India

1:00PM–2:15PM **EPIDEMIOLOGY 2**

Moderator: C. Epe

Room: Napoleon A3

1:00PM–1:15PM **Prevalence of helminth parasites in free range domestic fowl in Nairobi and its environs, Kenya.**

W.K. Munyua*

Department of Veterinary Pathology, Microbiology and Parasitology, Faculty of Veterinary Medicine, University of Nairobi, P.O. Box 29053, Nairobi, Kenya

1:15AM–1:30AM **Treatment of cattle with an abamectin pour-on had no averse effect on dung beetle populations in Australia.**

P.J. Martin^a, M. Friend^b, L. Lawrence^{a*}

^aVirbac (Australia) Pty Limited, Locked Bag 1000, Peakhurst NSW 2210; ^bVeterinary Health Research Pty Ltd Trevenna Rd, West Armidale NSW, 2350, Australia

1:30AM–1:45AM **Prevalence of tongue worm infection in stray dogs of Shahrekord, Iran.**

B. Meshgi^{a*}, R. Asgarian^b

^aDepartment of Parasitology, Faculty of Veterinary Medicine Tehran University, P.O. Box: 14155-6453 Tehran, Iran; ^bDepartment of Environment, Shahrekord, Iran

1:45AM–2:00PM **Recent investigation on the prevalence of gastrointestinal nematodes in cats from France and Germany.**

N. Coati^{a*}, K. Hellmann^b, N. Mencke^c, C. Epe^a

^aInstitute of Parasitology, Hannover School of Veterinary Medicine, Hannover Germany;

^bKlifovet AG, Munich, Germany; ^cBayer AG, BHC-Business Group Animal Health, Leverkusen, Germany

2:00 PM–2:15 PM **Fascioloidosis of red deer and roe deer in Hungary (1997-2002)**

B. Egri*, E. Giczi

University of West Hungary, Mosonmagyaróvár, Hungary

2:30PM–2:45PM Break

2:45PM–4:15PM **SYMPOSIUM: FACTORS THAT INFLUENCE THE PREVALENCE OF ACARICIDE RESISTANCE AND TICK-BORNE DISEASES (*CONTINUED*)**

Moderators: Chair: L. Foil, **Co-Chair:** F. Guerrero

Room: Maurepas

2:45PM–4:15PM **SYMPOSIUM: VETERINARY PARASITES IN THE MARINE ENVIRONMENT: A THREAT TO AQUATIC MAMMALS AND PUBLIC HEALTH.**

Moderators: R. Fayer, D. Lindsay

Room: Napoleon B3

Atlantic and Gulf Coast Study of *Cryptosporidium* in shellfish.

R. Fayer

An update on *Toxoplasma gondii* infections in California sea otters.

M. Miller^{ab*}, P. Conrad^a, I. Gardner^a, C. Kreuder^a, J. Mazet^a, D. Jessup^b, E. Dodd^b, M. Harris^b, J. Ames^b, K. Worcester^c, D. Paradies^c, M. Grigg^d

^aSchool of Vet. Med., UC Davis, Davis, CA USA; ^bCDFG, Santa Cruz, CA USA; ^cWater Quality Board, San Luis Obispo, CA USA; ^dStanford Medical School, Palo Alto, CA USA

***Giardia duodenalis* and *Cryptosporidium parvum* infections in pinnipeds.**

M.E. Olson^a, A. Appelbee^a, L. Measures^b

^aUniversity of Calgary, Calgary, Alberta, Canada; ^bFisheries and Oceans Canada, Maurice Lamontagne Institute, Mont-Joli, Quebec, Canada

***Toxoplasma gondii* in California sea otters (*Enhydra lutris nereis*): past and present.**

R.A. Cole^{*a}, D.S. Lindsay^b, J.P. Dubey^c and N.J. Thomas^a

^aUSGS, NWHC, Madison, Wisconsin USA; ^bVirginia Tech, Blacksburg, Virginia USA; ^cUSDA, ARS, Beltsville, Maryland USA

2:45PM–4:15PM **ZOONOSIS 3**

Moderator: A.L. Willingham III

Room: Napoleon A1

2:45PM–3:00PM **Population dynamics of *Toxocara canis* in pigs receiving a single or multiple infection.**

K. Taira^{*a}, I. Saeed^a, P. Lind^b, K.D. Murrell^a, C.M.O. Kapel^a

^aDanish Centre for Experimental Parasitology, Department of Veterinary Microbiology, The Royal Veterinary and Agricultural University, Dyrøgevej 100 DK-1870, Frederiksberg C, Denmark; ^bDanish Veterinary Laboratory, Department of Immunology and Biochemistry, Bülowsvej 27, DK-1790, Copenhagen V, Denmark

3:00PM–3:15PM **Survival of *Trichinella spiralis* in animal feeds.**

L. Oivanen^{ab}, T. Mikkonen^a, L. Haltia^a, H. Karhula^a, H. Saloniemi^a, A. Sukura^{*a}

^aFaculty of Veterinary Medicine, University of Helsinki, Finland; ^bNational Food Agency, Helsinki, Finland

- 3:15PM–3:30PM **The source of human *Ascaris* infections in Denmark.**
P. Nejsun^{*a}, E.D. Parker, Jr.^a, J. Frydenberg^a, J. Prag^b, U.S. Sørensen^c, A. Roepstorff^d, D. Murrell^d, J. Boes^c
^aDepartment of Genetics and Ecology, University of Aarhus, DK 8000, Aarhus C, Denmark; ^bDepartment of Clinical Microbiology, Vigorg-Kjellerup Hospital; ^cDepartment of Medical Microbiology and Immunology, University of Aarhus; ^dDanish Center for Experimental Parasitology, The Royal Veterinarian and Agricultural University, Copenhagen; ^eDanish Bacon and Meat Council, Copenhagen, Denmark
- 3:30PM–3:45PM **Comparison of infectivity of *Trichinella zimbabwensis* in indigenous Zimbabwean pig (Mukota) and Large White.**
E. Matenga^{*a}, S. Mukaratirwa^a, A. L. Willingham^b
^aDepartment of Paraclinical Veterinary Studies, University of Zimbabwe, P. O. Box MP167, Mt. Pleasant, Harare, Zimbabwe; ^bDanish Center for Experimental Parasitology, Royal Veterinary and Agricultural College, Ridebanevej3, 1870 Fredriksberg C, Denmark
- 3:45PM–4:00PM **Transmission of *Toxocara canis* infection: A pilot study in Estonia.**
H. Talvik^{*a}, E. Moks^b
^aEstonian Agricultural University; ^bUniversity of Tartu, Estonia
- 4:00PM–4:15PM **Study of human cutaneous dirofilariosis in Caspian territories of Iran in 2001.**
M.R. Siavashi
Pasteur Institute of Iran, Tehran, Iran
- 2:45PM–4:15PM **HOST RESPONSE/IMMUNITY 3**
Moderator: J.G.M. Houdijk
Room: Napoleon C3
- 2:45PM–3:00PM **Sequential analysis of mucosal inflammatory responses during abomasal nematode infection in ewes.**
R.L. Coop^{*a}, A. Donnan^a, J.F. Huntley^a, D. Bartley^a, E. Jackson^a, J.G.M. Houdijk^b, F. Jackson^a
^aMoredun Research Institute, Edinburgh, UK; ^bScottish Agricultural College, Edinburgh, UK
- 3:00PM–3:15PM **Local immune responses in calves infected with the lungworm *Dictyocaulus viviparus*.**
F.N.J. Kooyman^{*}, M. Eysker, H.W. Ploeger
Div. Parasitology and Tropical Veterinary Medicine, Dept. Infectious Diseases and Immunology, Utrecht University, The Netherlands
- 3:15PM–3:30PM **Protective responses against cyathostome infections.**
M.A. Baudena^{*}, M.R. Chapman, D.W. Horohov, T.R. Klei
Dept. of Pathobiological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70803 USA

- 3:30PM–3:45PM **A study of IL-4, IL-8, INF- γ And TNF- α in pigs infected with *Ascaris suum*.**
B. Lassen^{a*}, A. Roepstorff^b, N.R. Steenhard^b, B. Aasted^c, K.D. Murrell^b
^aCopenhagen University, Denmark; ^bDanish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University; ^cLaboratory of Virology and Immunology, The Royal Veterinary and Agricultural University, Denmark
- 3:45PM–4:00PM **The effect of polyunsaturated fatty acids (PUFA) on FEC, mucosal and mast cells and eosinophil numbers in calves infected with *Ostertagia ostertagi* and *Cooperia onchophora*.**
K.N. Nuituri^{*a}, M. Wallace^a, J. Struthers^a, J.R. Scaife^a, M.A. Lomax^a, F. Jackson^b, E. Jackson^b, A. Mackellar^b, J.F. Huntley^b, R.L. Coop^b
^aDepartment of Agriculture and Forestry, University of Aberdeen, Aberdeen, AB24 5UA, UK; ^bMoredun Research Institute, Pentlands Science Park, Pentlands, Edinburgh, EH26 0PZ, UK
- 4:00PM–4:15PM **Antigen-specific IgG(T) responses as markers for larval cyathostomin infection in horses.**
S.M.J. Dowdall^{*}, C.J. Proudman, R.J. Beynon, J.B. Matthews
Veterinary Clinical Sciences, University of Liverpool, Leahurst, Neston, Wirral, UK. CH64 7TE
- 2:45PM–4:15PM **EPIDEMIOLOGY 3**
Moderator: A.M. Zajac
Room: Napoleon A2
- 2:45PM–3:00PM ***Oesophagostomum dentatum* does exhibit thermotaxis.**
A.S. Freeman^{*}, F.T. Ashton, I.J. Driben, M. Larsen, G.A. Schad
University of Pennsylvania School of Veterinary Medicine, Department of Pathobiology, Philadelphia, Pennsylvania USA
- 3:00PM–3:15PM **Macroparasites of reindeer in Fennoscandia: parasite population dynamics, control options, and environmental impact implications.**
J.T. Hrabok^{*}, P.J. Waller
Department of Parasitology, National Veterinary Institute, SE-75189 Uppsala, Sweden
- 3:15PM–3:30PM **A digital map database for South America: A tool to predict environmental risk of parasitic diseases.**
P. Nieto^{a*}, M.E. Bavia^b, R. Amaral^c, M. Fuentes^d, J.B. Malone^a
^aLouisiana State University, Baton Rouge, LA USA; ^bUniversidade Federal da Bahia, Salvador, Brazil; ^cMinistry of Health, Brazilia, Brazil; ^dUniversidad de València, Valencia, Spain
- 3:30PM–3:45PM **Internal parasitism in feral island horses.**
A.N. Wack^{a*}, A.M. Zajac^a, S. Stuska^b
^aVirginia-Maryland College of Veterinary Medicine, Blacksburg, Virginia USA; ^bNational Park Service, Cape Lookout National Seashore, Harkers Island, North Carolina USA

- 3:45PM–4:00PM **A prevalence survey of antibodies to *Anoplocephala perfoliata* in horses from the United States.**
C.R. Reinemeyer^{a*}, A.W. Farley^a, S.A. Kania^b, B.W. Rohrbach^b, R.H. Dressler^c
^aEast Tennessee Clinical Research, Inc., Knoxville, Tennessee USA; ^bUniversity of Tennessee College of Veterinary Medicine, Knoxville, Tennessee USA; ^cPfizer Animal Health, Barksdale, Texas USA
- 4:00PM–4:15PM **Prevalence and distribution of *Fasciola gigantica* and *Paramphistomum microbothrium* in Iringa district, Tanzania.**
J.D. Keyyu^{a*}, A.A. Kassuku^a, N.C. Kyvsgaard^b, A.L. Willingham III^b, J. Monrad^b
^aSokoine University of Agriculture, P.O. Box 3019, Morogoro, Tanzania; ^bThe Royal Veterinary and Agricultural University, Dyrølægevej 100, DK-1870 Frederiksberg C, Denmark
- 2:45PM–4:15PM **DRUG RESISTANCE 1**
Moderator: L.F. LeJambre
Room: Napoleon A3
- 2:45PM–3:00PM **The effect of moxidectin and ivermectin on the larval viability and recovery of resistant *Ostertagia circumcincta*.**
K.L. Tyrrell*, L.F. LeJambre
CSIRO Livestock Industries, Locked Bag 1, Armidale, NSW 2350, Australia
- 3:00PM–3:15PM **Evaluation of strategies to control anthelmintic resistance in nematodes of sheep.**
M.A. Taylor^{a*}, K.R. Hunt^b, S.K. Leask^b, F. Kennedy^c, R. Keatinge^c
^aCentral Science Laboratory, Sand Hutton, York, UK; ^bVeterinary Laboratories Agency, Weybridge, UK; ^cADAS Redesdale, Otterburn, Northumberland, UK
- 3:15PM–3:30PM **A New Zealand perspective on anthelmintic resistance.**
A.W. Murphy
Fort Dodge, New Zealand Limited
- 3:30PM–3:45PM **Characterization of moxidectin resistant *Trichostrongylus colubriformis* and *Haemonchus contortus*.**
L.F. LeJambre^{*a}, J. Geoghegan^b, M. Lyndal-Murphy^c
^aCSIRO Livestock Industries, Locked bag 1, Armidale, NSW 2350 Australia; ^bVirbac, 15 Pritchard Place, Peakhurst, NSW, Australia; ^cQueensland Department of Primary Industries, Locked Mail Bag 4, Moorooka, Qld 4105, Australia

- 3:45PM–4:00PM **Prevalence of anthelmintic resistance on horse farms in the southern United States.**
R.M. Kaplan^{a*}, T.R. Klei^b, E.T. Lons^c, G.D. Lester^d, D.D. French^b, S.C. Tollover^c, C.H. Courtney^d
^aColl. Vet. Med., Univ. Georgia, Athens, GA USA; ^bSchool Vet. Med., Louisiana State Univ., Baton Rouge, LA USA; ^cGluck Equine Research Center, Univ. Kentucky, Lexington, KY USA; ^dColl. Vet. Med., Univ. Florida, Gainesville, FL USA
- 4:00PM–4:15PM **Characterisation of a multiple resistant field isolates of *Teladorsagia circumcincta* from Scottish lowland sheep farms.**
D.J. Bartley^{a*}, F. Jackson^a, E. Jackson^a, L. Stenhouse^a, N. Sargison^b
^aMoredun Research Institute, Pentland Science Park, EH26 OPZ, UK; ^bLAPTU, Easter Bush Veterinary Centre, Royal Dick School Veterinary Studies, EH25 9RG, UK
- 4:15PM–5:45PM **VIRBAC SYMPOSIUM : EQUIMAX, UPDATES ON THE DIAGNOSTICS, BIOLOGY AND CONTROL OF CESTODES IN HORSES**
Moderator: T.R. Klei, School of Veterinary Medicine, Louisiana State University
Room: Napoleon BC12
- A prevalence survey of antibodies to *Anoplocephala perfoliata* in horses from the United States.**
C. Reinemeyer.
East Tennessee Clinical Research, Knoxville, Tennessee USA
- Clinical aspects of tapeworm infection in the UK.**
C. Proudman
Senior Lecturer in Equine Surgery, University of Liverpool, UK
- Epidemiological studies on equine cestodes in warm climates: infection pattern, population dynamics and associated pathology.**
A. Meana
Associate Professor in Veterinary Parasitology, University of Madrid, Spain
- Efficacy and safety studies with Equimax (ivermectin –praziquantel)**
Virbac SA
R&D—Virbac Corp R&D
- CONCLUSIONS:** Interest of a combination product in the control of concomittant infections in horses.
G.C. Coles.

5:45PM–7:15PM **MERIAL SYMPOSIUM: CURRENT CONCEPTS IN VETERINARY
PARASITOLOGY**

Moderator: M. Soll, Merial

Room: Napoleon BC12

The use of acaracides in dogs to prevent the transmission of tick-borne pathogens.

E.B. Breitschwerdt

**Anthelmintic resistance in equine cyathostomins: Issues and implications for
control.**

R.M. Kaplan

The importance of parasite-induced behavioural changes in veterinary parasitology.

A.B. Forbes

8:00PM **MERIAL RECEPTION**

Room: Rhythm Ball Room, Second Floor

WEDNESDAY, AUGUST 13, 2003

7:30AM–9:00AM POSTER SESSION 2—CONTINENTAL BREAKFAST

Room: Armstrong

Posters will be exhibited Tuesday and Wednesday. Odd numbered posters will be tended by authors on Tuesday. Even numbered posters will be tended by authors on Wednesday.

9:00AM–9:45AM PLENARY 4—RECENT ORIGINS ON ANCIENT PARASITES—*TOXOPLASMA*.

Speaker: D. Sibley

Room: Napoleon BC12

9:45AM–10:30AM PLENARY 5—MODELING HOST GENETICS, RESISTANCE TO INFECTIOUS DISEASE.

Speaker: S.C. Bishop

Room: Napoleon BC12

10:30AM–10:45AM Break

10:45AM–12:15PM INTERVET SYMPOSIUM: BOVINE NEOSPOROSIS

Moderator: T. Schetters, Parasitological R&D—Intervet International

Room: Napoleon BC12

Bovine neosporosis, a serious obstacle to cattle breeding and a challenge for scientists.

J.P. Dubey.

USDA, Parasite Biology and Epidemiology Laboratory

Immune response to *Neospora caninum*.

A. Adrianarivo

University of California, Department of Pathology, Microbiology and Immunology

A controlled study with Bovilis Neoguard in New Zealand dairy herds.

C. Heuer

Massey University, Institute of Veterinary, Animal and Biomedical Sciences

A case/control study with Bovilis Neoguard in Costa Rican dairy herds.

K. Frankena

Wageningen University and Research Centre, Quantitative Veterinary Epidemiology Group.

12:15PM - AFTERNOON FREE

THURSDAY, AUGUST 14, 2003

7:30AM–8:15AM CONTINENTAL BREAKFAST

Place: Foyer outside Napoleon BC12

8:15AM–9:00AM **PLENARY 6—ANTIPARASITIC DRUGS IN THE 21ST CENTURY**

Speaker: T.G. Geary

Room: Napoleon BC12

9:00AM–10:30AM **SYMPOSIUM: ASSESSING THE BURDEN OF *TAENIA SOLIUM* CYSTICERCOSIS AND ECHINOCOCCOSUS**

Moderator: A.L. Willingham III, P.M. Schantz

Room: Napoleon B3

Assessing the burden and impact of cysticercosis and echinococcosis to justify global initiatives for combating these neglected parasitic zoonoses (Introduction).

A.L. Willingham III (9:00-9:10)

Assessing the burden of cysticercosis.

H. Carabin (9:10-9:35)

How does cysticercosis impact resource-poor communities in South Africa?

T. Krecek (9:35-9:50)

Taeniosis-cysticercosis in man and pigs in Ecuador.

P. Dorny (9:50-10:05)

Assessing the burden of echinococcosis.

P. Torgerson (10:05-10:30)

Break (10:30-10:45)

The burden and impact of echinococcosis in Australia.

D. Jenkins (10:45-11:00)

Cysticercosis and echinococcosis – Potential linkage with FAO activities and FAO support possibilities.

C. Eddi (11:00-11:15)

DISCUSSION (11:15- 12:00)

9:00AM–10:30AM **EQUINE CYATHASTOME WORKSHOP**

Moderator: R.M. Kaplan

Room: Napoleon BC12

9:00AM–10:30AM **CONTROL STRATEGIES 2/SHEEP**

Moderator: M.B. Molento

Room: Napoleon C3

9:00AM–9:15AM **Biological control of nematode parasites of sheep in Malaysia using the nematophagous fungus *Duddingtonia flagrans*.**

P. Chandrawathani^a, O. Jamnah^a, P.J. Waller^{b*}, M. Larsen^c, A.T. Gillespie^d

^aVRI, Ipoh, Malaysia; ^bSWEPAR, SVA, Uppsala, Sweden; ^cDCEP, KVL, Copenhagen, Denmark; ^dChr. Hansen A/S, Hørsholm, Denmark

9:15AM–9:30AM **Famacha method for decision making in the treatment of endoparasitic infection in small ruminants in Brazil.**

M.B. Molento*, C. Tasca, A.K. Gallo, M.J. Ferreira, R.R. Bononi, E. Stecca
Universidade Paranaense, Umuarama, PR, Brazil. *New address: Universidade Federal de Santa Maria, Santa Maria, RS, Brazil

9:30AM–9:45AM **Influence of different forages on gastrointestinal nematode infections in grazing lambs.**

S.M. Thamsborg*, H. Mejer, M. Bandier, M. Larsen

Danish Centre for Experimental Parasitology, Royal Veterinary & Agricultural University, Denmark

9:45AM–10:00AM **Farm evaluation of biological control of sheep parasites on the island of Gotland, Sweden.**

P.J. Waller^{a*}, O. Schwan^b, B-L. Ljungström^c

^aSWEPAR, SVA, Uppsala, Sweden; ^bSvDHV, Visby, Sweden; ^cVidilab, Enköping, Sweden

10:00AM–10:15AM **Efficacy of *Duddingtonia flagrans* chlamydospores against naturally acquired gastrointestinal nematode infections in Blackface ewes and lambs.**

F. Jackson^{a*}, Y. Gordon^a, R.L. Coop^a, D.J. Bartley^a, E. Jackson^a, A. Gillespie^b

^aMoredun Research Institute, EH26 OPZ, UK; ^bChr. Hansen, Animal Health Development, 2970 Hørsholm, Denmark

10:15AM–10:30AM **Reducing the degree of protein scarcity rapidly improves expression of immunity to abomasal nematodes in ewes.**

J.G.M. Houdijk^{a*}, I. Kyriazakis^a, F. Jackson^b, R.L. Coop^b

^aAnimal Nutrition and Health Department, Scottish Agricultural College, Edinburgh, UK;

^bMoredun Research Institute, Penicuik, UK

9:00AM–10:30AM **Chemotherapy 2**

Moderator: D.S. Lindsay

Room: Napoleon A1

9:00AM–9:15AM **Ponazuril is highly effective in the prevention and treatment of toxoplasmosis in mice.**

S.M. Mitchell^a, A.M. Zajac^a, W.L. Davis^b, D.S. Lindsay^a

^aVirginia Tech, Blacksburg, Virginia USA; ^bBayer HealthCare, Animal Health Division, Shawnee, Kansas USA

9:15AM–9:30AM **Use of reversing agents of P-glycoprotein to increase the systematic availability of macrocyclic lactones: a promising tool.**

M. Alvinerie*, J. Dupuy, J.F. Sutra, A. Lespine

Laboratoire de Pharmacologie Toxicologie, INRA 180 Chemin de Tournefeuille, 31931, Toulouse, France

9:30AM–9:45AM **Studies on the efficacy of toltrazuril, diclazuril and sulphadimidine against artificial infections with *Isospora suis* in piglets.**

H.C. Mundt^a*, A. Dauschies^b, S. Wüstenberg^a, M. Zimmermann^b

^aBayer AG, Animal Health Business Group, Clinical Development, Leverkusen, Germany;

^bInstitute for Parasitology, Faculty of Veterinary medicine, University of Leipzig, Leipzig, Germany

9:45AM–10:00AM **The effects of paraherquamide and 2-deoxy-paraherquamide on cholinergic receptor subtypes in *A. suum*.**

R.J. Martin*, C.L. Clarke, A.P. Robertson

Department of Biomedical Sciences, Iowa State University, Ames, IA 50011, USA

10:00AM–10:15AM **The effects of a imidacloprid and permethrin combination against developmental stages of *Ixodes ricinus* ticks.**

H. Mehlhorn^a*, G. Schmahl^a, N. Mencke^b, T. Bach^b

^aDepartment of Parasitology, Heinrich Heine University, Düsseldorf, Germany; ^bBayer AG, BHC-Business Group Animal Health, Leverkusen, Germany

10:15AM–10:30AM **The anthelmintic efficacy of the plant, *Albizia anthelmintica*, against the nematode parasites *Haemonchus contortus* of sheep and *Heligmosomoides polygyrus* of mice.**

J.B. Githiori^{ab}*, J. Höglund^b, P.J. Waller^b, R.L. Baker^a

^aInternational Livestock Research Institute (ILRI), P.O. Box 30709, Nairobi; ^bDepartment of Parasitology (SWEPAR), National Veterinary Institute and Swedish University of Agricultural Sciences, P.O. Box 7073, S-751 89 Uppsala, Sweden

9:00AM–10:30AM **RUMINANT PARASITES**

Moderator: M. Eysker

Room: Napoleon A2

9:00AM–9:15AM **Effect of gender on susceptibility to *Haemonchus contortus* infection in lambs.**

M. Gauly*, M. Schackert, G. Erhardt

Institute of Animal Breeding and Genetics, Justus Liebig University Giessen, D-35398 Giessen, Germany

9:15AM–9:30AM **Prevalence of *Fasciola gigantica* in Zambia.**

A.M. Phiri^{a*}, I.G.K. Phiri^a, C.S. Sikasunge^a, J. Monrad^b

^aSchool of Veterinary Medicine, University of Zambia, Lusaka, Zambia; ^bDanish Centre for Experimental Parasitology, Frederiksberg, Denmark

9:30AM–9:45AM ***In vivo* transfer of *Dictyocaulus viviparus*.**

H.W. Ploeger*, C. ten Cate, M. Eysker

Div. Parasitology & Tropical Veterinary Medicine, Dept. of Infectious Diseases and Immunology, Utrecht University, The Netherlands

9:45AM–10:00AM **Production effects of *Cooperia oncophora* infections in cattle.**

W.E. Pomroy^a, D.M. West^a, D.M. Leathwick^b, S.T. Morris^a

^aInstitute of Veterinary, Animal and Biomedical Sciences, Massey University; ^bAgResearch Grasslands, Palmerston North, New Zealand

10:00AM–10:15AM **Effect of gastro-intestinal nematodes on the productivity of goats in smallholder farms in Mozambique.**

A. Atanásio^{a*}, J. Boomker^b

^aDepartment of Diagnostics and Research, National Veterinary Research Institute, P.O. Box 1922, Maputo, Mozambique; ^bDepartment of Veterinary Tropical Diseases, University of Pretoria, Private Bag X04, Onderstepoort 0110, Republic of South Africa

10:15AM–10:30AM **A model for ruminant gastric worms: Intraspecific differences between cottontail & woodchuck isoates of *Obeliscoides cuniculi*.**

N. Samuel^{a*}, D.E. Worley^b

^aCalifornia Baptist University, Riverside CA USA; ^bVeterinary Molecular Biology Laboratory, Montana State University, Bozeman, Montana USA

9:00AM–10:30AM **PHYLOGENY AND SYSTEMATICS**

Moderator: R.B. Gasser

Room: Napoleon A3

9:00AM–9:15AM **SSCP-based identification of members within the *Contracaecum rudolphii* complex (Nematoda: Ascaridoidea: Anisakidae) using ribosomal DNA markers.**

X.Q. Zhu^{a*}, S. D'Amelio^b, F. He^a, R.Q. Lin^a, L. Paggi^b, R.B. Gasser^c, Z. Cao^a, H.Q. Song^a

^aSouth China Agricultural University, Guangzhou, Guangdong Province, China; ^bUniversità di Roma "La Sapienza", Rom, Italy; ^cThe University of Melbourne, Melbourne, Victoria, Australia

9:15AM–9:30AM **Molecular phylogeny of filarial nematodes and the evolution of the association between filariae and *Wolbachia pipientis*.**

M. Casiraghi^{a*}; L. Baldo^a, M. Mortarino^a, O. Bain^b

^aUniversità di Milano, DIPAV, Sezione di Patologia Generale e Parassitologia; ^bMuséum National d'Histoire Naturelle, Paris, France

9:30AM–9:45AM **Detection of *Hammondia heydorni*-like organisms and their differentiation from *Neospora caninum* using RAPD-PCR.**

C. Sreekumar^{a*}, D.E. Hill^a, V.M. Fournet^a, B.M. Rosenthal^a, D.S. Lindsay^b, J.P. Dubey^a

^aParasite Biology, Epidemiology and Systematics Laboratory, Animal and Natural Resources Institute, Agricultural Research Service, United States Department of Agriculture, Beltsville, Maryland 20705 USA; ^bCenter for Molecular Medicine and Infectious Diseases, Department of Biomedical Sciences and Pathobiology, Virginia-Maryland College of Veterinary Medicine, Virginia Tech, 1410 Prices Fork Road, Blacksburg, Virginia 24061 USA

9:45AM–10:00AM **Multilocus microsatellite genotyping of *Cryptosporidium parvum*.**

J.M. Wastling^a, M. Mallon^b, H.V. Smith^c, W.J. Reilly^d, A. Tait^b

^aDivision of Infection and Immunity, Joseph Black Building, IBLS, University of Glasgow, Glasgow G12 8QQ, United Kingdom; ^bWellcome Centre for Molecular Parasitology, University of Glasgow, UK; ^cScottish Parasite Diagnostic Laboratory, Glasgow, UK; ^dScottish Centre for Infection and Environmental Health, Glasgow, UK

10:00AM–10:15AM **Natural circulation of capsule-forming *Trichinella*, problems of taxonomy and hybridization.**

A.S. Bessonov^{*}

K. I. Skryabin. Institute of Helminthology, Moscow 117218, Russia

10:15AM–10:30AM **Genetic diversity in *Neospora caninum*.**

S.M. Latham^{a*}, E.A. Innes^a, J.M. Wastling^b

^aMoredun Research Institute, Pentlands Science Park, Edinburgh, UK; ^bDivision of Infection and Immunity, Institute of Biomedical and Life Sciences, University of Glasgow, Glasgow G12 8QQ, United Kingdom

10:30AM–10:45AM **BREAK**

10:45AM–12:15PM **SYMPOSIUM: CYSTICERCOSIS (CONTINUED)**

Moderator: A.L. Willingham III, P.M. Schantz

Room: Napoleon B3

10:45AM–12:15AM **WORKSHOP: VETERINARY PARASITE EDUCATION**

Moderator: C. Monahan

Room: Napoleon A1

10:45AM–12:15PM **CHEMOTHERAPY 3**

Moderator: F.V. Olaechea

Room: Napoleon BC12

10:45AM–11:00AM **Evaluation of the period of protection of 10% Moxidectin Cattle Long-Acting against *Dictyocaulus viviparus*, *Haemonchus placei*, *Trichostrongylus axei* and *Oesophagostomum radiatum* infection in cattle.**
S. Ranjan*, E. Szewczyk, R. Search, R. Pollet, D. Amodie, R. DeLay
Fort Dodge Animal Health, Princeton, New Jersey USA

11:00AM–11:15AM **Comparison of the anthelmintic persistence of doramectin, ivermectin, moxidectin and eprinomectin in weaned beef cattle in Australia against natural infections of nematodes.**
S.R. Barber^{a*}, M. Alvinerie^b, P.I. Veale^c, G.A. Anderson^d, V.M. Bowles^a
^aCentre for Animal Biotechnology, University of Melbourne, Australia; ^bLaboratoire de Pharmacologie-Toxicologie, INRA, Toulouse, France; ^cPara-Site Diagnostic Services, Benalla, Australia; ^dVeterinary Clinical Centre, University of Melbourne, Australia

11:15AM–11:30AM **Effect of urea-molasses block supplementation on goats naturally infected with gastrointestinal nematodes.**
R.M. Waruiru*, J.W. Ngotho, M.N. Mutune
Department of Veterinary Pathology, Microbiology & Parasitology, Faculty of Veterinary Medicine, University of Nairobi, P.O. Box 29053, Kangemi, Kenya

11:30AM–11:45AM **Eprinomectin pour-on at single and at double dose against gastrointestinal nematode infections in goats.**
L. Rinaldi^{a*}, V. Veneziano^a, G. Capelli^b, R. Rubino^c, G. Cringoli^a
^aDip. Patologia e Sanità Animale, Università di Napoli, Italy; ^bDip. Scienze Sperimentali Veterinarie, Università di Padova, Italy; ^cIstituto Sperimentale per la Zootecnia, Bella Scalo-Potenza, Italy

11:45AM–12:00AM **Efficacy of jetting and 2 pour-on formulations containing spinosad against *Melophagus ovinus*.**

F.V. Olachea^{a*}, J. Corley^a, H. Perez Monti^b, F. Raffo^a, J. Rothwell^b
^aNational Institute for Agricultural Technology (INTA), CC. 277, (8400) Bariloche, Argentina; ^bElanco Animal Health, 123 Epping Rd, Macquarie Park NSW 2113, Australia

12:00AM–12:15PM **Control effects of closantel limposomes on sheep experimentally infected with *Fasciola hepatica*.**

H.E. Hongxuan^{ab}, Q. Ximing^a, Z. Qiangzhe^a, D. Mingxing^{a*}
^aState Key Laboratory of Biomembrane & Membrane Biotechnology, Department of Biological Sciences and Biotechnology, Tsinghua University, Beijing 100084, P.R. China; ^bDepartment of Animal Science, Henan Vocation-Technical Teachers College, Xinxiang, Henan 450003, P.R. China

10:45AM–12:15PM **DRUG RESISTANCE 2**

Moderator: R.K. Prichard

Room: Napoleon A2

10:45AM–11:00AM **Studies on drug-resistance of *Eimeria tenella* in China.**

W. Ming^{a*}, A. Jian^b, Y. Liyun^a, G. Depei^a, Y. Yonglan^a
^aCollege of Veterinary Medicine, China Agricultural University, Beijing, P.R. China; ^bDepartment of Animal Science and Technology, Beijing Agricultural College, Beijing, P.R. China

11:00AM–11:15AM **Detection of primaquine resistant *Theileria sergenti* parasites by flow cytometry and some biochemical properties of the parasites.**

Y. Yagi^{a*}, A. Ohnuma^b, M. Yamanaka^c, H. Shiono^a, Y. Chikayama^a, A. Kumar^a

^aHokkaido Research Station, National Institute of Animal Health, Sapporo, Japan; ^bGraduate School of Science, Hokkaido University, Sapporo, Japan; ^cHokkaido Hidaka Livestock Hygiene Service Center, Shizunai, Japan

11:15AM–11:30AM **Sequencing of exon 4 of the (insert square)-tubulin isotype 1 gene from 12 cyathostomin species.**

J.E. Hodgkinson*, A.J. Davidson, J.B. Matthews
Department of Veterinary Parasitology, University of Liverpool, UK

11:30AM–11:45AM **Heterologous expression of glutamate gated chloride channel subunits from the cattle nematode *Cooperia oncophora*.**

A.I. Njue*, R.K. Prichard
Institute of Parasitology, McGill University, 21, 111 Lakeshore Road, Ste-Anne-de-Bellevue, Quebec, H9X 3V9, Canada

- 11:45AM–12:00PM **Importance of the beta-tubulin codon 200 polymorphism for the mechanism of benzimidazole resistance in cyathostomes investigated by quantitative real time PCR.**
G. von Samson-Himmelstjerna*, N. Wirtherle, M. Pape, S. Buschbaum, T. Schneider
Institute of Parasitology, Hannover School of Veterinary Medicine, Germany
- 12:00PM–12:15PM **Steps in characterization of allelic variation of an ivermectin sensitive GluCL gene in *C. nassatus*.**
R. Tandon*, R.M. Kaplan
Department of Medical Microbiology and Parasitology. College of Veterinary Medicine, University of Georgia, Athens, GA USA
- 10:45AM–12:15PM **CONTROL STRATEGIES 3**
Moderator: S. Petkevicius
Room: Napoleon A3
- 10:45AM–11:00AM **Dietary carbohydrates introduce changes in the metabolism in the large intestine that influence the population of *Oesophagostomum dentatum* in pigs.**
K.E. Bach Knudsen^{a*}, S. Petkevicius^b, H. Jørgensen^a, K.D. Murrell^b
^aDanish Institute of Agricultural Sciences, Tjele, Denmark; ^bThe Royal Veterinary & Agricultural University, Copenhagen, Denmark
- 11:00AM–11:15AM **Inactivation of *Cryptosporidium parvum* oocysts by the composting of cattle feces.**
K. Shimura*, T. Tsutsui, T. Kamio, M. Ohta, K. Kanehira, I. Yamane
National Institute of Animal Health, Tsukuba, Ibaraki, Japan
- 11:15AM–11:30AM **The effects of carbohydrates on the establishment of *Trichuris suis* in the large intestine of pigs.**
L.E. Thomsen^{a*}, K.E. Bach Knudsen^b, A. Roepstorff^a
^aDanish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University, Dyrhøjevej 100, DK-1870 Frederiksberg C, Denmark; ^bDepartment of Animal Nutrition and Physiology, Danish Institute of Agricultural Sciences, Research Centre Foulum, P.O. Box 50, DK-8830 Tjele, Denmark
- 11:30AM–11:45AM **A meta-analysis of the milk production response after anthelmintic treatment in adult dairy cattle.**
J. Sanchez^{*a}, I. Dohoo^a, J. Carrier^b, L. DesCôteaux^b
^aDepartment of Health Management, Atlantic Veterinary College, University of Prince Edward Island, 550 University Avenue, Charlottetown PEI, C1A 4P3, Canada; ^bFaculté de médecine vétérinaire, Université de Montréal, Sciences Cliniques, St-Hyacinthe, Quebec, J2S 7C6, Canada

11:45AM–12:00PM **Behavioral mechanisms underlying production responses in dairy cows treated with eprinomectin.**

A.B. Forbes^{a*}, C.A. Huckle^b, M.J. Gibb^b

^aMerial, Sandringham House, Harlow, Essex, CM19 5TG, UK; ^bInstitute of Grassland & Environmental Research (IGER), North Wyke, Devon, EX20 2SB, UK

12:00PM–12:15PM **Practical implementation of a strategic endoparasite control program in a commercial riding stable.**

E.M. Abbott^{a*}, D.J. Baker^b, J.P. Barley^c

^aAbbott Associates, Lutterworth, UK; ^bPriors Marston, UK; ^cHuntingdon Life Sciences, Huntingdon, UK

10:45AM–12:30PM **EPIDEMIOLOGY 4**

Moderator: E. Claerebout

Room: Napoleon C3

10:45AM–11:00AM **A sero-epidemiological survey of parasites in cattle in the north eastern Free State, South Africa.**

M.S. Mtshali^{a*}, P.A. Mbatia^a, D.T. de Waal^b

^aParasitology Research Program, Qwa-Qwa Campus, University of the Free State, South Africa; ^bParasitology Division, Onderstepoort Veterinary Institute, South Africa

11:00AM–11:15AM ***Cryptosporidium* and *Giardia*: epidemiology and control on California dairy farms.**

W.A. Smith^{*}, E.R. Atwill, K. Tate, D.J. Lewis, M. Lennox, M. Pereira, P.A. Conrad

University of California, Davis, CA USA

11:15AM–11:30AM **Epidemiology of subclinical nematode infections in dairy cows on five farms in England: 1978/9 & 2002.**

M.T. Fox^{a*}, M. Hutchinson^a, A. Riddle^a, R. Bond^a, A.B. Forbes^b

^aRoyal Veterinary College, London, UK; ^bMerial Animal Health, Harlow, UK

11:30AM–11:45AM **Seroprevalence and associated risk factors of neosporosis in beef and dairy cattle in southern Italy.**

P. Paradies^{a*}, G. Testini^a, N. Leone^a, R. Lia^a, G. Capelli^b, D. Otranto^a

^aDepartment of Health and Animal Welfare, Faculty of Veterinary Medicine, University of Bari, Italy; ^bDepartment of Experimental Veterinary Sciences, Faculty of Veterinary Medicine, University of Padua, Italy

11:45AM–12:00PM **Epidemiology of amphistomes in cattle in the Highveld and Lowveld Communal grazing areas of Zimbabwe.**

D.M. Pfukenyi^{a*}, S. Mukaratirwa^b, J. Monrad^c

^aCentral Veterinary Laboratory, Diagnostic and Research Branch, P.O. Box CY 551, Causeway, Harare, Zimbabwe; ^bUniversity of Zimbabwe, Faculty of Veterinary Science, Paraclinical Veterinary Studies, P.O. Box MP 167, Mt Pleasant, Harare, Zimbabwe; ^cDanish Centre for Experimental Parasitology, Dyr-laegevej 100, DK-1870, Frederiksberg, Denmark

- 12:00PM–12:15PM **Epidemiological survey of *Cryptosporidium parvum* and *Giardia duodenalis* in dairy calves in Belgium.**
T. Geurden^a, E. Claerebout^a, D. Berkens^b, P. Geldof^a, J. Vercruysse^a
^aLaboratory of Parasitology, Ghent University, Merelbeke, Belgium; ^bPrince Leopold Institute of Tropical Medicine, Antwerp, Belgium
- 12:15PM–12:30PM ***Neospora caninum* abortion in a dairy and beef herd: use of horizontal and vertical transmission parameters to assess the sensitivity and the specificity of an Indirect Immuno-Fluorescence Antibody Test.**
F. De Meerschman^a, N. Speybroeck^b, D. Berkvens^b, C. Focant^a, J. Detry^a, C. Rettigner^a, B. Losson^a
^aLaboratory of Parasitology, Department of Infectious and Parasitic Diseases, Faculty of Veterinary Medicine, University of Liege, Boulevard de Colonster, 20, 4000, Liege, Belgium; ^bDepartment of Animal Health, Unit of Epidemiology and Applied Statistics, Prince Leopold Institute of Tropical Medicine, 2000, Antwerp, Belgium
- 12:15AM–1:30PM **LUNCH: ON YOUR OWN**
- 1:30PM–2:30PM **VACCINE 2**
Moderator: G.M. Faubert
Room: Napoleon A1
- 1:30PM–1:45PM **The immuno-protective effect of DNA vaccine against experimental inoculation of chickens with *Eimeria tenella*.**
S.Q. Wu, J.J. Jiang*, Q. Liu, Y.J. Zhu
College of Veterinary Medicine, China Agricultural University, Beijing, China
- 1:45PM–2:00PM **Development of a recombinant vaccine against *Babesia divergens* in cattle.**
Th.P.M. Schetters^{a*}, E. Precigout^b, S. Delbecq^b, J. Kleuskens^a, J. van de Crommert^a, L. Janssen^a, A. Gorenflot^b
^aIntervet International, Boxmeer, The Netherlands; ^bUniversity of Montpellier I, Montpellier, France
- 2:00PM–2:15PM **Oral immunizations of BALB/c mice with *Giardia duodenalis* recombinant cyst wall protein (rCWP2) impedes cyst output.**
G.M. Faubert^{a*}, R. Larocque^a, K. Nakagaki^b, P. Lee^a, A. Abdul-Wahid^a
^aInstitute of Parasitology, McGill University, Montreal, Qc. Canada; ^bCollaborate Laboratories for Wildlife Health, Gentle, Nippon Jui Chikusan University, Yokyo, Japan.
- 2:15PM–2:30PM **The vaccine for prevention of echinococcosis of animals.**
M. Aminjonov*, Sh. Rasulov, Sh. Aminjonov
Uzbek Research Institute of Veterinary after named acad. K.I. Skryabin, Samarkand, Uzbekistan

1:30PM–3:15PM **CONTROL STRATEGIES 4**

Moderator: T.H. Terrill

Room: Napoleon BC12

- 1:30PM–1:45PM **Seasonal dynamics and overwintering survival of cattle GI nematodes using *Duddingtonia flagrans*.**
S-O. Dimander*, J. Höglund, P.J. Waller
SWEPAR, Uppsala, Sweden
- 1:45PM–2:00PM **Effectiveness of copper-oxide wire particles on the control of *Haemonchus contortus* in sheep.**
A.D. Watkins^{a*}, J.E. Miller^a, T.H. Terrill^b, M. Larsen^c, R.M. Kaplan^d
Department of Pathological Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70803 USA; ^bFort Valley State University, Fort Valley, GA USA; ^cRoyal Veterinary & Agricultural University, Denmark; ^dUniversity of Georgia, Athens, Georgia USA
- 2:00PM–2:15PM **Supplementation and/or single anthelmintic (AH) treatment of browsing kids naturally infected with gastrointestinal nematodes (GIN) during the wet season in tropical Mexico.**
J.F. Torres-Acosta^{a*}, A. Aguilar Caballero^a, L. Canul-Ku^a, L. Cob-Galera^a, J. Vargas-Magaña^a
^aFMVZ-Universidad Autonoma de Yucatan, Merida, Yucatan, Mexico
- 2:15PM–2:30PM **Potential of the fungus *Duddingtonia flagrans* to control nematodes in goats in southeastern United States: a dose-titration and dose-timing study.**
M. Larsen^{a*}, T.H. Terrill^b, O. Samples^b, S. Husted^a, J.E. Miller^c, R.M. Kaplan, S. Gelaye^b
^aRoyal Veterinary & Agricultural University, Denmark; ^bFort Valley State University, ^cUniversity of Georgia, Georgia USA; ^dLouisiana State University, Louisiana USA
- 2:30PM–2:45PM **Potential and limitations of the use of evasive grazing for prevention of parasitic gastroenteritis in small ruminants under temperate conditions.**
M. Eysker*, N. Bakker, Y.A. van der Hall, I. Van Hecke, F.N.J. Kooyman, H.W. Ploeger
Division of Parasitology and Tropical Veterinary Medicine, Utrecht University, Utrecht, The Netherlands
- 2:45PM–3:00PM **Successful substitution on pastures of a resistant nematode (*Teladorsagia circumcincta*) population with a susceptible strain.**
M.N. Moussavou-Boussougou, C. Sauvé, J. Cabaret*
INRA, BASE, 37380 Nouzilly, France

- 3:00PM–3:15PM **Screening and characterization of an Indian isolate of nematophagous fungi for its use in IPM as a biocontrol agent against nematode parasites of ruminants.**
J.B. Chauhan*, R.B. Subramanian, P.K. Sanyal
Lab No. 109, Department of Biosciences, Sardar Patel University, SPU Campus, Vallabh Vidyanagar- 388120, Gujarat, India; Biotechnology Laboratory (R&D), National Dairy Development Board (NDDB), Anand- 388001, Gujarat, India
- 1:30PM–2:45PM **EPIDEMIOLOGY 5/SWINE**
Moderator: TBA
Room: Napoleon A2
- 1:30PM–1:45PM **Factors associated with prevention of porcine cysticercosis in Mgeta Division, an area in a highly endemic country, Tanzania: Analysis of focus groups discussion and in-depth interviews of 251 informants and meat inspection.**
M.E. Boa^{*a}, A.A. Kassuku^a, A.L. Willingham^b
^aDepartment of Veterinary Microbiology and Parasitology, Sokoine University of Agriculture, P. O. Box 3019, Morogoro, Tanzania; ^bDanish Centre for Experimental Parasitology, Royal Veterinary and Agricultural University, Ridebanevej 3, DK-1870 Frederiksberg C, Denmark
- 1:45PM–2:00PM **A Bayesian approach for prevalence estimation and test validation of porcine cysticercosis in Zambia.**
P. Dorny^{ab*}, I.K. Phiri^c, D. Berkvens^a, A.L. Willingham III^d, S. Gabriel^b, J. Vercruysse^b
^aInstitute of Tropical Medicine, Antwerp, Belgium; ^bGhent University, Merelbeke, Belgium; ^cUniversity of Zambia, Lusaka, Zambia; ^dRoyal Veterinary and Agricultural University, Frederiksberg, Denmark
- 2:00PM–2:15PM **Disease surveillance of lesions in pigs at slaughterhouses during period 1996-2002 in the Czech Republic.**
M. Zizlavsky, D. Lukesova*, Z. Smitka, L. Svobodova, D. Tydlitát
Sevaron Consulting Ltd., Brno, Czech Republic
- 2:15PM–2:30PM **Transmission of *Ascaris suum* to piglets born on contaminated pastures.**
A. Roepstorff*, H. Mejer, N.P.K. Hansen
Danish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University, Frederiksberg C, Denmark
- 2:30PM–2:45PM **Effectiveness of health education intervention for reducing the risk of porcine cysticercosis in Mbulu District, Tanzania.**
H.A. Ngowi^{a*}, A.A. Kassuku^a, M.R.S. Mlozi^a, J.E.D. Mlangwa^a, H. Carabin^b, E.L. Tolma^b, A.L. Willingham III^c
^aSokoine University of Agriculture, Morogoro, Tanzania; ^bCollege of Public Health, Oklahoma City, OK USA; ^cWHO/FAO Collaborating Center for Parasitic Zoonoses, Danish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University, Frederiksberg, Denmark

1:30PM–3:00PM **HOST RESPONSE/IMMUNITY 4**

Moderator: T.W. Spithill

Room: Napoleon A3

- 1:30PM–1:45PM **The bovine gut cellular responses following primary and challenge infection with *Calicophoron microbothrium metacercariae*.**
M. Mavenyengwa^{a*}, S. Mukaratirwa^a, M. Obwolo^a, J. Monrad^b
^aDepartment of Paraclinical Veterinary Studies, University of Zimbabwe, P.O. Box MP 167, Mt Pleasant, Harare, Zimbabwe; ^bDanish Centre for Experimental Parasitology, Royal Veterinary and Agricultural University, Dyrølægevej 100, DK-1870, Frederiksberg C, Copenhagen, Denmark
- 1:45PM–2:00PM **Comparison of humoral response to *Fasciola hepatica* and *Fasciola gigantica* experimental infection in sheep.**
Z. Weiyu^{ab*}, M. Emmanuelle^b, H. Weiyi^a, C. Alain^b
^aCollege of Animal Science and Technology, Guangxi University, 530005 Nanning, China; ^bUMR INRA/ENVN Interactions, Hôte-parasite-Milieu, Ecole Nationale Vétérinaire de Nantes, BP 40706, F-44307 Nantes Cedex 03, France
- 2:00PM–2:15PM **Peritoneal lavage cells of Indonesian thin tail sheep mediate antibody-dependent superoxide radical cytotoxicity to newly excysted juvenile *Fasciola gigantica* but not *F. hepatica*.**
D. Piedraftia^a, S.E. Estuningsih^b, Suharyanta^b, S. Widjajanti^b, S. Partoutomo^b, H.W. Raadsma^c, T.W. Spithill^{ad*}
^aMonash University, Clayton Australia; ^bResearch Institute for Veterinary Science, Bogor, Indonesia; ^cUniversity of Sydney, Camden, Australia; ^dMcGill University, Montreal, Canada
- 2:15PM–2:30PM **Maternal to foetal transfer of immunoglobulins in *Schistosoma mattheei* infected cows.**
S. Gabriël^{ab*}, J. Vercruysse^b, I.K. Phiri^a, B. Goddeeris^b
^aSchool of Veterinary Medicine, Lusaka, Zambia; ^bFaculty of Veterinary Medicine, Ghent, Belgium
- 2:30PM–2:45PM **How the intestinal microflora of the pigs helps regulate the population dynamics of *Oesophagostomum dentatum*.**
S. Petkevicius^{ac*}, K.E. Bach Knudsen^b, K.D. Murrell^a, H. Jørgensen^b, A. Roepstorff^a
^aThe Royal Veterinary & Agricultural University, Copenhagen, Denmark; ^bDanish Institute of Agricultural Sciences, Tjele, Denmark; ^cVeterinary Institute of Lithuanian Veterinary Academy, Kaišiadorys, Lithuania
- 2:45PM–3:00PM **Predisposition to *Ascaris suum* infections in neonatally exposed pigs.**
H. Mejer^{a*}, A. Roepstorff^a, L. Eriksen^a
^aThe Royal Veterinary and Agricultural University, Frederiksberg, Denmark

1:30PM–3:00PM **CHEMOTHERAPY 4/CANINE**

Moderator: F. Beugnet

Room: Napoleon B3

- 1:30PM–1:45PM **Treatment of *Neotrombicula* associated dermatitis in dogs using topical permethrin-pyriproxyfen combination.**
D. Smal^a, P. Jasmin^{b*}, P. Mercier^b
^aDVM, Veterinary Clinic, 59 450 Sin Le Noble, France; ^bDVM, Medical Department, Virbac S.A., 06 511 Carros, France
- 1:45PM–2:00PM **Assay of fipronil efficacy to prevent canine monocytic ehrlichiosis in endemic areas.**
B. Davoust^a, F. Beugnet^{b*}
^aDirection du Service de Santé des Armées, BP16, Lyon 69998, France; ^bMerial, 29 Av T. Garnier, 69348 Lyon, France
- 2:00PM–2:15PM **Efficacy of a compound preparation containing imidacloprid 8.8% w/w and permethrin 44% w/w against ticks (*I. ricinus*, *R. sanguineus*) and fleas (*Ct. felis*) on dogs.**
C. Epe^{a*}, N. Coati^a, D. Stanneck^b
^aInstitute of Parasitology, Hannover School of Veterinary Medicine, Buenteweg 17, D-30559 Hannover, Germany; ^bBayer AG, BHC-BG Animal Health, D-51368 Leverkusen, Germany
- 2:15PM–2:30PM **Evaluation of the efficacy of an imidacloprid 10% / moxidectin 2.5% spot-on against *Sarcoptes scabiei* var *canis* on dogs.**
L.J. Fourie^{a*}, C. Du Rand^b, J. Heine^c
^aUniversity of the Free State, Bloemfontein, Republic of South Africa; ^bClinVet International (Pty) Ltd, Bloemfontein, Republic of South Africa; ^cBayer, BHC AH RD Parasiticides, Leverkusen, Germany
- 2:30PM–2:45PM **European multicenter field trial on the efficacy and safety of a topical formulation of imidacloprid and permethrin (Advantix™) in dogs naturally infected with ticks and/or fleas.**
K. Hellmann^a, T. Knoppe^a, K. Krieger^{b*}, D. Stanneck^b
^aKlifovet AG Munich, Germany; ^bBayer AG, BHC AH RD Parasiticides, Leverkusen, Germany
- 2:45PM–3:00PM **Evaluation of K9 Advantix™ vs Frontline® Plus topical treatments to repel brown dog ticks (*Rhipcephalus sanguineus*) on dogs.**
D.R. Young^{a*}, R.G. Arther^b, W.L. Davis^b
^aYoung Veterinary Research Services, Turlock, California USA; ^bBayer HealthCare, Shawnee Mission, Kansas USA

1:30PM–2:45PM **CHEMOTHERAPY 5/EQUINE**

Moderator: J.O.D. Slocombe

Room: Napoleon C3

1:30PM–1:45PM ***Parascaris* resistance to macrocyclic lactones.**

J.O.D. Slocombe^{a*}, R. de Gannes^b, M.C. Lake^a

^aDepartment of Pathobiology, Ontario Veterinary College, University of Guelph, Guelph, ON, Canada; ^bEquine Veterinary Services, Schomberg, ON, Canada

1:45PM–2:00PM **Field efficacy of ivermectin plus praziquantel oral paste against naturally acquired, gastrointestinal nematodes and cestodes of horses in North America and Europe.**

S. Rehbein^{a*}, J.E. Holste^b, M.Y. Doucet^c, C. Fenger^d, A. Paul^e, C.R. Reinemeyer^f, L.L. Smith^g, S. Yoon^h, S.E. Marley^h

^aMerial GmbH, Kathrinehof RC, Rohrdorf, Germany; ^bMerial, Missouri RC, Fulton, MO USA; ^cFac. Méd. Vét., Univ. Montréal, Saint-Hyacinthe, Canada; ^dEquine Internal Medicine Consulting, Georgetown, KY USA; ^eUniversity of Illinois, Urbana, IL USA; ^fEast Tennessee Clinical Res. Inc., Knoxville, TN USA; ^gSmith R&D, Lodi, WI USA; ^hMerial, Duluth, GA USA

2:00PM–2:15PM **Efficacy of an ivermectin (0.2 mg/kg) and praziquantel (1.0 mg/kg) combination paste against cestodes, nematodes, and bots when administered as a single oral dose to horses.**

S.E. Marley^a, D.E. Hutchens^b, C.R. Reinemeyer^c, J.E. Holste^d, A.J. Paul^b, S. Rehbein^e

^aMerial, Duluth, GA, USA; ^bUniv. of Illinois, Urbana, IL USA; ^cEast TN Clinical Research, Inc., Knoxville, TN USA; ^dMerial, Missouri RC, Fulton, MO USA; ^eMerial GmbH, KathrinehofRC, Rohrdorf, Germany

2:15PM–2:30PM **Efficacy of aversectin preparations against intestinal nematodes of horses.**

T.A. Kuzmina, A.I. Starovir*

Institute of Zoology, NAS of Ukraine, 15, B. Khmel'nitskiy Str., Kyiv, 01601, Ukraine

2:30PM–2:45PM **Larvicidal activity of an ivermectin praziquantel combination against migrating *Strongylus vulgaris* larvae in equids.**

L. Frayssinet^{a*}, P. Mercier^a, L. Grisi^b, I.V.F. Martins^b, C.R. White^c

^aVirbac SA, Carros, France; ^bUniversidade Federal Rural do Rio de Janeiro, RJ, Brazil; ^cVirbac do Brasil, Sao-Paulo, SP, Brazil

3:00PM–3:15PM **BREAK**

3:15PM–4:45PM **FORT DODGE ANIMAL HEALTH SYMPOSIUM: MOXIDECTIN: NEW PRODUCT
RESEARCH UPDATE**

Moderator: D. Rock, Ft Dodge Animal Health

Room: Napoleon BC12

PROHEART® 6 and PROHEART SR-12 Research update: A summary of recent studies on hookworm persistent efficacy, 3-month retroactive activity and safety in puppies.

K. Heaney^{a*}, T. Rock^a, D. Amodie^a, R.D. Rulli^a, D.D. Bowman^b, N. Neumann^b, M. Ulrich^b, J.W. McCall^c, R. Lindahl^d.

^aFort Dodge Animal Health, Princeton, NJ USA; ^bCHK-R&D, Stanwood, MI USA; ^cTRS Labs, INC., Athens, GA USA; ^dMPI Research, Mattawan, MI USA

CYDECTIN® moxidectin long-acting injectable solution for cattle: A novel parenteral moxidectin formulation providing extended protection for cattle against parasites.

R. DeLay*, W. Steber

Fort Dodge Animal Health, Princeton, New Jersey USA

Interest of a new combination of moxidectin and praziquantel in the control of mixed tapeworm infections and heavy strongyle challenge in horses.

F. Blond-Riou*, A. Flochlay

Fort Dodge Animal Health, Tours, France

Control of gastrointestinal parasitism in sheep in New Zealand by pre-lambing treatment of ewes with a 0.5% moxidectin injectable formulation (EWEGUARD).

A.W. Murphy*

Fort Dodge, New Zealand Limited

4:45PM–5:45PM **GENERAL ASSEMBLY—CLOSING CEREMONY**

Room: Napoleon BC12

6:30PM–7:30PM **COCKTAILS**

Room: TBA

7:30PM–10:00PM **BANQUET—DANCE BAND**

Room: TBA

Abstracts of Symposia and Oral Sessions

Abstracts are listed in alphabetical order by presenter. (*)

Practical implementation of a strategic endoparasite control program in a commercial riding stable.

E.M. Abbott^{a*}, D.J. Baker^b, J.P. Barley^c.

^aAbbott Associates, Lutterworth, UK; ^bPriors Marston, UK; ^cHuntingdon Life Sciences, Huntingdon, UK.

The present trial was undertaken on a riding school/livery yard where over a two year period several horses had developed diarrhoea and lost weight during the autumn and winter months. Parasite control had consisted of 2-3 monthly treatments with either ivermectin or pyrantel. A new control program comprising interval treatments with non-benzimidazole anthelmintics during the spring and summer months and strategic treatments for tapeworms (38 mg pyrantel/kg), encysted cyathostome larvae (7.5 mg fenbendazole/kg daily for 5 days) and “bots” (0.2 mg ivermectin/kg) in the autumn and winter months was introduced. The effectiveness of the control program was monitored over a 3year period by faecal examinations at the time of treatment. Grass samples were collected from each paddock monthly for pasture larval counts and identification. Daily total rainfall and maximum/minimum air temperature data were provided by a local Meteorological Office. Records of episodes of colic or diarrhoea were kept. Faecal egg counts remained below 120 epg throughout and the percentage of horses with positive egg counts during the summer and winter months also decreased with time. Instituting a control program that included interval and strategic use of anthelmintics reduced the incidence of winter diarrhoea and weight loss.

Use of reversing agents of P-glycoprotein to increase the systemic availability of macrocyclic lactones: A promising tool.

M. Alvinerie*, J. Dupuy, J.F. Sutra, A.Lespine.

Laboratoire de Pharmacologie Toxicologie, INRA 180 Chemin de Tournefeuille, 31931, Toulouse, France.

The anthelmintic activity of macrocyclic lactones (ML) is related to their active concentration at the site of parasites location for an adapted length of time. As a consequence the area under the plasma concentration-time curve is considered as the most pertinent parameter to evaluate the extent of drug exposure. Different physiological and /or pharmacological methods have been used to enhance the level of macrocyclic lactones in the plasma and target tissues of animals. More recently, the major involvement of P-glycoprotein (P-gp) has been reported in the cellular efflux of ML. Notably, P-glycoprotein modulates ML's distribution by contributing to intestinal and biliary elimination pathways. Furthermore, Pgp interfering agents like verapamil enhanced the bioavailability of ivermectin in rat and in sheep. That's why; the natural bioflavonoid quercetin was evaluated in lambs. Moxidectin was administered subcutaneously at the normal dose of 0.2mg/kg and quercetin at dose rate of 10 mg/kg. The co-administration of quercetin resulted in a significant increase in the area under the curve of moxidectin in treated lambs (83 % relative to the control group, receiving moxidectin alone). This enhancement of moxidectin bioavailability should be due to a diminution of biliary and intestinal secretion for which P-gp is involved and should contribute to higher drug concentrations at the extravascular sites of action. The combination of ML and Pgp interfering agents provides a useful tool and open new fields of therapeutic action of endectocides.

The vaccine for prevention of echinococcosis of animals.

M. Aminjonov*, Sh. Rasulov, Sh.U. Aminjonov.

Research Institute of Veterinary after named acad. K.I. Skryabin, Samarkand, Uzbekistan.

The results of the experiment indicated that the vaccine prepared from cultural production protoscolerxes of echinococcus cysts possessed with high immunogenic activity. As it is found from the results of the experiment its efficiency was from 50.0% to 100.0% depending from the dose. In the laboratory conditions the efficiency of tested vaccine dose reached - 80% (table 1). In the immunized sheep the number and size of cysts were in 3-4 times lower in comparison with control one. As always, the number of dead cysts in the experimental sheep was higher in comparison with control animals. For example in the first variant from 50 cysts 42 appeared dead (85.0%) or at the second variant from 70 cysts - 66 specimens were (94.3%) petrified. The same results were obtained from the used dose of vaccine at the third and the fourth variants of experiments. Particularly from the 16 cysts at the third variant - 12 cysts were dead (80.0%); from 23 cysts of control sheep only 5 were dead (21.7%). At the fourth variant the vaccine efficiency was 50.0-80.0%. But the number of died cysts in experimental groups was much higher than in control sheep. In the production conditions a good results were obtained from vaccine usage. From 10 thousands of immunized wether lambs only 23 were infested by echinococcosis (0.23%). The studied vaccine had rather immunogenic effect concerning the prophylaxis of dog's echinococcosis. The efficiency of vaccine depending from the used dose reached 100%. The number of found echinococcus was in 5-6 times less in comparison with control dogs. The level of immunizing feature of the vaccine increases gradually. That's why in artificially infested animals, the large number of echinococcus eggs was inoculated in sheep organism, but their considerable quantity with the increasing immunity titer began petrified not reaching their full development. Such phenomena was not observed in control sheep. The vaccine may be used for the echinococcosis prophylaxis in dogs. The results of the experiments on dogs showed that echinococcus in dog's intestine were located not on the surface but deeper in the inner mucous and muscular covers. Taking into consideration this, we can say that dog's echinococcus refers to the tissue helminthes and differs from multicysts. Consequently, the immunity formation in dogs is a natural phenomena and besides the existing methods in the struggle with dog's echinococcosis the immunoprophylaxis is recommended. The vaccination of dogs against echinococcosis is the most reliable and effective method in the spreading of echinococcosis among productive animals and people.

Imidacloprid + moxidectin topical solution as a monthly treatment for prevention of heartworm infection (*Dirofilaria immitis*) and control of fleas (*Ctenocephalides felis*) on cats.

R.G. Arther^{a*}, D.D. Bowman^b, J.W. McCall^c, O. Hansen^d, D.R. Young^e.

^aBayer HealthCare, Shawnee Mission, Kansas, USA; ^bCHK, Stanwood, Michigan, USA; ^cTRS Athens, Georgia, USA; ^dBayer AG, Monheim, Germany; ^eYVRS, Turlock, California, USA.

Imidacloprid applied monthly as a low volume topical application to cats provides highly effective flea control. Fleas are immobilized and killed after contact with imidacloprid on the dermis or hair of cats. Moxidectin is 100 % efficacious against preadult heartworm stages in dogs when administered orally or parentally in various formulations. Studies were conducted to evaluate flea control and heartworm prevention in cats with topically applied moxidectin and imidacloprid formulations. Moxidectin applied topically (1 mg/kg) was 100 % efficacious against experimental pre adult *D. immitis* infections. Moxidectin solution alone had little or no activity against adult fleas (*C. felis*). Imidacloprid alone (10 mg /kg) had no activity against preadult stages of *D. immitis*. Monthly topical treatment of cats with a combined formulation to provide 10 mg/kg imidacloprid + 1 mg/kg moxidectin provided 100 % prevention of *D. immitis* infection and >96 % control of adult fleas.

Effect of gastro-intestinal nematodes on the productivity of goats in smallholder farms in Mozambique.

A. Atanásio^{a*}, J. Boomker^b.

^aDepartment of Disgnostics and Research, National Veterinary Research Institute, P.O.Box 1922, Maputo, Mozambique;

^bDepartment of Veterinary Tropical Diseases, university of Pretoria, Private Bag X04, Onderstepoort 0110, Republic of South Africa.

An investigation into the effect of gastro-intestinal nematodes on the productivity of goats in smallholder farms was carried out during two years in four of the ten Provinces of Mozambique. A total of 440 goats of both sexes and various ages were selected from the family sector for the study. A total of twenty flocks, consisting of five flocks in each province, each with 8 to 34 goats, were involved in the survey. The animals were mainly a local breed, the Landim goats. All farms were visited once a month, and faecal samples collected. In each province the selected animals were divided into two equal groups. One group was treated against gastro-intestinal helminths with albendazole (Valbazen, Pfizer®, South Africa) and the dosage rate was 5 mg kg⁻¹, while the other group remained as an untreated control. Faecal nematode egg counts were done monthly using the Reinecke's modified McMaster technique, and the animals in the treated groups were drenched strategically when the number of eggs per gramme of faeces was about 1000. The results of this study demonstrated the negative effect of these parasites on the productivity of goats of that sector. Therefore, the implementation of strategic control measures against these nematodes will reduce the worm burdens from the animals, and this will both prevent the contamination of pastures and improve the weight gain of the animals.

Canine trypanosomosis due to *Trypanosoma evansi*: Clinical studies.

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Trypanosomosis caused by *Trypanosoma evansi* in dogs is usually an acute infection terminating fatally, however chronic cases produce a wide variety of symptoms creating difficulty in the diagnosis unless biological test is conducted. In the present communication, clinicoparasitological, pathological, endocrinological and haematobiochemical changes and efficacy of Berenil (Diminazene aceturate: Hoechst India Ltd.) in three naturally *T. evansi* infected dogs has been discussed. The symptoms in the three cases varied from low to high grade fever, inappetance, corneal opacity, lacrimation, staggering gait, convulsions, weight loss and anemia. The diagnosis was made on the basis of blood film examination (2 cases) and by biological test in one case. One of the dogs was treated for corneal opacity with antibiotics and corticosteroids locally but with no response, later on the dog was found positive for *T. evansi* by mice inoculation test. In this case increase in intraocular pressure was observed. Haematological changes included anaemia, neutrophilia, and lymphopaenia. Endocrinological studies conducted in one dog revealed higher levels of cortisol and lower values of T₃. Significant increase in SGPT and SGOT was observed. Histopathological changes in one dog died of acute trypanosomosis revealed degenerative changes in various organs. One acute case was successfully treated with Berenil @ 3.5 mg/kg b.w. but in the case with corneal involvement no clinical improvement was seen, however it was negative for *T. evansi* by mice inoculation test. Third dog suffering from chronic infection died of trypanosomosis by fourth day of treatment. It is concluded that the prognosis in trypanosomosis in dogs is favorable if treated in the early stages of the disease, however in delayed treatment response may not be good due to irreversible changes caused by the disease in the various vital organs.

Vaccination against the rodent intestinal nematode *Nippostrongylus brasiliensis*.

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The rat hookworm *Nippostrongylus brasiliensis* is a commonly used model of gastro-intestinal nematode parasite infection. Single infections with L3 larvae have a characteristic profile with worm numbers and egg output peaking around day seven. Worm expulsion is associated with increased immune cell activity in the intestinal mucosa and reactive oxygen species such as O₂⁻ and H₂O₂, from host phagocytes have also been implicated. Superoxide dismutase (SOD), which “detoxifies” O₂⁻ and acetylcholinesterase (AChE), which can modulate immune responses, are released and may protect the parasite from immune mediated damage. In this study a SOD encoding gene was isolated from *N. brasiliensis* cDNA using PCR and the protein expressed in a bacterial vector. Homology analysis of this protein showed similarity to nematode cytosolic SODs. The expression of native SOD proteins from larval and adult *N. brasiliensis* was demonstrated by Western blot and RT PCR. In a vaccination trial in rats using recombinant SOD and a recombinant AChE from *N. brasiliensis* (kindly provided by Prof. M. Selkirk, Imperial College, London), faecal egg output from rats vaccinated with the latter was reduced by 48 % compared to controls while the former was without apparent effect.

Filarial nematodes and *Wolbachia*: A veterinary perspective.

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The most important filarial parasites of humans and animals harbour intracellular bacteria of the genus *Wolbachia*. This bacterial load in the parasite body has implications for the immunopathogenesis of filariasis. In addition, *Wolbachia* appears as a mutualistic symbiont: treatments with antibacterial drugs have detrimental effects on the host filaria. Several aspects of the pathogenesis of heartworm disease in dogs and cats could be reinterpreted on the basis of the presence of *Wolbachia*, from the side effects of microfilaricidal treatments, to the alterations of the arterial wall and pulmonary parenchyma in heavily infected animals. The identification of *Wolbachia* in *Dirofilaria immitis* and in other filariae infecting animals has prompted us to investigate the phylogeny of filarial nematodes, with the aim of understanding how hosts (filarial) and symbionts (*Wolbachia*) have coevolved. Based on sequence data from mitochondrial (COI, 12S rDNA) and nuclear (18S rDNA) genes a phylogenetic framework has been generated for filarial nematodes, and compared with the phylogeny of *Wolbachia*, based on 16S rDNA and various protein-coding genes. Our results suggest that *Wolbachia* has been acquired along the phylogenetic line leading to the Onchocercinae (which include *Dirofilaria* spp.), and lost along some branches of this subfamily. The DNA data set we have generated for filarial nematodes has allowed us to generate PCR methods for identification of filarial species and genera. In addition, *Wolbachia* proteins appear to have potential for serodiagnostic applications in human and animal dirofilariasis.

Investigation of the life cycle of *Hepatozoon canis* in the dog and tick *Rhipicephalus sanguineus*.

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Hepatozoon canis is a tick-borne apicomplexan protozoa that infects dogs and is associated with anemia, severe lethargy and cachexia. It has been reported from southern Europe, Asia, Africa and South America. The life cycle of *H. canis* was studied in experimentally and naturally-infected dogs and in *Rhipicephalus sanguineus* ticks. *R. sanguineus* nymphs were experimentally infected by feeding on a naturally-infected dog or by percutaneous injection of blood. Dogs were inoculated by ingestion of adult ticks containing mature oocysts. The different life stages of *H. canis* in the tick and dog tissues were observed by light and electron microscopy. Syzygy was observed in a nymph 24 hours after percutaneous injection and developing oocysts were observed 13 days post-molt in adult ticks. Adult *R. sanguineus* ticks were infective by ingestion to dogs 53 days after feeding as nymphs. Merogony was first detected in the dogs' bone marrow 13 days post-inoculation (PI). Meronts contained either macromerozoites or micromerozoites which aligned in a circle forming a 'wheel spoke' form. In addition, a distinct form of a small monozoic cyst was also observed. Gamonts within the cytoplasm of neutrophils were detectable in the blood from 28 days PI. The life cycle of *H. canis* is complex and is currently not fully understood. In addition to transmission by ingestion of infected ticks, vertical transmission from dam to pups has been reported and transmission through predation and ingestion of tissue cysts was described in other *Hepatozoon* species and may be prevalent also in canine hepatozoonosis.

Congenital transmission of *Schistosoma japonicum*.

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Schistosomiasis japonica is one of the most important human parasitic disease in the Far East, where an estimated two million people are infected. More than 40 mammals, including cattle, buffaloes, pigs, rabbits act as natural definitive hosts. The percutaneous route of infection is generally regarded as the only route whereby *Schistosoma japonica* cercariae infect the definitive hosts through the skin during water contact. However, early and more recent investigations indicate that transplacental transmission from mother to offspring is also a common occurrence. Recent 3 years Qian research group has been working on the project of Congenital transmission of *Schistosoma japonicum*, getting some new finding. The study design as follows: 1. Congenital transmission of *S. japonicum* in rabbits; 2. Congenital transmission of *S. japonicum* in mice; 3. Sero-immunological dynamics on congenital transmission of *S. japonicum*. 4. Challenge infection on congenital transmission of *S. japonicum*.

Comparison of the anthelmintic persistence of doramectin, ivermectin, moxidectin and eprinomectin in weaned beef cattle in Australia against natural infections of nematodes.

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The advent of the macrocyclic lactones (MLs) dramatically reduced clinical cases of parasitosis in beef cattle, however sub-clinical disease continues to decrease production. This study examined the effects of administration of commercial MLs (doramectin, eprinomectin, ivermectin and moxidectin) via sub-cutaneous and transdermal administration. 160 young cattle, infected predominantly with *Cooperia* and *Ostertagia*, were allocated to one of eight treatment groups (n=20). Faecal egg count (FEC), faecal larval culture (LC) and pepsinogen data were collected over 119 days post treatment. The seven ML treated groups demonstrated a significant reduction in FEC after treatment compared to untreated animals. While ML treatments resulted in variable persistent efficacy as measured by FEC, by 119 days post treatment, the FECs of all eight groups were not statistically different from each other. After ML treatment, the percentage of *Cooperia* in faeces, as measured by LC, increased compared to untreated animals. This affect was not maintained for the duration of the study. Abomasal damage as assessed via pepsinogen in serum demonstrated reduced damage after ML treatment compared to untreated animals.

Characterisation of a multiple resistant field isolates of *Teladorsagia circumcincta* from Scottish lowland sheep farms.

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Multiple anthelmintic resistance has been reported globally but the first case in European sheep involving *Teladorsagia circumcincta* was reported in 2001 in Scotland. Comparative characterisation studies conducted at Moredun Research Institute have used a field isolate and a known susceptible isolate in a number of *in vivo* and *in vitro* assays including controlled efficacy tests (CET), faecal egg count reduction tests (FECRT), egg hatch assays (EHA) and larval feeding inhibition assays (LFIA). The initial studies examined the efficacy of single administration and combinations of all three broad-spectrum anthelmintic families (benzimidazoles, FBZ; levamisoles, LEV; and/or avermectins/milbemycins, IVM/MOX) in lambs treated 28 days post infection. The CET provided evidence of multiple resistance, the respective efficacies of FBZ, LEV, IVM & MOX were 59%, 88%, 60% and 98%, combination treatment of FBZ/LEV, FBZ/IVM and FBZ/LEV/IVM were 93%, 94% and 92% effective respectively. Efficacies of the avermectins and milbemycins appeared to be lower against the immature stages of the multiple resistant field isolates. *In vitro* bioassays have confirmed BZ, LEV and IVM resistance, as have preliminary molecular characterisation studies.

Infection of *Meriones unguiculatus* and *Cavia aperea pamparum* with *Neospora caninum* oocysts from naturally infected dogs from Argentina.

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Neospora caninum causes abortion and stillbirth in cattle, and neuromuscular disease and death in dogs. The aim of this study was to reproduce the life cycle of *N. caninum* with oocysts from naturally infected dogs from Argentina using *Cavia aperea pamparum* and gerbils (*Meriones unguiculatus*). Sporulated oocysts from two naturally infected dogs from Argentina: isolate NC-6 Argentina and isolate I-2 were orally inoculated in one gerbil, and in 5 gerbils and 2 captive born, *N. caninum* negative, *C. aperea pamparum*, respectively. Gerbils were tested for anti- *N. caninum* antibodies at 30 days post infection (dpi.) by a direct agglutination test (AT) and *C. aperea pamparum* by the indirect fluorescence antibody assay (IFAT). One puppy was fed the NC-6 infected gerbil (puppy 1) and a littermate the I-2 infected *C. aperea pamparum* (puppy 2). Feces from each dog, were examined by sucrose flotation technique, incubated in 2 % potassium bichromate, and fed to 2 gerbils that were examined for anti- *N. caninum* antibodies at 28 dpi. by the AT. The puppies were examined for anti- *N. caninum* antibodies prior to and 21 dpi. by the IFAT. Antibodies to *N. caninum* were detected in the gerbil inoculated with NC-6 oocysts, in all 5 gerbils inoculated with I-2 oocysts and in one *C. aperea pamparum*. Both puppies remained negative to *N. caninum*. Few *N. caninum*-like oocysts were detected in the feces of puppy 1. Only one of the gerbils fed feces (from puppy 1) developed antibody titer of 1:80. This is the first report of *N. caninum* infection in *C. aperea pamparum*. The experimental life cycle of *N. caninum* NC-6 Argentina was reproduced and confirmed serologically and with the excretion of oocysts by the puppy fed the infected gerbil. The molecular characterisation of I-2 is being performed.

Molecular detection of equine babesia DNA in vector ticks.

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In this study we have demonstrated that PCR and nested PCR methods enabled detection of *Babesia caballi* and *Babesia equi* using specific primers. *B. equi* merozoite-specific 218 bp gene fragment was detected in almost 96% of horse blood samples, and 45.3-62.5% of females, eggs, larvae, and nymphs of *B. microplus* collected from 47 horses in Campo Grande in the State of Matto Grosso, Brazil. Except for the partially-fed female ticks, the *B. caballi*-specific 430 bp gene fragment was amplified from horse blood samples, and all developmental stages of ticks. Mixed *B. equi* (EMA-1) and *B. caballi* (BC48) gene fragments were detected in 23% out of 26 horse blood samples from Altanbulag, Tuv province in Mongolia, 13% partially-fed female ticks, 9.0% each in eggs and larvae *D. nuttalli*. Parasite DNA from both species was detected in horse blood samples and *B. microplus*, with the preponderance of *B. equi* DNA. We have obtained molecular evidence that *B. microplus* and *D. nuttalli* as natural vectors of *B. equi*, and highly likely of *B. caballi*, as well. The detection of *B. equi* and *B. caballi* DNA in eggs and larvae is likewise suggestive of the possibility of both transovarial and transstadial parasite transmissions in the tick vectors.

Protective responses against cyathostome infections.

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To study the protective responses of cyathostome-infected ponies, challenges were performed employing animals with different histories of exposure to these parasites. Parasite free, and previously contaminated, young and adult ponies were used. The animals were challenged with an experimental infection with 150,000 cyathostome infective L₃ given over a period of 5 days, or naturally by grazing a cyathostome contaminated pasture for 7 weeks. The parasitological data recovered showed that ponies with acquired resistance to cyathostome infections (adult animals) had reduced total number of worms, of developing larvae, luminal fourth stage larvae, adult parasites and of cyathostome species. The acquisition of resistance was also observed as elevations in numbers of hypobiotic larvae, of intestinal mast cells, intestinal and peripheral eosinophils, and antibody responses. These responses were consistent with increases in Th2 type cytokines, principally IL-4. The data obtained suggest that the immune mechanisms of resistance developed in ponies with acquired protection to cyathostome are slow to develop and are targeted against each parasite stage present in the host.

Use of geo-processing technologies to delimit spatial distribution of emerging zoonosis in Bahia, Brazil.

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This paper reports on the results of three studies using Geographic Information Systems (GIS) as a tool to define the specific geographic area occupied by *Babesia canis*, *Ehrlichia canis*, and *Dirofilaria immitis*, the three most important emerging zoonosis registered in the small animal clinics of Salvador, Brazil. The average annual number cases diagnosed for babesiosis for a period of four years is 382 cases/year. The disease is more common in small dogs aged above 24 months. The highest incidence rates were found at the beginning of autumn and the end of spring. GIS analysis showed the presence of clusters of the disease in two specific areas when considering altitude difference, high demographic population density, and low income. The remainder of cases were distributed by chance around the city in different subdivisions. Five percent of the total (15 859) dogs examined were positive for *Ehrlichia canis*. Pathology was seen in highest frequency in small dogs above 24 months of age during the wet and dry period. Clusters were observed in defined areas of median to high socio-economic status, and in subdivisions with elevation near sea level. Considering the difficulty of finding autochthonous cases of *Dirofilaria immitis* parasitism in a given area considered endemic to its parasites, this study is continuing. Previous results have shown that 12 of 16 cases of the disease are clustered in two specific geographic areas on the beach. The others are distributed by chance around the subdivision. Geo-processing technologies have been very helpful with the mapping of spatial distribution, facilitating the delimitation of risk areas, and contributing to the rationalization of actions in control programs.

Natural circulation of capsule-forming *Trichinella*, problems of taxonomy and hybridization.

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In contrast to the opinion that natural life cycle of capsule-forming *Trichinella* is mediated among carnivores (Pozio et al., 1998) the essential role of micromammals is emphasized. Micromammals serve as a source of food for carnivores and their abundance, as well as the relatively high rate of *Trichinella* infection in them (from 0,04 to 6,88%) make them an important link in transmission of the causative agent. *Trichinella* biomass constantly disperses in micromammals ("zoological trichinellosis") and concentrates in carnivores. Such fluctuation along with the multiplicity of hosts provides an independent parasite circulation in nature, steady character of *T. spiralis* and its varieties. Multispecies status of capsule-forming *Trichinella* (5 species by Zarlenga et al., 2000) raises a lot of doubts. Initially offered 8 criteria of new species validity (Pozio et al., 1992) were found to be insolvent (Bessonov, 2002) and genetical differences don't appear to be practically significant in epidemiology and only can add the characteristics of *Trichinella* variations. "Sibling species" conception of capsule-forming *Trichinella* is not confirmed by experimental hybridization tests. *T.s. britovi* easily crosses with *T.s. nelsoni* (Britov, Nivin, 2002). At insemination of *T.s. spiralis* females by *T.s. nativa* males and following crossing of these females with males of homologous variety one obtained a viable larvae generation. Following close reproduction (each with other) these larvae (telegones) in 9-th generation began to cross with *T.s. nativa* (Britov, 1998, 2001).

Assay of fipronil efficacy to prevent canine monocytic ehrlichiosis in endemic areas.

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A controlled trial was conducted for 1 year in dog kennels to evaluate the efficacy of fipronil for the prevention of *Ehrlichia canis* transmission to dogs by *Rhipicephalus sanguineus* in two endemic areas situated in North Africa (Dakar, Senegal and Djibouti). 248 dogs, divided in 8 groups, were studied. 55 fipronil treated dogs were located in 2 separated kennels (G3, 37 dogs in Djibouti and G8, 18 dogs in Dakar). G1 (66 dogs) and G2 (60 dogs) were untreated control groups located in Djibouti whereas G4 (32 dogs), G5 (13 dogs), G6 (18 dogs) and G7 (4 dogs) were the control groups located in Dakar. The epidemiological status of each group was known. Tick infestation, clinical status and *Ehrlichia* seroprevalence were assessed during one year. No dog treated with fipronil presented with Canine Monocytic Ehrlichiosis (CME) or with tick infestation. In all groups of untreated control animals, *R. sanguineus* tick infestations were frequent, as well as morbidity and mortality due to CME. Among control animals, seroprevalence of *E.canis* was maximum (100%) in dogs living in kennels and high among native dogs in Djibouti 69.7% (46/66) and in Dakar 50% (16/32). Dogs belonging to expatriate citizens (G2) were less likely to be infected: 21.7% (13/60). In contrast, only one dog each in groups G3 and G8 were positive. The results of this study indicate the high level of preventative efficacy of a fipronil monthly treatment to avoid CME in endemic areas.

Evaluation of a combination containing imidacloprid and permethrin for prevention of *Borrelia burgdorferi* transmission from black-legged ticks (*Ixodes scapularis*) to *Borrelia burgdorferi*-free dogs B.L. Blagburn^{a*}, J.A. Spencer^a, J.M. Butler^a, C.C. Dykstra^a, K.C. Stafford^b, M.B. Pough^c, S.A. Levy^d, D.L. Bledsoe^e.

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Lyme borreliosis is an infectious disease caused by the spirochete *Borrelia burgdorferi*. The aim of this study was to evaluate the ability of a product containing 8.8% w/w imidacloprid and 44% w/w permethrin (K-9 AdvantixTM) to prevent transmission of *B. burgdorferi* to dogs. Adult Beagle dogs confirmed to be free from *B. burgdorferi* exposure via IFA testing, were randomly assigned to two groups (treated and nontreated control) of 8 animals each and housed separately in a BL-2 facility. K-9 Advantix was applied according to label instruction to one or several sites the dorsal midline of all 8 treated dogs. Field caught adult *Ixodes scapularis* with an average infectivity rate of 57.6% were used as source of *B. burgdorferi* organisms. One week post treatment 100 ticks per dog were placed on the backs of the dogs and encouraged into the hair coat. Serum antibody titers to *B. burgdorferi* were obtained for weeks 2 through 13. By week 6 all nontreated control dogs had seroconverted and all treated dogs continued to remain antibody negative. There was total agreement between the ELISA and IFA antibody results. Skin punch biopsies obtained from control dogs for PCR testing were positive for *B. burgdorferi* DNA. The results of this study show that K-9 Advantix is effective 7 days after treatment in the prevention of transmission of Lyme borreliosis from infected *I. scapularis* ticks to dogs.

Interest of a new combination of moxidectin and praziquantel in the control of mixed tapeworm infections and heavy strongyle challenge in horses.

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Recent pilot coproscopical survey carried out on 48 growing horses kept under extensive grazing conditions showed that strongyle infections remain a substantial concern in Europe and that tapeworm infections involve not only *Anoplocephala perfoliata* but also *A. magna* and *Paranoplocephala mamillana*. A new antiparasitic combination under development associates praziquantel, a well-known tapeworm dewormer incorporated a dose higher than those currently available in Europe, and moxidectin, a macrocyclic lactone with proven persistent efficacy against strongyles. The efficacy of this combination is demonstrated in two studies: In the first one (Egg Reappearance Period determination study), 12 horses were treated in June and nematode fecal egg counts were carried out until December. The Egg reappearance period was 160 days. The 12 other control animals, kept grazing on the same pasture, showed high nematode excretion levels throughout the experimental period. The efficacy against tapeworms was 100%. A second test was conducted in 7 horses infected with both *A. perfoliata* and *A. magna*, necropsied for post-mortem tapeworm count 14 days post-treatment. The moxidectin praziquantel combination was 100% effective, compared to a group of 8 control horses, against these 2 tapeworm species. These findings demonstrate that this new combination should provide a good control of equine parasites under temperate European conditions.

Factors associated with prevention of porcine cysticercosis in Mgeta Division, an area in a highly endemic country, Tanzania: Analysis of focus groups discussion and in-depth interviews of 251 informants and meat inspection.

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To determine the prevalence and risk factors associated to absence of porcine cysticercosis in Mgeta Division, Tanzania. Pig cyst was diagnosed by post mortem meat inspection of 124 carcasses of pigs raised in the area. Risk factors were assessed by focus group discussions and in-depth interviews involving 251 informants. Two types of questionnaires were designed with one questionnaire targeting farmers, butchers, village herdsmen and village public health workers (n=233). The second one targeted Meat Inspectors, Agricultural/Livestock Workers and Public Health Workers (n=18). The questionnaires were structured to give information on land size, sanitation, education, awareness of the disease, pig husbandry and management, meat inspection coverage, people's pork eating habits especially ingestion of undercooked pork and information on mode of transmission of *Taenia solium* cysticercosis/taeniosis. None of the 124 pigs examined post mortem had cysts. All of those who were interviewed had never seen any cysts nor had any knowledge of its mode of transmission. In all the villages pigs are kept under total confinement and farmers are fined if their pigs are found roaming. And the main reason for totally confining pigs was to avoid destruction of crops because this is a high potential agricultural area thus highly populated and most farms are occupied with crops both during the wet season and dry season. Each village had an active Village Health Committee and all the villages have standard guidelines for construction and maintenance of latrines enforced by village bylaws. Availability and use of latrine was found to be very high (97.6%). Pork consumption was popular in the households and among those people who were taking the local brews and beef is not available. Boiling and deep frying are the most (78.7%) preferred forms of preparing pork. Health center data showed that there were no cases of taeniosis. Few centers had recorded few cases of epilepsy. From the above it was concluded that there is no porcine cysticercosis and *Taenia solium* taeniosis in Mgeta Division, Tanzania. The lack of this parasite in the study area may then be attributed to: -Local regulations (bylaws) to keep pigs confined, presence and use of latrine by over 97.6% of all the community members, avoidance of ingestion of infected pork by thorough cooking of pork and awareness of the local population that they should not defecate in the bush.

Efficacy of FRONTLINE® Plus (fipronil/(S)-methoprene) for dogs against developing stages and adult fleas (*C. felis*).

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Thirty-two beagle dogs were included in a study to evaluate effects of treatment with fipronil (10% w/v solution), (S)-methoprene (9% w/v), and a fipronil/(S)-methoprene combination (10% w/v and 9% w/v solution) on fleas (*Ctenocephalides felis*). Dogs were randomly assigned to a group treated once topically with one of these products on Day 0 or to an untreated control. On Days -1, 21, and weekly to Day 84 each dog was infested with ~200 fleas and comb counted the following day (~24 hours). On Days 1, 22, and weekly to Day 85 each dog was again infested with ~200 fleas. Eggs were collected over ~24 hours beginning ~72 hours after infestation. One aliquot of up to 100 eggs from each animal at each infestation time was incubated for ~72 hours to determine larval hatch and another for 35 days to determine the number of adults that developed. The fipronil 10% w/v spot-on and the combination spot-on product provided excellent control of adult fleas for 5 weeks. The combination product provided excellent ovicidal activity for 8 weeks and high inhibition of adult flea emergence for 12 weeks. During this period, both a larvicidal effect and an effect on adult flea emergence were evident. Based on activity against all flea life cycle stages, FRONTLINE Plus provided a high level of total flea control for 12 weeks.

A survey of parasite infections on organic, free range and conventional pig farms in the Netherlands.

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Parasite infections on 11 organic, 16 free range and 9 conventional pig farms were investigated. In the period November 2001-October 2002, farms were visited four times with a three months interval. Faecal samples were collected from suckling pigs, weaned pigs, fatteners and pregnant sows. On all organic farms, on 62.5% of the free range farms and 66.7% of the conventional farms one or more positive samples (oocysts of *Coccidia* and/or helminth eggs) were found. Infections with *Coccidia* were most prevalent on the organic farms (90.9%), followed by the conventional farms (66.7%) and the free range farms (43.8%). Among the infections with helminths (*Ascaris suum*, *Oesophagostomum* spp., *Trichuris suis*), those with *A. suum* were most frequent (81.8% of the organic farms, 43.8 of the free range farms and 11.1% of the conventional farms). In all three farm types ca. 25% of the farms were positive for *Oesophagostomum* spp.. *T. suis* was present on organic (36.4%) and free range farms (31.3%), but absent on conventional farms. Infections with *Coccidia* were most prevalent in pregnant sows (*Eimeria* spp.), followed by suckling pigs (*Isospora suis*) and weaned pigs, but less in fatteners. However, in fatteners on organic and free range farms *A. suum* infections were frequently observed (54.5% resp. 42.9%), but much less in the other groups. Infections with *Oesophagostomum* spp. and *T. suis* were most observed in pregnant sows.

The use of acaracides in dogs to prevent the transmission of tick-borne pathogens.

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There is increasing evidence that tick infestation can result in the transmission of a broad spectrum of bacterial and protozoal organisms to dogs. *Anaplasma*, *Babesia*, *Bartonella*, *Borrelia*, *Coxiella*, *Ehrlichia*, *Hepatazoon* and *Rickettsia* species comprise the most important canine tick-transmitted pathogens in the United States. Many of these organisms have evolved so as to facilitate persistent intravascular infection, which can be sustained in healthy dogs for months to years before disease manifestations are recognized. The factor or factors that contribute to disease expression in dogs chronically infected with one or several tick borne organisms remains unknown. Importantly, many canine tick borne pathogens are of zoonotic importance. Recently, development of sensitive molecular diagnostic tests have facilitated the detection of organism-specific DNA, thereby allowing the laboratory to document simultaneous infections with multiple tick borne organisms in dogs with extensive tick exposure. The above factors contribute to the need for highly effective acaracidal products that can decrease or eliminate the transmission of tick borne pathogens. Although the mechanisms differ among various bacterial and protozoal organisms, there is generally a delay in transmission following tick attachment. Therefore a "window of opportunity" exists during which time acaracidal products might reasonably interrupt transmission, by rapidly killing the tick. Recent studies indicate that fipronil can significantly reduce the transmission of *Ehrlichia canis* to dogs in *Rhipicephalus sanguineus* endemic areas and the transmission of *Borrelia burgdorferi* in dogs experimentally infested with infected *Ixodes scapularis*. Additional longitudinal field studies should be conducted to extend these observations.

Potential biological control of *Psoroptes* mites with the fungal pathogen *Metarhizium anisopliae*.

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The potential for use of the fungal pathogen *Metarhizium anisopliae* as a biological control agent against *Psoroptes* mites has been investigated. In laboratory bioassays, the fungal pathogen was shown to have a significant effect on the survival rates of mites: over 90% became infected after exposure to a 1×10^8 spore ml⁻¹ suspension. The presence of infected cadavers was also able to initiate infections in other uninfected mites in the same experimental chamber; only one infected mite was required to infect 20-40% of other mites. Cadavers of infected mites were shown to be infective for between 5 and 18 days after the initial observation of infection. Significant variation in the effects of temperature on pathogenicity was observed between a range of fungal isolates. The formulation in which the spores are suspended was also found to have a significant effect on infectivity levels, with silicone oil resulting in higher infection levels than an aqueous solvent. In field trials sheep were treated with a 10^8 spore ml⁻¹ suspension in silicone oil by conventional knapsack spraying or pour-on methods. It was found that spores remained in the fleece and on the skin and maintained infectivity for up to 4 weeks.

Successful substitution on pastures of a resistant nematode (*Teladorsagia circumcincta*) population with a susceptible strain.

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Teladorsagia circumcincta is one of the most prevalent digestive-tract strongyle in sheep and goats of temperate climates. The frequent use of benzimidazoles has led to increased rates of anthelmintic resistance. One alternative is to substitute a resistant population by a susceptible one, so that classical anthelmintic control could be used again. Four paddocks of different resistance history were used (December 1999: control -C: 24% of resistant genotype in the flock, 22% in the levamisole treated flock-Lev, 53% in the levamisole and benzimidazole treated flocks- LevBz, and 91% in benzimidazole treated flock-Bz). The paddocks were left ungrazed all the winter up to July 2000. The grass was cut in beginning of July and rolled hay was prepared. This hay was fed to naive lambs and they remained uninfected. These operations on paddocks were intended to eliminate the nematode resistant population. Thereafter, 10 lambs/paddock were led to graze up to November 2000. They were 5 months old and naive, and then mildly infected (3000 L3) with a susceptible strain on their arrival to the paddocks. Half of the group in each paddock was treated with fenbendazole (10 mg/kg bw) at the end of experiment: efficacy was over 95% at necropsy in lambs from all paddocks. The egg hatch essay indicated that the new strain could be considered as susceptible. The percentage of worms with a resistant genotype ranged from 0 to 2.5% according to the paddocks. Nematode population substitution is then an alternative, even when resistance has reached a very high level.

Studies on the antigenicity of invariant surface proteins of *Trypanosoma evansi*.

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The preliminary studies of the antigenicity of invariant surface proteins of *Trypanosoma evansi* were carried out. After purification of *T. evansi* by DEAE-52 chromatography, the parasites of different geographic strains were lysed by sonication and their soluble proteins (antigens) were analyzed with SDS-PAGE and western blotting. About 20-30 protein bands with a relative molecular weight (*Mr*) 7.9~109.5 kDa could be revealed with Coomassie blue R-250 stain after SDS-PAGE. The results of western blotting suggested that among the various strains, 10-20 antigen fractions with *Mr*>66kDa, 49~66 kDa and <20 kDa were recognized respectively by the mice antiserum induced by the soluble antigens from Zhejiang Strain *T. evansi*. With a labelling reagent, NHS-LC-biotin [sulfo-succinimidyl 6-(biotinamido) hexanoate], the surface proteins of *T. evansi* were isolated from the detergent-rich phase of membrane fraction by using a combination of Triton X-114 phase separation, ConA-Sepharose and streptavidin-agarose affinity-precipitation. A about 60 kDa surface protein was suggested that it is a common protein or an invariant protein among the different strains of *T. evansi* by the analysis of SDS-PAGE and western blotting. Indirect immunofluorescence staining of homologous and heterologous live Trypanosomes by using anti-60 kDa protein hyperimmune serum raised in ICR mice as primary antibody revealed the specific surface staining of parasites. ICR mice immunized with this surface protein were partially protected from the challenge of homologous and heterologous parasite because these immunized mice have a longer prepatent time and survival time than the unimmunized mice. We also found that the mice immunized with whole soluble or membrane antigens could have a complete protection to the challenge of homologous parasites, but only a partial protection from the heterologous challenge.

Serological and entomological surveillance of a new autochthonous focus of canine leishmaniasis in north-eastern Italy.

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In 1994 a new autochthonous focus of canine leishmaniasis (CanL) was discovered in a hilly territory of north-eastern Italy. *Leishmania infantum* MON-1 was typed and *Phlebotomus perniciosus*, a proven *L. infantum* vector, was the prevalent species (62.3%). The risk of CanL spreading from the focus was evaluated by serological screening of healthy dog population and entomological surveys carried out in surrounding areas: A) at the border of the focus, with sporadic seropositive dogs in 1995; B) at north-west, with seronegative dogs in 1995; C) at north-west, never monitored. Sera of 472 dogs (140 in 2001 and 332 in 2002) were examined by IFAT. The overall seroprevalence in the two-year study was 2.5%, with antibody titres ranging from 1:40 to 1:640. In 2001, only dogs from area B were screened, with a seroprevalence of 4.3%. In 2002 seroprevalence was 2.9%, 2.4% and 0.0% in areas A, B and C respectively. A variety of sandfly diurnal resting sites were monitored by using sticky traps. 1,352 sandflies were caught from 16 sites. Among the *Phlebotomus* species, *P. perniciosus* was the most abundant (19.1%), followed by *P. neglectus* (4.7%) (another proven *L. infantum* vector) and *P. papatasi* (1.1%). Results show that CanL infection is spreading towards north-west (areas A and B), but have not yet reached area C at far northern. The presence of two *L. infantum* vectors in the areas monitored outlines the risk of further expansion of CanL from the original focus.

Assessing the burden of cysticercosis.

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The zoonotic parasite *Taenia solium* requires humans and pigs as definitive and intermediate hosts, respectively, to complete its life cycle. The larval stage of the parasite can cause disease in both humans and pigs with potentially large economical impact in areas where the disease is endemic, i.e. primarily least developed countries of Latin America, Asia and Africa. In areas where meat inspection is present, infected pigs carcasses are totally or partially condemned, leading to important income losses to the pig's owner. These losses are also likely to impact on local, regional, national and even international trade. In humans, it has been reported that from 69 to 96% of symptomatic neurocysticercosis cases have seizures and many will go on to develop epilepsy. Epilepsy is a syndrome with considerable social, psychological, economical and physical impact in a community. We have developed a methodology to determine the health burden cysticercosis. We will present a decision tree analysis approach to estimate the societal cost of human and pig cysticercosis in multiple countries. The decision tree will be used in each country to estimate the expected number of human and animal infections and associated disease. Each parameter of interest (eg the probability of developing neurocysticercosis when infected, the probability of being diagnosed with neurocysticercosis, etc) will be associated with a range of values depending on the quality of published estimates. Monte Carlo sampling will be used to reflect this uncertainty in the overall estimate of the cost of cysticercosis in each study country. Sensitivity analyses will be performed by regressing the outcome variable (overall costs) against the values of the uncertain parameters (measured in standard deviation changes). This will permit exploration of the sensitivity of the overall costs to different input parameters, and therefore the identification of those with the largest influence and for which better data should be measured in future research.

Molecular phylogeny of filarial nematodes and the evolution of the association between filariae and *Wolbachia pipientis*.

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The identification as *Wolbachia pipientis* of the bacterial endosymbiont of filarial nematodes has attracted a great deal of attention: *W. pipientis* has been shown to play an important role in the biology of the worms and in the pathology of filariasis. Despite this interest, the evolutionary aspects of the association between *W. pipientis* and its filarial hosts have not been investigated in detail. A key to understanding the evolution of this association would be to generate a robust phylogeny of filarial nematodes. Here we present a phylogenetic analysis of these parasites based on nuclear (18S rDNA) and mitochondrial (12S rDNA and COI) genes. The species of filarial nematodes included in the phylogenetic reconstructions represent the main lineages of the superfamily Filarioidea, including representatives of both family Filariidae and Onchocercidae. The branching order and the stability of the reconstructions based on COI gene sequences were not satisfactory, as already observed in previous studies based on a smaller sample of species. In the reconstructions based on 12S rDNA and 18S rDNA the representative of the family Filariidae is consistently placed the deepest branch of the superfamily, while the representatives of the subfamilies Setariinae and Waltonellinae are placed as deep branches of the Onchocercidae family. The presence/absence of *W. pipientis* has been mapped on the trees generated, thus providing new insights on the events of acquisition and loss of this symbiont.

The efficacy of two anthelmintics against ascarids and hookworms in naturally infected cats.

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A trial was conducted to establish the comparative efficacy of two different products (A: pyrantel embonate plus praziquantel, B: milbemycin oxime plus praziquantel), against natural infestations of ascarids and hookworms in cats. Young cats of about 6 – 36 months of age were obtained from feral colonies. The infection was confirmed by fecal egg. The products were used at the recommended dosage rates, where specifically product A's dose was tailored to the exact weight of each animal by fractionating the tablets. In the case of product B, the recommended dosage rate was strictly applied relative to the size of tablet or half tablet. Feces were collected daily after treatment and all excreted worms were recovered and identified. Seven days after treatment, the cats were euthanased. Efficacy was calculated by the critical method for each individual animal. During the conduct of the trial, it was determined that a majority of cats were infected with hookworm alone and very few cats were found to be infected with both ascarids and hookworms. Thus, the trial had to be completed utilizing some cats only infested with hookworms, others with both worms and some with ascarids alone. The percent efficacy was calculated as mean of eight cats per group, showed 100% efficacy of both products against *Toxocara spp.*. The efficacy against *Ancylostoma spp.* differ, the pyrantel/praziquantel showed a 99.1% efficacy, while the efficacy of the milbemycin/praziquantel combination dropped to 93.5%.

Attractants and traps for myiasis-causing flies.

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Three dipteran families (Calliphoridae, Sarcophagidae, Oestridae) cause most of the cases of myiasis in humans and animals in the world. Trapping-out has been extensively used for sampling, monitoring and lastly, controlling adult populations. During the last decades, efforts have been made to develop or improve trap efficiency and luring technology for targeted fly species included in the first two families, especially the Calliphorids. Advanced trapping systems are designed considering physical (color, shape, size of trap), and chemical (odor from single compounds, synthetic odor mixtures or bacteria-synthesized volatiles that elicit specific behaviors in adults) attractive stimuli, aided by appropriate setting of trap density and location in the field. In the case of the oestrids, much of the host-parasite relationships and parasite ecology are unknown, though chemical attractants have been demonstrated for a few species. Visual cues from the host and environmental landmarks are important to fly attraction. In general, future research on biology and mechanisms of attraction will lead to development of more efficient, durable baits, and used to lower fly trap design cost and maintenance. Due to environmental concerns, pesticides in traps may be eliminated or replaced with safer agents in order to kill or sterilize the adults. Fly population modeling analysis will be a valuable tool helping to manage specific myiasis. Genetic modification of fly strains may be used to manipulate trap attractability. In the future, trapping systems will undoubtedly not be the sole control measure for myiasis producing flies, but should always be considered as part of an IPM program.

Success in control of *Cochliomyia hominivorax*.

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New World Screwworm (NWS), *Cochliomyia hominivorax*, eradication program relies on the use of sterile insect technique (SIT) for controlling screwworm populations. The concept of SIT, first conceived and proposed by the late entomologist Edward F. Knippling, relies on mass rearing and release of sterilized NWS males that overwhelm the native population, where native females inseminated by sterile males produce nonviable eggs, and the population declines. Success in eradication of screwworm from the U.S., Mexico and the Central American countries is discussed. Successful eradication of NWS from the U.S., Mexico and countries of Central America has prevented tremendous losses in the livestock industry and saved numerous human lives. The United States Department of Agriculture considers screwworm eradication program to be one of the most successful programs in the history. The current goal of the program is to eradicate screwworm from the entire Central America and create a barrier zone at the Darien Province of Panama. New world screwworms still exist in some Caribbean islands and in South America. As long as the screwworm exists in the Western hemisphere there will be a danger of re-infestation in areas where screwworm has been eradicated. Eradication can never be called permanent until *Cochliomyia hominivorax* has vanished completely from the Americas. Future prospect is discussed.

Screening and characterization of an Indian isolate of nematophagous fungi for its use in IPM as a biocontrol agent against nematode parasites of ruminants.

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The integration of biocontrol agent for managing gastroenteritis in ruminant caused by *Haemonchus spp.* is a current option to minimize drug resistance, residues on feed and environmental degradation exerted by existing chemical control measure used for the control of zoo-parasitic nematodes. In order to use nematophagous fungi as biocontrol agent, two isolates were recovered and identified as *Arthrobotrys musiformis* and *Monacrosporium* sp. from soil out of 52 samples from various ecological niches screened. Based on correlated nematophagous activity *A. musiformis* was characterized for its suitability as a biocontrol agent against nematode parasite. The parameters employed were growth assay, nematophagous activity, germination potential and ability to survive ruminant gut passage. *In vitro* studies indicated that the isolate had all the characteristics of a potential biocontrol agent. The inoculated fungus could also be recovered from faeces of fungus fed sheep and goats confirming its successful gastrointestinal passage. Further *in vitro* study on comparative efficacy of the Indian isolates of *A. musiformis* and *Duddingtonia flagrans* following feeding of known amount of chlamydospores of these two fungi alone or in combination in sheep naturally infected with *Haemonchus contortus* showed the number of larvae captured from faeces of fungus fed sheep was significantly higher compared to fungus unfed control irrespective of the fungus used. The fungal combination did not show any antagonistic effect and can be used as efficiently as the fungi alone to effect biocontrol of animal parasitic nematodes. The new isolate *A. musiformis* may prove to be a promising candidate for biological control of nematode parasite of livestock

Detecting the antigen-antibody reactions of *Fasciola gigantica* by using electrochemical immunosensor.

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To develop a rapid, sensitive, specific and simple detecting and diagnosing method of Fasciolosis, a microelectrochemical immunosensor was designed and fabricated by us. Electrochemical immunosensor is a device that can convert biochemical energy of antibody-antigen reactions into electric energy. By using proper physical and chemical methods, the antigen is immobilized onto a working electrode and the antibody reacts to the antigen in aqueous phases. The biochemical energy of the antibody-antigen reactions is converted into electric energy. Then, the electric current or electric potential is transmitted to the detector by electric circuit. By detecting the change of the electric signals, we can judge the characters and state of antibody-antigen reactions. Our experiments were firstly conducted by applying standard reagents of antibody and antigen to test the properties of the electrochemical immunosensor and to decide the reaction aqueous phases, cleansing solution, reaction parameters such as reaction quality, PH, capacity of electric signals and other conditions. Then the antigen, positive and negative serum of *Fasciola gigantica*, a common fluke of cattle in South China, were prepared. The sample serum of *F. gigantica* were collected from a farm's cattle in Guangxi province. The experiment results indicated the microelectrochemical immunosensor could be used for detecting reactions of antibody and antigen effectively. The electric response of standard positive serum is at least 15nA higher than that of standard negative serum. 12 sample serum of cattle that had been judged by ELISA as the positive serum gained the electric response are 30nA, 26nA, 31nA, 24nA, 6nA, 25nA, 22nA, 40nA, 21nA, 14nA, 12nA and 16nA respectively higher than that of negative serum of cattle. If the electric response of positive reactions compared with negative serum is appointed to 15nA, our preliminary experiment showed the result obtained by electrochemical immunosensor method conforming to that of ELISA is 83.3 percentage. The experiment also showed the operation of the sensor method is simple and quick. It needed less than one hour for detecting one sample and only consumed 10 serum for one time.

The responsiveness of the Nigerian Dwarf goat in concurrent *Trypanosoma brucei*-*Haemonchus contortus* infection.

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The parasitological responses of the Nigerian West African Dwarf (WAD) goat to *Haemonchus contortus* (Hc) infection are characterised by marked individual variability in faecal egg count (FEC) and worm burden, suggestive of genetic influence. One factor which is likely to modulate this responsiveness under field conditions in the Nigerian humid zone is endemic trypanosomiasis. Forty 8-10 month old, male, WAD goats received graded, weekly, escalating Hc infections for 7 weeks, totalling 9500 L3. The individual average weekly FEC during 10 weeks of infection were used to select 18 (Class 1) and 18 (Class 2) goats with the lowest and highest FEC, respectively. The infection was abbreviated with Fenbendazole at the end of wk10, followed by challenge with 3000 L3 at wk11. These two FEC classes and nine uninfected controls were used to test the hypothesis that this response phenotype will not be significantly altered by concomitant *Trypanosoma brucei* (Tb) infection. Concurrent infection with 5×10^6 Tb one week before Hc challenge significantly increased FEC and worm burdens ($P < 0.01$), especially in Class 2 goats, but did not alter their pre-challenge FEC phenotypes. Concurrent Tb infection increases FEC and worm burdens, without altering the response phenotypes of Hc-infected WAD goats.

Validation of the protective capacity of the *Ostertagia ostertagi* ES-thiol antigens with different adjuvantia.

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In a previous experiment we demonstrated that intramuscular immunisation of calves with an excretory-secretory antigen fraction enriched for cysteine proteinase activity (ES-thiol) and QuilA as adjuvant induced a protective immune response against *Ostertagia ostertagi*. A second vaccine trial was conducted to confirm the protective capacity of ES-thiol + QuilA and to test Al(OH)₃ as adjuvant for vaccination against *O. ostertagi*. Four groups of calves (n=7/group) were vaccinated three times intramuscularly with 100 µg ES-thiol antigen + adjuvant (QuilA or Al(OH)₃) or adjuvant alone and were subsequently challenged with a trickled oral infection of 25,000 infective larvae in total over 25 days (1000 L3/day). Faecal egg counts in the ES-thiol QuilA group were reduced by 56 % during the two month period of the trial compared to the QuilA control group (P<0.002). Although worm numbers were not significantly different between treatment groups, calves immunised with ES-thiol QuilA had significantly smaller adult worms (P<0.002) and less eggs/female worm (P<0.05) compared to the QuilA control group. Worm counts, faecal egg counts and other parameters of worm fitness were not significantly different between the ES-thiol Al(OH)₃ group and the Al(OH)₃ control group. In conclusion, the protective capacity of the ES-thiol fraction was confirmed and it was demonstrated that the effect of the adjuvant was crucial. Intramuscular immunisation with Al (OH)₃ did not confer protection, while immunisation with QuilA reduced the fecundity of the parasite.

Recent investigation on the prevalence of gastrointestinal nematodes in cats from France and Germany.

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Since 1995 multiple clinical studies on efficacy of different compounds were performed in France and Germany according to the GCP guidelines. Approximately 3000 cat faecal samples of 44 participating practices were examined. Cats tested positive for nematodes were included into the study. Additionally, the faecal samples sent to the routine diagnostic lab of the Institute of Parasitology were analysed and compared with the study samples. Although both sets of data did not derive from epidemiological studies with representative sample calculation, they represent extensive data with following result: 12% of the samples examined contained endoparasites of different stages. 92% of these positive samples were *Toxocara cati*, 2.8% - 3.9% stages of either hookworms, *Toxascaris leonina*, *Dipylidium* spp. or taeniids. Due to the methods used in these multicenter field studies a detection of protozoa was not applicable. In an additional approach a questionnaire was completed for all positive cases from one of the multicenter studies with information to origin, environment, conditions of animal housing and anthelmintic treatment of the endoparasite positive cats. Approximately 60% of the positive cats live in urban, 40% in rural environment, 20% on agricultural farms. About 20% of the positive cats were housed indoors without any access to outdoor environments. Furthermore the study showed that a frequency of anthelmintic treatment 3-4 times per year reduced the prevalence significantly, 80% of the cats were dewormed less than 3 times per year, only 2% of the more frequent dewormed cats (3-4 times per year or more often) belong to the study included population.

Helminth parasites of horses in the UK: A changing scene.

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Infection with endoparasites can be a major cause of ill health in horses. Possible changes in prevalence of helminths in horses at a licensed abattoir were determined for tissue dwelling helminths, tapeworms and benzimidazole resistance in cyathostomes. 34.4% of 924 horse livers were rejected for human consumption by the abattoir. Damage included hydatid cysts (*Echinococcus granulosus*) (17.4% of livers), cysts of *Strongylus edentatus* (14.3%) and diffuse cysts of unknown etiology (4.1%). Hydatid cysts were found in 3.4% of lungs. Developing *S.edentatus* were seen in 13.7% of peritoneal cavities. Aneurysms were seen in 6.4% of horses and tracks in the aortic wall in 10.6% of animals. *Anoplocephala perfoliata* remained common with 41% infected but 38% of horses examined in detail had tapeworms exclusively attached to the caecal wall. No evidence for benzimidazole resistance in cyathostomes was found in 41 horses using a delineating dose in the Egg Hatch Test. Prevalence of parasites appears to be declining from previously recorded values. The most encouraging change was the failure to find benzimidazole resistant nematodes suggesting that reversion to susceptibility may occur. The change in *A.perfoliata* attachment sites might be due to displacement of parasites by normal doses of pyrantel. In part third year student honours projects supported by Intervet (UK).

Economics aspects of myiasis: A tale of complexity and neglect.

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Institution of control efforts for parasitic diseases is based on the presence of significant mortality and morbidity in conjunction with the demonstration of a financial cost to producers and society at large. Traumatic myiasis has undeniable economic consequences that have justified resources allocated to their reduction. Eradication of the New World screwworm in North and Central America exemplifies this case. There has been massive involvement of governmental resources translating into financial gains for livestock producers of the region. Oestrid myiasis have less clearly demonstrable impact on livestock production, although prior to the advent of systemic insecticides hypodermosis was an example that provided much data. North American data clearly demonstrated the impact of hypodermosis at the terminal end of the beef production system where significant losses were incurred by meat packers which were virtually eliminated through extensive use of macrocyclic lactones. Losses incurred earlier in the beef production system and in dairy production were not as clearly demonstrated. Weight gain reduction data were controversial and the likelihood of compensatory gain made the outcome ambivalent. Persistence of infestations in the cow-calf sector throughout North America suggests a need for clarification of this data. The economic impacts of other consequences, such as immuno-suppression, remain unquantified. One example of a complete economic assessment of the impact of organized control was conducted with the Canada/US Joint Cattle Grub Control Project in the 1980's. However, there remains a striking paucity of data for other oestrid myiasis and there seems to be no effort to provide much more than anecdotal evidence.

Sequential analysis of mucosal inflammatory responses during abomasal nematode infection in ewes.

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A technique to take sequential tissue biopsies from the abomasal mucosa of ewes is described. Mucosal samples were extracted via an abomasal cannula inserted into the wall of the abomasa. Biopsy forceps were introduced through the cannula lumen and 5 abomasal biopsies (2mm²) were taken at each sampling period. A pilot study investigated the sequential local mucosal inflammatory cell responses in periparturient ewes experimentally infected with *Teladorsagia circumcincta* and subjected to nutritional depletion. Diets were formulated to be non-limiting for ME. The low protein (LP) diet provided 0.8 and the high protein (HP) diet 1.2 times the MP requirements. Half of the HP and LP ewes were infected 3 x weekly (20,000L3/dose) from 1 to 6 weeks post-lambing. The remaining ewes in the two dietary groups were challenged with 20,000 L3 at 4 weeks post-lambing. Biopsy tissues were collected at weekly intervals. The continuously infected groups showed a higher mucosal mast cell response than the single challenge groups. Mucosal eosinophil distribution was focal and counts were more consistent in the repeated challenge groups rising over time. There was no evidence of an effect of protein level on these mucosal cellular responses. The cannulation technique provided a safe and reproducible method for obtaining sequential mucosal samples in pregnant/lactating sheep.

Characterisation of potentially host-protective material from *Teladorsagia circumcincta*.

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A protein extract from *Teladorsagia circumcincta* (TSBP), a nematode parasite of sheep, was obtained from a Triton X-100 soluble fraction from adult worms. Vaccination trials with this extract resulted in variable degrees of protection in lambs against challenge with the same parasite, ranging from 0-75% as judged by faecal egg counts. A cDNA library constructed from adult *T.circumcincta* was screened with pre-challenge host serum from this trial and forty-one immuno-positive clones were isolated. These clones were sequenced and database searches carried out with the sequences. Amongst others, these analyses identified clones encoding homologues of methylmalonate-semialdehyde dehydrogenase, 10-formyltetrahydrofolate dehydrogenase and catalase which were further characterised. Another source of antigenic material, excretory-secretory proteins, is released by the different parasitic stages. Adult and L4 *T.circumcincta* were cultured in vitro and the culture medium was removed at intervals over the culture period. This medium was then concentrated and analysed by various methods, including 2D electrophoresis, with the intention of detecting any changes in the protein composition with the length of time cultured, stage-specific protein release and identifying prominent proteins using techniques such as mass spectrometry.

Study to compare the efficacy and safety of FRONTLINE® Plus (fipronil/(S)-methoprene) and FRONTLINE® Spot-On against ticks in dogs under field conditions in Japan.

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The efficacy and safety of a topical spot-on formulation of fipronil/(S)-methoprene (FRONTLINE Plus) was evaluated against natural infestations of ticks and compared to FRONTLINE Spot-On for Dogs under field conditions. From a total of 26 clinics throughout Japan, 117 dogs of various breeds with at least one tick at the initial tick count and no history of treatment with a tick-control product within the previous six weeks were enrolled. Dogs were randomly assigned to receive fipronil/(S)-methoprene spot-on combination or FRONTLINE Spot-On for Dogs on Day 0. At Visit 1 (Day 0), Visit 2 (Day 2) and Visit 3 (Day 30), ticks were counted. Counts at Visit 1 (Day 0) ranged from one to >50 ticks and the geometric mean tick counts of fipronil/(S)-methoprene and FRONTLINE Spot-On were 3.4 and 5.3, respectively. The efficacy of fipronil/(S)-methoprene spot-on and FRONTLINE Spot-On were 95.1% and 86.5%, respectively on Visit 2 and 97.4% and 97.8%, respectively on the last visit when compared to the pre-treatment total tick count. At Visits 2 and 3, groups were not significantly different ($p>0.10$) for number of attached ticks. These data demonstrate that fipronil/(S)-methoprene spot-on, and FRONTLINE Spot-On for Dogs are both highly effective in controlling tick infestations in dogs under field conditions.

Parasitological maps—An Italian experience.

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A common method of displaying the geographical (spatial) distribution of diseases and related factors is by drawing maps (cartography); a map is constructed to identify spatial patterns of diseases visually and then to find hints for further investigation. The early impetus for mapping infections arose from a vital need for reliable information concerning infection distributions to develop control strategies. The traditional cartographic approach, however, has two disadvantages: maps cannot be updated easily, and comparisons between areas shown on different maps are difficult. The numeric cartography, carried out by the use of Geographical Information Systems (GIS), offers solutions for both problems. Since 1996, GIS software has been used in territorial cross-sectional and longitudinal parasitological surveys in Italy; this in order to experiment new applications to plan sampling protocols and to display quickly, clearly, and analytically the spatial and/or temporal distribution of parasitological data. The use of GIS allowed us to draw the following types of parasitological maps: distribution maps, distribution maps with proportioned peaks, choroplethic maps with proportioned peaks, point distribution maps and point distribution maps with proportioned peaks. These studies have been performed in central and southern Italy as well as in the entire Italian territory.

Current situation of Chagas' disease in Mexico.

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Since 1928, vectors of *Trypanosoma cruzi*, have been described in Mexico, but only after 1940, Chagas' disease was recognized as an important parasitic disease present in the country. It is well known that human cases are reported from southern United States and throughout the rest of the American Continent, as far as Southern Argentina. In Mexico however, Chagas' disease has not been recognized as a major public health problem. The objective of this work is to present the current situation of this zoonotic disease from different points of view. We had recorded 895 published papers, written in Spanish, English, Portuguese and French. All distributed in the following topics: Vectors, Seroepidemiology, Parasitology, Immunology Reviews, Diagnoses, Genetics and molecular biology, Cardiology, Reservoirs, Blood transfusion infection, Control, Treatment., Digestive organs, Acute cases, Indeterminate cases, and Congenital transmission. The decade with highest rate of publications was the 1990's. The States with more human reported cases were Morelos, Jalisco, Chiapas, Oaxaca, Veracruz, and Yucatan with a total of approximately of 3000 cases. Both, national and international universities and research centers have supported research projects in Mexico on Chagas' disease. The role of domestic animals is not well understood, but it is a topic that needs more attention in the very near future. Initial epidemiological analysis with support of Geographical Information Systems will be presented.

Experimental infection of dairy calves with *Borrelia burgdorferi* by exposure to field collected Ixodid ticks.

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A number of reports in recent years have shown that *Borrelia burgdorferi* can infect domestic animals, including cattle. The effects of this pathogen vary greatly among vertebrate species it infects, and the impact of *B. burgdorferi* on cattle is poorly understood. The aim of this ongoing study is to determine the symptoms and effects of "natural" infection (via tick bite) of *B. burgdorferi* on dairy cattle in a controlled situation. Ticks were either 1) released on calves, 2) released in a small pasture with calves, or 3) not allowed access to calves (control calves). After 5 days, pastured calves were moved into cages within a confinement barn to facilitate collection of fully fed ticks. Blood from calves was collected weekly. Skin biopsy samples were taken from sites near tick attachment on the infested calves and at similar locations on the control calves and flash-frozen until testing. Front and rear leg joint measurements were taken regularly from all calves. To date, 44% of the adult female *Ixodes scapularis* ticks that were allowed to feed to repletion on the infested calves tested PCR positive for *B. burgdorferi* with 16S rDNA primers (TEC-set), indicating exposure to Lyme disease. Whole blood collected from the tick fed animals tested negative with the same primers, but 33% of the skin biopsies taken near areas of tick attachment tested positive for the spirochete. ELISA tests for serum antibodies to *B. burgdorferi* showed steady increase in titers for tick fed calves, but no change in control animals. No outward signs of disease including elevated temperature, swelling of major joints, weight loss, rash, were observed for any animals.

Pathological observations on canine sarcopticosis.

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Dog is the first carnivore to be domesticated and have been utilized for hunting, patrolling in police services, in wars and as companion. These lives in human houses as family members and a dominance subordination relation of the pet develops with the family, it lives in. Each pet needs a lot of care and management particularly of skin as it is the outermost covering of the body and is maximally exposed to the adversities of the environment. Sarcopticosis or canine scabies is an extremely pruritic and contagious disease of dogs. This condition in dog is of great public health importance as 50 % of human cases may result due to handling of infected dogs. In the present investigation, a total of 172 skin samples collected from the dogs of either sex, different age groups and breeds, were processed mechanically for paraffin embedding by acetone and benzene technique for histopathological examination. The blood samples were also collected from suspected cases for analysis of various haemato-biochemical parameters. Sarcopticosis was recorded in 45.45% of the total cases of cutaneous ectoparasitoses. Grossly, often pruritic, reddish, papulo-crustous eruptions along with alopecia were present. Distribution of lesions were on the thin haired areas of animals. Microscopically, presence of focal areas of epidermal edema, exocytosis, degeneration and necrosis were noticed. At places, focal parakeratotic hyperkeratosis was pronounced. Varying degrees of superficial perivascular infiltration of lymphocytes were observed and superficial dermatitis of hyperplastic and spongiotic type was seen. Haematological observations revealed a decrease in total erythrocyte count (TEC), haemoglobin and packed cell volume (PCV) and an increase in total leucocyte count (TLC) and eosinophilia.

Experiences with field studies on parasites in donkeys.

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Programme "Donkey Sanctuary – International League for the Protection of Horses, National Autonomous University of Mexico (DS-ILPH-UNAM)". School of Veterinary Medicine, Circuito Exterior S/N, Ciudad Universitaria, CP 04510 México.

The programme which the Donkey Sanctuary has been funding at the School of Veterinary Medicine of the National Autonomous University of Mexico is operating since 1984. At the beginning the main objective was deworming the donkeys in those communities that were regularly visited and that belonged to marginalized peasants. It was soon realized that these poor peasants also needed help with their horses and Dr. Elisabeth D. Svendsen had the vision to invite The International League for the Protection of Horses to collaborate. The treatment teams of DS-IDPT-UNAM now regularly deworm horses, mules and donkeys in the areas where they work. The cost of the treatments is a main factor when recommending a feasible calendar for deworming their animals. We have therefore realized field trials to evaluate the results in order to be able to recommend useful strategies. Some of the important problems we have encountered while doing these field trials over a considerable length of time <one year> are the following: The owners do not show up the day that was agreed upon in order to sample the animals. The common reasons for this is that they were too busy working in the fields, or that there was nobody to take the animal to the gathering point, that they have sold their animal, that it died or that they have let it to somebody on that particular day. As a consequence, the originally planned number of animals in the survey suffers constant changes, which make the final interpretation difficult and questionable. Another problem is identification of the animals. At the beginning, the purpose of the trial is explained to the owners and only those are included which agree to bring the same animal once a month for sampling to a previously agreed meeting point. Experience suggests that instead of bringing the same animal, people bring a different one, which might have been newly acquired and resembles the one originally included in the trial. As a consequence the results of the egg counts may show enormous differences and make little sense. In order to avoid this confusion, we have tried to give each owner a photograph of his animal, but after some months of bringing the two together, we are informed that the picture got lost. The presentation will be illustrated to explain the points made.

CYDECTIN[®] moxidectin long-acting injectable solution for cattle: a novel parenteral moxidectin formulation providing extended protection for cattle against parasites.

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Moxidectin is a macrocyclic lactone of the milbemycin class of compounds. It is currently available globally in parenteral, oral and topical formulations for the treatment and control of a broad spectrum of endo- and ecto-parasites in most species of food-producing and companion animals. A novel parenteral formulation has been identified that is not only effective against existing parasitic infections/infestations of cattle, but also provides protection against reinfection/reinfestation for a period of time well beyond that of current formulations. CYDECTIN (moxidectin) Moxidectin Long-Acting Injectable Solution for Cattle (moxi LA) is an oil-based formulation containing 10% moxidectin. The recommended dose is 1 mL/100 kg body weight to provide 1 mg moxidectin/kg body weight. Administration is by subcutaneous injection in the proximal third of the dorsal (back) surface of the ear to cattle weighing between 100 and 400 kg. Pharmacokinetic studies demonstrate that the C_{max} for moxidectin in serum following dosing with moxi LA is $\geq$ to that of current parenteral moxidectin formulations and the AUC is approximately proportional to the dose rate. Thus, moxi LA provides control of the same spectrum of existing parasites as the current parenteral formulations. Parasite challenge studies indicate that moxi LA provides protection against reinfection/reinfestation of economically important endo- and ecto-parasites of cattle for up to 150 days following treatment. This new moxidectin formulation provides long-term control of parasites of cattle maintained under conditions of continuous parasite exposure, replacing the need for repeated treatment with conventional parasiticide formulations.

Isolation of carbonic anhydrase during exsheathment of *Ostertagia ostertagi* infective third-stage larvae.

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For trichostrongylid nematodes, transition from the free-living to the parasitic third-stage larvae requires shedding of the retained L₂ cuticle, a process referred to as exsheathment. Previous biochemical studies using trichostrongylid species have indicated that carbonic anhydrase plays a significant role in exsheathment. Here we present the partial sequence of a gene encoding a carbonic anhydrase isolated from *Ostertagia ostertagi* third-stage larvae immediately following exsheathment within the bovine rumen. Sequence analysis revealed a 77% identity to *Caenorhabditis elegans* carbonic anhydrase, CAH-6, and greater than 40% identity to mouse and rat carbonic anhydrase, CAIII. This is the first report of a carbonic anhydrase gene isolated during the natural exsheathment process of a parasitic trichostrongylid nematode. Quantitative stage specific expression of this gene will be investigated.

Seasonal dynamics and overwintering survival of cattle GI nematodes using *Duddingtonia flagrans*.

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Preventive anthelmintic treatments are expressly banned in organic cattle farming in Sweden. Thus, practically applicable non-anthelmintic alternatives are required to control GI nematode infections. The biocontrol agent *D. flagrans* was evaluated between 1998 and 2000; both in a field trial and in a parallel plot experiment. The dose levels were 1.0×10^6 fungal spores/kg BW/d in 1998 and 0.5×10^6 in 1999 and 2000. From pooled faeces collected from the cattle in the field trial, artificial 1 kg faecal pats (21 cm Ø) were deposited on a plot area. Herbage samples were collected from ¼ sectors (radius 40 cm) surrounding the pats 4, 6, 8 and 10 wks after deposition. In addition, at the time of turnout in early May the following year, overwintered herbage samples were clipped from a circular area (35 cm Ø) centred over the original pat location from the previous year. The position of the pats was repeated for the 3 years and comparison was made with herbage samples surrounding faecal pats derived from untreated cattle and faeces from ivermectin SR bolus treated animals. Results showed that the fungus overall significantly reduced the number of infective larvae on herbage compared with the untreated control. However, significant within and between years variation was observed. Poor performance followed heavy rainfall subsequent to pat deposition. It is suggested that the rainfall resulted in a rapid disintegration of the dung pats and thus a physical separation of the fungal spores and the pre-parasitic larval stages. Therefore, impaired parasite control may be expected when *D. flagrans* is used under such wet conditions, particularly if this coincides with periods of high faecal egg counts.

Rhinoestrus usbekistanikus (Gan 1947): its prevalence and pathological effect in donkeys.

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There are 3 species of nasal bots of equids: *Rhinoestrus purpureus* and *R. latifrons* in horses and donkeys (palearctic region) and *R. usbekistanikus* in horses, donkeys (palearctic region) and Burchell's zebra (*Equus burchellii*) in Africa south of Sahara (Ethiopian region). Few papers exist on these myiasis and pathological effects are hardly known. *R. usbekistanikus*, the equine lesser nasal bot fly, is usually indicated as being more prevalent. It has been recovered in Morocco, Tunisia, Senegal, Niger and Ethiopia. The prevalence can reach up to 84% in Senegal with a mean larval burden of 16 larvae. Even severe clinical signs have been described in former USSR, there is usually very little evidence of infection. The nasal discharge is serous or lightly mucous; no sneezing has been reported. The necropsies show first instar larvae on mucosa. Second and third instars are recovered on ethmoidal bone and sinus. Frequently there is interstitial pneumonia associated to emphysema and bronchiolitis with many eosinophils. This lesion is firstly related to the effect of parasitic antigens and proinflammatory products liberated by mastcells and eosinophils from nasal cavities inhaled in the lungs. Secondly, it appears that cestrids antigens have an immunosuppressive effect, allowing the actualization of pathogenic effect of virus inducing interstitial pneumonia. It appears that the parasitic evolution alters according to the geographical area. In very dry countries like Niger, an extended pupation occurs outside. In Senegal, close to the ocean, the evolution of the parasite is possible all year round. Doramectin, a lactone macrocyclic anthelmintic, is efficient on larvae and may be useful in treating infected donkeys. In all countries where *R. usbekistanikus* is prevalent, human ocular myiasis due to the first instar larva has quite frequently been observed. It is difficult to distinguish this infection from those due to *Cestrus ovis*. Morphological criteria of larvae may be useful in carrying out this identification.

A Bayesian approach for prevalence estimation and test validation of porcine cysticercosis in Zambia.

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Several diagnostic techniques are used in pigs to estimate the prevalence of the zoonotic cestode *Taenia solium*, but none of these are perfect, making interpretation of results hazardous. A Bayesian approach was used to estimate the prevalence of cysticercosis in Zambian village pigs by means of 4 imperfect tests. Pigs (N=874), slaughtered in Lusaka, were bled, and tongue and routine meat inspected. Serum antibody and parasite antigen concentrations were determined by ELISA. A model, based on a multinomial distribution and including all possible interactions between the individual tests, allowed 31 parameters to be estimated, but actually required 63 parameters. Using prior knowledge on specificity and independence of the tests, the number of parameters to be estimated could be reduced. The estimated prevalence was 67.5%. The performances of the tests were (sensitivity-specificity): tongue inspection (0.21–1.00), meat inspection (0.22–1.00), Ab-ELISA (0.36–0.92), Ag-ELISA (0.88–0.95). These estimates were externally validated using a slaughter trial: 65 pigs were bled, their tongue and meat routine inspected, and the carcasses dissected for total cysticercus counts. Cysticerci were found in 31 (47.7%) pigs, the range was 1–24662; in 14 pigs less than 200 cysticerci were counted, these cases were not detected by routine meat inspection. Sensitivity and specificity values obtained in this study were in agreement with those estimated: tongue inspection (0.16–1.00), meat inspection (0.39–1.00), Ab-ELISA (0.45–0.88), Ag-ELISA (0.65–0.91).

Antigen-specific IgG(T) responses as markers for larval cyathostomin infection in horses.

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Cyathostomins are the most important intestinal parasite of horses. Simultaneous reactivation of larval stages from the intestinal wall causes a potentially fatal inflammatory enteropathy. Mucosal stages constitute 90% of the total burden and are currently undetectable. We have identified two putative diagnostic complexes of 20 and 25kDa in somatic larval cyathostomin antigen preparations. Antigen-specific IgG(T) responses were detected by ELISA from 4–5 weeks post infection. Western blots confirmed the purity of the antigens and showed that epitopes in 20kDa complex were specific to larval cyathostomins. No cross-reactive antigens appeared to be present in *P. equorum* or *S. westeri* species. Low levels of cross-reactivity were observed in *S. edentatus* and *S. vulgaris* species. Helminth-naïve ponies that grazed cyathostomin-infected pasture before oral challenge had higher anti-25kDa complex IgG(T) levels than similar ponies that grazed ‘clean’ pasture before challenge. Ponies raised indoors, parasite-free, had the lowest IgG(T) levels. Anti-25kDa antibody levels significantly positively correlated with total mucosal burdens. Horses with enumerated cyathostomin infections had significantly higher IgG(T) levels to both complexes than uninfected horses and the burdens correlated with antigen-specific IgG(T) levels. Serum responses in clinical cases of larval cyathostominosis were significantly greater than responses in cyathostomin-negative horses. Responses were also found to vary with the age and sex of the case.

Toxoplasmosis in Pallas's Cats (*Otocolobus manul*, Pallas 1776) raised in captivity.

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The Pallas's Cat (*Otocolobus manul*) is a threatened small-sized felid species from Central Asia reared in special breeding programs in zoos. In contrast to domestic cats where clinical toxoplasmosis is rare, Pallas's Cats held in captivity appear to be highly susceptible. In 1997, Schoenbrunn Zoo, Vienna, purchased a breeding pair of Pallas's Cats from Novosibirsk Zoo, Russia. In the following years the female gave birth to four litters with high neonatal mortality rates (40-80 %), and it was decided to investigate possible *Toxoplasma* infections by monitoring antibody titres against *T. gondii* to determine the time point and source of natural infections, and to record the occurrence and duration of oocyst excretion by the queen and kittens during the first 8 months of age. In 2001, six kittens were born. At 84 days of age, one animal displayed weakness, ataxia, and anorexia and died two days later. Histopathological and immunohistochemical examinations confirmed a *Toxoplasma*-infection. Parasites from different organs were propagated in mice and tissue culture. After the detection of maternal antibodies by IFAT and HAT (45 days after birth) antibodies decreased and finally increased again on day 86 due to an acute infection. *Toxoplasma*-oocysts were detected in fecal samples of the kitten from day 72 to 86, and in those of the queen between 59 and 86 day post partum. The progression of antibody titres and oocyst excretion supports the assumption of a postnatal *Toxoplasma*-infection by ingestion of tissue cysts in intermediate hosts.

Fascioloidosis of red deer and roe deer in Hungary (1997-2002).

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The giant liver fluke (*Fascioloides magna*, Bassi, 1875) was detected for the first time in Hungarian red deer shot in 1994 and became extensive up to date. The parasite can be found in a region extending from the Czech Republic, through Slovakia and from 2000 into Austria. The mean-prevalence among red deer and roe-deer in Hungary between 1997-1998 was 72% and 33.3%. In the period of 1997-2002, at necropsy of 582 red deer and 36 roe-deer livers (using Egri's method) the number of flukes per host ranged from 1 to 115. The first attempts for game treating was performed between 1996-2000, using the Rafendazole-premix medicated feed in feeding-places and feeding box. The efficiency of medication was low (mean-prevalence: 51 %). The efficacy of an experimental preparation (SBH-Exwormer, containing triclabendazole + levamisole)- feeding method was the same – was evaluated in the treatment of naturally acquired fluke-infections in red deer and roe-deer. The efficiency of SBH-Exwormer in 2002 was much better (mean prevalence in red deer: 28.6 %, in roe-deer: 0.0%). At the same time a controlled deworming program was conducted.

Epidemiology of subclinical nematode infections in dairy cows on five farms in England: 1978/9 & 2002.

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A study of subclinical gastro-intestinal (g-i) nematode infections in UK dairy cows in the 1970s revealed 85.2% to be infected, passing on average 4.8 egg faeces and ingesting an estimated 310 L₃ at pasture per day. The present study, which included five of the nine original dairy farms, was designed to establish whether changes in farming practices over the last 25 years had altered dairy cow nematode epidemiology. Faecal and grass samples were collected at 6- to 8-week intervals from each farm during the 2002 grazing season (April-November). Thirty-eight per cent of dairy cows were found to harbour patent g-i nematode infections passing on average 1.0 epg (range, 0 to 12 epg) faeces. Faecal worm egg counts rose to a peak in July and August (farm mean, 0.09 to 2.6 epg) before declining to low levels in November. Two per cent of cows exhibited patent *Dictyocaulus* infections passing between 0.004 and 0.024 L₁/g faeces. G-i nematode larvae (*Ostertagia*, *Haemonchus* and *Trichostrongylus* spp.) were recovered from pastures between July and November. Mean total larval counts from infected pastures ranged from 54 to 765 L₃ (2338 L₃ including *Haemonchus*)/kg DM. Estimated daily larval intake of high-yielding cows averaged 1524 L₃ (2247 L₃ including *Haemonchus*). Differences in the prevalence of infection and worm egg output between this and the previous study were thought to be due to differences in the timing of sample collection. The 4.9-fold rise in estimated daily larval intake in the present study resulted from an increase in herbage intake associated with the 37% increase in milk yield in the five herds during the intervening 25-year period.

Acaricide resistance in *Boophilus* ticks and tick-borne diseases in Mexico.

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Boophilus microplus ticks are widely distributed in Mexico, the risk tick infestation is on 21 millions cattle. The *Boophilus* tick control is basically by the use of acaricides, organophosphates (OP), pyrethroids (SP) and amidines (Am) applied on established periods depending upon the intensity of the tick infestation and the ecological area. A compulsory National Tick Campaign was established in Mexico in 1975 and after seven years the rate of tick infested cattle was reduced. Three events on acaricide resistance has taken place in Mexico, in 1982 was reported the first case of OP resistance; the OP compound were applied each 14 days for a period of seven years in eradication areas in the northeast of Mexico the original resistance strain was named Tuxpan. The second event was the pyrethroid resistance, which was diagnosed in 1993 in the northeast of Mexico in the state of Tamaulipas. The difference between these two events were that pyrethroid resistance was observed the immediately lack of efficacy of the pyrethroids and there was an increased of tick infestation rates in that area. The third event was the presence of Amidine resistance in 2000 in the southern part of Mexico in the state of Tabasco in which the ticks were also resistant to OP and SP acaricides. From the three events only in the case of pyrethroid resistant has been reported babesiosis outbreaks with 3% mortality rate or higher in adult animals and 5% morbidity rate on regions which were considered with enzootic stability. The outbreaks of bovine babesiosis in Mexico were due to the epidemiologic instability on the herds.

Larvicidal activity of an ivermectin praziquantel combination against migrating *Strongylus vulgaris* larvae in equids.

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An oral gel containing a combination of ivermectin-praziquantel was tested for efficacy in horses against experimental mixed infection of 56 days *Strongylus vulgaris* and Cyathostominae larvae. Selected horses coming from contaminated pastures were ranked by decreasing order body weight (D-1) and randomly allocated to a treated or untreated group (n = 6). Horses were infected on D0 with an oral inoculum coming from 2 donors and containing 500 *S.vulgaris* and 21900 small strongyles L₃ infective larvae. A single treatment was administered on D56 and necropsy examination was performed 14 days later (D70). Ivermectin was highly efficient (100%) against the *S. vulgaris* arterial stage (no live form was recovered) and there was no interference between the two active ingredients contained in the tested product.

***Oesophagostomum dentatum* does exhibit thermotaxis.**

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Previous work concerning thermotaxis by infective nematode larvae indicates that skin-penetrating species are often positively thermotactic. Other nematodes including *Haemonchus contortus*, a passively-ingested parasite, migrate to culture temperature. Previous studies with *Oesophagostomum. dentatum* failed to demonstrate attraction to warmth leading early workers to deny the occurrence of thermotactic behavior. Our study suggests, on the contrary, that thermotaxis does occur, and is influenced by culture temperature in a complex manner. When cultured at 26°C, essentially all *O. dentatum* third-stage infective larvae placed on a linear thermal gradient at 30°C moved in a direct thermotactic manner. Of the 52 L3s tested, 69±18% migrated to a range including warm, host-like temperatures (33-44°C), 30±17% migrated to cooler temperatures (15-27°C), while the remaining 2±8% failed to exhibit a thermal preference. In contrast, when the experiment was repeated with cold-cultured (16°C) larvae (n=69), 71% exhibited direct thermotactic behavior, but only 14±15% migrated to a range including host-like temperatures (33-44°C). Whereas 53±28% migrated to the colder end of the gradient (13-27°C) suggesting that they were cold-conditioned. Strikingly, a large subset (33±22%) of larvae remained at the origin (28°-32°C), in contrast to experiments with the larvae cultured at 26°C where none remained in this temperature range. While traditionally, positive thermotaxis among animal parasitic nematodes has been readily interpreted as adaptive with respect to host-finding behavior, the observed complex response is not as easily explained, but suggests that sub-populations adapted to both homeothermic body temperatures as well as environmental temperatures conducive to growth and survival exist within this strain.

Maternal to foetal transfer of immunoglobulins in *Schistosoma mattheei* infected cows

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During previous studies specific antibodies (Ab) have been detected in the serum at birth from some calves born to *Schistosoma mattheei* infected cows. Western blotting analyses from the serum and colostrum samples of these newborns (at birth) and their mothers on SWAP *mattheei* and *E. coli*, demonstrated identical recognition patterns. These results were strongly indicative for a transplacental transfer of immunoglobulins. The objectives of this study were (1) to investigate whether schistosome eggs present in the uteri of cows naturally infected with *S. mattheei* could produce lesions bringing about a confluence of maternal and foetal circulations, thereby causing a transfer of immunoglobulins and (2) to study possible effects of this Ab transfer on infection patterns. Therefore, 22 uteri from confirmed infected cows were examined. 5-20% of the caruncles (maternal side), cotyledones (foetal side) and the liver from the foetus were digested for tissue egg counts. Amnion and allantois fluids were also checked for the presence of eggs. Serum samples were collected from the foetus for detection of specific Ab against SWAP *mattheei* using ELISA. Schistosome eggs were detected in the caruncles from 4 uteri. In 2 of those, schistosome eggs were also detected in the cotyledones, amnion and allantois fluids, demonstrating clearly a maternal to foetal passage of eggs. No specific Ab were detected in the serum from the foeti. In conclusion, this study demonstrates for the first time that *S. mattheei* eggs can cross the placental barrier and could be responsible for placental lesions and transfer of maternal immunoglobulins. After exposure to natural infections the calves born with specific Ab showed significant lower faecal egg counts.

Mange (*Sarcoptes scabiei*) eradication through sow treatment with ivermectin and validation by slaughter checks and ELISA assays.

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Three mange elimination programs were constructed based on pig flow and other management factors. The first two were for use with continuous pig flow, and the third with batch farrowing. The first program involved medication of all sows and boars with ivermectin by injection on the same day, repeated 14 days later. The second program was to treat dry sows and boars with ivermectin in the feed for 7 days and repeat after a 7-day break, while lactating sows were treated by injection on the day in-feed treatment commenced and 14 days later. In the third program sows were treated with ivermectin by topdressing their feed for 7 days pre-farrowing and pre-weaning, while all boars were treated whenever a batch of sows was treated. Two farms were enrolled to each program, using manufacturer's recommended dose rates. Sows examined before treatment were positive for both *Sarcoptes* mites and eggs while those examined 6 months after treatment were negative for mites and mite eggs. Slaughter pigs weaned before treatment had Average Dermatitis Scores (ADS) indicative of mange, while those weaned 6 and 12 months after treatment had ADS below the mange threshold. ELISA scores of piglets 6 and 12 months post-treatment did not indicate exposure to mites. Average daily gain (ADG) of pigs weaned 6 to 9 months after treatment were 1% to 5% higher than ADG of piglets weaned before treatment, demonstrating the productivity gains that can be achieved by eradicating mange.

Mitochondrial genomics of parasitic nematodes – recent progress and implications for systematics and population genetics studies.

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While there is still limited information on mitochondrial (mt) genomes of parasitic nematodes, there has been some progress over the last few years. Recent investigations have provided new insights into mt genome structures of some nematodes of socio-economic importance, and into their systematics and population genetics *via* the use of mutation scanning methods. These advances provide unique prospects and opportunities for investigating processes of gene rearrangement, mutation rates, and the inheritance of mt genes. Importantly, they also provide a foundation for tackling questions regarding the ecology and epidemiology of parasitic nematodes, thus contributing, in the broader sense, to the diagnosis and control of parasitic diseases. While the main focus of this account will be on parasitic nematodes, the findings should have implications for studying other parasite groups.

Effect of gender on susceptibility to *Haemonchus contortus* infection in lambs.

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In addition to breed differences, gender may play an important role in resistance to parasitic infections as gender-related differences in infection rates, intensities, or population patterns have been described in a wide range of species. Males generally exhibit lower immune responses as well as higher intensity and prevalence of infections compared to females. The aim of the present study was to assess gender-related differences in resistance to *Haemonchus contortus* infection in lambs. Thirty-six intact male and 69 female 12-week-old lambs of two German sheep breeds ($n = 61$ Merinoland; $n = 38$ Rhön) were orally infected with 5000 third-stage larvae of the nematode *Haemonchus contortus*. Four and 8 weeks later, faecal egg counts (FEC) and haematocrit were determined. All lambs were slaughtered after 8 weeks and their gastrointestinal tracts were examined for the adult stages of *H. contortus*. Animals were weighed at all samplings. Male lambs of both breeds showed significantly higher log FEC ($p < 0.001$), higher mean worm establishment rates ($p < 0.05$), higher worm burdens ($p < 0.01$) and lower haematocrit values ($p < 0.001$) than female lambs. Correlation values between important economic traits (body weight, daily weight gain) and parasitologic parameters were higher in male animals.

***Wolbachia* endosymbionts in *Dirofilaria immitis*.**

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Filarial nematodes harbor intracellular endosymbiotic bacteria which have been identified as *Wolbachia*. The presence of these bacteria must be considered when investigating the immunology and pathogenesis of filarial diseases. In addition, *Wolbachia* appears to be necessary for the development and reproduction of filarial nematodes, and could thus represent a target for the control of filarial diseases. In previous studies we have shown that tetracycline (an antibiotic which is effective against *Wolbachia*) inhibits embryogenesis in *Dirofilaria immitis*. We are currently investigating the biological and immunological role of *Wolbachia* in *D. immitis*. We have shown that all the samples of *D. immitis* that we have examined, collected worldwide, harbor *Wolbachia*. These *Wolbachia* bacteria from *D. immitis* have identical gene sequences. It is notable that wolbachiae from different filarial species have different gene sequences. To investigate the immunological role of *Wolbachia*, recombinant proteins from different wolbachiae have been produced (WSP, GROEL, FTSZ). We have shown in different hosts that, after heartworm infection, the animals develop an IgG response against *Wolbachia*. We are currently investigating the potential use of WSP for the sero-diagnosis of heartworm infection in both humans and animals and the possible role of *Wolbachia* in neutrophil chemotaxis in the dog.

Assessing the benefit of the immune response toward *Trichostrongylus colubriformis* in sheep.

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Nematode resistance to anthelmintics has stimulated breeding programs for an enhanced host immune response. However, selected lines have not demonstrated the anticipated improvement in productivity, indicating the immune response may carry a high nutritional cost. Thirty six parasite naïve five-month-old Coopworth lambs were offered *ad libitum* a complete ruminant diet. One group (n=9) was infected for 77 days with 2000 L3 *T. colubriformis* d⁻¹ (IF), a second group (n=9) received the same infection but was treated weekly with 1ml 30kgLW⁻¹ of the glucocorticoid Depredone (40 mg ml⁻¹ methylprednisolone acetate) to suppress immune function (ISIF), a third group (n=9) received only the glucocorticoid (ISC) and the fourth (n=9) remained as a control (C). Infection significantly increased both serum total antibody and IgA absorbance in IF animals (p<0.001 for both), with levels in ISIF remaining the same as in ISC and C animals, indicating successful immune suppression. Voluntary feed intake (VFI) of IF animals was reduced between days 14 and 63 of infection by 30% (p<0.001). Intake in ISIF animals was the same as in C and ISC groups throughout. Growth rates averaged 146, 160, 171 and 226 g d⁻¹ for IF, ISC, ISIF and C animals, respectively. Faecal egg counts (FEC) of IF animals peaked at 1250 eggs g⁻¹ (epg) on day 41 before declining to less than 100 epg by day 75. FEC in ISIF animals increased to 3990 epg by day 75. Recovery of intake in IF animals was associated with the development of an effective immune response, as judged by FEC, which coincided with a reduction in IgA at day 63. These results suggest the developing immune response, rather than the actual parasite, may be responsible for the reduction in VFI and reduced performance in young parasitised sheep, with implications for genetic selection programs.

Development of population genetic tools for the parasitic nematode *Teladorsagia (Ostertagia) circumcincta*

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Anthelmintic resistance in *T. circumcincta*, a parasitic gastrointestinal nematode of sheep and goats, is of major economic importance worldwide. However, relatively little is understood regarding how resistance develops and spreads in parasitic nematode populations. In order to address these issues, we are developing tools to study the population genetics of *T. circumcincta* to investigate the possibility of cryptic speciation and to study parasite gene flow between different host species and geographical locations. To date, we have isolated 50 dinucleotide microsatellite loci and characterised and sequenced 21 of these. Over 2/3 of these are linked to a 146bp repeat sequence homologous to a repeat linked to many microsatellites in the related nematode *H. contortus*. Individual microsatellite loci can be PCR amplified from a single adult or L3 stages and appear to be polymorphic both within and between parasite isolates. Drug resistance in sheep nematodes has been preceded by drug resistance in goat nematodes, suggesting that goats may be a source of resistant parasites for sheep. Consequently, we are undertaking a survey of goat farms to determine anthelmintic treatment efficacy and identify resistant parasite populations. These will provide us with study populations on which to apply our genetic markers.

The spatial and temporal distribution of West Nile virus in Louisiana in 2002.

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In 1999, West Nile Virus was first detected in North America in New York City. Since West Nile Virus's introduction in the United States, West Nile Virus has spread with speed and ferocity to almost all of the contiguous 48 states. West Nile Virus is transmitted by mosquitoes and mainly affects humans, horses, and birds, especially blue jays and crows. West Nile Virus first hit Louisiana in 2001 in Vermilion, Calcasieu, Iberia, Plaquemine, and Jefferson parishes. By the end of the 2002, West Nile Virus cases were present almost everywhere in the Louisiana, especially from East Baton Rouge to Slidell, and Ouachita and Calcasieu parishes. Information about human, equine, and avian cases were acquired through the Louisiana Department of Health and Hospitals Office of Public Health and the Louisiana Veterinary Medical Diagnostic Laboratory at the LSU School of Veterinary Medicine. Shapefiles for humans, horses, and birds were created by geocoding addresses for each of the cases in ArcView 3.3 using Streetmap. All cases were also assigned a date code to look for temporal patterns since transmission of the virus is dependent upon mosquitoes and to evaluate the role of birds as an early warning system for the detection of West Nile Virus in an area. Early analysis of results indicate temporal differences between human, equine, and avian cases with avian cases usually occurring before cases in people or horses thus confirming their usefulness as a early warning system for West Nile Virus, but further investigations are needed. Ongoing research will concentrate on the factors influencing the spatial and temporal distribution of West Nile Virus in Louisiana as well as monitor future outbreaks.

Molecular diagnosis of acaricide resistance in *Boophilus microplus*.

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Our research group has begun the development of molecular-based assays for specific acaricide resistance-associated genes to facilitate the identification of acaricide resistant populations of *Boophilus microplus*. We have devised a PCR-based assay to detect a specific sodium channel gene mutation that is associated with resistance to permethrin. In contrast to bioassays which can take several weeks to perform, this assay can be performed on individual ticks at any life stage with results available in a few hours. A number of Mexican strains of *B. microplus* with varying profiles of pesticide resistance have been genotyped using this test. Additionally, a specific metabolic esterase with permethrin-hydrolyzing activity has been purified and its gene coding region cloned. A mutant allele of this esterase gene has been found, though the mutation seems to provide only a low level of additional permethrin resistance compared to that provided by the wild type allele. Work is continuing to clone specific acetylcholinesterase (AChE) and carboxylesterase genes that appear to be involved in resistance to organophosphates (OP). Our ultimate goal is the design of a battery of DNA-or ELISA-based assays capable of rapidly genotyping individual ticks to obtain a comprehensive profile of their susceptibility to various pesticides.

A review of the 2002 American Heartworm Society guidelines for the management of heartworm (*Dirofilaria immitis*) infection in dogs and cats.

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The recommendations generated by the American Heartworm Society after its 2001 triennial symposium are based on the research reports presented during the symposium in the areas of canine and feline heartworm epidemiology, diagnosis, chemoprophylaxis and adulticide therapy. These recommendations summarize data on diagnostics recommending the antigen detection tests for the diagnosis of canine heartworm infections and the careful evaluation of the antigen and antibody detection tests associated to other evidence in the case of feline heartworm disease. Heartworm chemoprophylaxis in both species of animals is discussed in detail focusing mainly in the use of the macrocyclic lactones. The continuous monthly use of ivermectin to control late precardiac larval and young adult stages of *D. immitis* is also discussed in relation to the use of an approved adulticide based on melarsomine dihydrochloride. Among other important subjects the guidelines also present some aspects of the unique pathophysiological mechanisms of the heartworm infection in cats.

Neuropeptides and the anterior sensory neuroanatomy of gastrointestinal nematodes.

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The nematode *Haemonchus contortus* is a blood feeding, gastrointestinal parasite of the family Trichostrongylidae; its hosts include sheep, cattle, and other ruminants. A heavy infection of 4000 adult worms in a single ruminant can result in 60 ml of blood loss per day and premature death. Neurons in the sensillae of these worms, known as amphids, are thought to be important in the development and migration of the different life stages. Relatively little work has been carried out on the neuropeptides involved in these processes in the adult and larvae stage. Using the techniques of electron immunocytochemistry and immunogold labelling, as well as standard immunocytochemical methodologies, this paper examines the neuropeptides involved in amphidial function. Comparative studies were carried out using *Teladorsagia circumcincta* and *Trichostrongylus colubriformis*. Immunopositivity for the FMRFamide-related peptide (FaRP), GLGPRPLRFamide, and the classical neurotransmitter 5-HT were obtained at the light level as well as the cellular level, in the amphids and circumpharyngeal nerve ring. An extensive ultrastructural study of the anterior neuroanatomy of *H. contortus* was also carried out.

Host cell tropism underlies species restriction of human and bovine genotypes of *Cryptosporidium parvum* genotypes.

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Human cryptosporidiosis can arise from infection with either human (genotype I) or animal (genotype II) *C. parvum* subtypes. Compared with genotype II, little is known of the biology of invasion of the human restricted type I *C. parvum*. The aim of this study was (i) to explore and compare with genotype II the pathogenesis of type I infection using an established in vitro model and (ii) to examine the possibility that host specific cell tropism underlies species restriction among genotype I and II using a novel ex vivo small intestinal primary cell model of infection. Genotype I and genotype II *C. parvum* were used to infect HCT-8 cells and primary cultured intestinal epithelial cells *in vitro*. HCT-8 cells were invaded by type I and type II with similar efficiency. Actin co-localization at the host parasite interface and inhibition of invasion using microfilament inhibitors (Cytochalasin B&D) was observed for both types of *C. parvum*. In addition pre-treatment of oocysts with microtubule inhibitors (Colchicine and vincristine) reduced invasion of type I and type II isolates. Primary cells were invaded more efficiently than HCT-8 cells by *C. parvum*. Host-cells actin cytoskeleton involvement in primary cells was similar to that observed in the HCT-8 cell line. However, inhibition of parasite tubulin did not reduce invasion of primary cells. Although the type II isolates invaded primary cells regardless of the human or bovine origin, type I organisms invaded only human small bowel cells. Genotype I *C. parvum* invades host epithelia in a manner similar to that described for genotype II. However, type I isolate cannot enter bovine epithelium suggesting that the species restriction of this *C. parvum* genotype reflects host tissue tropism.

PROHEART® 6 and PROHEART SR-12 research update: A summary of recent studies on hookworm persistent efficacy, 3-month retroactive activity and safety in puppies.

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ProHeart 6 (0.17 mg moxidectin (MOX)/kg BW) and ProHeart SR-12 (0.5 mg MOX/kg BW) are sustained release formulations designed to deliver MOX for 6 months and 12 months, respectively, for the prevention of heartworm infection and treatment of existing larval and adult hookworms in dogs. Since registration, additional efficacy and safety studies have been conducted. One study was conducted to evaluate persistent efficacy of ProHeart 6 against *A. caninum* and *U. stenocephala* infections induced 3, 4, 5, and 6 months after the dogs (8/grp) received their injection. Dogs treated with PH6 (at any time) had significantly reduced fecal egg counts compared to dogs in the control group with percent egg reductions using geometric means (GM) of 99.2%, 97.0%, 84.8% and 81.2%, respectively. Dogs receiving PH6 (at any time) had statistically significant reduced *A. caninum* counts compared to dogs in the control group. Reductions in worm counts using (GM) for the different groups at 3, 4, 5, and 6 months were: 94.7%, 90.3%, 82.0%, and 60.2%, respectively. All dogs receiving PH6, excluding dogs treated at 6 months, showed a statistically significant reduction in *U. stenocephala* counts compared to dogs in the control group. Reductions in worm counts using GM for the different groups at 3, 4, 5, and 6 months were: 94.6%, 85.3%, 71.6%, and 48.2%, respectively. Overall, the treatments administered 3 and 4 months prior to inoculation with larvae provided excellent protection, and treatment at 5 months provided good protection. A second study was conducted to evaluate the 3-month retroactive activity of PH6 and PH SR-12 against *D. immitis*. In this study, dogs challenged with 50 *Di* L3 3 months prior to treatment and necropsied 6 months post treatment had efficacies of 98.8% and 96.0% for PH6 and PH SR-12, respectively, when compared to saline treated controls. A third study was conducted to investigate the safety of 3X and 5X PH6 administered to beagle puppies 10 weeks old.

The anthelmintic efficacy and the safety of a combination of imidacloprid and moxidectin spot-on in cats and dogs under field conditions in Europe.

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Cats and dogs were allocated in veterinary practices located in three regions of Germany and in two regions of France. Fecal samples of 1,292 cats and 1,355 dogs were examined for the presence of nematode eggs. 141 positive cats and 131 positive dogs were treated with the test product or an established positive reference product: for cats a spot on combination of 10.0 mg/kg Imidacloprid and 1.0 mg/kg Moxidectin or 5 mg/kg Praziquantel and 57.5 mg/kg Pyrantelmonat, administered orally; for dogs a spot on combination of 10.0 mg/kg Imidacloprid and 2.5 mg/kg Moxidectin or 5.0 mg/kg Praziquantel, 14.4 mg/kg Pyrantelmonat and 15 mg Febantel, administered orally. Efficacy was assessed by analyzing the reduction in fecal egg counts of a fecal sample taken between days 7 to 1 before treatment in comparison to a fecal sample taken between days 7 to 13 after treatment. In cats, for the test product an efficacy of 99.99 % against *Toxocara cati* and an efficacy of 99.64 % against *Ancylostomatidae* was calculated. For the reference product an efficacy of 99.96 % and 100 % respectively was calculated. In dogs, for the test product an efficacy of 98.81 % against *Toxocara canis* and an efficacy of 99.92 against *Ancylostomatidae* was calculated. For the reference product an efficacy of 99.96 % and 99.91 respectively were calculated. In no cat or dog treated with the spot on combination of Imidacloprid and Moxidectin any adverse drug reaction was observed.

Detection of *Cryptosporidium parvum* in polluted stream water.

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Currently, most surveys of water samples for the presence of *C. parvum* involve the use of capsule filtration, immunomagnetic separation (IMS), and IFA microscopy; for example, the "USEPA Method 1623". While published reports conducted using low-turbidity water indicate recoveries with this method can approach 70%, it is expensive and time-consuming. We are interested in screening stream water samples for the presence of *C. parvum* oocysts on a weekly, long-term (ie., one-year) basis, and thus prefer a less expensive method that offers sensitivity equivalent to that of capsule filtration. Accordingly, we adopted a method recently described by the L. Xiao and A. Lal laboratory at the CDC, in which 125 – 200 ml samples of water are processed using simple centrifugation and IMS. Recovered oocysts are subjected to RNA extraction and RT-PCR is performed using several different sets of published primers targeting the *C. parvum* *hsp70*, viral symbiont, and 18S rRNA genes. Our selection of these primers was determined by a series of experiments using discrete quantities of oocysts, enumerated using micromanipulation (kindly provided by G. Sturbaum) and FACS (purchased from the Wisconsin State Laboratory). These purified oocysts were lysed and subjected to RT-PCR; the detection limits for various primer combinations ranged from 1 to 10 oocysts per RT-PCR. Since March 2003, weekly analyses have been done on water samples obtained from Gwynns Falls/Gwynns Run, a highly polluted stream located in metropolitan Baltimore, MD. This stream has a history of high coliform counts and turbidity readings and receives water from both rural and urban sources. Preliminary results indicate that our method can indeed detect oocysts in this stream, and sequencing of amplicons has indicated that they are *C. parvum*. Data on the frequency of positive samples, and the species/genotype characteristics of the detected oocysts, will be presented.

Sequencing of exon 4 of the beta-tubulin isotype 1 gene from 12 cyathostomin species.

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The Cyathostominae are the primary parasitic pathogens of horses producing complex infections involving over 50 different species. Their control is limited due to reduced efficacy of anthelmintic drugs to the mucosal stages and their resistance to anthelmintics, particularly the benzimidazoles (BZs). In *Haemonchus contortus* mutations in beta-tubulin genes, at codons 167 and 200 of beta-tubulin isotype 1 and 2, have been shown to confer BZ resistance. Recently, the cDNA sequence of β -tubulin isotype 1 has been reported for cyathostomins. Here, we report PCR amplification of exon 4 of beta-tubulin isotype 1 from cyathostomins. A 345bp PCR product, encoding codons 167 and 200, was generated from genomic DNA of 42 individual adult parasites from 12 different species. Inter and intra specific sequence variation was seen at the nucleotide level. The encoded 115 amino acid sequence showed substitutions at six different loci. The resistance status of the adult parasites was not known, however mutations at codon 200 were seen for one individual from three different species, *Cylicostephanus goldi*, *Cyathostomum catinatum* and *Cyathostomum pateratum*. Furthermore, all three individuals showed an additional amino acid substitution at codon 174. No amino acid substitution was found at codon 167. This sequence comparison has allowed the design of conserved PCR primers to investigate the role of mutations in exon 4 of β -tubulin isotype 1 from BZ resistant cyathostomin populations.

Eprinomectin treatment of lungworms at early patency and its influence on development of immunity in young cattle.

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The effect of eprinomectin treatment at early patency was studied on the development of protection against *Dictyocaulus viviparus*. Three groups of 6 weaned calves were monitored at weekly intervals. Calves in groups A and B were inoculated with 100 L3 for five days at the start of the experiment, whereas group C served as an uninfected control. Animals in group A were treated with eprinomectin (0.5 mg per kg bodyweight) in a pour-on formulation at day 24 post the first inoculation. Calves in groups B and C were left untreated. Seven weeks post the day of treatment all calves were challenged with 1500 L3. Another four weeks later they were sacrificed and worms were counted. Calves in group B were about 8 times more resistant than those in group A, whereas group C calves were about 35 times more susceptible to infection. The eosinophil counts at the time of slaughter indicate that immunity was involved in the protection and the response was correlated with previous exposure and worm load. It was concluded that eprinomectin was effective against adult lungworms. However, the untreated calves (group B) developed a more marked resistance to reinfection compared to those that were subjected to anthelmintic treatment at early patency (group A). On the other hand, the cumulative number of excreted larvae was on an average 43 times higher. Thus, infected calves that remain out on pasture should be treated. This will restrain transmission despite that the level of immunity is deteriorated.

Reducing the degree of protein scarcity rapidly improves expression of immunity to abomasal nematodes in ewes.

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An increasing body of evidence supports the view that metabolizable protein (MP) supply can improve expression of immunity to gastrointestinal nematodes in periparturient ewes. Here, we investigated the rate at which such an improvement can occur through reducing MP demand whilst maintaining MP supply. Three groups of 15 twin-bearing ewes were infected with *Teladorsagia circumcincta* (10,000 L₃/day, 3 days/wk) from d₇₀ to d₁₆, with parturition as d₀. Two groups of twin-rearing ewes were fed iso-energetically at 0.85 and 0.60 (L22) or 1.25 and 1.20 (H22) times MP requirements during late pregnancy and lactation, respectively. A third group was fed the same daily allowances as the L22 ewes, but one lamb was weaned on d₁₀ (L21). The lactating L22 ewes, but not the H22 ewes, lost weight (P<0.001), whilst L21 ewes started to gain weight from d₁₀ onwards. FEC of the L22 ewes increased gradually to 203 (147-281) epg on d₁₀ and then to 285 (203-399) between d₁₀₋₂₁ whilst FEC of the H22 ewes increased slowly to 43 (28-68) epg on d₁₀ and averaged 45 (27-75) epg between d₁₀₋₂₁ (P<0.01). FEC of the L21 ewes rapidly decreased after d₁₀, and were similar to the H22 ewes from d₁₅ onwards. Total worm burden of the L22, L21 and H22 ewes was 22652 (18286-28061), 9919 (7989-12315) and 8192 (5885-11403), respectively, on d₂₁ (P<0.05). This study shows that reducing the degree of protein scarcity rapidly improved immunity to *T. circumcincta* and supports the view that improved periparturient protein nutrition can reduce dependency on anthelmintic drugs for gastrointestinal parasite control.

Gastrointestinal nematode control through direct and indirect effects of host nutrition.

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Whilst gastrointestinal nematode parasitism reduces host performance through affecting its nutritional status, host nutrition can also directly or indirectly affect gastrointestinal nematode parasitism. Direct effects of host nutrition are related to the ingestion of plant secondary metabolites (PSM) that have antiparasitic properties. Since most PSM are also antinutritional factors, the consequence of their ingestion for the parasitised host needs to be considered within a trade-off framework. Parasitised hosts could obtain a net benefit from the PSM consumption if antiparasitic effects outweigh their anti-nutritional effects. Host nutrition can indirectly affect gastrointestinal nematodes through its influence on host immunity. This is because expression of acquired immunity to parasites is often penalized at times of nutrient scarcity, and it is postulated that this is because scarce nutrient allocation is prioritized to growth and/or reproductive functions. Indeed, an increased supply of protein, from a wide range of protein sources, can reduce the level of gastrointestinal nematode parasitism in both growing and periparturient hosts. In theory, this would apply to all first limiting nutrients, but to date, it remains inconclusive whether an increased supply of energy affects gastrointestinal parasitism. A strategic combination of these direct and indirect effects of host nutrition could greatly contribute towards a non-chemical, sustainable parasite control in organic systems of ruminant production. It is anticipated that such nutritional control will be part of an integrated approach for parasite control, e.g. together with genetic selection for increased resistance, vaccination and biological control, rather than being used in isolation.

Characterization of Zimbabwean *Toxoplasma gondii* isolates with stage-specific monoclonal antibodies.

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Cell culture derived parasites of eight *Toxoplasma gondii* isolates of animal origin were characterized using a panel of stage specific monoclonal antibodies (mAb): mAb 4.3 (bradyzoite-specific), mAb 4.25(tachyzoite-specific), mAb 5.1(tachyzoite-specific) and mAb 5.15(tachyzoite-bradyzoite specific). The Danish *T. gondii* strain SSI 119, a group B strain, was included in the experiment. All the isolates reacted with the four mAb, in a similar pattern to that of SSI 119. For all isolates, the reactivity with mAb 4.3 was the strongest whereas very few parasites reacted with mAb 4.25, 5.1, 5.15 and the tachyzoite specific anti-P22 (positive control), irrespective of the antibody titer.

Macroparasites of reindeer in Fennoscandia: parasite population dynamics, control options, and environmental impact implications.

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With the aim of determining the monthly dynamics, impact, and identification of the best time for treatment intervention, a long-term (2002–2005) study has commenced on the gastro-intestinal and pulmonary nematode parasites of semi-domesticated reindeer at the Kutuharju Experimental Station in northern Finland (69° N, 27° E). Since June 2002, the mean number of nematode eggs·g⁻¹ faeces (mEPG) was higher in calves (mEPG=57) than in adult female reindeer (mEPG=29). In adult animals, *Capillaria* sp. was prevalent in December (mEPG=120), although it was not detected in June 2002 or February 2003. *Ostertagia* spp. eggs were ubiquitous in adults, with a major peak in September (mEPG=90). Nematodirinae were not detected in adult reindeer. In calves, *Capillaria* sp. was most abundant in December (mEPG=103), *Ostertagia* spp. in September (mEPG=88), and the Nematodirinae in November (mEPG=97). Female calves (mEPG=62) excreted more eggs than male calves (mEPG=46). Since November 2002, the pick-up of infective larvae from the grazing environment has been estimated by the sequential use of 4 worm-free ‘tracer’ reindeer calves, every 8 weeks. Larval pickup from pasture was highest in November (χ =343) and lowest in February (χ =100). Male calves (χ =276) harboured marginally more nematodes than female calves (χ =229). The predominant taxa were *Ostertagia* spp. and the Nematodirinae. A previously unreported feature of these infections is the high level of inhibition of the early fourth larval stage of development, suggestive of a survival mechanism to enable the parasite to escape adverse environmental conditions in the sub-arctic.

Sheep scab: Immunosuppression with Cyclosporin A reduces mite numbers and lesion area.

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Infection with the sheep scab mite, *Psoroptes ovis*, induces a rapid inflammatory cell response, involving the massive influx of eosinophils and T helper cells into the epidermis. Together with the proliferation of mast cells and generation of IgE antibody, these reactions are characteristic of a type 1 hypersensitivity reaction resulting in an atopic dermatitis that is the scab lesion. However, it is unclear as to whether this inflammatory response is part of the immune mechanism which eventually overwhelms the mite, or whether this reaction is instigated by the mite for its own benefit in terms of feeding or maintenance. In an attempt to answer this question, we have studied the effect of the continuous (daily) intravenous injection of the anti-inflammatory drug Cyclosporin A to experimentally infected sheep, on the development of the lesion and on mite survival. A highly significant ($p > 0.001$) reduction in mite number and lesion area was obtained after 3 weeks dosing, and this was accompanied by a significant amelioration of the inflammatory cell response as judged by immunohistochemical analysis of skin sections. However, interpretation remains difficult due to the possible cytotoxic nature of Cyclosporin A to *P. ovis*, and these results will be discussed in detail.

Efficacy of *Duddingtonia flagrans* chlamydospores against naturally acquired gastrointestinal nematode infections in Blackface ewes and lambs.

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The replicated study (n=4) examined the efficacy of *D.flagrans* chlamydospores against naturally acquired ewe (n=10) and lamb (n=18) nematode infections in which *Nematodirus* and *Teladorsagia* were the predominant contaminating genera. Ewes were offered 500,000 chlamydospores per kg bodyweight with their daily ruminant ration and lambs were treated at the same rate. Efficacy in reducing larval yield was determined *in vitro* using coproculture/larval yield (CLY) and the extent of challenge from pasture was determined using tracer lambs (n=3) at turnout in May and post weaning in October. Ewe and lamb faecal egg counts were similar on each of the four fungus exposed (FE) and non-exposed (NE) groups. CLY data showed reductions of yield of 80% (during housing) and mean reductions of 44% (at pasture) for the ewes and 33% for the lambs at pasture. Mean total tracer burden of the FE and NE lambs grazing in May were 4300 and 4079 respectively, compared to FE and NE burdens of 13500 and 24492 in lambs grazing in October, a reduction of 44.9% in tracer total worm burden on the FE paddocks. In the early season tracers the predominant species were *Nematodirus battus* (93%) and *T.circumcincta* (7%) whereas in the late season tracers the predominant genera were *Nematodirus* (56%) *Teladorsagia* (29%) and *Trichostrongylus* (12%).

Can host genetics be useful in the fight against myiasis?

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UMR INRA/DGER 1225 Interactions Hôtes -Agents Pathogènes, Ecole Nationale Vétérinaire de Toulouse, Toulouse, France.

Increasing genetic resistance of sheep may be one approach to controlling the economically important parasites such as gastro-intestinal nematodes or myiasis. A long term strategy to reduce fly strike based on selection of sheep resistant to fleece rot and body strike has been undertaken in Australia. The precise mechanism of resistance has not been elucidated, but there is evidence that differences in inflammatory responses are involved. Genetic control in other myiasis such as *Oestrus ovis* is unknown. Previous demonstration that a high IgG response against excretory-secretory products of *O. ovis* larvae interfered with the larval development lead to an experiment using back crosses of two breeds (Sarda and Lacaune) to detect Quantitative Traits Loci (QTL) related to the intensity of the immune response to *O. ovis*. The intensity of the *O. ovis* specific IgG was measured in 1000 Backcross (BC) Sarda x Lacaune females, i.e about 100 females per family x 10 families in July 2001, April and July 2002. These BC ewes originated in Sardinia where natural prevalence of *Oestrus ovis* infections is high. A significant ram effect ($P < 0.001$) was noted in the IgG response and the phenotypic correlation between the IgG response in July 2001, April 2002 and July 2002 was 0.53 suggesting that this response is, at least partially, under genetic control. The QTL detection in antibody response against *O. ovis* is in progress. Preliminary results indicated that a QTL may be present on chromosome 2 (likelihood : 29.2; probability : 0.06) in three families (chi squares : 11.2, 4.25, 5.15). This is the first time that a genetic control of *O. ovis* antibody response was identified and this claims for further investigations.

Treatment of *Neotrombicula* associated dermatitis in dogs using topical permethrin-pyriproxyfen combination.

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Few data are available on dermatological consequences and treatment of *Neotrombicula autumnalis* infestation in dogs. The objective of this study was to evaluate in naturally *Neotrombicula* infested dogs the parasitocidal and clinical efficacy of two topical formulations of the permethrin-pyriproxyfen combination (Duowin Spray® or Duowin Contact®, Virbac S.A.). Dermatological and parasitological condition of the dog was assessed on D0, D8 and D21 by quotation of pruritus, lesions (erythema, papules, pustules, scales and crusts) and the *Neotrombicula* population. All dogs were affected with moderate to severe pruritic dermatitis. Mean pruritus and lesions were reduced by more than 60% and *Trombicula* population by more than 75% within 1 week and by 97 to 99% 3 weeks after treatment ($p < 0.05$, Wilcoxon tests), with no significant difference in both treatment groups. At the end of the study, 14 out of 15 included dogs were parasitologically and clinically cured. In most of the cases, successful treatment was reached within 1 to 3 weeks after only one topical application of a permethrin-pyriproxyfen combination. Two applications were necessary in a few cases, then careful follow-up is required. Efficacy and tolerance of both formulations were excellent. Existence of a real *Neotrombicula* dermatitis, with possible hypersensitivity reactions to the parasite, should lead to its systematic inclusion in the differential diagnosis of pruritic dermatitis in dogs.

Comparison of antibody isotypes and lymphocyte subsets responses in rats immunised with protein or cDNA of s-Glutathione Transferase (GST) of *Fasciola hepatica*.

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Fascioliasis is an important disease affecting many mammals with a cosmopolitan distribution and causing important losses. In domestic ruminants fasciolosis causes decreased meat and milk productions, decreased female fertility and increased veterinary costs. Metacercariae of *F. hepatica* enter the final host by the oral route, penetrate the gut wall and migrate through the peritoneal cavity towards the liver. Chemotherapy is commonly used to prevent this disease, with several disadvantages (residues in animal products, drug resistance). Therefore, vaccination methods should be developed to limit these problems. Recently developed technology for DNA vaccination appears to offer the good prospect for the development of a vaccine that will effectively activate both the humoral and cell mediated mechanisms of the immune system. Glutathione S-transferases (GST) have long been regarded as attractive vaccine targets in fasciolosis due to their suspected role in detoxification processes of the fluke. GSTs are present in the parenchyma and tegument of adult *F. hepatica*. GSTs are multifunctional enzymes that play an important role in the detoxification of xenobiotics, through the catalysis of the conjugation of glutathione to electrophilic substances. It has been proposed that the detoxifying role of the GST helps to protect helminth parasites from the host immune attack. In the present experiment we sought to compare the antibody response and the phenotype of the T cells (CD4+ and CD 8+) of rats immunised first with cDNA encoding for *F. hepatica* GST and next (three weeks later) with GST protein (group 1) with the immune responses of rats primed with GST protein and then boosted with cDNA of *F. hepatica* GST (group 2). The GST specific IgG1 antibody level was eight times higher in rats from group 1 than in rats of group 2. A similar situation was also observed in the dynamics of the IgG2a antibody response. The IgA antibody response was increased in group 1 but significantly decreased in group 2. Anti-ES IgG1 and IgG2a levels in sera from infected rats were significantly increased in the first group but decreased in the second. However IgG2b and IgA antibodies behaved similarly, with a decreasing tendency in both groups. The frequency of CD 4+ cells was increased in both groups; however, the percentage of CD 4+ cells was lower in the second group than in the first one. The percentage of CD 8+ T lymphocytes varied among the two groups. In the first group values for CD8+ cells decreased after challenge but were increased in the second. Initial immunisation with cDNA may preferentially stimulate Th-2 lymphocytes, however priming with a protein might stimulate Th-1 lymphocytes in rats challenged with metacercariae of *F. hepatica*. These assumptions must be further investigated.

The burden and impact of echinococcosis in Australia.

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Echinococcosis, caused by *Echinococcus granulosus*, is widespread in Australia, particularly in wildlife but also in domestic livestock. Between 80 and 100 new cases of human infection occur annually, mostly from the eastern side of the continent with a few additional cases occurring in Western Australia. The status of hydatid infection in animals and humans in Australia is largely unknown. Data on hydatid infection in domestic livestock killed in abattoirs is neither collected nor reported and infection in wildlife is only ever surveyed on an ad hoc basis. Human hydatidosis is a notifiable disease in all states and territories of Australia, except New South Wales, the state where most human cases arise. In 1999, health authorities of New South Wales chose to remove hydatidosis from their list of notifiable diseases. Hydatid disease has always been under-notified in Australia and the New South Wales decision to delist hydatidosis has compounded the difficulty of monitoring human hydatid disease in Australia. Between 1987 and 1992 in New South Wales 321 patients were treated, only 17 were reported during that period. In Victoria, in the 12 months up to July 1991 only two of 50 new or recurrent cases were recorded. Hydatid disease is not perceived as a problem in Australia largely because of non- or sub-optimal reporting.

The role of Australian wild dogs (dingoes and dingo/domestic dog hybrids) in the transmission of *Echinococcus granulosus* from the bush to suburbia in Australia.

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Echinococcus granulosus is the only member of the Genus *Echinococcus* to occur in Australia having been introduced with domestic animals during settlement. The presence of highly susceptible indigenous animal definitive and intermediate hosts allowed the parasite to become established in native wildlife. Consequently, wildlife in many areas acts as an important reservoir perpetuating transmission, with “spill-over” to domestic livestock and humans. The distribution of *E. granulosus* in Australia is rainfall dependent, with the highest prevalence occurring in wildlife in the east of the continent along the length of the Great Dividing Range and in Western Australia in areas around Perth. Dingoes and dingo/domestic dog hybrids (wild dogs) are the most important definitive hosts for *E. granulosus* in Australia because they commonly have heavy infections, there is a high prevalence of infection in wild dog populations (up to 100%) and their behavior allows eggs of *E. granulosus* to be distributed over wide areas. The encroachment of urban development into established wild dog home ranges has led to wild dogs entering suburbia where they defecate in front yards and public recreation areas, hunt domestic pets and/or raid garbage bins. In addition to the public nuisance caused by the behavior of these “suburban wild dogs”, a study in Townsville, Queensland, has shown they also present a risk to public health. The study identified 25% of 26 wild dogs trapped in the outer suburbs of Townsville were infected with *E. granulosus*.

Detection of circulating immune complexes (CIC) of trypanosomosis suspected cattle and buffaloes of Haryana (India) using sandwich – ELISA.

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The studies carried out in randomly selected cattle (111) and buffaloes (255) from two districts (Karnal and Hisar) of Haryana revealed *Trypanosoma evansi* parasites in 3.6 and 2.35 percent with WBC and 4.5 and 2.35 percent with MHCT, respectively. The sandwich ELISA using heterologous antisera failed to detect demonstrable levels of circulating antigens in *T. evansi* positive cattle and buffaloes. However, sandwich ELISA using antbovine IgG conjugate detected all the parasitaemic and 37.8 percent aparasitaemic animals (39.64% cattle and 36.1% buffaloes) positive for circulating immune complexes (CIC), the CIC-ELISA was also found specific in detection of immune complexes against *T. evansi* and had no cross reactions with *Theileria annulata* serum. The parasite positive and CIC positive cattle and buffaloes had significantly lowered values of packed cell volume, which indicates anaemia, one of the cardinal signs of trypanosomosis. These observations suggest the use of CIC-ELISA for immunodiagnosis of trypanosomosis in cattle and buffaloes.

The immuno-protective effect of DNA vaccine against experimental inoculation of chickens with *Eimeria tenella*.

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Avian coccidiosis is an economically important disease for the poultry industries throughout the world. Many methods besides chemotherapy have been explored to eliminate its damage due to the increasing emergence of drug-resistant strain and the consumers' appeal for green food. Recently, novel vaccination strategies using antigen-encoding DNA plasmids have been shown to be able to induce protective cellular and humoral immune responses against many kinds of infectious diseases and cancer. In order to attempt a new method of controlling coccidiosis in poultry industry of China, we have successfully ligated the gene TA4 and Et1A to the mammalian expression vector pcDNA3.1, aiming to express them in a fusion protein form. The IFAT was done to examine the in vitro expression of constructed pcDNA-Et1A-TA4 and pcDNA-TA4 in COS cell, and all gave positive results. The DNA vaccines were given to the birds i.m. after the muscle was pre-treated with 25% sucrose solution 15min before. After vaccinating twice at 1wk and 2wk of age, chickens were challenged with sporulated oocysts of *eimeria tenella*. 7 days later, chickens were killed and the lesion cores of caeca and the weight gains of different groups were compared. Results indicated that, both the pcDNA-Et1A-TA4 and pcDNA-TA4 had definitely protective effects against coccidial infection, they can obviously attenuate the body weight decrease following coccidial inoculation. When pcDNA-Et1A-TA4 was given to the birds along with the Eimericox® vaccine simultaneously, birds have the maximum body weight gains and the minimum lesion scores in all the immunized groups compared with the infective control group. The recombinant IFN- γ could also enhance the immuno-protective effect of DNA vaccine when given to the birds i.m. at the same time. This encourage us to have a detailed research on the DNA vaccine against parasite infection involving coccidiosis, as their immuno-responses are mostly cellular response which is one of the characters of DNA immunization.

Stage-specific biochemical changes during the life cycle of *Oesophagostomum* spp.

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Oesophagostomum dentatum and *O. quadrispinulatum* are amongst the most common nematode parasites of swine in intensive farming. Their ability to establish in the host high numbers at low pathogenicity and to reinfect without considerable development of immunity makes them an attractive model for host-parasite interaction studies. To demonstrate changes in biochemical composition during the developmental cycle of the nematode (glyco)protein, antigen and fatty acid compositions were determined using electrophoresis and blotting, in situ labelling or gas chromatography, respectively, to investigate third-stage larvae (L3), histotropic and luminal L4 and male and female adults. It could be demonstrated that various proteins are expressed in a stage-specific manner and that antigen shedding and host molecule acquisition occur in vitro. Fatty acid changes during parasite development are probably related to stage-specific production and release of bioactive lipids (eicosanoids) which can act as immunosuppressive or immunostimulating agents. It is proposed that these mechanisms aid in the establishment and survival of the worm, probably by interaction with specific and non-specific immune reactions as described previously.

Synthetic pyrethroid resistance in *Boophilus microplus* in Australia: Association with the use of synthetic pyrethroid products to control *Haematobia irritans exigua*.

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Cattle tick (*Boophilus microplus*) and buffalo fly (*Haematobia irritans exigua*) have overlapping distributions in Australia. In Queensland, measures for the control of each parasite are generally implemented independently. In the late 1990s we conducted on-farm interviews of 199 dairy farmers to determine their practices for control of ticks and buffalo fly. Engorged female ticks were collected from a proportionally allocated random subset of participants (n = 66) and their susceptibility to acaricides was determined by the larval packet test. Multiple models were used to predict the probability of resistance associated with 30 putative risk factors. One putative risk factor was the frequency of application of synthetic pyrethroid insecticides (SPs) for the control of buffalo fly. Frequent application of SPs was associated with increased probability of resistance in *B. microplus* to all SPs (0.44, 0.81 and 0.98 for 0, 1 to 10 and 11 to 20 applications respectively). Since this work was completed, the use of SPs for tick control has declined, while the use of macrocyclic lactones has increased. It is likely that similar associations will become apparent for this class of chemicals, possibly also with consequences for resistance in helminths.

Infectivity and reproduction of *Echinococcus multilocularis* in cat, dog, fox and raccoon dogs.

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The geographical distribution of the small fox tapeworm *Echinococcus multilocularis*, a serious parasitic zoonosis, appear to be extending in Europe. This is probably linked to increasing populations of foxes (*Vulpes vulpes*) and raccoon dogs (*Nyctereutes procyonoides*), a newly recognized natural host of *E. multilocularis*. With the increasing use of urban habitats by these two wild hosts there is also increasing risk of transmission to domestic definitive hosts as cats and dog. However, the relative epidemiological significance of foxes, dogs, cats and raccoon dogs is not yet well understood and such information is essential for control and treatment strategies. In this study, the establishment and development of intestinal worms, the faecal eggs excretion, and the detection by direct and indirect methods were evaluation in these four host species up to 90 days post inoculation. Foxes and racoon dogs proved to excellent hosts of the tapeworm with consistent morphological development and significant egg excretion. The development was more variable in the domestic hosts, where only significant egg excretion was found in the dogs. The infectivity of eggs recovered both from faeces and from mature intestinal worms was examined in a bioassay on mice. Whereas eggs from foxes, racoon dogs and dogs resulted in massive infection in the mice, eggs from cats did not cause infection.

Anthelmintic resistance in equine cyathostomins: Issues and implications for control.

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Resistance to thiabendazole was first reported in cyathostomin nematodes in 1965, just a few years after its introduction to the equine anthelmintic market. Since that time, reports of resistance to benzimidazole (BZ) anthelmintics have become increasingly common, and in some areas of the world the prevalence of resistance to BZ anthelmintics is now greater than 90%. Resistance to pyrantel has been slower to develop, and most studies from around the world suggest that pyrantel resistance is present at relatively low prevalence. This contrasts to recent findings in the southern United States where the prevalence of resistance to pyrantel pamoate was greater than 45% using conservative criteria for declaring resistance. There are still no reports of ivermectin resistance in the cyathostomins despite over 20 years of use as the most commonly administered equine anthelmintic. Presently, the fecal egg count reduction test (FECRT) is the only means by which resistance can be diagnosed on privately owned farms. *In vitro* assays used to detect resistance in nematodes of small ruminants have been tested with cyathostomins, but these have failed to yield reliable results. Interpretation of results from FECRT is complicated by large variations in fecal egg counts (FEC) between horses and many factors that can affect measurements for individual FEC. Furthermore, FECRT uses an insensitive phenotypic measure for resistance that fails to detect resistance until resistant alleles have reached very high levels. Prevention and proper management of resistance requires tests that can detect resistance alleles while the frequency in the population is still very low. This requires molecular-based tests which can only be developed once resistance-associated mutations are known.

Prevalence of anthelmintic resistance on horse farms in the southern United States.

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The objective of this study was to perform a regional, multi-farm investigation to accurately estimate of the prevalence of anthelmintic resistance in horses in the southern United States. Fecal egg count (FEC) reduction tests were performed on 44 large farms/stables in Georgia, South Carolina, Florida, Louisiana and Kentucky. Horses on each farm were assigned to 1 of 4 different treatment groups: fenbendazole (5.0 mg/kg), oxbendazole (10 mg/kg), pyrantel pamoate (6.6 mg/kg), or ivermectin (200 µg/kg). Mean FEC reduction was calculated at 2 weeks post-treatment for each treatment group. Anthelmintic efficacy was evaluated using the following conservative criteria: <80% reduction = resistant; 80-90% reduction = suspected resistant; >90% reduction = sensitive. The percent of farms demonstrating the presence of anthelmintic-resistant cyathostomes were 100%, 67%, 48%, and 0% for fenbendazole, oxbendazole, pyrantel pamoate, and ivermectin, respectively, with mean percent reductions of 31%, 69%, 73%, and >99%, respectively. The prevalence of resistance found in this study is higher than in previous reports, suggesting progressive development of drug resistance. Furthermore, data from these 5 geographically and physiographically distinct southern states were similar. This suggests that resistance to benzimidazole and tetrahydropyrimidine anthelmintics in cyathostomes is highly prevalent throughout the entire southern United States and probably nationwide. Resistance to ivermectin is not apparent at this time.

***Pseudoloma neurophilia* (Microsporidia) and *Pseudocapillaria tomentosa* (Nematoda) in zebrafish (*Danio rerio*) held in research facilities.**

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There has been a dramatic increase in the use of zebrafish as a research model, particularly in the field of developmental genetics. In support of these endeavors, the Zebrafish International Resource Center was established, which includes a diagnostic service for the research community. Zebrafish are susceptible to parasitic diseases common to other aquarium fishes, such as 'velvet'. However, the most common parasite infection that we observe is *Pseudoloma neurophilia*, a neurotropic microsporidian that also infects somatic muscle. Muscle infections are associated with a chronic emaciation, a common condition called "skinny disease". The precise role of the parasite this disease has yet to be elucidated – i.e., it may be the primary cause or just a secondary opportunist. Occurrence of the parasite in the ovaries and eggs suggests that vertical (or egg associated) transmission may occur, which would account for the high prevalence of infection in zebrafish facilities. Several capillarid nematodes cause disease in fishes, and *Pseudocapillaria tomentosa* is a recognized pathogen in zebrafish facilities. Capillarids of fishes may utilize paratenic hosts in their life cycles, but we showed that *P. tomentosa* could be directly transmitted between zebrafish in aquaria. We observed a higher incidence of intestinal carcinomas in zebrafish, including those exposed to carcinogens, which suggests that the nematode may be a promoter of these neoplasms.

Prevalence and distribution of *Fasciola gigantica* and *Paramphistomum microbothrium* in Iringa district, Tanzania.

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A cross sectional study was carried to determine the prevalence and distribution of *Fasciola gigantica* and *Paramphistomum microbothrium* in Iringa district. The study involved indigenous, small-scale dairy and large-scale dairy farms. The prevalence and range of *F. gigantica* was 64% (19-75%) in traditional farms, 46% (4-92%) in large-scale dairy farms and 28% (6-54%) in small-scale dairy farms. The prevalence and range of *P. microbothrium* was 82% (67-92%) in traditional farms, 56% (4-100%) in large-scale dairy and 41% (19-83%) in small-scale dairy farms. The prevalence of parasites was associated to the type of management. Traditional farms had the highest prevalence of the two parasite species and that the prevalence of paramphistomes was higher than that of *F. gigantica* among management systems. The prevalence of both fasciola and paramphistomes was higher in adults (59, 75%) than in yearlings (36, 52%) and calves (25, 47%). Grazing and watering cattle in communal areas were the major risk factors of fasciola and paramphistome infection in the area. We concluded that *F. gigantica* and *P. microbothrium* are highly prevalent and widespread in Iringa district. More studies on seasonal transmission pattern are required in order to design rational control programs.

Canine demodicosis- A pathological study.

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The development of dog is as obscure as evolution of man himself and its presence in social status as a pet has been increasing continuously as companion. The pet has got the inherent psychological instinct for companionship like human urge and the emotional bondage of a woman to its pet is often more closer than a mother to her child. Being the largest body organ, skin protects the animal from external injuries and gives a charming look to the animal. It can also be said that the skin is the mirror of dog's body to some extent. Cutaneous ectoparasitoses is one of the important skin disease of dogs and in some instances, they cause a nuisance but mostly the cause debilitation or even prove to be life threatening. Canine demodicosis also known as demodectic mange or red mange or follicular mange is most common in young dogs, especially the short-haired breeds. Natural infestation is apparently acquired neonatally through contact with the nursing bitch when the adult and motile mites invade the hair follicles of pup. In this study, a total of 172 skin samples collected from the dogs of either sex, different age groups and breeds, were processed mechanically for paraffin embedding by acetone and benzene technique for histopathological examination. The blood samples were also collected from suspected cases for analysis of various haemato-biochemical parameters. Demodicosis was recorded in 54.54% of the total cases of cutaneous ectoparasitoses. Grossly, two forms of demodicosis *i.e.* localized or squamous and generalized were identified. In the localized form, few small, circumscribed, erythematous, hyperpigmented, scaly, non-pruritic, periocular alopecia facially or on the fore legs. In generalized form, large multifocal areas of alopecia, erythema and hyperpigmentation on the head, legs and trunk were recorded. Microscopically, follicles contain mites, keratinous debris and inflammatory perifolliculitis, folliculitis and furunculosis. There were infiltration of plasma cells, lymphocytes, macrophages, mast cells and eosinophils found around the follicles infiltrating the epithelium. Haematological observations revealed slight decrease in total erythrocyte count (TEC), haemoglobin and packed cell volume (PCV) and an increase in total leucocyte count (TLC) and eosinophilia. The biochemical studies revealed hypoalbuminemia and hyperglobulinemia.

Methods of identification the 4th stage larvae of horse strongylids to mature worms.

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The morphology of the 4th stage larvae of horse strongylids (L4) is still studied imperfectly. Dvojnok and Kharchenko (1987a, 1987b, 1990), Kharchenko and Dvojnok (1989) summarized results in this field. The object of this work is to describe methods of identification larvae to mature. The larvae examined are kept in collection of Parasitology Department in Schmalhausen Institute of Zoology NAS Ukraine. Larvae of 27 species cyathostomins and small strongylins were identified. Mostly thanks to presence of molting stages which had buccal capsule both larvae and adult worm identification became possible. In such a way larvae of 21 species were identified. When these species were excluded the identification based on the characters common for both L4 and mature worms (esophagus shape, place of cervical papillae and excretory pore, shape of females' tail. Triodontophorus brevicauda, Craterostomum acuticaudatum, *Cylicocyclus leptostomus*, *C. ultrajectinus*, *Petrovinema poculatum* and *Gyalocephalus capitatus* were identified in a such way. There were L4 of 6 types that we could not identify. To *H. pekingensis* one of this types possibly belongs. To six strongylid species: *Bidentostomum ivaschkini*, *Coronocyclus sagittatus*, *Cylicostephanus asymmetricus*, *Skrjabinodentus caragandicus*, *S. thsoijoi*, *Cylicodontophorus bicoronatus*, belong the others. Molting worms is the most distinctive approach to larvae identification. Identification is also possible according to characters common for adults and L4 both. DNA tests can be used for control of identification and for larvae definition of the rest of species.

***Brugia* and *Wolbachia*: A reexamination of host-parasite interactions.**

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The endosymbiot *Wolbachia* has been suggested to be important if not essential for the development and continued viability of several filarial nematodes. *In vitro* and limited *in vivo* studies also indicate that these organisms play a major role in filarial nematode induce lesions. The *Brugia pahangi*-gerbil model of lymphatic filariasis has been used to further examine these questions *in vivo*. Observations in both intraperitoneal and lymphatic infections showed a direct relationship between the loss of *Wolbachia* and decreased fecundity and worm death confirming previous findings. Data indicate that tetracycline treatment kills both male and female worms and that this is not necessarily related to moulting of the parasites from the L4 to L5 stages. Detection of *Wolbachia* by RT-PCR and Southern Blotting as well as fecundity decreased markedly before worm death. Differences were observed in the kinetics of male and female worm death. These kinetics also varied with the site of infection. The peritoneal inflammatory responses and nematode induced lymphatic granulomas as well as IL-4 and IFN γ levels were monitored in gerbils during the course of tetracycline and ivermectin treatments. Observations indicate that these responses are not significantly altered by these treatments. These *in vivo* experiments question the overall significance of *Wolbachia* in the pathogenesis of lymphatic filariasis.

Protection in sheep using a purified cysteine protease fraction of adult *Haemonchus contortus*.

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Vaccination with a membrane-bound thiol sepharose-binding fraction (TSBP) of adult *H. contortus* had been shown previously to confer significant levels of protection against homologous challenge in sheep. This fraction is greatly enriched for cysteine proteases. TSBP was fractionated by anion-exchange chromatography on MonoQ. Only subfractions containing cysteine protease activity afforded protection in a subsequent sheep vaccination trial. The TSBP cysteine proteases were further purified by affinity chromatography using recombinant *Haemonchus* cystatin, a potent cysteine protease inhibitor. Although only 1-1.5% of total TSBP bound to cystatin-sepharose, this fraction contained 100% of the cysteine protease activity, as determined by gelatin substrate gel analysis. When used in a sheep vaccine trial, <3µg of this cysteine protease fraction conferred significant and repeatable levels of protection against homologous challenge. The effector mechanism of host immunity remains undefined. Full-length cDNAs encoding three cysteine proteases present in TSBP have been isolated and expressed in bacteria as insoluble, GST-fusion proteins. The protective capacity of a cocktail of these recombinant proteins has been assessed in sheep. Although no reduction in FEC was observed, a highly significant 38% reduction in worm burdens ($P<0.01$) was observed.

Dietary carbohydrates introduce changes in the metabolism in the large intestine that influence the population of *Oesophagostomum dentatum* in pigs.

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We investigated the influence of type and level of dietary carbohydrates on the population of *O. dentatum* in pigs. Four experimental diets were formulated based on barley flour with added insoluble fibre from oat husk (Diet 1), inulin (β -2,1 fructan) (Diet 2), sugar beet fibre (SBF) (Diet 3) or inulin plus SBF (Diet 4). Thirty-two 10 weeks old pigs were randomly divided into 4 groups each of 8 pigs. After three weeks' adaptation on Diet 1, all pigs were infected with a single dose of 6,000 L₃ *O. dentatum*. At week 7 p.i., one group of pigs was switched to Diet 2, another group to Diet 3 and a third group to Diet 4 with the remaining pigs continuing on Diet 1. At week 13, all pigs were necropsed and their gastrointestinal content analysed for organic acids (short-chain fatty acids (SCFA) and lactic acids (LA)) and worm burdens determined. Four ileal cannulated pigs were used to determine the ileal recovery of carbohydrates and other nutrients. The worm recoveries from the pigs on Diet 2 were reduced by 97% compared to the control with marked reduced faecal egg counts also. The most likely cause is the huge difference in fermented carbohydrates; on Diet 2 the total amount of carbohydrates fermented in the large intestine was more than five times higher than on the control diet. The rapid fermentation caused a significantly higher LA concentration in caecum when feeding Diet 2 compared to the other three diets.

Local immune responses in calves infected with the lungworm *Dictyocaulus viviparus*.

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In previous experiments serum IgE, but not IgA or IgG1 correlated with protection after primary infection with 30 L3 larvae. In a subsequent experiment we infected calves with 200 L3 followed by a challenge with 2,000 L3 35 days later. Animals were necropsied 15 days after the challenge infection. Levels and secretion of IgA, IgE and IgG1 were examined in weekly samples of BronchoAlveolar Lavage Fluid (BALF) and following necropsy in the lymph nodes from the small intestine and lungs as well as intestinal mucus. No correlation between IgE and protection was found. This was possibly caused by the higher primary dose used here compared with the previous experiments. We were not able to find significant responses in the lymph nodes of the small intestine and only low responses in the intestinal mucus were found. However, parasite specific IgA/mg protein was almost 10 fold higher in BALF than in serum, while IgE and IgG1 levels in BALF and serum were similar. High numbers of parasite specific IgA secreting cells, but no IgE or IgG1 secreting cells were found in BALF. In lung lymph nodes we found IgA and IgG1 secreting cells, but no IgE secreting cells. IgA levels and number of IgA secreting cells in BALF were correlated with protection against reinfection. The effective immune mechanism against lungworm seems to be dose dependent.

Antioxidant enzyme systems in *Haemonchus contortus*: cDNA cloning of antioxidant genes, and role of enzyme induction in protection against oxidative stress.

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The ability of *Haemonchus contortus* to establish and maintain infections may rely to some extent on the capacity of the nematode to detoxify oxidants produced as part of the host immune response. This study investigated the range of antioxidant defensive enzymes available to the nematode, and aspects of their role in protection against oxidative stress. cDNA cloning identified the presence of a 2-Cys peroxidoxin, a catalase, and a selenium-independent glutathione peroxidase in L3 and adult *H. contortus*. Biochemical experiments demonstrated significant induction of catalase in L4 and adult worms in response to an oxidant threat *in vitro*. Adult worms showing induced catalase (following exposure to low levels of hydrogen peroxide) were subsequently able to survive in the presence of significantly greater levels of the peroxide than worms which had received no pre-exposure. A protective role for the induced catalase was therefore demonstrated. Quantitative PCR analysis of L3 and adult worms showed a significant increase in peroxidoxin expression in adults compared to L3, suggesting a role for this enzyme system in allowing the nematode to detoxify hydrogen peroxide encountered in the parasitic environment. It is apparent that *H. contortus* possesses a number of enzyme systems for detoxifying oxidants. Disruption of these systems may provide a method for interfering with the ability of the worm to establish infections.

Immunoreactivity for the Wolbachia Surface Protein in lung and liver of dogs affected by heartworm disease (*Dirofilaria immitis*).

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The intracellular bacteria Wolbachia harboured by several filarial worms of human and veterinary interest have been implicated in both the biology of filarial worm development and in the pathogenesis of filarial disease. It has been suggested that release of bacteria from dying worms (macro-, microfilariae) and subsequent exposure to the host innate/adaptive immune system may contribute to the pathological alterations observed in affected subjects. Different tissues (lung, liver, spleen, kidney) from 3 dogs with heartworm disease were studied. Organs were stained with a polyclonal antibody against Wolbachia Surface Protein (WSP). Tissues from one dog not affected by heartworm disease were used as control. Positive staining for WSP was observed in macrophages from the lungs and liver (Kupffer cells) of 2/3 dogs studied, while all other organs and tissues from the control dog were negative. Positive staining in the lungs was associated with neutrophil infiltration, which was however absent from the liver. The presence of WSP+ macrophages in skin nodules from humans affected by *Onchocerca volvulus* has been reported, but this is, to the authors' knowledge, the first report of the presence of Wolbachia-derived molecules in heartworm-affected dogs.

***Wolbachia* endosymbionts and the immunopathogenesis of filarial disease.**

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Human and animal parasitic filarial nematodes, often the cause of severe disease, harbour intracellular bacteria of the genus *Wolbachia* (Rickettsiales). It is thought that these bacteria play an important role in the pathogenesis and immune response to filarial infection. *Wolbachia* components likely play a role in the induction of innate and adaptive immune responses, thus determining pro-inflammatory or immunomodulatory effects. Crude extracts of *Wolbachia*-containing filariae stimulate cytokine production by monocytes in vitro and in vivo in both human and murine models. The *Wolbachia* surface protein has been shown to stimulate monocytes and neutrophils, with production of proinflammatory cytokines and chemokines, and activation of chemokinesis in neutrophils. Cytokine production and antibody response in BALB/c mice inoculated with soluble antigens from *D. immitis* show a preferential Th1 type of response towards *Wolbachia* derived molecules. It has also been shown that IL-10 is produced by macrophages following incubation with *O. volvulus* extracts in vitro, thus indicating a possible role for *Wolbachia* derived molecules in the immunosuppression observed in chronic filariasis.

Best practice worm management for equids in Africa.

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“Best practice” combines the very best approaches available to address a challenge. Management of worms in equids is the challenge, especially to owners who live in developing communities in Africa. Equids harbour numerous helminth parasite species and often large numbers, which affect their health status and ability to work. The problem is to combat and manage these parasites by sustainable and appropriate recommendations to the owners. In a recent exhaustive study funded by the Department for International Development in the UK, diseases and pathogens in equids and other domestic animals were ranked according to their impact on the poor. Two of the top three pathogens in donkeys included helminths and trypanosomes. Factors such as anthelmintic resistance and environmental awareness are impacting a shift from the frequent use of deworming chemotherapies to nonchemical interventions. Some alternative interventions or technologies which can be used in worm control include faecal removal together with strategic anthelmintic treatment, selective chemotherapy, strategic nutrition and biological control tools (e.g. nematode trapping fungi). Adoption of new technologies is directly correlated to level of education. Numerous studies have shown that there is a current and growing demand for knowledge by the owner or enduser. Making appropriate information about sustainable worm control available to these endusers promises to lead to “best practice worm management”.

How does cysticercosis impact resource-poor communities in South Africa?

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The pig tapeworm, *Taenia solium*, has been recognised as a problem in South Africa for many decades. Recent reviews of the emergence of *T. solium* cysticercosis as a serious agricultural problem and public health risk, and the current status of neurocysticercosis in Eastern and Southern Africa have brought the situation in South Africa into focus. An early report in this country indicated 0.50-25.70% of pigs were infected. Hospital surveys utilising serological and radiological diagnostic techniques have indicated that 28-50% of epileptics, predominantly African and many children were positive for this parasite. This paper will focus on the burden and impact of porcine cysticercosis in South Africa against the background of increasing reports of its occurrence throughout the subregion and current studies underway in the country. The human populations at highest risk of being infected by these parasitic helminths are people living in rural areas most of whom earn their livelihood wholly or partially through livestock enterprises. The impact of this tapeworm on human health which includes the presence, prevalence, how it affects people and their lives socioeconomically and socioculturally as well as the agricultural costs (e.g. production losses) has not previously been considered in this part of the world. The current situation in South Africa will be addressed.

European multicenter field trial on the efficacy and safety of a topical formulation of imidacloprid and permethrin (Advantix™) in dogs naturally infested with ticks and/or fleas.

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In a field trial 363 dogs naturally infested with ticks ($n \geq 1$) and/or fleas ($n \geq 5$) were enrolled at 23 centres in Germany, France and Italy. A total of 229 dogs were treated once with the test product, a topical formulation of imidacloprid 10% and permethrin 50%. 134 dogs were treated once with a registered control product, a topical fipronil 10% formulation, according to the label instructions. All dogs and cats living in the same household were treated with the control product. Cats living with the imidacloprid-permethrin treated dogs were treated with a mono imidacloprid formulation. Efficacy and safety of the products were assessed 2 days and 1,2,3 and 4 weeks after treatment by individual parasite counts and clinical examination. Continuous infestation pressure during the trial period was demonstrated by monitoring other dogs presented to the clinics. Efficacy calculations were based on geometric means of the individual parasite counts compared to pre-treatment infestation. The acute efficacy (day 2) of the imidacloprid permethrin combination vs. the control product was 91.1% vs. 89.7% against *Ixodes ricinus*, 85.4% vs. 80.9% against *Rhipicephalus spp.* and 98.3% vs. 97.0% against *Ctenocephalides spp.* Residual efficacy (day 28) of the two products was 95.2% vs. 69.5% against *I. ricinus*, 98.5% vs. 89.4% against *R. spp.* and 92.5% vs. 93.5% against *C. spp.* Results of the trial proved the safety of both products in treated dogs and in dogs and cats, living in the same household.

Potential of the fungus *Duddingtonia flagrans* to control nematodes in goats in southeastern United States: A dose-titration and dose-timing study.

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Gastrointestinal nematode infections are detrimental to goat production in the southeastern United States. Two studies were completed with naturally infected Spanish meat goat does, testing the potential of the fungus *D. flagrans* to reduce numbers of nematode larvae. In study 1, five levels of fungal spores, given once daily in the diet, were tested in goats kept in metabolism crates. Spore concentrations were 5×10^5 , 2.5×10^5 , 10^5 , 5×10^4 , and 0 spores per kg body weight, respectively. Spores were provided for 1 week and animals followed for another week. Faeces were collected daily to estimate eggs/g and setting up larval cultures. Compared to the control group, the mean larval reduction from day 2 until day 8 was approx. 94, 80, 84 and 61% in cultures from animals given the highest to lowest spore dose, respectively. In study 2, 2.5×10^5 spores were given per kg body weight to does daily, every second or third day respectively, for two weeks. The yield of larvae before and after fungus feeding period was between 48 and 58%, and the average percentage reduction day after fungus dose given was 54.8%, lower than what an equivalent dose caused in the previous study. Reduction on days 2 or/and 3 after fungus dosing fell to 22 and 20% approximately. Daily fungal spore feeding provide more consistent larval reduction than intermittent feeding.

Clinical, histopathological and immunological aspects of neosporosis in experimentally infected dogs.

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Since 1988, the causative agent of neosporosis, *Neospora caninum*, was named, cultivated and recognized as a major cause of bovine abortion in many countries. Although the parasite was originally identified in the tissues of paralyzed dogs, this species was recently considered to be a definitive host shedding infective oocysts. However little is known at present regarding the frequency of shedding of *N. caninum* oocysts by canids in nature and whether dogs shed oocysts more than once. While studies using murine models demonstrated that protective immunity against neosporosis is cell mediated, information on the role of the immune response in canine neosporosis is limited. In this study, the immune responses of experimentally infected dogs were correlated with their parasitological and clinical status. Seven dogs were infected orally on day 0 by feeding them with the brain tissue of chronically infected CBA mice. The dogs were challenged on day 60. No clinical symptoms were observed in any of the infected dogs either after the first or second infection. Four of the seven dogs shed *N. caninum* oocysts after the first infection. Oocysts excretion was observed again after the challenge infection in 2 of these four dogs. Antibody titers (ELISA) to crude antigens were low and only a few antigens were recognized by western blotting. However, five dogs exhibited a specific lymphocytes proliferation to crude *N. caninum* antigen which was even more pronounced after the challenge. One of the two dogs which had shed oocysts was euthanized. Specific DNA was detected by PCR in the spleen, the liver, the brain and the lungs. Immunohistochemistry on the brain material revealed the presence of tachyzoites but no lesions were observed.

A study of IL-4, IL-8, INF- γ and TNF- α in pigs infected with *Ascaris suum*.

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Nematodes, such as *Ascaris suum* are thought to stimulate the immune response of their host towards a Th2 polarisation. The objective the present studies was to examine a single infection with *A. suum* by measuring the cytokine development over a period of 8 weeks. Two levels of 1000 and 5000 single *A. suum* eggs doses were given to 20-25 kg pigs ($n_{1000}=11$ and $n_{5000}=10$). Additionally, 14 pigs were kept as controls ($n_{1000}=8$, $n_{5000}=6$). Peripheral blood mononuclear cells (PBMC) were isolated by Ficoll 0, 7, 10, 12, 14, 17, 20, 22, 28, 35, 42, 49, 54 and 56 days p.i. Mesenteric lymph nodes (MLN) cells draining the jejunum were isolated 12 and 20 days p.i. All cells were stained for IL-4, IL-8, IFN- γ and TNF- α and examined using intercellular staining and flow cytometry. MLN cells found in infected pigs had reduced levels of IFN- γ stained lymphocytes on day 12 p.i., which support the existing theory of a Th1 down regulation in *A. suum* infected pigs. Increased levels in PBMC's of infected pigs were significant 17 days p.i., in both IL-4 stained cells and IFN- γ stained cells from the monocytes gated area. Increased systemic levels of IFN- γ (Th1) and IL-4 (Th2) 17 days p.i. indicate a mixed cytokine response during the expulsion phase. This day may be an interesting date for future immunological studies regarding *A. suum* infections.

Treatment of cattle with an abamectin pour on had no adverse effect on dung beetle populations in Australia.

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Endectocides are known to be excreted via the faeces of treated cattle. Because of their insecticidal activity, endectocides have been implicated in adverse effects on dung fauna. Several papers have reported detrimental effects on adult dung beetles or their developing stages when studied in artificial situations. These papers contribute little to understanding the broader ecological question of any impact on dung beetle populations under typical field conditions. In order to evaluate the effect on dung beetle populations in the field, a study was designed in which eight replicate groups of four cattle were grazed separately in paddocks. Half the groups were treated with abamectin (500µg/kg; Virbamec Pour-On for Cattle) on Days 0 and 42, while the other four groups were left untreated. Faecal pats (2-3 days old) were collected approximately weekly for 84 days and the beetles recovered for enumeration and identification. Eleven species of beetles representing native and introduced species were recovered. There was no apparent effect of endectocide treatment when beetle populations from the treated and the untreated groups were compared statistically. These results indicate that the treatment of cattle with an abamectin pour on does not adversely effect dung beetle population. These results are not surprising as insect populations must be sufficiently resilient to withstand adverse environmental conditions. The application of an endectocide to cattle for parasite control on two occasions six weeks apart would represent a minor environmental insult.

Genetic diversity of *Toxoplasma gondii* isolates from free ranging chickens from many countries.

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Toxoplasma gondii infections are widely prevalent in human beings and animals worldwide. Only a small percentage of exposed adult humans develop clinical signs. It is unknown whether the severity of toxoplasmosis in immunocompetent persons is due to the parasite strain, host variability or to other factors. *Toxoplasma gondii* isolates have been classified in 3 genetic types (I, II, III) based on restriction fragment length polymorphism (RFLP). It has been suggested that type I strains or recombinants of types I and III are more likely to result in clinical ocular toxoplasmosis, but genetic characterization has been limited essentially to isolates from patients ill with toxoplasmosis. Until recently, most isolates of *T. gondii* from animals genetically typed were type II or type III. We have selected to compare *T. gondii* isolates from chickens from many countries because chickens become infected mostly by feeding from the ground contaminated with oocysts and prevalence of *T. gondii* in chickens is a good indicator of the strains prevalent in their environment. Furthermore, most isolates from animals or humans that were genetically categorized were from Europe or the United States. Using the SAG2 locus, we found that 51 of 73 (70%) isolates of *T. gondii* obtained from asymptomatic free range chickens from Brazil were type I whereas isolates from chickens from the US, Egypt, and other countries were type II or III. Mixed genotypes were not found.

Characterization of moxidectin resistant *Trichostrongylus colubriformis* and *Haemonchus contortus*.

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The development of moxidectin resistance (MOX-R) in sheep parasitic nematodes already carrying multiple resistances to other anthelmintic groups has made control of these strains very difficult. The anthelmintic resistance patterns of MOX-R strains of *Trichostrongylus colubriformis* and *Haemonchus contortus* was characterized to provide an insight on the remaining role of anthelmintics in control of such strains. Homozygous MOX-R individuals of both species were unaffected by moxidectin. For MOX-R heterozygotes a dose rate of 200µg/kg abamectin (ABA) oral removed 25% of *H. contortus* while 200µg/kg MOX oral achieved a 72% reduction. Doubling the dose rate of ABA lifted the mean efficacy of the anthelmintic to 37%. In *H. contortus* MOX-R is inherited as an incomplete dominant against abamectin but as an incomplete recessive against moxidectin. A dose rate of 8mg/kg levamisole and 400 µg/kg naphthalophos achieved a >95% reduction in worm count of the MOX-R homozygous *H. contortus* but only 85 and 7% respectively against the MOX-R homozygous *T. colubriformis*.

Withdrawn

Characterisation and PCR-SSCP analysis of Benedeniines (Monogenea: Capsalidae) from Marine Fish in China by rDNA sequence.

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As it is not easy to identify some species of Benedeniines (Monogenea: Capsalidae) only by their morphological characteristics, we used molecular methods to mark genetically four benedeniine capsalid specimens: *Benedenia sargocentron* from *Sargocentron spiniferum*, *Neobenedenia melleni* from *Epinephelus awoara*, *Neobenedenia* sp1 from *E. akaara* and *Neobenedenia* sp2 from *Lutjanus sanguineus*. The nuclear ribosomal DNA region spanning the first internal transcribed spacer (ITS1) was amplified and sequenced. The lengths of ITS1 ranged from 406~428bp. *Neobenedenia* sp1, *Neobenedenia* sp2 and *N. melleni* are very likely the same species since their ITS1 sequences are high identical, with a difference of 0.7%. The difference of sequences between *Benedenia sargocentron* and *Neobenedenia* spp. is 33%. Based on the sequence difference, single-strand conformation polymorphism methods (SSCP) was established for identification of *Benedenia* and *Neobenedenia*.

Development of an avian ionophore-tolerant *Eimeria* vaccine for the control of coccidiosis in chickens.

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Avian coccidiosis is usually controlled by prophylactic chemotherapy but the rapid emergence of drug resistant strains, difficulty and expenses of developing new drugs has warranted the search for new vaccines. We describe here the development of a live ionophore-tolerant attenuated *Eimeria* vaccine containing *E. tenella*, *E. maxima* and *E. acervulina*. Drug resistant *Eimeria* species were isolated, and subjected to selection for precocity by passage in 1-2 weeks old chickens. The best precocious lines of each species were combined into five vaccine batches at different doses and administered by gavage to 150 chickens divided into five treatment groups (vaccinated medicated with monensin (100 ppm) (VM), vaccinated unmedicated (VUM), medicated unvaccinated (MUV), unvaccinated unmedicated challenged (UVUM-C) and unvaccinated unmedicated non-challenged (UVUM-NC) groups). A total of 300 Chinese Yellow chickens (of even sex) were randomly allocated to five treatment groups with three replications of 20 birds each (10 of each sex), and 1 ml of the vaccine administered by gavage to VM and VUM groups and monensin given to the MUV group at the rate of 100 ppm. At eight weeks of age, male VM birds had a higher live weight than the VUM and MUV groups, the FCR was 7.23% higher for VM birds, 6.10% higher for VUM birds, and 3.75% for MUV birds compared to the UVUM control groups. There was a significant difference ($P=0.05$) in overall performance of VM birds compared to the VUM and MUV birds. It showed that the bird's immunity was satisfactory.

Progress in eradication of hypodermosis from the European Union.

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Cattle hypodermosis is widely distributed over the northern hemisphere and has marked effects on bovine productivity and health. This has prompted many European countries to launch organised control or eradication campaigns. The feasibility of eradication at the EU level relies on : 1) biological factors (high parasite specificity, seasonal development of both species of warble flies) 2) the availability of safe, easy to use and highly cost effective insecticides to be used on very large numbers of animals 3) the development and use of highly specific and sensitive serological tools to monitor the progress in eradication and certify the parasite free status of the different EU members 4) a reliable and computerized herd identification system which is available in many European countries. As a consequence warble fly has been eradicated from Denmark, Ireland, The Netherlands and U.K. and is about to be eradicated from the Czech Republic, France, Germany and Switzerland. The sanitary and financial returns of these eradication programs were shown to be beneficial to all the partners of cattle production, to the quality of environment and to the consumers. In order to avoid reinfestations, surveillance at the borders remains critical as in other countries such as Austria, Belgium, Italy, Portugal and Spain a national eradication program has not started yet.

Disease surveillance of lesions in pigs at slaughterhouses during period 1996-2002 in the Czech Republic.

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Pathological lesions in pigs brought to slaughterhouses were monitored in order to study the prevalence of economically important subclinical swine diseases between 1996 and 2002 in the Czech Republic. The skin of slaughtered and scalded pigs was examined for papular dermatitis caused by *Sarcoptes scabiei var.suis* infections (total number = 23,108 slaughtered pigs). The severity of skin findings was scored 0 to 3 in compliance with the ADS methodology Pointon (1992). The liver of slaughtered pigs were examined for milk spots caused by the development of *Ascaris suum* (total number = 41,894 slaughtered pigs). The severity of the disease was scored 0 (no milk spots), 1 (1-4 spots), 2 (5-15 spots) and 3 (16 and more spots). For each herd, the average milk spot score (AMSS)-designed by Zizlavsky (2000)- was calculated. In the past six years, positive health development has also been recorded in the prevalence of milk spots on the liver and the hypersensitive form of sarcoptic mange. The milk spots prevalence was 43,70% (n=3,798) in 1996-1997, later 31,20% (n=21,578) in 1999-2000, 20,00% (n=11,037) in 2001 and 18,68% (n=5,481) in 2002. The mange prevalence was 54,10% (n=5,007) in 1996-1997, than 9,02% (n=11,258) in 1999-2000, later 6,80% (n=5,098) in 2001 and 8,60% (n=1,745) in 2002. Compared with the 1996-1997 period (ADS=0,620), the consumption of peroral and parenteral endectocides in 1999-2000 increased by about 10 % (ADS=0,110) - the number of sows in breeding herds in the Czech Republic dropped by 8 %. During the year 2001 was observed ADS=0,08 ! A major reason for that probably has been the launch of effective antiparasitary programmes as a necessary fundamental veterinary measure on pig farms. In the year 2002 were used the popular equivalents of avermectins (ADS=0,101) with the same patterns like doramectin and the different effectivity.

Effect of *Tetrameres americana* (Cram, 1927) in chickens fed with high and low protein diets.

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The mature female *Tetrameres americana* is found embedded in the proventricular glands of birds and is known to be haematophagous. A study was conducted to determine the effect of *T. americana* in chickens fed different levels of protein. Sixty chicks were weight matched into four groups of 15 each. Groups 1 and 2 were fed high protein diet containing 17.8% crude protein (CP) whereas groups 3 and 4 were fed low protein diet containing 13.3% CP. The feed and water were supplied *ad libitum*. At two-week of age, groups 1 and 3 were experimentally infected by a single dose of 100 L₃ of *T. americana* whereas groups 2 and 4 were left as uninfected controls. Weight and blood were taken every 14 days for 12 weeks when the experiment was terminated. The blood was analysed for packed cell volume (PCV), haemoglobin (Hb) and pepsinogen levels. Results showed that the infected chickens on high protein diet had a mean of 11.2 (range 0 - 20) worms whereas chickens on low protein diet had an average of 8.7 worms (range 1 - 14). Infected chickens fed low protein diet showed slightly lower weight gains compared to their counterparts the condition that was not noticed in high protein diet fed groups. Infected chickens showed significantly lower PCV ($p < 0.05$) from 4 to 10 weeks post infections when compared to their counterparts. Haemoglobin concentration was significantly lower ($p < 0.05$) in infected chickens fed low protein diet during week 2 and 6 post infection whereas pepsinogen level was statistically higher in chickens infected with *T. americana* compared to controls ($p < 0.05$). In addition, low protein diet seemed to exacerbate the condition. These results demonstrate that *T. americana* has the ability of causing transient anaemia and elevating pepsinogen level in *ad libitum* fed chickens especially so in chickens fed low protein diet.

Gastrointestinal nematode infections in sheep on communal grazing land in Nyandarua District of central Kenya.

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In many parts of tropical and subtropical Africa, livestock owners traditionally graze their livestock on communal land. Information on the epidemiology of gastrointestinal nematode infections in small ruminants on communal grazing land in Kenya is lacking. The objective of this study was to determine the levels of gastrointestinal nematode infections in sheep grazing on communal land in the highlands of central Kenya, in relation to flock owners' deworming practices and weather conditions. The study was carried out over a period of 12 months (August 1996 - August 1997). In August 1996, five Corriedale, 4 to 6 months old ram lambs, belonging to each of 10 sheep owners (total of 50 lambs) in the central Kenya were selected and ear-tagged. During the study period, the lambs grazed together with the other sheep on the communal land. The flock owners were left to deworm their sheep including the study lambs following their normal practices, but to record each time this was done. Nematode egg counts (EPG) for the study lambs were determined every 3 weeks and faecal cultures prepared and larvae identified during the dry and wet seasons. Six of the 10 flock owners dewormed their sheep every 3 to 4 months, 2 dewormed twice and 2 only once during the 12 months. The majority of the flock owners dewormed sheep during the season of short rains (70%) in October and November and long rains (80%) from April to July. This resulted in a significant reduction of faecal egg counts in the study lambs and the proportion of animals shedding nematode eggs during the wet seasons, compared to the dry seasons. However, in all cases, the study lambs got re-infected soon afterwards and in most cases, the lambs had high EPG 6-7 weeks after treatment. *Haemonchus contortus* followed by *Trichostrongylus* spp. were the most prevalent nematodes in faecal cultures. Results from this study indicate that under the communal grazing system practised in parts of central Kenya, sheep are constantly exposed to GIT nematode infections. Control can be achieved through management interventions targeting all or the majority of the flocks. Anthelmintic treatments administered during the rainy seasons may be an effective strategy.

Efficacy of an ivermectin (0.2 mg/kg) and praziquantel (1.0 mg/kg) combination paste against cestodes, nematodes, and bots when administered as a single oral dose to horses.

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The efficacy in horses of praziquantel (PZQ - 1.0 mg/kg bwt) combined as a paste with ivermectin (IVM - 0.2 mg/kg bwt) against cestodes, nematodes, and bots was tested when the paste was administered as a single oral dose. In one dose selection study, the effective cestocidal dose of PZQ in the IVM + PZQ combination was determined to be 1.0 mg/kg bwt. Two studies were conducted to confirm the efficacy of the IVM + PZQ combination. In these studies, animals were not treated (Control) or received IVM + PZQ paste, IVM alone, or PZQ alone, orally, once on Day 0. Compared to Controls, horses treated with IVM + PZQ had significantly ($p < 0.05$) fewer and with >99% reductions of adult *Anoplocephala perfoliata*, *Coronocylus coronatus*, *C. labiatus*, *C. labratus*; *Cyathostomum catinatum*; *Cylicocylus leptostomum*, *C. nassatus*, *C. insigne*; *Cylicostephanus calicatus*, *C. goldi*, *C. longibursatus*, & *C. minutus*; and L2 & L3 *Gasterophilus intestinalis*, L3 *G. nasalis*; and L4 Cyathostominae genera *Cyathostomum*, *Cylicocylus*, and *Cylicostephanus* at necropsy ~2 weeks post-treatment. Additionally, results demonstrated the non-interference of PZQ when combined with IVM for the control of nematodes and cestodes when the IVM + PZQ paste was administered as a single oral dose. No adverse drug events were observed with the IVM + PZQ drug treatment.

The effects of paraherquamide and 2-deoxy-paraherquamide on cholinergic receptor subtypes in *A. suum*.

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We have examined the effects of the antibiotic anthelmintic paraherquamide and its synthetic derivative 2-deoxy-paraherquamide. We used obtained dose-response relationships of *A. suum* muscle strips to cholinergic agonists. The agonists examined included the cholinergic anthelmintics oxantel, bephenium, thenium, pyrantel, levamisole and methyridine. The potency of the antagonism produced by paraherquamide and 2-deoxy-paraherquamide was measured by conventional pharmacological techniques estimating pA_2 values by non-linear regression. We observed that paraherquamide and 2-deoxy-paraherquamide are potent selective cholinergic antagonists that distinguish, on a basis of the pA_2 values, subtypes of cholinergic receptor in *Ascaris* muscle corresponding to: nicotine-sensitive, *N*-subtypes; levamisole-sensitive, *L*-subtypes; and bephenium-sensitive, *B*-subtypes. We also observed that methyridine and nicotine activated the same receptor subtype and that levamisole and pyrantel also activated the same receptor subtype. The importance of these observations includes a more detailed description of the mode of action of paraherquamide and 2-deoxy-paraherquamide and suggest a new approach for dealing with levamisole and pyrantel resistant parasites. NIH to RJM: RO1 A147194-02.

Comparison of infectivity of *Trichinella zimbabwensis* in indigenous Zimbabwean pig (Mukota) and Large White.

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10 pigs (5 Mukota, 5 Large White) were each experimentally infected with approximately 150 000 larvae of crocodile derived *Trichinella zimbabwensis*. Two pigs, one of each breed were not infected and these made up the control group. Blood samples were serially collected every 7 days post-infection. Full blood counts were carried out and the sera were analysed for creatinine kinase (CK) and lactate dehydrogenase (LDH). On Day 42 post-infection, 3 pigs from each group were slaughtered. The tongue, psoas, masseter, snout and intercostal muscles were collected from each pig and digested by the HCL-pepsin method. Larvae per gram (Lpg) of each muscle were determined. Mean CK levels were consistently higher than normal in the sera of Large White pigs, recording the highest level of 1254iuL (normal range: 65.7-489.4 iuL) on Day 35 post-infection. CK levels in Mukota pigs reached their peak of 732iuL on Day 21 and decreased to the normal range towards the end of the experiment. There were significant differences in levels of CK between the two breeds on day 35 and 42 with the Large White breed recording higher levels. There were no significant differences in levels of LDH throughout the whole period, although the exotic pigs recorded higher levels than the Mukota. LDH levels peaked on Day 14 for both breeds i.e. Large White-616iuL, Mukota-624 iuL (normal range: 159.6-424.7). There were no significant differences in white blood cell counts throughout the whole duration of the experiment. There were no significant differences in mean Lpg between the breeds for the masseter, snout, and tongue muscles. There were significant differences in mean Lpg for the diaphragm-Large White-24.6, Mukota-0.2, and psoas: Large White- 2.7, Mukota- 0.07.

First case report of dogs infected naturally with *Babesia canis vogeli* in South Africa.

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A pilot study on the prevalence of *Babesia canis* infections in abandoned or stray dogs in shelters showed that there were dogs infected with *Babesia canis vogeli* after isolating and sequencing the 18S nuclear subunit ribosomal RNA gene. A total of 41 blood samples were collected in Bloemfontein, one of the cities studied. Screening of the blood samples using the Reverse Line Blot revealed that 28% of the dogs sampled carried the *Babesia canis vogeli* parasite, 3% carried *Babesia canis rossi* parasite and 25% had an unspecific *Babesia* infection.

Progress in the molecular diagnosis of cyathostomins: Implications and prospects.

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The cyathostomins are common, pathogenic nematodes of horses. These parasites consist of a complex group containing over 50 species. The detailed biology of the free-living and host stages of cyathostomins is not yet known at the single species level. Furthermore, the role of individual species in the pathogenesis of mixed strongyle infection remains unclear. These nematodes cannot be classified to species as pre-parasitic stages, and there are limited morphological features that allow identification of the parasitic larval stages. To investigate the relative importance of individual species, we have developed species-specific DNA probes for identification of six common cyathostomins, *Cylicocyclus ashworthi*, *Cylicocyclus nassatus*, *Cylicocyclus insigne*, *Cyathostomum catinatum*, *Cylicostephanus longibursatus* and *Cylicostephanus goldi*. These probes are based on intergenic spacer (IGS) region DNA sequences. A seventh probe has also been designed to act as a positive control to identify all these members of the Cyathostominae. We used the DNA probes to identify fourth stage larvae, harvested from the diarrhoeic faeces of horses suffering from larval cyathostominosis. The results indicated that clinical larval cyathostominosis is predominantly caused by mixed species infections. We have also utilized the DNA probes to identify species of cyathostomin eggs present in the faeces of horses treated with larvicidal doses of fenbendazole. Species identification was performed before and after treatment on parasite populations known to be resistant to this drug. The results suggested that the aforementioned cyathostomin species show different egg reappearance periods after fenbendazole treatment. The findings will be discussed in the context of the impact that these species have on the pathogenesis and epidemiology of strongyle infections.

Cloning and expression of acetylcholinesterase genes from *Dictyocaulus viviparus*.

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Dictyocaulus viviparus is a pathogenic lungworm that affects cattle in temperate regions. Adult parasites secrete a number of acetylcholinesterases (AChE), against which infected animals have strong antibody responses. These enzymes may play an important role in the survival of these parasites within the lungs. Two variants encoding secreted AChEs have been cloned and expressed in *Pichia pastoris*. The two variants (Dvace-1 and Dvace-2) were 614 and 615 amino acids long and showed 94.7% identity to one another. The highest level of identity was with the ACE-2 sequence of *Caenorhabditis elegans*. The structure of DvACE-1 and DvACE-2 showed conservation at residues representative of the catalytic triad and at a critical side chain residue of the choline-binding site. The two *D. viviparus* AChE sequences differed from one another in the number of potential glycosylation sites, the number of cysteine residues and at one residue in the peripheral anionic site. Both variants have a unique insertion of 38 amino acids, which is not present in AChE sequences of other species. Preliminary analysis suggests that this may form a loop at the enzyme surface. Southern blotting and PCR experiments indicated that the genes encoding these enzymes are distinct. When expressed in recombinant form, DvACE-1 and DvACE-2 were active and differed subtly in their biochemical characteristics. Both recombinant enzymes have a strong substrate specificity for acetylcholine and are inhibited only by AChE inhibitors, indicating that they represent true AChEs.

The bovine gut cellular responses following primary and challenge infection with *Calicophoron microbothrium metacercariae*.

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A total of 24 Tuli steers aged one year each were subdivided into four groups (I–IV) of six animals each and infected with different doses of *Calicophoron microbothrium metacercariae*. Animals in groups II and I were each immunized with 5000 metacercariae on the first day of the study. At day 90 post immunization, animals in group I were de-wormed against mature amphistomes using Oxytoclozanide. A challenge dose of 15 000 metacercariae was then administered to each of the animals in groups I and II at day 150 of the study while group III animals received an immunizing dose of 15000 metacercariae. Group IV animals remained as uninfected controls. The animals were then serially slaughtered at days 28 and 42 post-challenge infection, established amphistomes recovered and samples for routine histo-pathology examination and cytology collected from the jejunum, duodenum, abomasum and the rumen. The gross pathology lesions observed comprised, mild thickening and corrugation of the duodenal mucosa more severe in group III. Mucoïd enteritis was the predominant lesion in groups I and II. Goblet cell hyperplasia, reactive Peyer's patches, fibrous tissue deposition, infiltration of mononuclear cells, including macrophages, lymphocytes and plasma cells were predominant in groups I and II. A heavy infiltration of eosinophils and mast cells in the intestinal mucosa of all the infected groups was also present and heavier in groups II and III. The globule leukocytes and the basophils occurred in low numbers in all the infected groups. The results demonstrate that cattle upon reinfection with amphistome metacercariae can mount resistance which may involve eosinophils and mast cells as the cellular effector system. The globule leukocytes and basophils appear unimportant in the development of resistance to amphistome reinfection in cattle.

Comparison of the “safety-net” and “soft-kill” effects of macrocyclic lactone products used for heartworm prevention.

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The potent “safety net” (reach-back, retroactive, clinical prophylactic) activity of monthly administered prophylactic doses of ivermectin (IVM) against older larvae and “immatures” and its “soft-kill” (slow killing) effect against adult heartworms (*Dirofilaria immitis*) and the general lack of such activity by milbemycin oxime (MBO) are now well documented. These additional efficacy benefits of IVM have practical relevance in situations of owner compliance failure. In summary, “safety-net” effects and adulticidal activity of IVM are superior to that of MBO. Drug effects of IVM are related to the age of the heartworms at initiation of monthly treatment. The earlier treatment is started, the more stunted the worms are and the shorter their survival time, the less likely a patent infection will develop, the lower the microfilarial count, and the shorter the patent period. Conversely, the later treatment is started, the longer the worms live, the more likely antigen (Ag) will be detected, the higher the Ag level, and the longer the dog will be Ag-positive. While treatment for 6-12 months reduces worm mass in old worms by 20% or more, which translates to a reduction in worm burden, treatment for 2 years or longer may be needed to kill 95% or more older adult heartworms. Drug effects are not greatly enhanced by increasing the dosage and/or administering the drug at shorter intervals, and it appears that continuous monthly treatment is needed to produce the full effects of the drug. The “safety-net” and “soft-kill” effects of monthly administered topical selamectin (SEL) and oral moxidectin (MOX) and the injectable formulation of MOX generally are higher than those for MBO, but the limits of such efficacy for SEL and MOX are yet to be determined.

Use of medical information systems for risk prediction and control of *Schistosoma haematobium* in Kenya.

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Recent work indicates it is possible to predict the distribution and abundance of disease agents using new remote sensing and geographic information systems tools. A 5km² climate surface grid on 30-year average temperature and rainfall data can be used to calculate the number of growing degrees required for a disease agent to develop in a 'typical' year. Each organism requires a minimum temperature to develop. Growing degrees are the number of degrees over the minimum temperature times the number of days per month. By dividing accumulated growing degrees for a given period by the thermal energy, in growing degrees, required to complete the life cycle (293 for *S. haematobium*) the potential generations per time interval (eg. annual, seasonal), under given moisture thresholds, can be calculated to indicate "where, when and how bad" a disease is likely to be in a given region. Advanced Very High Resolution Radiometer (AVHRR) satellite sensor data was used as climate surrogate data to supplement results of the climate grid. A 10km buffer created around known snail locations was used to extract both maximum land surface temperature (Tmax) and vegetation index (VI) from the AVHRR sensor data (1km² resolution at earth surface). The range for Tmax was from 15C-28C while the range of VI was from 130-157. The two species of snail that transmit *S. haematobium* in Kenya had the same requirements for Tmax and VI factors. A "best fit" model is created by generating a query overlay, within the GIS, of the areas in which both Tmax and VI criteria are met, based on known sites with over 5% prevalence rates.

The activity of selamectin (Revolution®) and imidacloprid (Advantage®) against cat flea (*Ctenocephalides felis felis*) larvae in carpeting.

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On Day 0, 24 cats were each infested with 100 adult fleas and allocated to topical treatment with selamectin (6mg/kg), imidacloprid (10mg/kg) or placebo, applied 4 hours later. Cats were housed individually in cages with a grid floor and a solid catch pan underneath. A carpet square with 25 circular plugs (60mm) cut into it was placed in each catch pan. One day later, debris and flea feces remaining in the cat's hair coat was massaged off onto the carpet below. Then carpet squares were removed from each cage and 2 plugs were removed from each square, infested with 25 flea larvae and incubated to allow maturation of larvae to adult fleas. Cats were combed to remove fleas and carpet squares were stored until the next infestation. On days 7, 14, 21 and 28, the above procedure was repeated. Percentage reductions in numbers of adult fleas from larvae incubated with plugs removed on days 1, 8, 15, 22 and 29 were 97.9, 90.7, 98.9, 98.3 and 98.1, respectively, for selamectin and 83.2, 77.7, 86.7, 75.8 and 91.4, respectively, for imidacloprid, when debris was allowed to accumulate in the carpet from previous exposures. When plugs were exposed to cats for only one 24 hour period after each infestation, percentage reductions were 97.9, 92.4, 81.0, 77.8 and 78.0 for selamectin and 83.2, 56.7, 27.0, 29.0 and 40.2 for imidacloprid. Differences between the two treatments were significant ($P \leq 0.05$) on all days except days 8 and 29 from multiple exposures. Thus debris from selamectin-treated cats deposited in carpet appeared to have better larvicidal activity than that from imidacloprid-treated cats.

Prevalence of major gastrointestinal parasites in equids from Spanish abattoirs.

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The gastrointestinal tracts of 190 horses, mostly foals (76%), were examined after slaughter at different abattoirs from central Spain during the period 2002 to 2003. A quantitative study was carried out on tapeworms and a semiquantitative one on the rest of endoparasites. A high number of animals (91%) was parasitized with bots and/or helminths. Four different major groups of parasites were found in 7% of the animals (bots, strongyles, ascarids and tapeworms), whereas only one was in 20% of them. The most frequent groups of parasites were bots (80%: *Gasterophilus intestinalis* among others), strongyles (63%: cyathostomes, *Strongylus vulgaris*, *S. edentatus*) and ascarids (51%: *Parascaris equorum*). Tapeworms (*Anoplocephala perfoliata*, *A. magna*) were recovered from 39% of the intestines. It has been the first detection of *A. magna* in Spain with a prevalence of 19%, only in foals and usually associated to *A. perfoliata*. Cyathostomes were present in 100% of the horses positive to strongyles and *Strongylus* spp in 34% (only 25% of them had verminous aneurism). Data on seasonal distribution, pathological lesions and parasite burdens will be presented. Financial support from Virbac, S.A. is gratefully acknowledged.

***Neospora caninum* abortion in a dairy and beef herd: use of horizontal and vertical transmission parameters to assess the sensitivity and the specificity of an Indirect Immuno-Fluorescence Antibody Test.**

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The protozoan parasite *Neospora caninum* is regarded as an important infectious agent causing abortion in cattle worldwide. The only way to identify chronically infected animals is by detecting antibodies in the blood with different serological assays. In the present study an evaluation of the performance characteristic of a serological test (an in-house IFAT) for the diagnosis of *N. caninum* infection in cattle at different sampling periods was performed. In a farm experiencing *N. caninum* abortion, pre-colostral blood samples were collected from each newborn calf together with a blood sample from each dam. Two cross sectional blood samplings were also performed in the farm. Dam's sera were categorized into true infected and true uninfected animals on the basis of different examinations or criteria: immunohistochemistry or PCR on the tissues of the corresponding fetus, serological status of the aborted fetus or newborn calf, serological status of each dam according to the two cross sectional samplings and genealogy trees. The IFAT had a specificity of 95% and a sensitivity of 75% when cross sectional sera were considered. At parturition, the IFAT had a specificity of 96% and a sensitivity of 81%. When the dam's serological status was deduced from the newborn serological results, the sensitivity of the test reached 93%.

The effects of a imidacloprid and permethrin combination against developmental stages of *Ixodes ricinus* ticks.

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The castor bean tick *Ixodes ricinus* is vector of several agents of diseases (e.g. Borreliosis, Ehrlichiosis Babesiosis) that threaten the health of man and his companion animals. Thus exposition prophylaxis is needed in order to avoid infestation with ticks and transmission of tick-borne diseases. The topical solution containing a combination of 8.8%w/w imidacloprid and 44%w/w permethrin, showed high efficacy against larval, nymphal and adult stages of *Ixodes ricinus*. In the *in-vitro* experiments the different tick stages were placed on hair collected from dogs treated 7, 14, 21 or 28 days before, or on filter paper impregnated with the compounds. In the *in-vivo* part of the study, adult ticks were placed on shaved regions of the treated dogs. Tick showed avoidance behavior in all experiments, a clear signal for the repellent effect. A contact time of one hour with hair from treated dogs was sufficient to kill *Ixodes* ticks, thus demonstrating the acaricidal effect. Both effects lasted for four weeks over the length of the experiment. Ticks that got in contact with compound on surface, either treated hair or filter paper, stopped immediately and raised their fore-legs. In the case of the *in-vivo* experiments, they suddenly dropped off the dog, in the case of *in-vitro* experiments they turned round and went back. After a contact time of one hour with hair from treated dogs, tick were found 2 hours later lying on their back, showing only slight paralytic movements. They never recovered and died within 24–48 h after first exposure. The experiments clearly showed that the combination of imidacloprid and permethrin offers besides protection against flea infestation a significant long-lasting prevention against tick infestation.

Predisposition to *Ascaris suum* infections in neonatally exposed pigs.

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Earlier it has been shown that pigs may be predisposed to *Ascaris suum*. However, this phenomenon has not previously been investigated in pigs that have been exposed early in life. From the age of 3 weeks, 4 litters of outdoor pigs were infected with 25 *A. suum* eggs/kg body weight/day once weekly for 9-10 weeks. The pigs were weaned at the age of 7 weeks and allocated to 6 random groups. The pigs were then treated with piperazine and placed in individual cages for 48 hours for worm collection. Thereafter, the pigs were returned to their groups and re-infected with *A. suum* according to the earlier protocol. After 10 weeks all pigs were slaughtered for worm recovery. *A. suum* egg excretion was followed throughout the experiment. Though overall prevalence did not change much from treatment (81%) to slaughter (77%), all 4 litters did not respond equally well to the 2 infection periods. At treatment, infection levels varied considerably between pigs but to a lesser degree between litters. However, at slaughter 2 of the litters harboured a mean of only 1 worm/pig compared to 20 at treatment and prevalence decreased with 20%. In contrast, the 2 other litters had a mean of 23 and 17 worms at treatment and slaughter, respectively, and seemed to respond better to the second infection as prevalence (17%) and fecundity (12%) increased. Furthermore, they had a significant correlation between individual worm burdens at treatment and slaughter ($p=0.017$). The results confirm that moderate neonatal exposure may result in high worm establishment and the strong litter effect may offer some confirmation that infection levels and patterns may be influenced by genetic factors so that some pigs are more susceptible to infections.

Repellent efficacy of a combination containing imidacloprid and permethrin against the sand fly *Phlebotomus papatasi* on dogs.

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Sand flies of the genus *Phlebotomus* are the insect vectors of the protozoa parasite *Leishmania infantum*, the causative pathogen of leishmaniasis in humans and dogs. The aim of the study was to evaluate the repellent efficacy of imidacloprid 10%w/v/ permethrin 50%w/v in a spot-on formulation against *Phlebotomus papatasi* on dogs. Twelve laboratory-bred beagle dogs were allocated to two groups of six dogs each, one treatment group and one untreated control. The dogs in the treatment group received 0.1 ml per kg body weight of the test product. Dogs were sedated and exposed for about 1.5 hours on a weekly base to about 200 female sand flies. The study duration was four weeks. Live and dead flies were frozen and counted. The feeding status was determined by stereomicroscope. The repellent effect was based on the feeding rate in the treatment group in comparison to the control group. The product was well tolerated and no adverse reactions were recorded in any of the treated dogs throughout the study. The results showed a repellent effect of 94.6% (day 1), 93.3% (day 8), 80.0% (day 15), 72.8% (day 22) and 55.9% (day 29). Together with the insecticidal activity, this study clearly demonstrated the potential of the imidacloprid/ permethrin combination against sand flies, thus reducing the risk of transmission of *Leishmania infantum* to dogs.

Safety study on pregnant mares orally treated with a combination of ivermectin praziquantel.

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A blinded field study was conducted to evaluate the clinical and reproductive performance effects of pregnant mares orally treated with an anthelmintic containing a combination of ivermectin praziquantel and to assess the viability of their neonates. Forty parasite-affected and confirmed pregnant mares were selected from one stud yard. They were randomly allocated into two groups, one treated and one placebo (n = 20), and dosed at three times the therapeutic dose rate (yielding ivermectin 0.6 mg.kg⁻¹ and praziquantel 4.5 mg.kg⁻¹) fortnightly until parturition. Physical examinations were performed on both groups of mares and their neonates after birth (on D30, D60 and D90), the goal being to identify a dose-related effect. As an aid in assessing general health, haematological parameters and blood serum chemistry were monthly recorded on mares. Minor alterations in blood constituents were observed without biological significance. Reproductive performance was not affected by the unusual treatment duration, the high dose level of use, although administered during the crucial 30 to 60 days of the equine embryonic period. Neither side effect on mares nor abortion was reported. The follow up on foals for a 3-month period did not detect any abnormality. The safety of the combined product orally given to pregnant mares was fully demonstrated and documented in this study.

Prevalence of tongue worm infection in stray dogs of Shahrekord, Iran.

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The present study was undertaken in order to determine the prevalence of pantastomid parasites in stray dogs between 16 November 2002 and 16 April 2003 in Sahrekord from Chaharmahalobakhtiari province, Iran. In order to 143 stray dogs were shot and from their head prepared longitudinally section to expose the nasal cavity and worms were carefully removed. Adult *Linguatula serrata* were found in the nasal cavities 89 (62.2 %) dogs. The infestation rate was 67.4% and 53.7% in male and females, respectively. Examined dogs were divided to 3 age groups, including 1-2, 3-4, and up to 5 years old. There was a significant relation between age and infestation with *L. serrata* ($P<.01$). The most rate of infestation was in second group. The number of parasite in each dog varied from 1 to 29 and totally 382 adult parasites were collected of which 219 were female (57.3%) and 163 male (42.7%). Adult *L. serrata* were all registered for the first time from dogs in Iran. This study indicates that infestation with *L. serrata* occurs commonly in stray dogs of this region in Iran.

Biological and environmental factors affecting the survival of *Otodectes cynotis* (Acarina, Psoroptidae) off the host in natural and laboratory conditions.

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The biological and environmental factors affecting the off-host survival of *Otodectes cynotis* (Acarina, Psoroptidae) ear mites have been investigated in natural and laboratory conditions. From November 2000 to November 2002, mites were collected monthly from cats and microscopically identified and divided into four groups according to sex and life stages (males, females, nymphs and larvae); each group was placed in different Petri dishes. In laboratory conditions the mites were placed in an incubator maintained at 95% relative humidity (r.h.) and at temperatures of 10°C or 34°C. In field conditions the mites were placed in outdoor environment and protected from rain and wind. All plates were examined by stereomicroscopy every 24h until all the mites were dead. Mechanical stimulation with a needle was used to evaluate the vitality or death of the mites. The data were statistically analysed by multiple linear regressions and survival analysis. At 10°C mites were found to be alive between day 15 and 17, while at 34°C between day 5 and 6. The Maximum Survival Time – MST – of females was significantly higher than that of other stages. In field conditions females and nymphs had a higher mean MST than males and larvae (9 days vs 8 days respectively); females also had a higher mean LT50 than other mites (6 days vs 5 days). The survival of mites was showed to be more significantly influenced by temperature than humidity, with a longer survival time at decreasing temperatures.

An update on *Toxoplasma gondii* infections in California sea otters.

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Toxoplasma gondii infection is associated with fatal meningoencephalitis in southern sea otters (*Enhydra lutris neries*), a federally-listed threatened species. The source of *T. gondii* infection for these animals is unknown. Aside from cats, no oocyst-shedding hosts have been identified for *Toxoplasma*, and otters rarely consume recognized intermediate hosts. Since 1997, we have completed necropsies of California sea otters, along with serological testing, parasite isolation and brain immunohistochemistry. Because of the apparent terrestrial origin of *T. gondii*, we expected to find that natural infections were uncommon. However, *T. gondii* infections were detected in 36% of freshly dead otters examined between 1997 and 2001. We developed and validated an indirect fluorescent antibody test (IFAT) for *T. gondii*, and used the IFAT to screen sera from live, free-ranging sea otters from California, Washington and Alaska: 36% of free-ranging California sea otters were seropositive for *T. gondii*, compared to 38% of Washington otters and 0% of Alaskan otters. To investigate the apparent emergence of *T. gondii* infections in California otters, we examined spatial, environmental, and demographic data from 223 sea otters for associations with *T. gondii* exposure. Risk factors associated with *T. gondii* seropositivity included male gender and older age class. Spatial analysis revealed 2 “high-risk” sites for *T. gondii* exposure. Most importantly, otters sampled near heavy freshwater outflow were almost 3 times more likely to be seropositive to *T. gondii* than otters sampled near areas of low flow.

Acaricide resistance mechanisms present in southern cattle ticks, *Boophilus microplus*, from Mexico.

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Populations of southern cattle ticks, *Boophilus microplus*, from Mexico have developed resistance to many classes of acaricide. These include chlorinated hydrocarbons (DDT), pyrethroids, organophosphates, and formamidines (amitraz). Target site mutations are the most common resistance mechanism observed in *B. microplus* collected from Mexico, but there are examples in which metabolic mechanisms are the main cause. In many pyrethroid resistant strains, a single target site mutation on the Na⁺ channel confers very high resistance (resistance ratios > 1,000X) to both DDT and all pyrethroid acaricides. However, it has been shown in one population, Coatzacoalcas, that esterase (CzEst9) and MFO activity are together the main source of pyrethroid resistance. The most common mechanism of resistance to organophosphate acaricides is target site mediated. Acetylcholine esterase affinity for OPs is changed in resistant tick populations. In some populations AChE is insensitive and in others it has greater affinity for OPs. Only one strain studied to date, Tuxpan, shows a major metabolic mechanism (Est10). Very little is known about amitraz resistance, because reliable bioassay techniques have only just been developed for the study of amitraz resistance. Initial synergist studies indicate that enzyme mediated resistance is not highly important and inheritance studies indicate that amitraz resistance is recessive. These data taken together suggest a target site mutation as the mechanism of amitraz resistance. In recent years, almost every *B. microplus* strain collected from Mexico is resistant to multiple classes of acaricide.

Studies on drug-resistance of *Eimeria tenella* in China.

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Studies on drug-resistance of *Eimeria tenella* in China are as followed: 1) Resistances of field isolates of *E. tenella* from different farms are investigated by criterion of POAA, RLS and ROP, the resistance of isolate is related to the isolated place. 30% isolates of *E. tenella* is resistant to maduramysin, 30% to toltrazuril, 40% to lasalocid, 70% to salinomycin, and 80% to two or more coccidiostats. 2) Resistance to maduramysin, lasalocid, diclazuril and clodol is experimentally developed through serially passages in chickens. The initial concentration, gradient and practical method in coccidian resistant development is established in laboratory. The time and degree of development of resistance to maduramysin show no relation to concentrations and strains. The passages which monensin-resistance strain isolated from field, and sensitive strain developed to 5mg.kg⁻¹ maduramysin resistance is 18. While passages which salinomycin-resistance strain isolated from field and sensitive strain to 135mg.kg⁻¹ lasalocid □ 1.25mg.kg⁻¹ diclazuril and 150mg.kg⁻¹ clodol resistance development is respectively 15, 10, 6. In summary, maduramysin resistance is the most difficult to be developed, while clodol is the easiest. 3) Cross resistance is experimentally studied among different strains. There is no cross-resistance between chemical and ionophore anticoccidials such as diclazuril and lasalocid. There is no cross-resistances between bivalence and monovalence ionophore anticoccidials such as lasalocid and salinomycin, lasalocid and maduramysin. Among monovalence ionophore anticoccidials, there is no cross resistance between monensin and maduramysin. Among chemical anticoccidials, there is no cross resistance between clodol and diclazuril. The cross resistance between salinomycin and maduramysin is single directional resistance, maduramysin-resistance strain is resistant to salinomycin, but salinomycin-resistance strain is sensitive to maduramysin. 4) Genetic transfer of resistant factor in *E. tenella* is studied, The factors controlling resistance have been transferred between the two different strains. The proportions of recombinant strains resistant to diclazuril and salinomycin, diclazuril and lasalocid, clodol and diclazuril is respectively 19.9%, 36.5% and 26.7%.

Control effects of closantel limposomes on sheep experimentally infected with *Fasciola hepatica*.

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Ten 4- and 5- month sheep from Xinxiang Farm in Henan Province were chosen to attest the control effect of closantel limposomes developed by modified freeze-thawing method. They were orally 150 *Fasciola hepatica* metacercariae once. After infected 15 weeks, sheep were randomly divided into two groups of 5 animals: closantel limposomes treated group (n=5) and untreated control group (n=5). Sheep in treated group were injected subcutaneously with closantel limposomes injection at a dose of 5mg/kg body weight. Blood sample from every goat was collected by jugular vein at same time per week. Red blood cell, white blood cell, eosinophile and antibody in sera, body weight, ratio of liver in body weight, decline ratio of fluke and egg were measured for evaluating the effect of closantel limposomes against *Fasciola hepatica*. The results showed that there are significant differences in most of indexes between treated and untreated control groups except that eosinophile appeared obvious lower at 1, 2 and 3 week after administration and ratio of fluke decline was 89.56%. It suggested that closantel limposomes has high helminthic efficacies on *Fasciola hepatica*, and it is worth spreading for prevention and treatment of fascioliasis.

Characterization of differentially expressed genes in unsporulated and sporulated oocysts of *Eimeria tenella*.

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The protozoan *Eimeria tenella*, is one of the species which causes coccidiosis in poultry. This is an economically important disease, costing the U.S. poultry industry millions of dollars annually. While the life-cycle of this parasite has been described, little is known about the genetic mechanisms that control its progression. To identify genes that are differentially expressed between unsporulated and sporulated oocysts of *E. tenella*, subtracted cDNA libraries were constructed from these two stages of *E. tenella* life-cycle. One hundred and sixty seven random clones were sequenced from subtracted cDNAs of unsporulated oocysts. These clones represent sequences from up to 69 different genes, of which 63% share no significant homology to sequences in the GenBank database. Fifty-four clones were sequenced from subtracted cDNAs of sporulated oocysts. These clones represent sequences from up to 22 different genes. Of these, 39% share no significant homology to sequences in the GenBank database. Allelic diversity was observed in genes for which multiple clones were identified. This data provides information on gene expression patterns in two developmental stages of *E. tenella*, however, it may also be used to measure genetic diversity. Altogether, subtractive hybridization is a powerful technique for studying organisms with complex life-cycles, such as the protozoans, whose gene expression profiles change significantly between developmental stages.

Ponazuril is highly effective in the prevention and treatment of toxoplasmosis in mice.

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Toxoplasmosis is an important zoonotic disease. Abortions are a common clinical sign in small ruminants and swine. Acute systemic disease is also common in other susceptible mammals. We have previously shown that ponazuril, a major metabolite of toltafuril, is active against the RH strain of *Toxoplasma gondii* in cell cultures. The current study was done to determine the efficacy of ponazuril in preventing and treating acute toxoplasmosis in outbred CD-1 mice. We used 1,000 tachyzoites of the RH strain per mouse in the present study. In our laboratory system all non-treated mice develop severe toxoplasmosis and die within 8 to 11 days when inoculated subcutaneously with 1,000 tachyzoites. Groups of 5 female mice were used. Mice were weighed daily and ponazuril administered orally in a suspension. Mice given 10 or 20 mg/kg BWT ponazuril 1 day prior to infection and then daily for 10 days were completely protected against acute toxoplasmosis. Relapse did not occur after treatments were stopped. Eighty percent of mice treated with 10 mg/kg ponazuril at 3 days after infection and 100% of mice treated with 20 mg/kg ponazuril 3 days after infection and then daily for 10 days were protected from fatal toxoplasmosis. Sixty percent of mice treated with 10 mg/kg ponazuril at 6 days after infection and 100% of mice treated with 20 mg/kg ponazuril 6 days after infection and then daily for 10 days were protected from fatal toxoplasmosis. Relapse did not occur after treatments were stopped. The results demonstrate that ponazuril is effective in preventing and treating toxoplasmosis in mice. It should be further investigated as a safe and effective treatment for this disease in animals. Supported by a grant from Bayer HealthCare, Animal Health Division.

Famacha method for decision making in the treatment of endoparasitic infection in small ruminants in Brazil.

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Although multidrug resistant nematodes are common in sheep and goat farms, producers still rely on the usage of chemical compounds in Brazil. The Famacha[®] method identifies clinically infected animals for selective treatments in a 1 to 5-color scale of the conjunctiva. The objective of this work was to evaluate the Famacha[®] method on the reduction of the number of anthelmintic treatments in sheep and goats. Thirty-seven sheep were maintained in naturally infected pastures for a period of 180 days and drug treatment was suspended 30 days prior to the start of the validation period. The conjunctiva from all the animals was inspected every two to three weeks using a standard chart as well as the hematocrit and the McMaster fecal exam (EPG). Only two animals had a hematocrit below 22% and none of the animals had a score above three. Between 10 and 43% of the animals had to be treated (Ivomec[®], Merial) every examination period. Twenty-nine animals were treated once, five animals were treated twice and only two animals were treated three times. The conjunctiva had a high correlation index (0.9) with the hematocrit values and although EPG values ranged from 100 up to 9.400 there were no signs of anemia or submandibular edema. *Haemonchus contortus* was the most prevalent (60%) parasite species. The data shows a considerable decrease (79,7%) in anthelmintic use, when compared to the traditional prophylactic treatment used by sheep producers. Although the Famacha[®] guide can be used in goats, some particularities have to be observed to obtain consistent results. The Famacha method can be used in Brazil as an alternative strategy to reduce drug usage and parasite selection.

A sero-epidemiological survey of parasites in cattle in the north eastern Free State, South Africa.

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Global economic losses due to parasitic infections in livestock are enormous. A survey to determine the incidence of parasites in cattle (n=386) was conducted in the north-eastern Free State between August 1999 and July 2000. Giemsa-stained blood smears were negative for blood parasites. A total of 94% of the cattle were sero-positive for *Babesia bigemina* by Indirect Fluorescent Antibody Test (IFAT) while 87% were sero-positive for *Anaplasma marginale* by Enzymed-linked Immunosorbent Assay (ELISA). All the animals were sero-negative for *B. bovis* and this is probably because the tick vector (*Boophilus microplus*) which transmits the disease is not present in the Free State Province. There was no significant difference in the incidence of either anaplasmosis or babesiosis between the seasons. Two tick species belonging to the family Ixodidae were found on cattle, namely, *Boophilus decoloratus* and *Rhipicephalus evertsi evertsi*. In the present study significant differences in seasonal burdens of *B. decoloratus* occurred, with the highest infestations recorded from February to June. The presence of *R. evertsi evertsi* throughout the year without any or with small fluctuations in winter months was observed, with a peak from February to May. The observation of negative blood smears but high incidence of positive serological results for *Anaplasma* and *Babesia* for the same group of cattle indicates that this area is endemic for these diseases but with a stable disease situation.

First report of a field outbreak of the oriental eye-fluke, *Philophthalmus gralli* (Mathis & Leger 1910), in commercially reared ostriches (*Struthio camelus*) in Zimbabwe.

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A total of 17 commercially reared breeder ostriches (*Struthio camelus*) from Msengi farm, Chinhoyi, Zimbabwe, observed with swollen eyes, severe conjunctivitis and constant lacrimation accompanied with a purulent exudate were restrained for further clinical examination. Some of the birds were semi-blind with severe loss of body condition. On physical examination of the eyes of the birds, tiny organisms were observed attached to the nictitating membrane and the conjunctival sac of both eyes. On laboratory examination, the organisms were identified as *Philophthalmus gralli*, the 'oriental eye-fluke', based on the morphological features observed. *Melanoides tuberculata*, a prosobranch snail, was confirmed as the intermediate host through natural and experimental infection. To the best of our knowledge this is the first record of the oriental eye-fluke infection in birds in Zimbabwe and Africa south of the Sahara and this extends the known geographical range of this parasite.

A field-trial of an experimental recombinant vaccine for the control of *Fasciola hepatica* infection in sheep.

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Control of *Fasciola hepatica* infection in sheep has become increasingly difficult due to the advent of drug-resistance, climate changes and growing consumer resistance to use of chemotherapy in food-producing animals. Previous work has shown that cathepsin-L enzymes, purified from *F. hepatica* and administered in appropriate adjuvants, can confer significant protection against parasite challenge in cattle. Sheep, however, suffer more acute clinical signs following *F. hepatica* infection and may die if grazed in flukey areas in the absence of appropriate control procedures. We investigated the ability of recombinant forms of *F. hepatica* cathepsin L1 (Cat-L1) to protect sheep against natural challenge. Immunised sheep developed antibody responses to Cat-L1 following vaccination which were boosted following exposure to *F. hepatica* on pasture, had lower levels of plasma liver enzyme levels, and lower *F. hepatica* faecal egg levels. These results support the hypothesis that vaccination may be a viable option for the control of fasciolosis in sheep as well as in cattle.

Studies on the efficacy of toltrazuril, diclazuril and sulphadimidine against artificial infections with *Isospora suis* in piglets.

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Isospora suis, the causal agent of piglet coccidiosis, is a prevalent and economically important parasite. Three randomized blinded studies were conducted to examine the therapeutic potential of various anticoccidials. Piglets were artificially infected each with 10^4 sporulated *I. suis* oocysts at the age of 3 days. Piglets were allocated to groups of 10 to 12 animals as follows: groups A: sham treated control group (each study); studies 1 and 2: group B: toltrazuril, 20 mg/kg body weight (bw), day 2 post infection (dpi); group C: diclazuril, 2 mg/kg bw, dpi 2 and 3; group D: sulphadimidine, 200 mg/kg bw, dpi 5, 6 and 7; study 3: group B: toltrazuril, 20 mg/kg bw, dpi 2; group C1: diclazuril, 15 mg/kg bw, dpi 2; group C2: diclazuril, 15 mg/kg bw, dpi 2 and 9. The following parameters were assessed: studies 1 and 3: general health, faecal consistency, oocyst excretion (opg), body weight; study 2: intestinal pathomorphology and villi length. Severe isosporosis was regularly observed in the sham treated controls (A). Diclazuril (C) and sulphadimidine (D) failed to suppress isosporosis. In contrast, oocyst excretion, diarrhoea and weight gain impairment were efficiently controlled by toltrazuril treatment (B). The villi were on average distinctly longer in the toltrazuril treated animals than in groups A, C and D on dpi 7 and 11. These differences were still visible on dpi 15. The episode of pathomorphological and functional alterations due to piglet isosporosis appeared to be considerably longer than the period of clinical disease.

Prevalence of helminth parasites in free range domestic fowl in Nairobi and its environs, Kenya.

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A study on the prevalence of helminth infections in free range chicken in Nairobi, Kenya was conducted from March to October, 2002. A hundred growers and adult birds were used and at necropsy the digestive tract was separated into oesophagus, crop, proventriculus, gizzard, small intestine and caeca with the contents and mucosa of each part being examined separately for helminth infection. Also the trachea, oviduct and the eyes were examined. The overall prevalence was observed to be 100%. Each chicken was found to harbour more than two species of worms with grower birds harbouring more than the adults. The species of worms recovered included *Ascaridia galli* (58%), *Tetrameres americanus* (60%), *Gongylonema ingluvicola* (2%), *Syngamus trachea* (2.8%), *Heterakis gallinarum* (62%), *Capillaria* spp. (4%), *Raillietina echinobothrida* (20.5%), *Davainea proglottina* (3.3%) and *Strongyloides avium* (3%). No trematodes were observed. The study indicated that high prevalence occurred in grower birds than in the adults which is important in designing a helminth control programme in free range chicken where more attention should be paid to young birds.

A New Zealand perspective on anthelmintic resistance.

A.W. Murphy.

Fort Dodge, New Zealand Limited.

Macrocyclic lactones (ML) are becoming the only remaining effective anthelmintic family and attention has turned to the selection of a particular ML in an attempt to slow down the resistance development in this family. To examine some of the relevant parameters of different ML formulations a trial was carried out on a property with known resistance to all three commonly used drench families. Efficacies of moxidectin, ivermectin, abamectin, a triple combination containing ivermectin, albendazole and levamisole, and ivermectin CRC were assessed by faecal egg count reduction and larval culture. Mean faecal egg counts before treatment were 1280 epg (*Haemonchus* 43%, *Ostertagia* 6%, *Trichostrongylus* 27%, *Cooperia* 24%). Ivermectin resistance was confirmed in both *Haemonchus* and *Ostertagia* spp. Abamectin, the triple combination, and ivermectin CRC were less effective than moxidectin which demonstrated >99.9% efficacy against all four species present. It is argued that as initial “head” efficacy is the most important factor in resistance selection and as moxidectin is the most potent anthelmintic it should be the first choice when using an ML. In contrast the triple combination allowed survival of sufficient resistant worms to permit rapid selection to all three families.

Control of gastrointestinal parasitism in sheep in New Zealand by pre-lambing treatment of ewes with a 0.5% moxidectin injectable formulation (EWEGUARD).

A.W. Murphy*.

Fort Dodge, New Zealand Limited.

The epidemiology of nematode parasitism in sheep in New Zealand is reviewed, with emphasis on the contribution of the ewe to pasture contamination and initial infection in lambs. A strategy for control based on pre-lambing ewe treatments utilising the persistent activity of an injectable moxidectin formulation is discussed and trial data presented which demonstrates a delay in the rise in the faecal egg output of treated ewes of approximately 2 months duration. The subsequent infection in lambs is greatly reduced. Benefits including weight of lambs weaned per ewe are demonstrated. In the trial results presented the increased value of the lambs averaged NZ\$6.90 per ewe over the control group (vaccine only). The requirement for exposure to infective larvae to stimulate the immune system of the ewe and the consequent self cure will be discussed. The acceptance of pre-lambing ewe treatments by farmers and the impact on the New Zealand market are presented.

The effect of polyunsaturated fatty acids (PUFA) on FEC, mucosal mast cells and eosinophil numbers in calves infected with *Ostertagia ostertagi* and *Cooperia onchophora*.

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Diet-induced changes in the PUFA content of immune cells, particularly the ratio of n-3 to n-6 PUFA, have been shown to influence the immune phenotype that develops following infection. The aim of this study was to establish whether the immune response to an abomasal and intestinal nematode parasite infection in the calf would be influenced by dietary PUFA. Calves (n=24) were divided into two treatment groups and fed 25g/d of either fish oil (n-3 group) or a binary mixture of palm/rapeseed oil (normal-group) as a supplement in milk replacer. Within each treatment group 8 calves were infected with 2000 L3 of each parasite, three times/week for 8 weeks, the remaining calves were pair-fed controls. Faeces for faecal egg counts (FEC) were collected twice weekly and at slaughter, abomasal and intestinal tissue samples for cellular immunohistological analysis and worm counts were collected. Data were analysed by one-way (ANOVA). Mucosal mast cell and eosinophils numbers were significantly increased ($p<0.05$) by infection and were significantly higher ($p<0.05$) in the intestinal tissue of the normal infected group. FEC were not significantly influenced by oil supplement but tended to remain higher in the normal group. The recruitment of mucosal mast cells and eosinophils to the mucosa in the small intestine of infected calves is indicative of a Th₂ immunophenotype response to intestinal nematode infection. Supplementation with n-3 PUFA did not significantly affect FEC, but the trend in the FEC profile suggest that further studies on the manipulation of dietary n-3/n-6 PUFA ratio are worthwhile.

The source of human *Ascaris* infections in Denmark.

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An epidemiological survey in Viborg County, Denmark, has shown an association between human *Ascaris* infection and contact to pigs or pig manure. Using two different molecular techniques (PCR-RFLP of the ITS region of r-DNA, and AFLP), we compared the worms from Danish humans to different geographic and/or host samples of *Ascaris*: pig worms from Denmark (n=49), Guatemala (n=6) and Philippines (n=3) and human worms from Guatemala (n=9), Bangladesh (n=25) and Nepal (n=5). We found that human worms from Denmark are significantly different from the pooled endemic human samples ($p<.001$), but homogeneous with the Danish pig sample for the ITS polymorphism. We scored 146 polymorphic fragment loci using the AFLP technique. Twenty-two of the 27 worms from Danish humans could be allocated to Danish pig samples ($p>0.05$), while none could be allocated to the Guatemala or Bangladesh human samples ($p<0.001$). Our AFLP analysis revealed 20 unique fragment polymorphisms in the pig worms. None of these fragments were found in the human worms from the endemic areas, but were polymorphic in the Danish human sample. The overall conclusion is that all of the 25 cases of human ascariasis investigated in this study from Viborg County, are due to cross-infections from domestic pigs from Denmark.

Effectiveness of health education intervention for reducing the risk of porcine cysticercosis in Mbulu District, Tanzania.

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Cysticercosis caused by *Taenia solium* is an infection of public health and economic importance. In January 2002, a sociological study was conducted in Mbulu District, northern Tanzania, to investigate perceptions of the community regarding pig farming and porcine cysticercosis and explore behavioural factors related to the spread of porcine cysticercosis in the area. The purpose was to involve the local community in the planning of a health education intervention for effective and sustainable control of the infection. Focus group discussions and in-depth interviews with farmers, a local meat inspector, and a local health worker were conducted. Farmers said that pig farming was an important economic activity and a major source of income for women and young people in the area. Little was known about the public health implications of porcine cysticercosis. Farmers used various local methods to prevent and treat porcine cysticercosis, but most of these had little effect. Free ranging of pigs, eating infected pork, drinking unboiled water and unhygienic use of pit latrines were major practices enhancing parasite transmission. Health education in Mbulu should focus on creating awareness of pig farmers on how porcine cysticercosis is transmitted, the full impact of the parasite, and appropriate measures to be taken to prevent parasite transmission. Improving pig rearing and general hygiene in Mbulu should make use of locally available resources. Health education should be targeted at various levels in the community with women be given priority to participate in the program.

A digital map database for South America: A tool to predict environmental risk of parasitic diseases.

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Geographic information System (GIS) and satellite surveillance tools have recently been successfully used to develop risk models for a number of parasitic diseases including malaria, trypanosomiasis, onchocerciasis, schistosomiasis and leishmaniasis. A regional minimum medical GIS database (MMDb) has been prepared for South America for use in medical and veterinary applications and as a tool for development of spatial decision support system models. The MMDb can be used to match the response of parasites and vectors to the environmental preferences and limits of tolerance of disease agents. The MMDb regional database uses compatible GIS formats, software, methods and data resources to allow seamless incorporation of results from other regional GIS projects into a global model. One example will be presented to show the usefulness of the MMDb in Brazil where it was used to map the distribution of *Schistosoma mansoni* and the three different snail host species *Biomphalaria glabrata*, *B. tenagophila* and *B. straminea*. Using maps on environmental, climate, infrastructure, political boundaries, population data and normal difference index (NDVI), a model was created that can give a more accurate assessment of the environmental suitability of Brazil for *Schistosoma*. This information can then be used to predict disease risk and to design control programs for all Brazil and elsewhere in South America.

Heterologous expression of glutamate gated chloride channel subunits from the cattle nematode *Cooperia oncophora*.

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Institute of Parasitology, McGill University, 21, 111 Lakeshore Road, Ste-Anne-de-Bellevue, Quebec, H9X 3V9, Canada. In the last few years, there have been several reports of ivermectin resistance involving the cattle nematode *Cooperia oncophora*. The glutamate gated chloride channel genes are believed to be involved in ivermectin resistance. In trying to understand the mechanisms underlying ivermectin resistance, we have cloned two full-length glutamate-gated chloride channel subunits from ivermectin-susceptible and -resistant *C. oncophora*, and expressed them in *Xenopus* oocytes. Both ivermectin-susceptible subunits form functional homomeric glutamate gated channels when expressed in *Xenopus* oocytes. While the first subunit, termed *gbr*, also responds to ivermectin, the second subunit (*glucl* beta) does not. The response to glutamate is rapid in onset and reversible, while ivermectin evokes a response that is slower to activate, and essential irreversible. The resistant *gbr* subunit also forms functional homomeric channels when expressed in *Xenopus* oocytes. This subunit differs at three amino acid positions when compared to the ivermectin-susceptible *gbr* subunit. The resistant *gbr* subunit appears to be less sensitive to both glutamate and ivermectin when compared to the susceptible *gbr* subunit. Studies are underway to determine the contribution of each of the three mutations to ivermectin resistance.

Efficacy of jetting and 2 pour-on formulations containing spinosad against *Melophagus ovinus*.

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Spinosad has been effective in curing lice and large fly-strikes due to *Lucilia cuprina* in sheep and in preventing re-strikes. The aim of this study was to determine whether Spinosad was also useful for treating natural infestations of *Melophagus ovinus* in housed sheep. Five groups of six animals each were formed as follows: control – non treated unshorn, group 2: spinosad aqueous solution 20 g/l: pour-on 15 or 20 ml/head (300 or: group 1 400 mg/ head, according to weight), recently shorn, group 3: Extinosad 25 g/l: spray, diluted in 1000:1, to 25 ppm applying 5l/head unshorn, group 4: Extinosad 25g/l: Pour-on 12,5 or 17,5 ml/head (312,5 or 437,5 mg/head) recently shorn, group 5: control – non treated shorn. The results indicate that Spinosad administered as a pour-on and spray treatments (groups 2, 3 and 4) showed steadily increasing efficacy against *M. ovinus*. The comparison of the number of keds found in treated groups with those in the untreated groups showed the efficacy of spinosad to be 100 %, 6 days after Extinosad treatment (g4). In turn, Spinosad pour-on (g2) and spray (g3) application showed a dramatic decrease in ked population (99,6 to 100 % reductions), but no eradication. It appears that drug doses rather than the condition of shorn vs. unshorn, was presumably the factor responsible for differences found between groups.

Molecular tools for the identification of Oestridae.

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Unlike the immediate practical application of species of sarcophagidae and calliphoridae in forensic science, the molecular identification of oestrid flies might erroneously appear to be a less important topic. However, during the past five years a number of studies into the molecular characterization of the cytochrome oxidase i (coi) gene of 18 species of oestrid flies have resulted in much useful taxonomical and phylogenetic data. The nucleotide sequences of the investigated species include 385 conserved sites and 303 variable sites; variation within each subfamily ranges from 5.3% to 13.34%. Intra-specific pairwise divergences range from 0.14% to 1.59%, while inter-specific variation ranges from 0.7% to 27%. From a taxonomical point of view, molecular data confirm the morphological classification, with the species examined divided into four subfamilies (i.e. Hypodermatinae, Gasterophilinae, Cuterebrinae and Oestrinae) within the Oestridae family. Nevertheless, new insights have been gained concerning the molecular differentiation of the most common species of *Hypoderma* (i.e. *Hypoderma bovis*, *Hypoderma lineatum*, *Hypoderma actaeon*, *Hypoderma diana* and *Hypoderma tarandi*) and, in particular, the restriction enzyme *bfai*, provides a diagnostic profile that can be used to simultaneously differentiate all the *Hypoderma* species examined. The identity of *Hypoderma sinense* as an actual species, cross-infecting with *H. bovis* and *H. lineatum* yaks in china, has also been assessed using morphological and molecular approaches.

New developments in sero-diagnosis of hypodermosis.

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Since the demonstration of collagenase from first instars of *Hypoderma lineatum* in 1970 various serological tests have been developed to detect hypodermosis in cattle. Indirect elisa tests are currently used on serum and milk samples in many countries to detect the presence of circulating antibodies. The collagenase hypodermin c (hyc) is considered the antigen of choice for the immunodiagnosis of *Hypoderma*. Recently a recombinant hyc has been obtained in an enzymatically active form and has been shown to be a useful alternative to the natural parasite antigen for the serodiagnosis of *Hypoderma* in cattle, especially in areas of low prevalence. In those areas, a competitive ELISA has proved to be a valuable tool for the confirmation of seropositive animals during large-scale surveys. However, antibody detection does not give an accurate indication of the status of the infestation because antibodies persist in animals that have no active larvae (i.e. older animals with previous exposures and animals treated with parasiticides). The development of an antigen capture assay for the detection of circulating hyc, using a murine monoclonal antibody or chicken egg yolk antibodies and capable of detecting hyc in serum as early as 6 weeks after infection, gives an insight into the timing of *Hypoderma* larval migration within the host and into the timing and site of larval mortality.

Seroprevalence and associated risk factors of neosporosis in beef and dairy cattle in southern Italy.

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A cross-sectional serological survey for *Neospora caninum* was carried out on beef and dairy cattle in southern Italy. A total of 78 herds and 772 animals were tested using a commercial ELISA kit (CHEKIT[®] - *Neospora*) to detect anti-*N. caninum* antibodies. Management and individual data were collected and analysed both by linear and logistic multiple-regression models in order to find good predictors of the cattle seroprevalence and anti-*N. caninum* antibody levels. At least one seropositive animal was found in 31 herds (39.7%). The percentage of herds with seropositive animals was lower in beef (33.3%) than in dairy herds (46.15%). A total of 67 animals out of 772 (8.7%) were found to be seropositive. One of the best predictors of neosporosis seroprevalence in this study was the practice of self-rearing replacement heifers. Further risk factors were linked to higher stocking density, i.e. animals farmed in large herds and with no summer or permanent grazing practices were more likely to be seropositive than others. Among individual characteristics, seropositivity was higher in animals sampled in mid- or late-pregnancy compared to animals either in early pregnancy or not pregnant. None of the epidemiological data recorded was a good predictor of the anti-*N. caninum* antibody level.

Use of standardized inoculum of *Anaplasma marginale* and chemoprophylaxis to control bovine anaplasmosis.

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Bovine anaplasmosis is an important arthropod-borne rickettsial infection that causes progressive anemia and hemolysis and consequently high economic losses in tropical and subtropical regions. As vaccines are not available in Brazil, the use of a homologous standardized inoculum of *Anaplasma marginale* and a chemoprophylactic method, using dihydrate oxytetracycline, were evaluated as alternative methods to control clinical disease in an endemic area. The study took into account the reduction of rickettsemia and packed cell volume (PCV), during *A. marginale* infections in calves. The animals that had received the inoculum (10^7 *A. marginale* infected erythrocytes) showed a 1.2% reduction of rickettsemia and the PCV decreased 23.0%, when challenged in the field. These values were statistically lower than those obtained from animals in the control group. As far as chemoprophylaxis is concerned, the animals that had been treated three times with dihydrate oxytetracycline (20 mg/kg) showed a 2.7% reduction of rickettsemia and the PCV decreased 36.3% when challenged. These values were also statistically lower than those obtained from animals in the control group. Both preventive measures proved to be efficient in reducing rickettsemia and decrease of PCV during *A. marginale* infections.

What role does *Babesia bicornis* and *Theileria bicornis* play in causing mortality in black rhinoceroses?

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Two piroplasms have recently been described from the endangered black rhinoceros *Diceros bicornis* [*J. clin. Microbiol.* 41(5)]. *Babesia bicornis* has been incriminated as contributing to mortality in black rhinos, while *Theileria bicornis* would appear to be benign. It is imperative that the role these piroplasms could play in causing mortality in black rhinos should be put in perspective. There is ample historical evidence that a large piroplasm, presumably *B. bicornis*, occurs naturally in black rhino populations in Kenya, Tanzania and KwaZulu-Natal, South Africa. Black rhinos originating from Etosha National Park in Namibia and kept in Kalahari savannah were negative for *B. bicornis*, presumably due to the absence of the vector in this arid environment. Mortalities generally only occur if the animal is severely stressed, e.g. through capture and subsequent confinement. There is circumstantial evidence that treatment with diminazene aceturate, an antibabesial compound successfully used against bovine and canine babesiosis, is not effective against *B. bicornis*.

System to test products against mosquitoes infesting horses.

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A system to evaluate products against mosquitoes infesting horses was developed and implemented to obtain consistent and reliable results. Each horse was tied to a stanchion located inside a chamber with vinyl net walls supported by a plastic frame. This was followed by the release of ~200 adult female *Ae. albopictus*. The infestation period lasted 60 minutes. Two infestation chambers were set up inside a vinyl tent to provide a semi-controlled environment. Mosquitoes were collected for at least 30 minutes following completion of the exposure period with the horse inside the chamber. Mosquito collection resumed for at least 10 more minutes after the horse was removed. Mosquitoes were collected in catch bottles using an insect vacuum. Catch bottles were transported in a cooler with ice packs and stored frozen at the laboratory. Defrosted mosquitoes were sorted, examined under a dissecting microscope, and counted after crushing to ascertain blood-feeding. Late-fall and winter weather adversely affected the mosquito recovery rate. Behavioral features of the host (stomping, defecation, urination) and ectoparasite (resting on floor and surreptitious places) also decreased the number of mosquitoes recovered. A horse with 25% of the live mosquitoes recovered showing evidence of blood-feeding was considered to be an acceptable host. This system allows the testing of products against mosquitoes on horses under Good Laboratory Practice to obtain a direct label claim for vectors of West Nile virus.

How the intestinal microflora of the pigs helps regulate the population dynamics of *Oesophagostomum dentatum*.

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We tested the hypothesis that the antiparasitic effect of inulin (β -2,1 fructan) operates through its instigation of microfloral changes and the resulting fermentation products short chain fatty acids (SCFA) and lactic acid (LA). We investigated the direct influence of infusion of SCFA and LA on already established *O. dentatum* infection in cannulated pigs. The normal diet used in the pig experiment was based on barley flour with insoluble fibre from oat husk. After two weeks of adaptation to the diet all the pigs were inoculated with 6000 infective larvae of *O. dentatum*. Six weeks later, surgery on all pigs was performed to install cannulas. On 7 week post infection (p.i.) SCFA and LA infusion was initiated in pigs in Group 1; pigs in Group 2 served as controls and received only saline. At week 10 p.i., all pigs were necropsed and their worm burdens determined. SCFA and LA infused pigs exhibited markedly reduced faecal egg counts and worm recoveries (88% compared to saline controls). The results from this study indicate that metabolic products of highly degradable carbohydrates such as SCFA and LA have a significant negative influence on established *O. dentatum* infection in growing pigs. The nature of the microflora in the large intestine, and dietary influences on their activity, can be decisive in determining the outcome of helminth infection in that host location.

Epidemiology of amphistomes in cattle in the Highveld and Lowveld Communal grazing areas of Zimbabwe.

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During the period between January 1999 and December 2000, the distribution and seasonal patterns of amphistome infection in cattle in the highveld and lowveld of Zimbabwe were determined through monthly coprological examination. Patterns of distribution and seasonal fluctuations of intermediate host-snail populations and the climatic factors influencing the distribution were also determined at monthly intervals for a period of 24 months (November 1998 to October 2000). During the same period larval stages of amphistomes were determined through shedding of snails at monthly intervals. Overall 33 % of the animals were positive for amphistomes. Adult cattle and the wet season had a significantly high prevalence of amphistomes than calves and the dry season ($P < 0.01$). The main intermediate host for amphistomes was *Bulinus tropicus* with a prevalence of infection of 8.5%. However, amphistome cercariae were also recorded in *Biomphalaria pfeifferi* and *B. forskalii*. Amphistome cercarial shedding had peak prevalence during the post-rainy season (March-May). Based on the epidemiological findings a control program was devised. Anthelmintics would be administered in January/February and July/August to control the mature and immature stages, respectively. To reduce cercarial shedding by the intermediate host snails molluscicides would be applied during the peak transmission periods (April/May and August/September).

Prevalence of *Fasciola gigantica* in Zambia.

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This disease caused by the trematode parasite *Fasciola gigantica* contributes to the important economic loss in the ruminant industry. It is widespread throughout Africa, Asia and the Pacific. In Zambia, very little is known on the prevalence and impact of fasciolosis especially in the resource poor farmers most of whom live along the Kafue and Zambezi flood plains. The aim of this study is to determine prevalence of the disease in selected parts of Zambia at slaughter. The research was carried out in Lusaka, Central, Southern and Western provinces in selected abattoirs. The meat inspections were done at random and it was from inspected animals that faeces and blood were collected. From a total of 825 animals inspected, serum was collected for antibody ELISA. Out of that number, 661 faecal samples were collected and analysed for fluke eggs. This comprised 200 cattle from commercial farms and 461 traditionally owned cattle. A sieving and sedimentation technique was used for the detection and quantification of the fluke egg (faecal egg counts). 53 % of the animals were positive at meat inspection while 45.84 % on faecal examination. Prevalence of the disease was 62.78 % (n = 661) on both inspection and faecal egg count. Comparatively, commercial and traditional animals had prevalences of 69 % and 53.36 % respectively. Average total worm count was 6 ± 17.64 (Range: 0 to 223). Commercial and traditional cattle showed average fluke counts of 6 (range 0 to 75) and 8 (range 0 to 223) respectively. Results indicate that *Fasciola gigantica* infection is an important disease both for commercial and traditionally owned animals. A higher number of livers are condemned because of the disease. Immunological analyses of the collected serum samples are still under progress.

Number, distribution and viability of *Taenia solium* cysticerci in Zambian village pigs.

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Porcine cysticercosis is hyper-endemic in Zambia; in an earlier study more than 20% of village pigs slaughtered in Lusaka were found to be massively infected. The objective of this study was to measure the intensity of infections in traditionally reared pigs, the distribution and the viability of the cysts, and to assess the performances of tongue and meat inspection. Sixty-five village pigs were randomly purchased from Southern and Eastern provinces of Zambia, examined by tongue palpation for cysticercosis, and routine meat inspected at slaughter. This was followed by carcass dissection: the cysticerci were counted and their distribution registered and viability assessed. Out of 65 pigs, 5 (7.7%) were positive on tongue examination, while routine meat inspection showed 12 (18.5%) positives. However, carcass dissection detected cysticerci in 31 (47.7%) of the pigs; 7 of these animals harboured only calcified cysts. The range in number of cysticerci was 1 to 14662. Fourteen pigs had more than 100 viable cysts, 6 between 2 and 100, and 4 had single cyst infections. Cysticerci were distributed throughout the carcass with the highest concentration in the heart, tongue and hind legs. In one animal 13 viable cysts were detected only in the brain. While the specificity of tongue palpation and meat inspection was 100%, these tests failed to detect the infection in 83.9% and 61.3% of the infected animals, respectively. These findings demonstrate, that not all infections with *T. solium* cysticercosis in African village pigs are massive, and the serious shortcomings of routine detection methods for porcine cysticercosis.

***In vivo* transfer of *Dictyocaulus viviparus*.**

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Using the experimental procedure of collecting Broncho Alveolar Lavage Fluid (BALF) *in vivo* we regularly recover living lungworms. In a pilot experiment we examined the possibility to transfer living lungworms collected from infected donor calves to helminth-naïve recipient calves. Four recipient calves were used, 2 receiving 13-day old worms (14 and 22 respectively) and 2 receiving 21-day old worms (21 and 9 respectively). From each group one transfer was successful as evidenced by consistent faecal larval excretion and elevated adult lungworm-specific serum IgG levels. Additionally, it was examined whether in these two recipient calves protection had developed against a challenge infection following the end of the patent period. Results indicated no protection whatsoever had developed. However, it should be considered that the numbers of worms transferred were low, estimated to be comparable to an oral primary infection dose in the range of 30-50 L3. As far as we know, this is the first time a successful *in vivo* transfer of lungworms is reported. Though the procedure has to be optimized, it opens the way to research immunological responses exclusively induced by the lung stages with no interference of responses developed during the normal penetration and migration route from intestine to lungs.

Old dreams, new visions: Cystic echinococcosis in Sicily.

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Sicily is the biggest Italian island and one of the widest of the Mediterranean sea islands, with a number of bred sheep of 1.300.000 head. According to Mantovani (1994) this geographic basin may be considered the cradle of zoonoses and Cystic Echinococcosis (CE) remains, mainly in the Mediterranean area, the most important parasitic zoonoses (mortality of 5% in humans involved). After many years of silence it is important to renew the interest in this animal disease and this is the aim of the present survey on CE in sheep raised in Sicily. Near thousand (956) sheep 2 – 3 years old, coming from 29 flocks in 8 Sicilian provinces, were inspected at slaughterhouse. The general prevalence was of 15% with significant differences ($P < 0.01$) in various provinces, ranging from 36,5% in Palermo to 6,5 in Agrigento. The cysts (727) were found only in the liver (479) in the lungs (248) and in both the organs (38) with a mean intensity of infection of 4,87. The mean fertility of 31% ranged from 90 % in Agrigento to 13% in Enna, Messina and Ragusa. The fertility in the liver resulted higher (22,6%) than in the lungs (8,6%) and the cysts were mainly of 3 cm Ø and globose in shape according to the young age of the host.

Prevalence of otacariosis in French goats.

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Two Acari are recognized to parasite external ear canal of goat: *Raillietia caprae* and *Psoroptes cuniculi*. Symptoms associated with these external otitis haven't been often described but we observed head shaking and dermatitis of the pinna tip associated with these parasites in some French flocks, also we wanted to study their prevalence in France. One hundred and six heads of adult goats were collected from an abattoir where 70% of the French goats are slaughtered. To collect mites, the base of the pinna was cut transversely exposing the depth of the external ear canal, cerumen was gathered, and 60% alcohol was instilled to flush the canal. Most of these goats were infested (76.4%), *Raillietia caprae* was detected in 34.0% and *Psoroptes cuniculi* in 49.1%. Both parasites were present on goats whatever their geographic origin or their breed (French Alpine or Saanen). Number of parasites per animal was generally high for *Psoroptes cuniculi* and more variable for *Raillietia caprae*. There was on average 3.5 adult *Raillietia caprae* per goat with extremes from 0 adult (but presence of larvae or nymphs) up to 77 adults per goat. It is the first time that *Raillietia caprae* is described in France, further studies must now be done to estimate clinical and economic consequences of these infestations, and to find a treatment for infested dairy goat.

Production effects of *Cooperia oncophora* infections in cattle.

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The study aimed to quantify production losses due to *Cooperia oncophora* in young cattle. A replicated grazing study was conducted on a property with a history of ivermectin-resistant *C. oncophora*. 140 young bulls were set-stocked in 8 paddocks from Jan-Jul 2001. Four groups of animals (TRT1) were treated 4-weekly with topical ivermectin (0.5mg/kg), the other 4 (TRT2) with an ivermectin SR bolus + 4-weekly treatments with levamisole HCl (7.5mg/kg) and albendazole (10mg/kg). At the end of the study two tracer calves (3 months-old) were grazed in each paddock. Faecal egg counts in TRT1 increased progressively up to the end of April and then gradually declined. The highest mean egg count was 350 eggs/g. Egg counts in TRT2 remained low. Only *Cooperia* were seen in larval cultures. TRT1 gained 127.7kg compared to TRT2 of 116.0kg but this difference was not significant ($p > 0.05$). The tracer calves in TRT1 had significantly ($p < 0.05$) more worms (mean 20923 ± 6438) than TRT2 (mean 1292 ± 805). Although the reduction in weight gain was not significantly different between TRT1 and TRT2, the egg counts do indicate only moderate worm burdens established. However, the worm counts of the tracer calves indicate that the level of pasture contamination with *Cooperia* larvae was very different between the 2 treatments at the end of the study and suggest that if the trial had continued into the second year the differences in weight gain may have been more substantial.

Optimization of a *Leishmania infantum* challenge model in hamsters.

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In leishmaniasis research mouse models of infection are generally used. However, mice are unsuitable hosts for *L. infantum* and therefore hamsters are used when working with this parasite species. We performed experiments to establish a standard infection route and dose and evaluate the value of the hamster model for vaccine research. Parasite doses ranging from 10^2 to 10^8 promastigotes were injected into hamsters via different routes; intraperitoneal, subcutaneous and intradermal. At 1 and 3 months after infection hamsters were necropsied and the presence of parasites in the spleen, liver, bone marrow, lymph node and skin was determined by histopathology. Parasite numbers in spleen and liver were estimated by culture microtitration. It was found that the inoculation can be given via either route but is most successful when given intraperitoneal. The lowest number of promastigotes that resulted in a detectable parasite burden at 3 months after infection was 10^4 . The value of the hamster model of infection was further evaluated by comparing the *in vitro* and *in vivo* infectivity of 12 different *L. infantum* clones. Cysteine proteinase knockouts, of which some were expected to have reduced virulence, were compared to wild type parasites. It was found that the knockouts were attenuated to a different degree and that the *in vitro* and *in vivo* data correlated well.

The molecular basis of anthelmintic resistance.

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Economically important parasitic nematodes can have very large genetic variability. Modern anthelmintics impose very high selection pressures, eliminating most of the population that has genes conferring drug susceptibility. Those few parasites with resistance genes can continue to reproduce despite drug treatment and under certain conditions will result in a resistant population and a control problem. The parasite can bounce back despite excellent anthelmintics. Understanding which genes confer resistance helps us to understand the mechanisms of resistance. This knowledge can suggest ways to reduce selection pressure for resistance, partially overcome resistance and the development of very sensitive DNA based methods to monitor for the frequency of resistance alleles. We now have a good understanding of benzimidazole (BZ) resistance and a developing understanding of macrocyclic lactone (ML) resistance and have developed some PCR based tests for BZ and ML resistance alleles. BZ resistance involves mutations on codons 200 or 167 in the beta-tubulin gene(s). ML resistance can involve mutations in the mode of action receptors, glutamate-gated chloride channel subunits and gamma-aminobutyric acid-gated chloride channel subunits, as well as ABC transporters which can regulate ML uptake, and surprisingly beta-tubulin again. However, the mutations in beta-tubulin seen in ML resistance are at different codons from those involved in BZ resistance.

Evaluation of the period of protection of 10% moxidectin cattle long-acting against *Dictyocaulus viviparus*, *Haemonchus placei*, *Trichostrongylus axei* and *Oesophagostomum radiatum* infection in cattle.

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Two studies were conducted to evaluate the period of persistent activity of 10% moxidectin cattle long-acting (LA) formulation administered subcutaneously at the recommended dose rate of 1.0 mg moxidectin/kg (0.01 ml/kg) BW against experimentally induced infections of cattle nematode L₃. The first study was conducted to evaluate the period of protection against *D. viviparus*, *H. placei* and *Oe. radiatum* in cattle. The second study was conducted to evaluate the period of protection against *T. axei* in cattle. In the first study, 30 nematode free steers were used (10 calves/grp); two groups of steers were treated 150 and 120 days prior to a single challenge infection and a third group remained as untreated controls. On Day 0 of the study, each animal was infected with approximately 1,500 *D. viviparus*, 10,000 *H. placei* and 2,500 *Oe. radiatum* L₃. All animals were necropsied approximately 32-33 days post-infection. In the second study, 20 nematode free steers were used (10 calves/grp); one group of steers was treated with moxidectin and the second group was treated with placebo 90 days prior to a single challenge infection. On Day 0 of the study, each animal was infected with approximately 20,000 *T. axei* L₃. All animals were necropsied approximately 21-22 days post-infection. The results of these studies indicate that the 10% moxidectin cattle long-acting formulation administered subcutaneously at the recommended dose rate of 1.0 mg moxidectin/kg BW protects cattle from reinfection with *D. viviparus*, *H. placei*, *T. axei* and *Oe. radiatum* for an extended period of time following treatment.

The effects of sheep breed on the progress of *Lucilia sericata* larvae infestations (blowfly strike).

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Blowfly strike of sheep in the UK is a traumatic myiasis commonly caused by larvae of the sheep blowfly, *Lucilia sericata*. This study investigated effects of sheep breed on progression of artificially induced blowfly strike. The effects on blood and biochemical parameters of two recognised breeds (Swaledale and North of England Mule) in the UK were investigated. Animals were challenged with larvae of the VLA reference strain of *Lucilia sericata*. Haematological parameters monitored were total and differential white cell counts, PCV (packed cell volume), haemoglobin and major histocompatibility cell markers, MHC, MCH, MCV and MCHC. Biochemical parameters investigated were total protein, albumin, chloride and the following enzymes: alkaline phosphatase (AP), aspartate transferase (AST), gamma glutamyl transferase (GGT), glutamate dehydrogenase (GLDH), lactate dehydrogenase, (LDH) and creatine kinase (CK). There were no significant breed differences with respect to the development of the larval challenges. The inflammatory cell responses by the Mules were more variable and more marked with some significant differences. Some enzyme responses by the Swaledales were more marked, some significantly, than responses by the Mules. The haematological and biochemical parameters illustrated a physiological basis of breed differences in their responses to infestations of *Lucilia sericata* larvae (blowfly strike).

Field efficacy of ivermectin plus praziquantel oral paste against naturally acquired, gastrointestinal nematodes and cestodes of horses in North America and Europe.

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The efficacy and acceptability of ivermectin (IVM) + praziquantel (PZQ) in an oral paste formulation was assessed under field conditions in North America and Europe. Fifteen study sites were included, involving 273 horses aged ~3 months to 25 years across a wide variety of breeds. Horses were confirmed by positive faecal egg counts to be infected with strongyles (100%) and tapeworms (76%). Per replicate, 3 horses received IVM (0.2 mg/kg BW) + PZQ (1 mg/kg BW) paste, and one horse served as a control (non-treated or received vehicle paste). Faecal samples were examined at various times pre-treatment and 7, 8, 9, and 14, 15, and 16 days post-treatment. Pre-treatment strongylid and cestode egg counts were similar for horses allocated to treated and control groups ($p>0.10$). Across the study sites of both North America and Europe, horses treated with IVM + PZQ had significantly ($p<0.01$) lower post-treatment strongylid and cestode egg counts (reductions $\geq 98\%$) than the controls. The results of the studies demonstrated IVM + PZQ paste to be highly effective against gastrointestinal nematode and cestode infections, and to be safe for use in horses under field conditions.

A prevalence survey of antibodies to *Anoplocephala perfoliata* in horses from the United States.

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The 48 contiguous states were divided into 10 regions, each comprising approximately 10% (range 9.1% to 11.3%) of the total U.S. equine population. In one (Texas) or two states within each region, laboratories were asked to provide serum from samples that had been submitted for Equine Infectious Anemia testing. Between August, 2002 and April, 2003, 19 laboratories each provided sera from ~160 horses (320 from Texas and California; 108 from Florida), along with information regarding the donor's age, sex, breed, and state of residence. Sera were analyzed by an ELISA that measured IgG(T) antibodies against *Anoplocephala perfoliata* (sensitivity 81.0%; specificity 95.1%). Antibody concentrations were expressed as a percentage of the positive control titer. The regional prevalence of antibodies against *A. perfoliata* ranged from 12.7% along the Pacific coast to 95.8% in the upper Midwest, and was greater than 30% in 8/10 regions. The overall national prevalence was 54.2%. The prevalence of antibodies was significantly less ($P<0.01$) in intact males, and in Arabians, Mustangs, and Quarter Horses compared with mixed breed horses. Seroprevalence was significantly greater ($P<0.01$) in horses older than 15 years. Differences by sex and age were attributed to variations in management, specifically to the extent of pasture exposure.

The reactivation of *Neospora caninum* chronic infection in pregnant mice.

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The factors responsible for the reactivation of a *Neospora caninum* latent infection are unknown, but it is postulated that the maternal immune response, which limits the parasite dissemination, could be altered during pregnancy. In the present study, the immune response was investigated in *N. caninum* chronically infected mice during successive pregnancies. A group of non pregnant infected mice, a group of mice infected when pregnant and a group of pregnant chronically infected mice (4 to 6 months) were used. Vertical transmission was demonstrated in chronically infected mice after the first pregnancy. This rate of foetal infection fell after further pregnancies. Before the pregnancy, the chronically infected mice showed a marked specific proliferative response and an IgG2a isotype preferential secretion. During the course of the first pregnancy, no significant modification in the immune response was recorded. After 2 successive pregnancies, the specific cellular response showed a significative fall whereas IL-4 and IL-10 mRNA expression was noticed. At the same time, IgG1 secretion increased to reach IgG2a level. At the third delivery, a partial restoration of the proliferative response was observed. In contrast to infected non pregnant mice, mice infected when pregnant showed no specific proliferative response when tested on day 11 PI. The reactivation of *N.caninum* chronic infection during pregnancy seems not consecutive to immunodepression. Nevertheless pregnancy could favour parasite multiplication at the uterus level after an occasional spontaneous release of bradyzoites.

Eprinomectin pour-on at single and at double dose against gastrointestinal nematode infections in goats.

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A field trial was conducted in southern Italy to assess the efficacy of eprinomectin applied topically at the dose rate of 500 µg/Kg and at the dose rate of 1000 µg/Kg to goats with naturally occurring infections of gastrointestinal nematodes. The nematode population consisted of *Teladorsagia circumcincta*, *Haemonchus contortus*, *Trichostrongylus colubriformis*, and *Oesophagostomum venulosum*. Seventy five lactating goats were assigned to the following treatment groups of 25 animals each: an eprinomectin single dose treated group (E1-group), an eprinomectin double dose treated group (E2-group), and a control untreated group (C-group). The percentage reductions in faecal egg counts from the E1-group, compared to the C-group, were 90.0% on day 7; 91.6% on day 14; 89.4% on day 21; and 87.0% on day 28. The percentage reductions in faecal egg counts from the E2-group, compared to the C-group, were 99.5% on day 7; 99.6 % on day 14; 99.7% on day 21; and 96.7 % on day 28. In the course of the trial, the eprinomectin formulation was well tolerated by all the treated animals of the E1- and E2- groups with no adverse reactions to treatments.

Transmission of *Ascaris suum* to piglets born on contaminated pastures.

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Danish Centre for Experimental Parasitology, The Royal Veterinary and Agricultural University, Frederiksberg C, Denmark. *Ascaris suum* is primarily found in growing pigs and 10-weeks old weaners in outdoor/organic herds have much higher prevalences than conventionally reared weaners. To investigate the infection patterns of outdoor piglets, 6 sows farrowed in late summer on 6 pastures that had been contaminated by egg-excreting pigs the previous year. Three of the pastures had been ploughed in the winter and resown in May. The piglets were born in small huts, placed directly on the soil and filled with plenty of straw, and they first get out of the huts after 14 days of life. One piglet from each litter was necropsied days 7, 10, 14, 17, 21, 28, 35, 42, and 49 of life and *Ascaris* populations were quantified in the lungs (pepsin-HCl digestion, migrating larvae pass the lungs days 6-9 of infection) and the small intestine (agar gel technique, larvae arrive to the small intestine days 9-10 of infection). White spots on the livers were counted. The results clearly demonstrated that a high transmission took place already within the first 10 days of life, as the numbers of larvae migrating in the lungs reached mean values of 2, 47, and 112 per piglet at days 7, 10, and 14, respectively. The first liver white spots and intestinal worms were found day 10. Thus, piglets become heavily infected before they left the hut, and they may have obtained the eggs from the soil within the hut and, perhaps more likely, from the soil-contaminated utter of the sows. The transmission was reduced on the ploughed pastures compared to the unploughed, however, ploughing did not prevent transmission. Interestingly, the largest immature worms in the small intestine must have been gradually expelled, because their maximum lengths decreased during the last weeks of the study, and no large worms were found in any piglets.

Methodological advances in the characterizing the population genetics and molecular systematics of veterinary tissue cyst-forming coccidia.

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Tissue cyst forming coccidia represent a diverse but poorly characterized group of veterinary parasites. Of the hundreds of described species in the Sarcocystidae, variously assigned to the genera *Sarcocystis*, *Toxoplasma*, *Besnoitia*, *Hammondia*, *Frenkelia*, *Isospora*, and *Neospora*, complete life-history descriptions are available for only a few. Although ultrastructural characteristics provide those with expertise the means to differentially diagnose many of these named species, we lack a thorough comparative context that would promote a more comprehensive understanding of the biodiversity of this parasite group, and the epizootiology of its constituent taxa. Genetic data obtained from any developmental stage may serve as a powerful means to identify individual taxa, and can be used to elucidate the descent relationships among related parasite types. Analyses of ribosomal DNAs, plastid-encoded genes, anonymous DNA fragments, and microsatellite loci have recently elucidated features of the population genetics and molecular systematics of this important parasite group. Extraordinarily recent origins for worldwide distributed *T. gondii* clones illustrate the surprises that lay in store when the tools of molecular systematics and population genetics are applied to these pervasive, but poorly understood, protistan parasites. Initial insights into the diversity among species of *Besnoitia* and *Sarcocystis* attest to the paucity of standing genetic variation apparent within specimens whose host range and morphology suggest their conspecific status.

Canine leishmaniasis: Results of 1-year experimental infection of beagles with an American isolate of *Leishmania infantum*.

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Previously considered an exotic disease in the United States, canine leishmaniasis caused by *Leishmania infantum* has emerged within the foxhound population in the United States. *Leishmania infantum* is the etiologic agent of visceral leishmaniasis in many areas of the world and dogs are considered a major reservoir host for human *Leishmania* infections. We isolated *L. infantum* from 3 naturally infected foxhounds from Virginia and examined the pathogenic and immunological responses of American *L. infantum* for dogs. We inoculated (IV) 8 five month old female purpose bred beagles with promastigotes (high dose = 2×10^8 ; low dose = 1×10^7) of our LIVT-1 strain of *L. infantum*. Dogs that received the high dose of promastigotes developed clinical signs associated with leishmaniasis including weight loss, skin abnormalities, ocular discharge, and polyarthritis. Promastigotes were cultured from bone marrow or lymph node aspirates by 13 weeks post inoculation (PI) from all high dose dogs. Lymphocyte subsets (CD4+ and CD8+) were quantified by flow cytometric analysis. Seroconversion was evaluated by an indirect fluorescent IgG antibody test. These data may help to characterize the pathogenicity of American *L. infantum* and to improve diagnosis of canine leishmaniasis in the United States. Supported in part by grant DO1CA-16 from the Morris Animal Foundation to DSL and AMZ. ACR is a Morris Animal Foundation Fellow.

***Toxocara canis* in experimentally infected foxes.**

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Adult farm foxes and cubs of two species (*Vulpes vulpes* and *Alopex lagopus*) were used to study the migration pattern of *Toxocara canis*. Different infective dose levels of *T. canis* eggs or larvae were administered. The effect of infection on activity of *Toxocara* was examined with respect to: (i) the age of foxes, (ii) the dose of ova or larvae administered, and (iii) the effect of primary and challenge infection. At necropsy of the foxes about 3-10 months after exposure, skeletal muscles, liver, lungs, intestinal lymph nodes, kidney, diaphragm, tongue, heart, brain, and eyes were examined for larvae by digestion method. Alimentary tract were opened and examined for adult worms. The excreted eggs per gram faeces (EPG) were recorded daily. The highest number of larvae per gram (LPG) of tissue was found in the kidneys of all necropsied foxes (3-10 months post infection). The two foxes species showed no significant differences with regard to predilection sites of *Toxocara* larvae. During the course of the experiment, the larval burdens decreased in most organs whereas an increase was observed in the kidneys. For cubs (6 weeks old at the time of exposure), almost all larval *T. canis* migrated synchronously through the "tracheal migration" route. However, in adult foxes (> 10 months old at the time of exposure), many larvae were recovered from other tissues. The development of adult worms in adult fox or cub intestine requires tracheal migration of the ingested infective *T. canis* eggs or larvae from new infected paratenic host. The size of the egg dose seems important even in cubs or adults. There were reduction in number of *T. canis* larvae and adults in the foxes body tissues and intestine, respectively and also in the fecundity of female worms after repeated infections.

Importance of the beta-tubulin codon 200 polymorphism for the mechanism of benzimidazole resistance in cyathostomes investigated by quantitative real time PCR.

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The suitability of the quantitative real time PCR approach using TaqMan minor groove binder probes was evaluated for the allelic discrimination of the β -tubulin codon 200 TTC/TAC single nucleotide polymorphism in cyathostome species. Amplification of titrated cloned full-length β -tubulin cDNA revealed that the TaqMan minor groove binder PCR is capable of specifically detecting as few as ten copies. Testing of DNA from single adult and larval stages of several different small strongyle species reproducibly allowed the genotyping of the individual worms. By the real-time PCR approach, the throughput of samples was considerably increased compared with the conventional post PCR readout procedure. Only 7.8% homozygous TAC L3 were found among 102 L3 which were genotyped from phenotypically BZ-resistant small strongyle populations. The percentages of the homozygous TTC and heterozygous TTC/TAC were 41.3% and 50.9%, respectively. This resulted in a total TAC-allele percentage of only 33.3%. These findings correspond to data obtained by genotyping of an experimentally selected BZ-resistant small strongyle population. It is concluded that the β -tubulin codon 200 polymorphism is not the sole mechanism involved in the process of BZ resistance in small strongyles.

Larvicidal and adulticidal efficacy of an imidacloprid and moxidectin topical formulation against endoparasites in cats and dogs.

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A new topical antiparasiticide combines the insecticide Imidacloprid and the macrocyclic lactone Moxidectin for the simultaneous treatment and prevention of ecto- and endoparasitic infections in cats was investigated. Recent investigations in France and Germany have shown that specific cat populations were infected with endoparasites and also carried another parasite, the flea. Results from extended studies concerning the efficacy of the imidacloprid/moxidectin combination against different larval stages of *Toxocara cati* and *Ancylostoma tubaeforme* will be presented. Two controlled studies using experimentally infected cats showed 100% efficacy against third, fourth and immature adult stages of *A. tubaeforme*. Experimental infections with *T. cati* were eliminated to >97% and 91% concerning fourth and immature adult stages, respectively. Treatment of cats naturally infected with *T. cati* resulted in a complete removal of worm burdens. Evidence of persistent efficacy of the combination was obtained by treating dogs 18 days prior to infection with *Uncinaria stenocephala* larvae. In contrast to untreated control animals no worms were found in the intestines of the treated dogs 21 days post infection. No signs of local or systemic side effects were observed during these studies.

A model for ruminant gastric worms: Intraspecific differences between cottontail & woodchuck isolates of *Obeliscoides cuniculi*.

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This investigation was undertaken to establish a model in studying ruminant gastric worms and to compare physiological and morphological characteristics of *Obeliscoides cuniculi* isolates from the southern woodchuck (*Marmota monax monax*) and the eastern cottontail rabbit (*Sylvilagus floridanus mearnsi*). Infections were induced in laboratory rabbits by oral inoculation of 3,000 infective larvae of woodchuck or cottontail origin. In the first experiment, the course of the infection was studied in two 5-animal groups by determining worm egg counts twice weekly during a 5-month period. In the second experiment, two 5-animal groups were necropsied 28 days postinoculation for histopathological observations. The prepatent period averaged approximately 17 days in the woodchuck strain (W) and 15 days in the cottontail strain (C). Worm egg output in strain C was consistently higher than in strain W. At 161 days postinoculation, the average number of eggs passed in a 24-hour period was 17,931 strain C and 2,998 strain W. More adult worms were recovered at necropsy from rabbits infected with strain C than from strain W hosts. The female-to-male ratio in both strains was approximately 1:1.3 on day 28 postinoculation and 1:2 on day 168. Pathological changes associated with *O. cuniculi* infections were primarily those of gastritis, with scattered petechial hemorrhages and minor areas of ulceration in the gastric mucosa. Crateriform ulcers occurred occasionally and were limited primarily to rabbits with strain W infections. Significant differences between strains ($P < 0.01$) were noted in length of body, esophagus, spicules, and in distance from anterior end to vulvar region of adult specimens.

A meta-analysis of the milk production response after anthelmintic treatment in adult dairy cattle.

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This study presents the results of a meta-analysis to estimate the effects anthelmintic treatment on milk production in dairy cattle. The literature search included peer reviewed journals, conference proceedings and theses and included documents written in English, Spanish, French, Portuguese or Italian. The study outcome was defined as the difference in milk production (kg/cow/day) between treated and untreated cows. Fixed and random effect meta-analyses were performed on 75 trials published between 1972 and 2002. The combined estimate after controlling for publication bias and/or small study effect was of 0.35 kg/cow/day. Significant variation among studies was detected and although several variables were found to be associated with the study outcome, they did not significantly reduce the unexplained variability among trials. Trials reporting the use of endectocides had higher milk production response compared with trials using older anthelmintics. Similarly, whole herd treatment trials or trials which applied the treatment in mid lactation or strategically had higher milk response compared with calving or dry period treatment trials. Trials reporting the results as total 305 days milk production had lower response compared with trials which measured production as daily weight. Primiparous cows trials and trials carried out in southern countries had lower responses compared with multiparous cows trials and trials carried out in northern countries, respectively.

Vaccination against myiasis flies – where to next?

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The development of vaccines against myiasis causing flies has largely concentrated on two species, *Lucilia cuprina* and *Hypoderma lineatum*. While these species differ widely in their parasitic lifestyles and in the host immune response, there are some interesting similarities in the vaccine candidate antigens that allow comparisons to be drawn. Research into *Hypoderma* has shown the existence of highly effective immune responses against a limited number of excreted antigens, particularly proteases, following the first season of infection. Furthermore, a protective immune response can be stimulated in the host following vaccination and a number of these antigens, but particularly the Hypodermin enzymes, have significant vaccine potential. In contrast, *Lucilia* infections do not result in an effective acquired immune response. In addition, while excreted antigens (including proteases) and novel somatic antigens have been used in vaccine trials, commercially acceptable protection has not to date been demonstrated in the field. Against this background the future options for vaccine development against myiasis flies are discussed especially with respect to the choice of antigens, the nature of the protective immune response that is required, the likely impact of a vaccine in production systems and the commercial viability of a vaccine. The myiasis vaccine history has clear lessons both with respect to the difficulty of developing vaccines against large parasitic targets but also in the potential for the use of such vaccines in commercial animals.

Prevalence and pathology of gastrointestinal infections in poultry in Punjab state (India).

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Parasitic infections constitute a limiting factor in the development of poultry industry as a number of these are highly pathogenic contribute not only to heavy productional losses, but also death. The present study deals with the pattern of infection and pathology of different gastrointestinal parasites from 13,525 birds in different age groups necropsied at the poultry disease diagnostic laboratory, Punjab Agricultural University, Ludhiana received from various private and government owned poultry farms of the state during the period from January, 2001 to December 2002. The two-year study included the examination of gastrointestinal tract for macroparasites, the gross and histopathological lesions, intestinal faecal & scraping samples for identification of coccidial and other parasites. A total of 98 outbreaks of parasitic infections were recorded. It was notable to record that all outbreaks were recorded in broiler chicks raised mainly in deep litter system. The incidence of coccidiosis was maximum (75/98), out of which maximum outbreaks were recorded in the month of January (24/75) followed by March, February, September and April, respectively. The highest prevalence (41.3 %) was recorded in young birds of 1-6 weeks, followed by 6-12 weeks (35.3 %) and least above 12 weeks (21.3 %). The mortality rate was highest in winter (December-January) and spring seasons (February- March), followed by rainy (August- October) and summer (April – July). Incidence of cestodes and nematodes revealed maximum number of outbreaks in summer followed by spring and rainy season, respectively. Pathology in different infections has been discussed with reference to different gross and histopathological changes. From the present study it was concluded that pathogenesis and prevalence of gastrointestinal parasitic infections is of great importance in deep litter and free range commercial systems, the prevalence of these infections have been reduced significantly in commercial indoor cage poultry production system due to improved housing, hygiene and management.

Electrophysiological analysis of neuropeptide and classical transmitter modulation of pharyngeal pumping in sheep nematodes.

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Feeding by parasites is an essential function and the study of the effect of FMRFamide-related peptides (FaRPs) on feeding physiology might help to identify novel methods to control parasites. Three FaRPs were identified and sequenced following extraction from *Haemonchus contortus* and a further 8 were predicted from *H. contortus* EST sequences. Synthetic mimics of several of the peptides were tested on exposed pharynges of the sheep parasitic nematode *Trichostrongylus colubriformis*. This parasite is related to *H. contortus* but, because of its smaller size, is amenable to monitoring of pharyngeal pumping frequency and amplitude using electrophysiological recordings of current flowing in and out of the nematode's buccal cavity. The peptides AF1 ($\geq 10^{-6}$ M), AF2 ($\geq 3 \times 10^{-8}$ M) and PF3 ($\geq 10^{-5}$ M) increased pharyngeal pumping rate while AF15 ($\geq 3 \times 10^{-8}$ M), KSAFVRamide ($\geq 3 \times 10^{-9}$ M) and KSQYIRamide ($\geq 10^{-6}$ M) inhibited pharyngeal pumping. CF3, HF3 (a novel *Haemonchus* peptide) and PF4 had no effect. The pharmacology of *flp*-17 peptides KSAFVRamide and KSQYIRamide were further studied in drug-susceptible and LEV-resistant L4 *H. contortus*. Acetylcholine (ACh, $\geq 10^{-7}$ M), levamisole (LEV, $\geq 10^{-7}$ M), KSAFVRamide ($\geq 10^{-8}$ M) and KSQYIRamide ($\geq 10^{-7}$ M) were inhibitory and, although distinct from their action on somatic muscle, ACh and LEV displayed nicotine receptor-like pharmacology. These data suggest that the nematode pharynx expresses a unique set of receptors for FaRPs and classical neurotransmitters.

Development of a recombinant vaccine against *Babesia divergens* in cattle.

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Based on the observation that gerbils can be vaccinated against virulent *Babesia divergens* challenge infection using a preparation containing soluble parasite antigens (SPA) from in vitro cultures a research programme was developed to reveal the protective antigen. The SPA of culture supernatants were separated into four distinct fractions, of which one fraction (coined F4) contained the essential protective antigens. A range of monoclonal antibodies (Moab) was produced against the F4-antigens, which revealed a Moab (DG7) that had inhibitory activity on parasite proliferation in vitro but showed no protective effect in vivo. Surprisingly, a second Moab (F4.2F8) was discovered that, although not inhibitory in vitro, did prevent infection in vivo and could even cure on ongoing infection. This Moab recognised a 37kD molecule of SPA of *B. divergens* culture supernatants. The gene was cloned and expressed in different expression vectors. Recombinant antigens were mixed with saponin and used to vaccinate gerbils. Results showed that gerbils were completely protected against heterologous challenge infection. To show that antibody reactivity against 37kD antigen could protect cattle against *B. divergens*, calves were vaccinated twice with recombinant antigens, subsequently splenectomised and then challenged with *B. divergens*. Results showed that calves were significantly protected from babesiosis. In addition it was shown that infusion of Moab F4.2F8 also conferred protection to splenectomised calves.

Antiparasitic drugs and myiasis.

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Ignoring accidental and facultative myiasis, antiparasitic drug treatment of obligate myiasis is directed toward the parasitic larval stages. Conventional drug applications toward arthropods affecting man and his animals have normally targeted the parasitic adult stage. Depending on the predilection site of the larvae (including dermic, subdermic or furuncular, wound, digestive, or respiratory), applications have been designed to deliver chemicals to these immature stages. The history of chemical therapy of myiasis can be essentially divided into two eras: treatment involving harsh chemicals, many of which are no longer permitted for use, and the years after the introduction of the macrocyclic lactones in the early 1980's. The very high efficacy of especially the avermectins against all species of flies with larvae involved in obligate myiasis has made control much less complicated. Despite concerns about possible environmental consequences from their use, these drugs possess unique characteristics not seen in previous chemical control technologies. For the oestrids that extensively migrate like the Hypodermatinae, the avermectins are able to kill both migrating and furuncular stages. Additionally, very high efficacy has been demonstrated even at dramatically low dosage levels, leading to use in microdose eradication efforts. Because these drugs are endectocides, it has yet to be shown whether usage at these dilutions will lead to resistance problems with endoparasites and other ectoparasites not as susceptible.

A PCR-based comparative survey of arthropod-transmitted infections in dogs, cats and ticks in southern France.

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Although arthropod-borne infections are well-recognised in companion dogs resident in and travelling to, southern France, little is known about the prevalence of active infection, co-infection, feline infection or the pathogen carriage of ticks in this area. Between April and December 2001, EDTA blood samples and clinical histories were collected from 632 dogs and 243 cats from 55 veterinary clinics in Provence-Côte d'Azur and Languedoc Roussillon. Ticks found on 89 dogs and 51 cats were collected into ethanol and identified. DNA was extracted from blood samples and from 182/214 ticks. Canine blood samples were screened by PCR analysis for genera *Leishmania*, *Babesia*, *Borrelia*, *Bartonella*, *Ehrlichia* and *Anaplasma*, feline blood samples for *Babesia*, *Ehrlichia*, *Borrelia* and *Mycoplasma* (*Haemobartonella*) species, and ticks for genera *Babesia*, *Ehrlichia*, *Anaplasma* and *Borrelia*. Positive samples were sequenced. No cats were PCR positive for *Babesia*, *Ehrlichia* or *Borrelia* DNA but 62/243 (26%) were positive for feline haemoplasma DNA. No dogs were positive for *Borrelia* or *Bartonella* DNA but 25/632 (4%) were positive for *Babesia* (*B. canis canis*) and one for *E. canis* DNA. Co-infections with differing feline haemoplasmas were found but no co-infections were identified in dogs. On cats, 75% of ticks found were *Ixodes* sp. and no PCR positive ticks were identified. On dogs, *Dermacentor* sp predominated (47%) and 24% of all ticks were PCR positive; 8% for *Babesia canis canis*, 17% for *E. canis* and 3/182 for *Babesia* and *Ehrlichia*. Infection prevalence and tick fauna on dogs differs from cats and *Babesia* and *Ehrlichia* infection challenge in dogs is high.

Inactivation of *Cryptosporidium parvum* oocysts by the composting of cattle feces.

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Cryptosporidiosis is one of the important zoonotic diseases. Oocysts of *Cryptosporidium parvum* in animal feces is important as the source for contamination of water resources. To prevent their contamination, reduction of the number of the infectious oocysts at farms is very important. We examined the effects of composting on the infectivity of oocysts. Compost was made with 290kg cattle feces and 50kg rice shells. Cattle feces containing 2×10^6 *C. parvum* oocysts/ml was put in small tubes, and the three sets of tubes were embedded in the surface level and the depth of 20cm and 40cm from the of the compost respectively. The compost was mixed once in a week and tubes were recovered in the same time. The infectivity of oocysts was examined by the suckling mice inoculation method. The oocysts embedded in 20cm and 40cm depth lost infectivity in the first week, and that in the surface lost it in the second week. In the first week temperature in 20cm and 40cm depth rose over 45°C, but in the surface it occurred in the second week. It suggested that composting with more than 45°C of temperature is useful method to inactivate the oocysts of *C. parvum*.

Study of human cutaneous dirofilariosis at Caspian territories of Iran in 2001.

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Dirofilaria repens is a filarial worm naturally affecting canines as definitive host and its intermediate host are some species of culicine mosquitoes. It acts as an incidental parasite for human being. After first report of dirofilariosis in Iran in 1994 by the present author, we designed a greater retrospective study on this infection at Caspian territories of Iran where is a rainy area fully covered by the forests. In this way all of 370 nodules (355 cutaneous and 15 pulmonary nodules) referred to local medical laboratories by the year 2001 were examined by histopathological and parasitological methods and sections stained by H&E and trichrome staining methods. In five cases (1.4%) out of 355 cutaneous nodules we observed *Dirofilaria repens*, but none of pulmonary cases were parasitic. The wall of nodules was made of vascularized fibrotic tissue infiltrated by macrophages and lymphoid cells. At the center of nodules there was a prurient exudate and various sections of immature worms with double empty uteri. With respect to this fact that dirofilariosis can also affect more important organs than skin such as lungs and mucosal tissues, it would be of demand to have a further study on its vectors and areas affected by this parasite.

Seroprevalence and transmission risk factors of porcine cysticercosis in rural pigs of eastern and southern provinces of Zambia.

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Human and pig cysticercosis caused by infection of metacestodes larvae (*Cysticercus cellulosae*) of a zoonotic pork tapeworm, *Taenia solium* is prevalent in many developing countries of the world including Zambia. The objective of the study was to determine the prevalence and the potential risk factors associated with disease transmission and maintenance in humans and pigs in the rural areas of Eastern and Southern Provinces of Zambia. Prevalence in pigs was determined by lingual examination and using a monoclonal antibody-based sandwich enzyme linked-immunosorbent assay for circulating antigen (Ag-ELISA). Risk factors were assessed by a questionnaire. On tongue examination, 15.8% of the pigs (n=701) were positive. Lingual prevalences in surveyed districts were Southern province [Gwembe 25.4% (n=291)] and Eastern province [Petauke 9.3% (n=150)] and [Katete 8.8% (n=260)]. Ag-ELISA results were Gwembe 39.2%, Petauke 14% and Katete 23.5% with the two provinces having an overall prevalence of 28%. Higher prevalence was found in male 32.1% (n=187) than female 26.5% (n=514) pigs. Of the 386 farmers interviewed, 53.4% lacked latrines, 74.9% kept pigs on free-range, 92.4% consumed pork, 96.6% slaughtered pigs at home without inspection, 85.2% have observed cysts in pork, 32.1% admitted eating cysticercosed pork, 57.5% were ignorant about *Cysticercus cellulosae* they observed in pork, whereas 33.7% obtained drinking water from rivers and shallow wells. The high prevalence is suggestive of a wide spread human taeniosis and cysticercosis in surveyed areas. There is an urgent need to conduct a taeniosis and cysticercosis prevalence study in humans in these areas.

Clinico-therapeutic studies on theileriosis in crossbred cattle of Thar of India.

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Theileriosis is a tick borne protozoan disease caused by *Theileria annulata* in cattle causing heavy economic losses in form of mortality and decreased production. Out of some 150 clinical cases of theileriosis in cattle observed during 2002-2003 at college clinics and individual holdings, forty cases of either sex, different age groups (3 year to 14 year old) and breed (Holstein and Jersey crosses with red Dane and Rathi cattle) were selected for detailed clinico-pathological and therapeutic trial in this study. Clinical manifestations were pyrexia (up to 107°F), pallor of mucosa, anorexia, dyspnoea, diarrhoea, weight loss and enlargement of superficial lymph nodes. In some cases at recumbent stage convulsions and paddling movements were also observed. The cases were confirmed with blood smear and lymph node biopsy examination. Haematology and blood biochemistry revealed leukopenia, decreased haemoglobin, packed cell volume and reduction in serum glucose levels. The cases were treated with different regimen by using injections of oxytetracycline, chloroquine phosphate, diamenazine acetate, and buparvaquone. Effect of injection buparvaquone with oxytetracycline showed better results. To reduce the economic losses some newer vaccines and control of drug resistant ticks was necessary.

Neem extract as an effective risk-free insecticide in dogs.

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Ectoparasites (ticks, fleas, lice) cause irritation, allergy, blood loss, itching, discomfort, and are a major problem in all dogs worldwide. Several commercially available insecticides (tablets, spray, collar, application, etc) are used extensively, in spite of the undesired residual effect of toxicity. The level of exposure and type of chemical determines the toxicity. In this study a total of 32 dogs (ranging from 6 months to 8 years of age, of different socio-economic status) were exposed neem extract prepared from raw neem leaves (crushed and filtered) was applied all over the entire body area as scrub. This crude neem extract application was allowed to remain on the body for 5 min. followed by plain water bath to clean the neem residues from the skin. All the dogs were free from ectoparasites for period ranging from 12 days to 3 months depending on case-to-case & level of re-infection in the vicinity of the dog's area. No unwanted effects/symptom was noticed in any case. Neem extract could be used safely in ectoparasite control (absolutely free from any side-effects) of dogs. Neem extract could possibly be processed to purify the actual inherent insecticidal chemical and can be used in large-scale basis as a risk-free product for control of ticks, fleas, lice and other insecticides. Till such time the crude neem extract can be a very economical and safe way of ectoparasite control.

A kinesin-related protein of *Babesia divergens*.

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Kinesin-related proteins (KRPs) typically show >35% sequence identity to the kinesin heavy chain motor domain but differ in sequence outside the domain. This difference is attributed to the functions of the proteins. Kinesins have roles in vesicle/organelle transport, whereas KRPs are involved in spindle function and chromosome motility as well as being microtubule motor proteins. Some KRPs are capable of class V myosin interactions. This raises the possibility that KRPs may be involved in the actin-myosin motor mechanism used by apicomplexan parasites in the invasion of their host cells. Sequence data obtained for *B. divergens* was homologous with various KRPs in the area of the conserved motor domain corresponding to the motif ERSYINKSLLV. The sequence data and an alignment of KRP conserved motor domains were used to design primers for a PCR protocol aimed at amplifying up more of the motor domain. Two primers corresponding to the motifs INKSLLV and IFAYGQTGKT generated a 600 base pair PCR product. This product was sequenced and subjected to homology searches, which revealed further homology with KRPs, including those of the protozoan parasites *Giardia lamblia* and *Plasmodium falciparum*. The PCR product was used in the design of DIG-labelled oligonucleotide probes that were used to probe a cDNA library of *B. divergens* in order to obtain the complete sequence of the KRP gene.

Gene expression patterns in the sheep gastrointestinal nematodes, *Haemonchus* and *Teladorsagia*.

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Gastrointestinal nematode parasites are the scourge of the livestock industry worldwide. At present, they are controlled by the strategic use of anthelmintic drugs but this approach is likely to be unsustainable due to the inexorable rise of resistant parasite populations. Similarly, although significant progress continues to be made in the development of anti-nematode vaccines, none of these is considered to be near market. Detailed analyses of gene and protein expression in the parasite and its host should provide an insight into the host-parasite interface at the molecular level and may highlight key events in the parasite's life-cycle that may be future drug or vaccine targets. To this end, we have been comparing gene expression patterns in two major gastrointestinal nematode species, namely *Haemonchus contortus* and *Teladorsagia circumcincta*, as revealed by expressed sequence tag (EST) analysis. Comparisons have been made between the respective life-cycle stages of each species and also between the two species, which reflect subtle differences in their biology. In a pilot study with *Haemonchus*, we have also been evaluating serial analysis of gene expression (SAGE) as a high throughput expression profiling tool and comparing data obtained with that from the EST analysis.

***Parascaris* resistance to macrocyclic lactones.**

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Several Clinical Trials were conducted on each of two Thoroughbred and one Standardbred farms with up to 44 foals in Ontario, Canada in August-November 2002. In each trial, prior to treatment (PRT) and 12-18 days post-treatment (POT) a 5-g fecal sample from each foal was used to secure a *Parascaris* egg count (epg). On some occasions, POT eggs served as PRT eggs for the next trial on the farm. Foals were ranked by PRT epg from highest to lowest and blocked for treatment. The first treatment block had foals from the top of the rank order and the number of foals taken down the rank order was equal to the number of treatments for the trial. Foals within that block were randomized to treatment. Other treatment blocks were similarly constructed down the rank order. In each trial efficacy was determined by comparing PRT and POT eggs. For two trials on each Thoroughbred farm mean efficacies for ivermectin were 22.6% and 39.1%, two trials with moxidectin 40.5 and 53.3%, one trial on one farm and two on the other with fenbendazole 100 and 93.5%. On the Standardbred farm most foals were 7-9 months when a trial with fenbendazole and two with moxidectin had mean efficacies of 100 and 55.4%, respectively, but in untreated controls the mean POT epg had fallen by 63.5%. On all farms trials with pyrantel pamoate were with older foals, most 7-8 months, with mean efficacies of 91.8, 100 and 99.7%, but untreated foals had high mean reduction in epg. There appeared to be *Parascaris* resistance to macrocyclic lactones on Thoroughbred farms and possibly also on the Standardbred. Fenbendazole was highly effective for *Parascaris*.

RNAi to study post-embryonic GATA factor function in *C. elegans*; a model for parasitic nematodes?

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The GATA transcription factors have essential roles in gene regulation and tissue differentiation in a wide range of organisms. We are studying these genes in both *C. elegans* and parasitic nematodes with the aim of identifying aspects of GATA factor function that are both essential and specific to nematode development. There appears to be a high level of functional conservation of the *elt-2* gene between *C. elegans* and *H. contortus* (see abstract by Gilleard et al) suggesting that, for this gene family, work in *C. elegans* is likely to be of relevance to strongylid parasitic nematodes. We have been using RNAi to study post-embryonic functions of the *C. elegans elt-1* GATA factor, a gene essential for the early specification of hypodermal cell fates. Expression of *elt-1* is seen in most hypodermal cell precursors in early embryos but becomes restricted to the lateral seam cells from the comma stage onwards. Post-embryonically, there is continued expression in seam cells and additional expression in the ventral nerve cord, cell bodies of the retro-pharyngeal ganglion and muscles surrounding the vulva. When RNAi is applied post-embryonically a variety of phenotypes are seen. Larvae show an uncoordinated phenotype but appear otherwise normal until the L4-adult moult after which they become 'sick' and rupture at the vulva. Seam cells are progressively lost from the mid-L4 stage onwards. Scanning electron microscopy shows that there is disruption of the lateral adult cuticle and an absence of alae. Hence *elt-1* appears to have multiple essential functions during post-embryonic nematode development and potentially represents a novel drug target.

***Cryptosporidium* and *Giardia*: Epidemiology and control on California dairy farms.**

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Cryptosporidium and *Giardia* are well-known fecal protozoal pathogens that can cause self-limiting diarrhea in immunocompetent patients, with more serious and even fatal disease in immunocompromised patients. Environmental sources of *Cryptosporidium* and *Giardia* for aquatic ecosystems range from non-point discharges such runoff from animal agriculture, populations of wildlife, and urban-suburban locations, to more traditional point sources such as sewage outfalls and leaky septic tanks. Our study utilized seven farms in a coastal California ecosystem to evaluate various Beneficial Management Practices (BMP's) in reducing the rate of loading of *Cryptosporidium*, *Giardia*, and coliforms in storm runoff. Stormwater samples were collected either directly above or below the installed BMP, or using a paired-watershed design whereby one location was treated with a BMP while its pair served as the untreated control. Farm locations targeted for BMP evaluation were waste management systems, calf rearing areas, dry lots, grazed pastures, and streams. Beneficial Management Practices evaluated included vegetative buffer strips, mulch-treatment, straw barriers, and seasonal constraints on animal access to pastures. In the first year of our study, we have found various levels of *Cryptosporidium parvum* animal genotype, *Cryptosporidium andersonii*, and *Giardia* spp. in stormwater samples using immunomagnetic separation (IMS), direct fluorescent antibody (DFA), and polymerase chain reaction (PCR) analysis. Epidemiology of stormwater contamination with *Cryptosporidium* and *Giardia* on the farms and BMP efficacy over the past year will be discussed.

Population dynamics and intra-litter transmission patterns of *Isospora suis* under on-farm farrowing conditions.

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Piglet coccidiosis due to *Isospora suis* is an increasing problem throughout the world especially in countries with intensive pig production. The epidemiology of the disease, however, is still not fully understood and thus intervention procedures remain suboptimal. Moreover, the information regarding intra-litter transmission dynamics is scarce. In this study we aimed to demonstrate the intra-litter infection dynamics of *I. suis* under normal farm farrowing conditions. The trial took place on a farm where anti-coccidian compounds were not employed and the prevalence of isosporosis was approx. 80%. Daily fecal samples were taken individually from every piglet of 4 litters each with 11-13 piglets from day 3 after birth and up to weaning 4 weeks later. The samples were examined by a concentration flotation technique using fluorescence to screen for *I. suis* oocysts. The overall incidence of infection in the 4 litters was 53.8%, 100%, 100% and 91.7%, respectively. Furthermore, piglets within a litter did not excrete oocysts concurrently. The piglet age for onset of oocyst excretion ranged from 5 to 29 days showing a pattern of one or two piglets initially excreting oocysts prior to the remaining litter. The results suggest that only a few piglets per litter are infected first, most probably by ingesting oocysts existing in the environment, they amplify the parasite in their intestine and subsequently by excreting bigger number of oocysts they manage to infect the rest of the litter.

Peritoneal lavage cells of Indonesian thin tail sheep mediate antibody-dependent superoxide radical cytotoxicity to newly excysted juvenile *Fasciola gigantica* but not *F. hepatica*.

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Indonesian thin tail (ITT) sheep are unusual in that they are able to kill the migrating parasites of *Fasciola gigantica* by an immunological mechanism within 2-4 weeks of infection whereas these sheep express no resistance to *F. hepatica*. Studies in ITT sheep show that little liver damage occurs following infection with *F. gigantica*, suggesting that many migrating flukes do not reach the liver and are likely to be killed within the peritoneum. We investigated whether peritoneal lavage cells (PLCs) from ITT sheep could kill juvenile *F. gigantica in vitro* and act as a potential mechanism of resistance against this parasite in these sheep. PLCs from 4 week *F. gigantica*-challenged sheep, rich in macrophages and eosinophils, mediated antibody-dependent cytotoxicity against juvenile *F. gigantica in vitro*. Furthermore, resident peritoneal monocyte/ macrophages or eosinophils (obtained from mammary washes elicited with *F. gigantica* extracts) from uninfected ITT sheep also killed juvenile *F. gigantica in vitro*. Using various inhibitors, we show that the molecular mechanism of killing in these assays was dependent on the production of superoxide radicals by macrophages and eosinophils. This cytotoxic mechanism was ineffective against juvenile *F. hepatica*. We suggest that superoxide produced by ovine macrophages and eosinophils may be important effector mechanism involved in the resistance of ITT sheep to *F. gigantica* infection.

Detection of *Hammondia heydorni*-like organisms and their differentiation from *Neospora caninum* using RAPD-PCR.

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Neospora caninum and *Hammondia heydorni* are morphologically and phylogenetically related coccidians that are found in the feces of dogs. New diagnostic genetic loci, based on random amplified polymorphic DNA- polymerase chain reaction (RAPD-PCR), were developed to aid in the detection of *H. heydorni*- like parasites and to discriminate them from *N. caninum* and other related coccidians of dogs. Based on the data obtained from 5 random decamers, *H. heydorni* (Manhattan-1) and *N. caninum* (NC1) were characterized by distinct banding patterns (similarity index = 0.068). High stringency PCR assays were developed from the sequences of 2 cloned bands, uniquely amplified from *H. heydorni*. Interestingly, of the 5 parasite isolates presumed to represent *H. heydorni*, only 2 supported amplification with the new diagnostic loci. An identical result was obtained from these 5 isolates using a recently described PCR assay directed to the *H. heydorni* internal transcribed spacer (ITS)-1. We conclude that *H. heydorni* and *N. caninum* are genetically distinct and that such tools may be useful in more completely characterizing the diversity of related parasites that occur in dogs.

Efficacy of aversectin preparations against intestinal nematodes of horses.

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The aim of our investigation was to evaluate the anthelmintic efficacy of three aversectin preparations against *Parascaris equorum* and intestinal *Strongylidae* of horses. Three anthelmintics were used: “Nemasektin” (1% aversectin, paste), “Univerm” (0.2% aversectin, powder) and “Equest” (1.9% moxidectin, oral gel). A hundred of horses from three age groups (1-year-old foals, 2-years-old and 6-8 years-old horses) were involved into experiment, 3 experimental groups were separated. Faecal samples were collected a day before and 14 days after treatment. Efficacy of each preparation was determined by faecal egg count reduction test (FECRT). Faecal samples were collected 84 days after treatment to estimate the duration of anthelmintic effect of the preparations. All preparations performed high efficacy against intestinal nematodes of horses. The FECRT revealed 99,4% reduction of nematode eggs’ number for “Nemasektin” and 100% for both “Univerm” and “Equest”. The result of coproscopy on 84th day showed that horses treated with “Nemasektin” restored 54,6 % (on average) of strongylid burden, horses treated with “Univerm” restored 13.8% and horses treated with “Equest” restored less than 2,3% of strongylid burden. Taking into account the shorter egg reappearance period for “Nemasektin” and “Univerm”, they should be applied every 8 weeks to avoid the development of clinical strongilidoses, especially in young horses.

Reappearance of eggs in faeces of horses after treatment with moxidectin and aversectin.

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The term and the scope of reinfection with intestinal nematodes in horses from Dubrovka State Stud Farm (Poltava region, Ukraine), were studied in November 2002 - March 2003. The horses were grazed on 340 hectares divided into nine pastures ranging from 30 to 90 hectares. All pastures were regularly grazed during the season, so "clean" pasture is generally not available. 49 foals of Russian and Orlov trotters (29 being of 1 y.o. and 18 being of 2 y.o.) with severe intestinal nematode infection, were selected for the experiment and divided into four groups by age and the drug studied. Horses have not received any anthelmintic treatment for six month prior to the beginning of the experiment. Anthelmintic treatment with Moxidectin (Equest) at 0.4 mg/kg BW and Aversectin (manufactured in Ukraine) at 0.2 mg/kg BW was conducted on November 3, 2002. Eggs were counted with McMaster technique (Herd, 1992) prior to the beginning of the experiment and on the 14th, 86th and the 118th days after the treatment. Equine nematodes have been recovering during two days after the treatment from faeces to search for parasites. Almost 100% of young horses were found to be infected with intestinal strongylides, with high infection rate (mean EPG - 563). Despite high efficacy of the Aversectin drug the reinfection with intestinal *cyathostomes* was quick and the infection rate was high, with 100% animals being reinfected. In the group of horses where Moxidectin was used the reinfection occurred only on the 118-th day with very low EPG indicator and low percentage of infected animals. Both drugs have a high antinematode efficacy. Moxidectin has higher efficacy than Aversectin drug in the increasing of reinfection period, this is probably due to the fact that Aversectin does not affect the encysted stage of *Cyathostominae*.

Non-invasive PCR for the detection of *Leishmania infantum* infection in dogs.

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A non-invasive sensitive PCR for the detection of *L. infantum* DNA in dog's tissues was evaluated. Specimens were obtained from *Leishmania*-seropositive dogs (n=25), dogs treated with allopurinol (n=10), experimentally infected beagle dogs (n=6), and seronegative dogs from an endemic area of *L. infantum* (n=65). Specimens included: conjunctival swabs, skin scrapes, buffy coats, blood, spleen and lymph node aspirates. Cultures of spleen and lymph node were obtained from all dogs except the seronegative dogs. The internal transcribed region 1 of *L. infantum* ribosomal operon sequence was used as a template for the amplification of a 314bp fragment. Sensitivity of spleen and lymph node PCR (SLP) of the seropositive dogs was identical to parasite cultures of these organs (84%). Using the non-invasive samples, PCR of conjunctival swabs (CSP) was superior (92%). Sensitivity of CSP in dogs during treatment was similar to that of culture (60% vs 63%), and considerably higher than that of SLP (44%). The experimentally infected dogs showed positive CSP already at 6 weeks post infection. These results indicate that CSP obtained non-invasively has a higher degree of sensitivity than PCR and culture obtained by invasive procedures. CSP positivity correlated best to serology in naturally infected dogs and was better than serology in experimentally infected dogs. Hence, the use of CSP is superior to culturing or to SLP due to its sensitivity and noninvasiveness and can serve to corroborate the presence of *L. infantum* parasites in seropositive dogs. This study was supported by grant number SO 220/5-1 from the Deutsche Forschungsgemeinschaft (DFG) for the Palestinian-German-Israeli Cooperative Project on leishmaniasis in Palestine and Israel.

Genes involved in hypobiosis in bovine lungworm.

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The cattle lungworm is one of the most important parasites in first year grazing cattle. Infection causes parasitic bronchitis, which often is lethal. Hypobiosis represents a mechanism of survival in adverse extrinsic and intrinsic environments. In lungworm inhibition of development is induced by exposure of third-stage larvae to low temperatures. Hypobiotic larvae of *Dictyocaulus viviparus* persist in the lung of infected cattle for several months before they mature to egg-laying adults. Studies on the rabbit stomach worm *Obeliscoides cuniculi* indicate a genetic regulation of inhibited development. In the free-living soil nematode *Caenorhabditis elegans* the *daf*-genes participate in the process of hypobiosis. To identify hypobiosis regulating genes and their expression in *D. viviparus* mRNA was isolated from experimentally hypobiosis induced and not induced third-stage larvae and converted into cDNA. Suppression Subtractive Hybridization was used to enrich differentially transcribed genes followed by construction of subtracted libraries of the two larval populations. After differential screening to identify false positive clones of the subtracted libraries, 58 clones of hypobiosis induced and 44 clones of not induced larvae were detected to be differentially transcribed. After verification by cDNA dot blot, 26 clones of the hypobiosis induced and 22 clones of the not induced larvae remained for further analysis. These gene transcripts were sequenced and compared with published sequences of other organisms. Three of them showed identities with a N-methyltransferase, a guanylate cyclase of *Caenorhabditis elegans* or the superoxide dismutase of *Haemonchus contortus*. 3'- and 5'-RACE was performed to obtain full length cDNA. Furthermore, Real-time PCR will be performed to investigate the transcription level in the two larval populations.

Survival of *Trichinella spiralis* in animal feeds.

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Trichinella spiralis can infect farm animals via several routes. The infections of swine and horses have been suspected to originate from contaminated feeding stuffs. With this study we wanted to assess how long *T. spiralis* can present a risk for an outbreak in contaminated feeds. *T. spiralis* infected rat carcasses were incubated for 6 weeks in several animal feeds: silage, grained barley, propionic acid-preserved feed, and also natural pasture conditions were simulated. Altogether 24 target rats were used; six in each test environment. Samples were collected after one-, two-, four-, and six-week-incubations. *Trichinella* larvae were recovered by digestion, and their infectivity was confirmed by inoculating recipient rats with isolated larvae. Two-week incubation diminished the number of larvae, but still after six weeks larvae were recovered from all feeds in small numbers, except in the environment simulating natural pasture conditions. In sampling after two weeks the larvae were infective in all test environments. However, up to four weeks, they survived only in propionic acid fermented feed and there in small numbers with reduced reproductive capability. Fresh hay is used soon after harvesting. In our experiment, infectivity in the pasture-condition simulation was not at all affected in one week. The typical management practice of milling the grain at the farm and mixing it with protein concentrate does not include long storage of prepared feed. Two weeks' persistence of infectivity can thus be hazardous if rats have colonized the crop storage. Silage is recommended to be fermented for at least one month before use. In summer temperatures, infectivity in silage was minimized by four weeks of incubation.

Population dynamics of *Toxocara canis* in pigs receiving a single or multiple infection.

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The population dynamics of *Toxocara canis* in pigs, and their immune response to a primary and a challenge infection, were studied by parasitological and haemato-serological parameters. Seventy pigs were divided into four groups; thirty-five pigs received a primary infection (group A), 15 pigs received both a primary and a challenge infection (group B), 15 pigs received the challenge infection only (group C), and 5 pigs served as helminth-free controls (group NC). A dose of 50 000 eggs was administered for the primary infection (day 0) and a dose of 10 000 eggs was given for the challenge infection (day 28). On days 7, 14, 21 and 28 p.i., five pigs of group A, and on days 35, 42 and 49 p.i., five pigs of the group A, B and C were necropsied. Numbers of recovered larvae were widely varied in 5 pigs of each group at each necropsy. *Toxocara canis* larvae were recovered predominantly from the lungs; migration of larvae to other organs or tissues from the lungs was restricted. In group A, the larval burden in the lungs peaked on day 14 p.i., even though the larval densities significantly decreased over time; thereafter, the majority of larvae were recovered from the lungs until the end of experiment (day 49 p.i.). A few larvae were found in the muscles and brain until day 42 p.i., and 2 larvae were found in the eyes of 2 pigs on day 35 p.i. There was little evidence of protective immunity to a challenge infection in this experiment; however, the acute eosinophilia did not occur in all pigs after challenge infection following a primary infection in contrast to the challenge control. The relevance of these data to the population biology and immunology of porcine and human toxocarosis is discussed.

Photography and staining techniques for helminth specimens, particularly with “Carmin staining and acetic-acid treatment.”

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It is necessary for the individual structure and character of a helminth specimen to be carefully considered for producing photomicrographs of highest quality. The type of photographic technique to be used should be selected on a case by case basis for each specimen. Structural complexity and varied shape, size, color, etc., of adult and immature parasites complicate the task of producing true photographic duplications. The techniques depend on the macro- or the micro-systems and different lighting methods, e.g., photomacrography system (transmitted lighting/incident lighting), photomicrography system (transmitted bright field), phase-contrast observation, fluorescence observation, incident bright field lighting, transmitted dark field lighting. The carmine staining and acetic-acid treatments are useful and practical techniques for preparation of specimens; only three reagents i.e., carmine, acetic acid and ethanol are used. Specimens treated with lactophenol also offer an advantage in observation of specimens. Through these techniques, “A Color Atlas of Clinical Helminthology of Domestic Animals, Revised Edition” was produced.

Transmission of *Toxocara canis* infection: A pilot study in Estonia.

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Preliminary study of 1087 dogs showed that 17,5% of them were shedding *T. canis* eggs with faeces. From 138 litters under study 132 (96%) were infected. To estimate the present state of contamination of children playgrounds and public parks with *T. canis* eggs in Tartu, the second largest town of Estonia, two distinct places were taken under investigation: Tähtvere Park and Anne district. From Tähtvere Park 71 faecal samples of dog origin were collected. In total 45 sand box samples were collected from children playgrounds in Anne district. In 21 cases faeces was found from sand boxes and sampled for the study. In other cases ca 50 g of sand was sampled from each sand box. Simple flotation technique was used for detection of *Toxocara* spp. eggs. Eight percent (6 from 71) of faecal samples of dog origin collected from Tähtvere Park in Tartu were *Toxocara canis* - positive. Both, sand and faecal samples from sand boxes contained *Toxocara* spp. eggs. In total 18% of sand box samples (8 from 45) were positive. According to our limited preliminary data sand boxes on children playgrounds are more often contaminated with *Toxocara* spp. eggs than public parks. The correct identification of species was not possible as the eggs of *Toxocara canis* and *T. mystax* are morphologically identical.

Steps in characterization of allelic variation of an ivermectin sensitive GluCl gene in *C.nassatus*.

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Small strongyles or cyathostomins including *C.nassatus* are now considered as the most important intestinal parasites and principle parasitic pathogen of horses (Love et al., 1999). Drug resistance in cyathostomins has been reported for phenothiazine, benzimidazoles, febantel, piperazine, and pyrantel pamoate (Drudge et al., 1989) but not for Avermectin/Milbemycins (AMs). The invertebrate glutamate-gated chloride (GluCl) channels are inhibitory ion channels and are the putative receptor molecules and targets of the AMs and are most probably involved in mechanism of drug-resistance. Selection at the GluCl gene in response to drug treatment can be ascertained by comparing frequencies of GluCl gene alleles in drug-selected and susceptible isolates of worms. Our hypothesis is that particular alleles are associated with selection for resistance to drug. SSCP is an excellent technique for detection of mutations and intron spanning regions of gene are considered best for analysis by SSCP. We have found intron sequences in alpha subunit of the GluCl gene in *C.nassatus* by amplifying genomic DNA and cDNA using same primers. Also, we have cloned and sequenced a fragment of beta-subunit of *C.nassatus* GluCl using degenerate primers based on amino acid homology in related organisms. Further work to characterize the allelic variation of GluCl gene in *C.nassatus* is in progress.

Evaluation of strategies to control anthelmintic resistance in nematodes of sheep.

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Infection with gastrointestinal nematodes causes considerable production losses in sheep and their control relies heavily on the use of anthelmintics. Alternation or class rotation of anthelmintic groups has been recommended as a means of slowing down or delaying the inevitable development of resistance. Control strategies, involving anthelmintic rotation either on a yearly basis, or within season, were compared with an early season suppressive control strategy and an organic, low input, system on 4 commercially run sheep farms. Effectiveness of the strategies was monitored by regular faecal worm egg counts (FEC) over a 3-year period and each farm checked regularly for the presence of anthelmintic resistance by a larval development test (LTD). All 3 strategies involving anthelmintic usage reduced the periparturient egg output in ewes, but in those kept organically, egg counts remained moderate. As a consequence egg counts generally remained low in lambs treated with anthelmintics and higher in those raised organically. Similar observations were made over each of the 3 years of the study. The presence of resistance to benzimidazoles (BDZ) and levamisole (LEV) in *Ostertagia (Teladorsagia) circumcincta* and *Trichostrongylus* spp was detected in samples taken from ewes in two of the anthelmintic treated groups during the first year of the study. No resistance was detected in samples subsequently taken, either from ewes for the remainder of the study, nor from lambs during the first two years. By the end of the third year of the study, however, small numbers of BDZ and LEV-resistant nematodes of the above species were detected in lamb samples on all three farms where anthelmintics had been used, and on the organic farm.

Epidemiology of goat gastrointestinal nematodes in Georgia.

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Infection with gastrointestinal nematodes (GIN), particularly *Haemonchus contortus*, is a major problem limiting profitable production of goats in the southeastern USA. Information on epidemiology of GIN in this region is needed, but data are limited. A 3-year study was completed in Central Georgia in which GIN fecal egg count (FEC) and blood packed cell volume (PCV) of 20-24 mature Spanish does grazing grass pasture were monitored year-round. The does were sampled every 2 weeks, with individual fecal cultures made at the time of sampling to allow speciation of the GIN. Salvage anthelmintic treatment was given to individual animals with PCV of 15 or lower (first 18 months of the study) or lower than 20 (final 18 months). Nematode FEC were higher in the first year of the study than in years 2 and 3, with seasonal fluctuation each year. The FEC generally increased from January to July and decreased from August to December, with a spike in September. In year 1, PCV values were higher from January to July and lower from August to December. This pattern was reversed in year 2, while PCV values fluctuated monthly in year 3. Number of goats requiring anthelmintic treatment was higher in spring and fall than in summer during the first 2 years, with similar treatment numbers in spring, summer, and fall in the final year of the study. Number of required treatments was generally cyclic within seasons, with peaks in March, May, July, September, or October in 2 out of 3 years. The number of required treatments increased each year of the study. Effects of parasitism on the goats appeared to be most severe when available green pasture was short and tall pasture was poor quality. This occurred in late spring and early fall when cool-season annual and warm-season perennial grasses, respectively, were in a reproductive growth phase. Effects of GIN were generally less when pastures were green and actively growing, in mid-spring and mid-summer. This could be related to improved nutrition or less grazing close to the soil surface during these times. The most predominant GIN in examined cultures was *H. contortus*.

Influence of different forages on gastrointestinal nematode infections in grazing lambs.

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Nematode infections of sheep may be influenced by secondary compounds in the diet, e.g. condensed tannins. A study was performed with 7 groups of lambs experimentally infected with *Teladorsagia circumcincta* and *Trichostrongylus vitrinus*. All groups were grazed on clean clover-grass pasture and then moved to paddocks with bioactive forages with either sainfoin (*Onobrychis viciifolia*) (groups Pre-S and Post-S), chicory (*Cichorium intybus*, cv. Grasslands Puna) (Pre-C and Post-C) or clover-grass as reference (Pre-G and Post-G). Pre-groups were infected before the move to bioactive forages, whereas all Post-groups were infected after the move. Group Pre-ctrl. was slaughtered for worm counts at the time of the move while the other groups were slaughtered after 5-8 weeks on bioactive forages. The faecal egg counts of pre-groups dropped markedly after the move, and Pre-S showed the fastest decline, by 80% within 3 weeks after the move. The mean faecal egg counts of Post-S was reduced by 40% 4 weeks p.i. compared to Post-G ($p<0.01$) whereas Post-C was 30-100% higher ($p<0.01$). *T. circumcincta* worm counts of Pre-S, Pre-C and Pre-G were 4300, 3200 and 7000 but differences were not significant due to large variation within groups (Pre-C vs. Pre-G: $p=0.12$). Other worm counts were not significantly different. The study indicates a marked reduction in faecal egg counts when lambs graze sainfoin and a possible anti-parasitic effect of chicory on abomasal worms.

Advances in the diagnosis and systematics of parasites of veterinary importance – new and exciting prospects.

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The control of parasitic diseases of veterinary importance depends upon the rapid and accurate detection of the aetiological agents. Conventional diagnostic techniques involving microscopy remain the mainstay of diagnostic laboratories but they are being rapidly complemented by a variety of molecular 'tools' that provide additional information about the causative agents. This includes the discrimination of morphologically identical strains/genotypes within a species. This may be important if such intra-specific variants differ in their host specificity, drug sensitivity, public health significance in the case of zoonotic agents, virulence or other factors of epidemiological importance. The value of such tools is greatest if they can be applied directly to faecal or tissue specimens, as well as environmental samples and food, and if there is the potential to automate such procedures. In this respect, PCR-based techniques have provided veterinary parasitologists with very powerful epidemiological tools. In addition to the diagnostic laboratory, they have a growing application to wildlife parasitology since data can be obtained from parasite stages obtained using non-invasive techniques on living animals. Similarly, molecular techniques have a major role to play as tools for surveillance, particularly with waterborne diseases and in the area of biosecurity. These advances will be described with reference to a range of parasites including *Cryptosporidium*, *Giardia*, *Toxoplasma*, *Trypanosoma*, *Echinococcus* and *Ancylostoma*. The future promises more exciting developments with the advent of proteomics, and the prospect of adapting PCR-based diagnostics for use in remote sensors.

The effect of carbohydrates on the establishment of *Trichuris suis* in the large intestine of pigs.

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Diets containing carbohydrates with contrasting fermentability have been shown to significantly influence the establishment, persistence and localization of *Oesophagostomum dentatum*. In pigs fed diets with highly fermentable carbohydrates the infection was reduced significantly compared with pigs given diets with less fermentable carbohydrates. The objective of the study was to investigate whether diets with similar carbohydrate properties would have an effect on infections with *Trichuris suis*. Two groups of pigs were fed diets with resistant (Diet A) and fermentable (Diet B) carbohydrates, respectively. All the pigs were inoculated with 2000 infective *T. suis* eggs each and infections were followed with faecal egg counts. Eight weeks post infection 6 pigs from each group were killed and the remaining pigs were sacrificed 12 weeks p.i.. The large intestine was divided into 5 sections and worms from each section were counted. Egg counts from pigs on Diet B were significantly lower compared with Diet A, and egg excretion stopped from pigs on Diet B 10 weeks p.i. Worm counts were high and similar in the two groups 8 weeks p.i., but 12 weeks p.i. only 10 worms were found in two pigs on Diet B, while the worm counts from Diet A pigs were comparable to the week 8 necropsy. Diets with highly fermentable carbohydrates may be an effective natural way of reducing/eliminating infections with helminth parasites in the large intestine of pigs.

The role of intestinal mucin on *Eimeria tenella* infection in vitro.

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Mucin is a protective barrier which invading pathogens must overcome in order to infect the underlying epithelium. Working models suggest that mucin epitopes in the mucus layer bind specific pathogen adhesions and prevent attachment to similar epitopes on host cell surfaces thus influencing the outcome of infection. Mucin varies spatially throughout the gastrointestinal tract and may contribute to chicken *Eimeria* species, site-specific invasion. The aim of this study was to look at *Eimeria tenella* interaction with mucin in vitro. Mucin was isolated and purified from the small and large intestine of the gastrointestinal tract of chickens by density gradient centrifugation and gel chromatography. The role of chicken and commercial mucin in *E. tenella* adhesion and invasion was investigated and characterised using an in vitro cell model. Investigations demonstrated *E. tenella* mucin adherence, which in turn influenced invasion.

Assessing the burden of echinococcosis

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Parasites of the genus *Echinococcus* present significant public health and economic problems. Human and livestock infection results in space occupying lesions due to the larval stage of the parasite. In the definitive host, which are various species of carnivores, the parasite is considered nonpathogenic. Cystic echinococcosis (CE), caused by *E. granulosus*, results in financial losses to the agricultural sector through condemnation of edible offal and through production deficits resulting from infection. Alveolar echinococcosis (AE), caused by *E. multilocularis*, is primarily a zoonotic infection transmitted to humans from wild and domestic carnivores, but infrequently affects domestic animals. CE and AE are serious human diseases resulting in significant morbidity and, the latter in particular, mortality. Assessing the burden of disease on society must take into account the impact on the health and agricultural sector. Financial approaches to understanding the latter are complicated by the non-standardisation of surveillance data in agricultural animals, and to inadequate experimental data regarding production losses. In this respect it is vital that age stratified data in affected agricultural species is obtained in order to estimate the burden of infection in such animals, whilst uncertainty of experimental evidence can be modelled by Monte-Carlo sampling. The burden of disease to humans can be assessed with a financial approach for treatment costs (such as hospitalisation, drug costs and surgery), but pain, suffering and death are more esoteric and present challenges to financial analysis. In particular, for zoonotic diseases, financial analysis would have the advantage in being a measure, particularly for CE, which can be combined with losses to the agricultural sector for the total societal burden of disease. Income lost due to such problems is one approach, but that is not without its drawbacks. Non-financial approaches such as disability adjusted life years (DALYS) can be calculated and these compared to other diseases to prioritise resources for public health programmes. The utility of these alternative approaches will be discussed.

Supplementation and/or single anthelmintic (AH) treatment of browsing kids naturally infected with gastrointestinal nematodes (GIN) during the wet season in tropical México.

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Supplementary feeding can improve resilience and resistance of browsing Criollo kids against natural GIN infections. However, supplementation cannot fully override negative effects of GIN especially in the last three months of the wet season. A single AH treatment was used to improve resilience of naturally infected supplemented browsing kids. 31 three month old Criollo kids raised nematode free were included in a 152 day trial consisting of five randomly divided groups: a) free of GIN infection and supplemented (NI-S), b) infected and supplemented (I-S), c) treated once and supplemented (T-S), d) treated once and non-supplemented (T-NS) and e) infected and non-supplemented (I-NS). Animals in supplemented groups (NI-S, I-S, T-S) were fed 100g fresh basis of supplement daily (74% sorghum meal:26% soybean meal). Kids in NI-S group were kept free of GIN infection using moxidectin (0.2mg/kg BW) every 28 days. Animals in treated groups (T-S and T-NS) received a single levamisole dose (10mg/kg BW s.c.) on day 77 of trial (September). Animals browsed seven hours daily. Kids were weighed every 14 days when faeces and blood samples were obtained. T-S group (6.9 ± 0.6 kg) achieved similar LWG than NI-S (7.6 ± 0.5 kg) and showed better LWG than I-S kids (4.6 ± 0.5 kg) ($P < 0.0001$). LWG of I-S was similar to T-NS (3.5 ± 0.6 kg) but higher than I-NS (1.47 ± 0.5 kg) ($P = 0.0001$). I-NS had lower mean packed cell volume and haemoglobin than the other groups ($P < 0.04$). I-S and T-S kids had lower FEC than I-NS ($P < 0.04$). Single AH treatment improves resilience of supplemented kids.

Tsetse control in Africa: A threat to enzootic stability for tick-borne diseases?

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Trypanosomiasis transmitted by tsetse flies is a major cause of mortality and morbidity for cattle in sub-Saharan Africa. Tick-borne diseases of cattle such as babesiosis, anaplasmosis and cowdriosis are also widespread in this region, but indigenous breeds of cattle can develop a natural immunity to these, providing they are exposed as young animals to infected ticks. This can lead to a state of enzootic stability, whereby clinical disease in a population is scarce despite a high rate of infection. Treatment of cattle with pyrethroids to control tsetse is an increasingly important means of controlling trypanosomiasis but widespread use of this technology may reduce tick numbers and hence disrupt enzootic stability. Indeed, in Zimbabwe the routine treatment of ~200,000 cattle with deltamethrin successfully controlled trypanosomiasis but increased susceptibility to babesiosis. Recent research has shown that (i) tsetse feed selectively on older and larger cattle and (ii) tsetse and ticks feed on different bodily regions of cattle. Consequently, the selective treatment of the feeding sites of tsetse on older and larger cattle with pyrethroids should not only reduce impact on tick populations, and hence preserve enzootic stability for tick-borne diseases, but also reduce costs and protect the environment.

Humans, dogs and parasitic zoonoses—unravelling the relationships in a remote endemic community in northeast India using molecular tools.

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Canine parasitic zoonoses pose a continuing public health problem, especially in developing countries and communities. Our study combined the use of conventional and molecular epidemiological tools to determine the role of dogs in transmission of gastrointestinal (GI) parasites such as hookworms, *Giardia* and *Ascaris* in a parasite endemic tea-growing community in northeast India. A highly sensitive and specific PCR-based RFLP diagnostic technique was developed to detect and differentiate the zoonotic species of canine hookworm eggs directly from faeces. This allowed epidemiological screening of canine hookworm species in this community to be conducted with ease and accuracy. The zoonotic potential of canine *Giardia* was also investigated by characterising *G. duodenalis* recovered from humans and dogs living in the same locality at three different genetic loci. Phylogenetic and epidemiological analysis provided compelling evidence to support the zoonotic transmission of canine *Giardia*. Molecular tools were also used to identify the species of *Ascaris* egg present in over 30 % of dog faecal samples. The results demonstrated the role of dogs as a significant disseminator of *Ascaris lumbricoides* in communities where promiscuous defecation practices exist. Our study demonstrated the usefulness of combining conventional and molecular epidemiological tools to help solve unresolved relationships with regards to parasitic zoonoses.

Identification of *Habronema microstoma* and *Habronema muscae* (Spirurida, Habronematidae) by a specific PCR-based assay using markers in the ITS2 rDNA and its implications.

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Habronema microstoma, *Habronema muscae* and *Draschia megastoma* are nematodes transmitted by inhabiting dung muscids and responsible for gastric and cutaneous diseases in equids. *Habronema* spp. has a worldwide distribution while *D. megastoma* is very uncommon. Data on the epidemiology of habronemosis are scanty due to the difficulties in diagnosing the gastric form in live animals, in differentiating the cutaneous form from other dermatopathies and in identifying of the intermediate hosts. To overcome these limitations, a molecular approach based on markers in the ribosomal second Internal Transcribed Spacers (ITS2) of the two species was developed. The ITS2 of *H. microstoma* and *H. muscae* were characterized and species-specific primers designed corresponding to regions of major sequence differences between the two species were evaluated in a PCR-based assay. The length of the ITS2 sequences was 296bp for *H. microstoma* and 334bp for *H. muscae*, with a homology rate of 60.23%. The specificity of the species-specific primer sets was assessed by using a range of heterologous DNA samples and the lowest amount of *Habronema* DNA yielding positive PCR runs was 10 pg for both species. This molecular approach allows the specific identification of the DNA of *H. microstoma* and *H. muscae* irrespective to the life-cycle stage and for its high levels of specificity and sensitivity it has important implications for studying the epidemiology of habronemosis (i.e. prevalence of infestation, species of *Habronema* involved, vectors).

The value of donkeys (*Equus asinus*) in parasitology.

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Historically the donkey (*Equus asinus*) was the villain in the parasite host world being the asymptomatic vector for the spread of lungworm (*Dictyocaulus arnfieldi*) to the elitist equestrian world and their horses (*Equus caballus*). Donkeys still remain the harbinger of the large strongyles (*Strongylus vulgaris*, *Strongylus edentatus*, *Strongylus equinus*), tapeworms (*Anoplocephala* spp) and liver fluke (*Fasciola hepatica*, *Fasciola gigantica*) in developing countries where owners will not or can not afford to treat their donkeys. However parasitological work in the last decade has highlighted the importance of this animal in providing useful information for the control of cyathostomins by strategic worming regimes using avermectins, conservative methods (monitoring faecal egg counts, identifying repeated shedders) to the latest in alternative therapies (garlic, plant species, wood bark). The donkey is ideal for these trials being of low maintenance, docile in nature and high in available numbers. Most recently work on Dourine (*Trypanosoma equiperdum*) will hopefully contribute significantly to measures for the control of trypanosomiasis. It is hoped that this presentation will encourage parasitologists to put forward projects for future research in the donkey.

Pyrosequencing analysis identifies discrete populations of *Haemonchus* from small ruminants.

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The genus *Haemonchus* consists of blood-sucking parasitic nematodes in the abomasum of ruminants and is responsible for huge animal welfare problems and extensive production losses. *H. contortus* is highly adapted to tropical and subtropical climatic conditions. However, the parasite also occurs in temperate regions even though low temperatures retard development. In a recent Swedish survey, the northernmost finding of *H. contortus* was discovered near the Arctic Circle. In view of these different climatic adaptations, we speculate as to whether the parasite in temperate regions is the same species as *H. contortus* in the tropics. In this study, we examined the internal transcribed spacers (ITS-1 and ITS-2) of the ribosomal RNA in *Haemonchus* isolated from Kenyan sheep, Swedish sheep and Swedish goat. Initially, interspecific polymorphisms in the ITS-1 were identified with Sanger sequencing. In the second phase the polymorphic sites were analysed by Pyrosequencing, a sequencing by synthesis technology in a total of 110 worms. This technique enabled us to rapidly analyse our samples and it was also possible to resolve a region for which the traditional sequencing had given conflicting results. The geographical isolates could to some extent be genetically distinguished, but none of the polymorphic positions were fixed among all individuals within each isolate. Therefore the isolates in this study are best described as discrete populations.

The effect of moxidectin and ivermectin on the larval viability and recovery of resistant *Ostertagia circumcincta*.

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The *in vivo* effects of Ivermectin (IVM) and Moxidectin (MOX) on egg viability and larval development of ivermectin-resistant *Ostertagia circumcincta* were examined after anthelmintic treatment of sheep. Thirty-five sheep with no previous exposure to worm infection were allocated to seven treatment groups. They were infected with IVM-resistant *O. circumcincta* and treated twenty-eight days later with either, intra-ruminal IVM capsules, oral IVM, oral MOX, injectable MOX or oral abamectin (ABA) at the manufacturers dose rate or left untreated (2 groups). At intervals of up to 112 days after anthelmintic treatment, faecal egg counts (FEC) were determined and percentage development to infective larvae (L3) cultured in faeces were measured. For both MOX groups, FEC was low post treatment. The IVM oral and ABA oral treated groups showed a 0% and 70% reduction respectively. There was no larval recovery from IVM capsule treated sheep suggesting that there was 100% efficacy of the treatment against egg development. It appeared that the prolonged exposure to IVM contributed to the low egg count, L3 recovery and worm counts seen in this treatment group compared with IVM oral. Worm counts in the IVM oral, ABA oral groups were similar to control groups, but were low in the MOX oral and MOX injectable groups. It appears that worms resistant to oral doses of either IVM or ABA are susceptible to MOX and to IVM delivered in sustained release forms.

Single nucleotide polymorphism analysis of the parasitic nematode *Cooperia oncophora*.

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Cooperia oncophora is a common intestinal parasitic nematode of cattle in temperate climates. Control of *C. oncophora* infections depends mainly on grazing management and the use of anthelmintics. The infection causes considerable production losses in the dairy and beef industries. *C. oncophora* belongs to the superfamily of Trichostrongyloidea. Extensive genetic variation detected within different trichostrongylid nematode populations is an important parameter in the ability of a population to respond to selective pressure and the changing conditions that are often met by parasitic nematodes. To study the genetic variation within *C. oncophora* populations the complete mitochondrial (mt) genome of *C. oncophora* was cloned and sequenced (13636 bp). The mt clones were derived from overlapping nucleotide sequences from different individuals allowing identification of 426 single nucleotide polymorphisms (SNPs). C/T and G/A transitions were most frequently observed. A laboratory population, maintained for 35 years, was submitted to a serial challenge passage experiment (10 generations) after which 50 individuals from both populations were screened by sequence analysis of six regions located within different regions of the mt genome covering a total of 1065 bp comprising coding, non-coding and ribosomal sequences of the mt genome. Based on the found SNPs both populations were haplotyped and compared for their genetic structure.

Internal parasitism in feral island horses.

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In summer 2002, and winters of 2001 and 2003, at least 1 fecal sample was collected from each of 144 feral horses on Shackleford Banks, an uninhabited barrier island off the coast of North Carolina. The herd on the island is of particular interest because of its apparent Spanish ancestry. Fecal samples were individually identified. Horse age, gender, location and body condition score were provided by the National Park Service. Parasite fecal egg counts (FEC) were determined using the modified McMaster exam and selected samples were also screened by centrifugal flotation. Strongylid eggs were found in the feces of all but the youngest horses with an overall mean FEC of 1298 eggs per gram (epg). FEC were higher in summer than winter, and higher for bachelor stallions than stallions with harems. Mean *Parascaris equorum* FEC was 72 epg with infection concentrated in horses less than 5 years of age. *Anoplocephala* spp. and *Oxyuris equi* eggs were also detected. Composite fecal samples were cultured for identification of third stage strongyle larvae (L3), the majority of which were cyathostomes. In summer 2002, herbage samples were collected from 12 plots to evaluate numbers of L3 in different ecological zones. Swale plots contained a significantly higher number of strongyle larvae than marsh or dune plots. Plot results indicate that swales may be the areas of greatest parasite transmission. Further characterization of this host/parasite system is ongoing.

Supermodel hits the bottle (modeling ovine cutaneous myiasis).

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Ovine cutaneous myiasis, known as blowfly strike, is a familiar and widespread disease of sheep in Britain and many other areas of the world. The primary agent of sheep strike throughout much of northern Europe is the “greenbottle” blowfly, *Lucilia sericata* (Meigen) (Diptera: Calliphoridae). Computer models have been developed which simulate the seasonal patterns of fly abundance and sheep susceptibility and use these two components to estimate the incidence of myiasis on farms in Britain. The development of the models and the fit between the model output and observed patterns of lamb and ewe strikes on farms will be outlined briefly. The use of the models to predict the start of seasonal blowfly strike, to give sheep farmers advance warning of approaching strike problems and to explore key intervention points and the potential effects of a range of novel strike management strategies, will be discussed.

Farm evaluation of biological control of sheep parasites on the island of Gotland, Sweden.

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The aim was to assess farmer opinions of the practicality and effectiveness of using *Duddingtonia flagrans* to control nematode parasites in their flocks. On Gotland lambing occurs in spring. Around mid-summer, sheep are moved to saved pastures due to pasture deterioration due to dry conditions. Weaned lambs are then returned to original lambing pastures in early autumn for finishing. One farm was used during 2001 and on two in 2002. On each farm, two flocks, each of 20 ewes+ twin lambs, were managed separately: Fungus Group: received a daily supplement + fungal spores from lambing until the summer move (6 weeks). Control Group: received supplement only. In 2001, 13/40 lambs (Fungus) were marketed by mid September, whereas 8/40 lambs (Controls) were suitable. Weights of the remaining lambs at the end of the trial were significantly heavier in the Fungus group ($p = 0.005$). Tracer tests during autumn showed that *Teladorsagia circumcincta* and *Trichostrongylus* spp. levels were significantly less in the Fungus treatment ($p = 0.018$). The summer/autumn of 2002 was one of the driest on record for Gotland. This resulted in very low levels of infective larval availability. But on both farms, *T. circumcincta* numbers were less on the Fungus than on the Control Paddocks. Lack of pasture necessitated supplementary feeding, but lamb turn-off was not greatly compromised. On one farm, more lambs in the Fungus Group were marketed earlier than those in the Control Group. The farmers were encouraged by these results, despite the lack of a major response in 2002, which could be attributed to drought. This work is continuing and being extended to another farm in a different geo-climatic region of Sweden in 2003.

Biological control of nematode parasites of sheep in Malaysia using the nematophagous fungus *Duddingtonia flagrans*.

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The wet tropical environment of Malaysia makes the raising of small ruminants very difficult. The nematode parasite, *Haemonchus contortus*, is a major problem and its control is exacerbated by the presence of high levels of multiple anthelmintic resistance. Alternative control methods are urgently required. Investigations using the nematophagous fungus, *Duddingtonia flagrans*, have been underway for several years, commencing with laboratory and pen studies. Very promising results led to a series of field evaluations, in combination with short-term rotational grazing (3.5 days grazing: 30 days spelling). Three trials (small paddock, large paddock and commercial) in different locations, showed that daily administration of *D. flagrans* spores (500,000 spores/kg liveweight per day) to groups of sheep with the normal feed supplement, led to consistently lower levels of *H. contortus* infective larval exposure as measured by tracer lambs. The latter two trials were run continuously for 12 months and 9 months respectively, to test these strategies over the long-term encompassing seasonal peaks and troughs in rainfall. Interventions with anthelmintic treatment were required on two occasions in the large paddock trial for the Control group only, showing the combination of the fungus with short-term rotational grazing offers a robust control alternative for *H. contortus* in the Malaysian environment.

Effect of urea-molasses block supplementation on goats naturally infected with gastrointestinal nematodes.

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The influence of feeding urea-molasses blocks (UMB) on growth and gastrointestinal (GI) nematode parasitism of weaner kids grazing the same pasture was investigated on a farm in Nyangarua District, Kenya. Thirty female small East African goat kids with an average age of 5 months were initially treated orally with albendazole (5 mg kg⁻¹ bodyweight) and randomly assigned into 2 groups: group I were fed UMB prepared using a cold process and group II were the control kids. The UMB were given in the evening when the animals returned from grazing and were consumed during the night at a rate of 100 g head⁻¹ day⁻¹. Supplementation was undertaken for three consecutive months between July to September 2001 and January to March 2002. Body weights of kids and faecal egg counts were measured monthly and larval cultures were performed on positive faecal samples of each group. Significant differences (p<0.05) were found in cumulative weight gains of UMB group from September compared with the control group. At the study termination the UMB group gained an average of (SD) 19.9 1.4 kg while the control group gained 10.9 1.1 kg. From January 2002, faecal egg counts of the UMB group differed significantly (p<0.05) compared to those of the control group and at slaughter, the mean (SD) worm counts for the UMB group was 482 229 while that of the control group was 1302 410. In all the goats *Haemonchus contortus* was the main nematode recovered. These results indicate that UMB had significant effects in the control of GI nematode parasitism and enhanced growth of young goats.

Multilocus microsatellite genotyping of *Cryptosporidium parvum*

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Cryptosporidium parvum is a zoonotic protozoan parasite that causes gastrointestinal disease in both humans and animals. Farm animals are thought to be an important reservoir of the parasite, but relatively little is known about transmission routes from animals to humans. Genotyping is available in some diagnostic laboratories to distinguish between Type I and Type II isolates, but as the division into just two types provides insufficient information to trace sources of outbreaks, typing is not routinely employed. In the absence of a more discriminatory typing system, tracking sources of infection is at best difficult, even when good classical epidemiological data are available. We report the development of a more discriminatory typing system based on micro- and minisatellite DNA of *C. parvum*. We have assembled and tested a panel of mini- and microsatellite markers that show variation within both Type 1 and 2 and which offer the prospect of being able to DNA fingerprint *C. parvum* isolates and help identify sources of human and animal outbreaks. We have evaluated these new tools in a pilot study using 180 clinical samples (136 human; 44 bovine) from the north east of Scotland collected over an 18 month period as part of a wider Scottish study of cryptosporidiosis, currently comprising over 1000 clinical samples. In a second study we have genotyped 240 Type 2 isolates from 3 different geographical regions and host species. Forty-eight different multilocus genotypes were identified in Type 2 samples alone. We have determined that some of the common genotypes were shared between humans and animals whilst others appeared to be unique to human or bovine hosts. Evidence of infection with multiple genotypes was also seen in both hosts. The results from our pilot study suggest that we will be able to apply our methods to wider and more complex scenarios, so that in conjunction with good classical data we can better define the epidemiology of cryptosporidiosis and the role of farm animals in the spread of disease.

Effectiveness of copper-oxide wire particles on the control of *Haemonchus contortus* in sheep.

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Among the gastrointestinal nematode parasites that cause the most problems to small ruminants, *Haemonchus contortus* is one of major concern. Currently, the control of *H. contortus* and others is almost entirely based on the use of anthelmintics. As a consequence, anthelmintic resistance has developed worldwide and this has become a serious problem in small ruminant control programs. In view of this, there is a need for alternative control methods. The use of Copper-Oxide Wire Particles (COWP) to help reduce parasite burden is one such alternative. Three trials were conducted to determine the effect of COWP on the reduction of *H. contortus* in ewes (Summer, 2002, and Spring, 2003) and lambs (Summer, 2002). Each trial followed similar protocols where the animals were allocated to treatment and control groups based on fecal egg count (FEC). COWP boluses were administered to the treatment group and infection level was monitored over a period of time by weekly determination of FEC and blood PCV. Serum copper levels were determined before and at the end of each trial. Feces were collected every other week for coproculture which was used to determine relative distribution of infective larvae genera. Results of all 3 trials indicated that COWP were effective in reducing FEC for a period of 4-5 weeks. There was no difference in PCV between groups for any trial. Coproculture indicated that the reduced FEC was primarily due to a reduction in *H. contortus*. Serum copper levels were either below or within normal range before treatment and remained within normal limits at the end of the trials. The results from these trials demonstrated that the use of COWP reduced *H. contortus* infection and this may be useful in conjunction with other control methods.

Purification and analysis of *Fasciola gigantica* glutathione S-transferases.

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Glutathione S-transferases (GST) are a group of isoenzymes which are widely distributed in helminth and can detoxify xenobiotics produced by the cells of hosts. As an important factor for the parasites' metabolism, GST's become the targets in drugs design and vaccine-candidates anti-helminth. In our present study, GST was isolated from the adult flukes *Fasciola gigantica* by affinity chromatography on a glutathione agarose column. Proteins of GST were then analysed by Sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE). Activity of GST was determined in 340nm using 1 mM MGSH and 1nM CDNB as standard substrates. The results showed that 2 proteins with molecular masses of 26.5 and 28.0 kDa in *F. gigantica* GST were identified by SDS-PAGE, similar to the results of Brophy which showed that *F. hepatica* GST with molecular masses from 26 to 26.5 kDa, and to the results of Hillyer which showed that *F. hepatica* GST with molecular masses from 27.8 to 29 kDa. Activity of *F. gigantica* GST was 17.08 μ mol/min.mg, which was higher than that of *F. hepatica* GST. In our work, high quantity of GST *F. gigantica* was observed after purification, 3.1 % of the total proteins in the supernatant of *F. gigantica* extracts were shown to be GST. It suggested that GST might play an important role in the metabolism of *F. gigantica*, and the vaccine against GST or the drugs destroying GST would be vital to the parasite.

Comparison of humoral response to *Fasciola hepatica* and *Fasciola gigantica* experimental infection in sheep.

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Humoral response to *Fasciola hepatica* and *Fasciola gigantica* experimental infection in sheep was comparatively studied. At necropsy, a significant difference in the numbers of flukes recovered for *F. hepatica* (18.1% $\pm$ 4.8) and *F. gigantica* (5.4% $\pm$ 2.1) was observed between the two groups of infected sheep. Sheep seemed to be less susceptible to *F. gigantica* than to *F. hepatica* infection. Anti *F. hepatica* or *F. gigantica* Excretory-Secretory Products (FhESP or FgESP)-IgG level increased from 2 weeks post-infection (WPI) in all infected sheep. The IgG responses to FhESP or to FgESP by ELISA displayed a peak at 10 WPI for *F. hepatica* infected sheep and at 13 WPI for *F. gigantica* infected sheep. FhESP or FgESP analyzed by sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) showed at least 25 bands from 13.4 to 135.1 kDa in FhESP and 31 bands from 12.0 to 127.6 kDa in FgESP. Western blot indicated that infected sheep sera recognized at least 30 antigens from 9.0 to 82.2 kDa in FhESP. 4 major bands of 17.1, 18.3, 19.3 and 21.6 kDa were recognized after 0 WPI by *F. hepatica* infected sheep sera and 2 major bands of 21.6 and 29.9 kDa by *F. gigantica* infected sheep sera. In FgESP, infected sheep sera recognized at least 30 antigens from 7.8 to 119.2 kDa. 6 major bands of 19.0, 29.8, 33.9, 47.2, 63.7 and 71.1 kDa were recognized after 0 WPI by *F. gigantica* infected sheep sera and 2 major bands of 19.0 and 29.8 kDa by *F. hepatica* infected sheep sera. *F. hepatica* infected sheep sera reacted strongly with the lower molecular mass antigens, while *F. gigantica* infected sheep sera reacted strongly with the higher molecular mass antigens. These differences of antigenic recognition might be associated with the susceptibility of sheep. Further investigation must be done to study the mechanism of resistance between the sheep infected with *F. hepatica* and *F. gigantica*.

EmTFP250: A TRAP family microneme protein in *Eimeria maxima*.

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Maternal immunity in chickens is mediated by the transfer of IgG antibodies from breeding hens to hatchlings and provides effective protection for offspring against infection with *Eimeria maxima*. Using protective sera collected from the progeny of hens deliberately infected with *Eimeria maxima*, we have consistently identified a 250 kDa protein, EmTFP250, in the asexual stages of development. Cloning of the encoding cDNA and sequence analysis of the protein has revealed a novel member of the TRAP family of microneme proteins, rich in thrombospondin type-1-like (TSP-1-like) repeats and epidermal growth factor-like (EGF-like) calcium binding domains. To assess the immunogenicity of EmTFP250, a recombinant derivative of the protein was expressed in a bacterial host system and used to immunise mice and chickens, inducing strong IgG responses in both models as determined by specific ELISAs. Protective maternal antibodies previously shown to recognise native EmTFP250 recognised the recombinant protein and, in addition, antibodies raised against the recombinant protein recognised native EmTFP250. Antibodies to recombinant EmTFP250, visualised using secondary antibodies conjugated to peroxidase or FITC for immuno-light microscopy and to gold particles for immuno-electron microscopy, showed specific labelling of micronemes. Members of the TRAP family of microneme proteins are implicated in host cell invasion and apicomplexan gliding motility, suggesting a functional significance for EmTFP250.

Assessing the burden and impact of cysticercosis and echinococcosis to justify global initiatives for combating these neglected parasitic zoonoses.

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Parasitic zoonoses such as cysticercosis and echinococcosis are neglected at the national, regional and international levels due to a lack of awareness of their presence and impacts, a perceived low burden of disease associated with them and indecision as to which sector (health or agriculture) should take responsibility for their investigation and control. These diseases have been linked with poverty and as such pose a serious constraint to the development of endemic areas. Novel ways of assessing the burden of cysticercosis and echinococcosis have been proposed which address their societal costs including both health and agricultural impacts. The information thus gathered should provide the evidence on which policymakers, donors and technical support agencies can make informed decisions concerning priority setting, cost-benefit analysis of potential interventions and provision of technical and financial support needed to combat these neglected parasitic zoonoses. The workshop will consider different methods for assessing the burden of echinococcosis and *Taenia solium* cysticercosis and will also consider the agricultural and health impacts of these diseases in specific endemic countries.

Characterisation of recombinant immunoreactive antigens from the scab mite *Sarcoptes scabiei*.

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Infestation with *Sarcoptes scabiei* can be difficult to diagnose. In general, the number of parasites on infested hosts is low, making direct detection of a sarcoptid mite quite difficult. A serological test based on recombinant antigens of *S. scabiei* designed to test circulating antibodies in the host for the definitive diagnosis of scabies infestations would be very useful. Based on the mRNA of *S. scabiei* var. *suis* we constructed a cDNA phage library, which was screened with the serum of 10 *S. scabiei* infested humans. 61 detected clones were isolated and to date now 8 of them sequenced. These clones reacted only with the serum of *S. scabiei* positive patients but not with the serum of persons with allergy against house dust mites. Except one clone, which showed a low identity to a house dust mite allergen, all clones have a common pattern of highly repetitive GA-nucleotide sequences, indicating that the genes are members of one family. The deduced proteins bear a central domain of degenerate repeats, flanked by non-repetitive 5' and 3' ends. The sequences do not match with known sequences in public databases. Our results indicate that *Sarcoptes* mites bear a family of immunodominant proteins with unique structural features.

Detection of primaquine resistant *Theileria sergenti* parasites by flow cytometry and some biochemical properties of the parasites.

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Bovine theileriosis caused by *Theileria sergenti* (Ts) is the most important disease of grazing cattle in Japan. Primaquine (Pq) is the most effective drug against this parasite till date. But the frequent use of this drug leads to development of Pq-resistant (PqR) strain of Ts parasites and there is no suitable method for detection of such parasites. In this study, we identified PqR parasites by using Flow cytometry (FCM) and also analysed some biochemical properties of the parasite. PqR strain was developed using dexamethasone and Pq, 2-4 times each in alternation in Ts-infected calves. RBCs recovered during peak parasitemia from PqR and Pq sensitive (PqS) Ts infected calves were incubated with RPMI1640 medium having 10% normal calf serum and 0-200µM/ml of Pq under 5% each CO₂ and O₂ at 37°C for 24 h. These RBCs were stained with 1 µM of SYTO[®]16 (Molecular probe) for further analysis using FCM (Ex; 488nm, Em; 520nm). The incubated RBCs were also lysed using nitrogen gas under high-pressure to isolate parasites for determination of antioxidative enzyme (GSH, GR, GST, and GSHPx) activity. FCM revealed a reduction in SYTO[®]16-reactive fluorescence in parasitic DNA with increase in Pq concentration starting at 6.25 µM/ml (upto 50 µM/ml) in PqS parasites while it started showing a reduction above 50 µM/ml in PqR parasites. A significant increase in GR (x 8) and GSHPx (x 5.6) activities was observed in PqR indicating an acceleration of antioxidative system in these parasites.

Evaluation of K9 Advantix™ vs Frontline® Plus topical treatments to repel brown dog ticks (*Rhipicephalus sanguineus*) on dogs.

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The ability of pesticides to repel or kill ticks before they attach to a host and feed is important for the prevention of tick born pathogens. A study design was developed to evaluate the transfer and attachment of ticks from the environment to dogs. Eighteen preconditioned laboratory dogs were allocated in to 3 treatment groups (6 dogs/group): Group 1- K9 Advantix (8.8% imidacloprid + 44.0% permethrin), Group 2 –Frontline Plus (9.8% fipronil + 8.8% S-methoprene), Group 3- untreated control. Treatments were applied per label directions on test day 0. Individual heavy-gauge plastic pet transport carriers (68 x 76x 102 cm) with nylon carpet floors were used for tick challenges. Dogs were placed in the carriers containing 50 adult *R. sanguineus* for a 2 hour period. The dogs were then removed, and the number of live and dead ticks on the dog, and ticks remaining in the carrier were counted. Tick challenges and subsequent tick counts were conducted on test days 3, 7, 14, 21, 28, and 35. Tick efficacy was determined by comparing the geo. mean number of live ticks on the treated dogs with the number of live ticks on the control dogs. The number of live ticks on the control dogs ranged from a geometric mean of 12.0 to 29.5 ticks per dog during the study. Percent efficacy for the K9 Advantix group ranged from 84.0 to 98.5 % between test days 3 and 35. Percent efficacy for the Frontline Plus group ranged from –28.1 to 56.8% during the corresponding period.

Cloning and characterization of a TGF- β homologue within populations of *Ascaris suum* 4th Stage larvae (L4): Regulated transcription and multiple splicing differentiate L4 in the jejunum and ileum during spontaneous cure.

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Ascaris species represent the most prevalent parasitic worm infecting humans and swine worldwide. During the infection process, *Ascaris suum* L4 establish in the jejunum and develop into adults. However, a large percentage of L4 in the jejunum spontaneously cure 14 to 21 days after inoculation and are eventually expelled from the intestine. Increased expression of L4 genes for structural proteins related to parasite vigor were detected by cDNA microarray analysis, but gene products that alter host responses to parasitism have not been detected. To this end, a jejunum L4-derived EST library was generated and a putative TGF- β homologue was identified and characterized by sequence similarity to the *Brugia malayi* Tgh-1 gene and the TGF- β -like growth factor from *Caenorhabditis elegans*. Partial sequence information from enzymatically-amplified cDNA revealed at least 2 differentially spliced transcripts. PCR analysis of transcript levels revealed similar quantities of the TGF- β homologue in all larval stages analyzed except the L4 from the ileum where levels were remarkably lower. Given that mammalian TGF- β is anti-inflammatory and down regulates the intensity of immune and inflammatory responses, these data support a relationship between L4 avoidance of spontaneous cure and the ability to modify local immunity. Characterization of these genes and their products may provide useful information on the infection process and in designing new control strategies.

Identification and classification within the genus, *Trichinella*, with special emphasis on non-encapsulated species.

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Since James Paget and Richard Owen first described *Trichinella* in 1835, three basic points of view have emerged on the organization of the genus; 1) those that consider the genus monospecific and made up of numerous isolates or subspecies; 2) those that subdivide it into 4 species consisting of *T. spiralis*, *T. nativa*, *T. nelsoni* and *T. pseudospiralis*, with a collection of geographical isolates, and; 3) the most current belief that the genus is partitioned into 8 species with at least 1 additional genotype (*Trichinella* T6) whose classification remains undetermined. Where views 1 and 2 have their foundations primarily in historical opinion and infectivity data, classification scheme 3 is supported by these considerations as well as molecular and biochemical data, cross-breeding experiments, and methodically analyzed biological information. Nonetheless, the classification of this genus remains in flux. With the identification of three non-encapsulated species, *T. pseudospiralis*, *T. papuae* and *T. zimbabwensis*, and the delineation of biological and biochemical characters among isolates of *T. pseudospiralis*, evidence is mounting for segregating the non-encapsulated group from those that induce capsule formation. This presentation will outline methods for differentiating *Trichinella* parasites, review current support for the multiple species concept, and provide a molecular foundation for considering non-encapsulated species as a unique group, based primarily upon sequence information from genomic ITS and mitochondrial DNA, expansion segment V of the *lsu* rDNA, and newly described glutamic acid-rich genes specifically expressed in newborn larvae.

SSCP-based identification of members within the *Contracaecum rudolphii* complex (Nematoda: Ascaridoidea: Anisakidae) using ribosomal DNA markers.

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The anisakid nematodes from *Phalacrocorax carbo sinensis* (cormorant) from North-eastern Italy, previously identified as *Contracaecum rudolphii* A and *Contracaecum rudolphii* B based on the length of their male spicules, were characterised using a DNA approach, including *Contracaecum septentrionale* for comparative purposes. The first (ITS-1) and second (ITS-2) internal transcribed spacers (ITS) of ribosomal DNA (rDNA) were amplified by PCR from individual nematodes and the amplicons were subjected to single-strand conformation polymorphism (SSCP) analysis, followed by selective sequencing. While no variation in single-stranded ITS-1 and ITS-2 profiles was detected among individuals within each *C. rudolphii* A and *C. rudolphii* B (with the exception of slight microheterogeneity), SSCP analysis of the ITS-1 and ITS-2 amplicons allowed their unequivocal differentiation, which was supported by differences in their ITS rDNA sequences. As expected, samples representing the *C. septentrionale* had unique SSCP profiles and ITS sequences. These findings and the molecular approach taken should have important implications for studying the population genetics and ecology of these anisakid nematodes.

Abstracts of Posters

Abstracts are listed in alphabetical order by presenter (*).

What horse owners do to control internal parasites: time for more veterinary involvement?

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Horse ownership has increased over the past 20 years partly because of the increasing availability of grazing land to rent. Anthelmintics are readily available through registered traders and recent owner surveys have indicated that advice on worm control programs comes from many sources but rarely from the veterinarian. The various surveys have also highlighted the confusion among all categories of horse owner on how to develop a control program for their particular needs. Programs relying on interval treatments during the spring and summer only seem to be insufficient to prevent disease and so programs have become more complex thus contributing to the confusion. The frequent mild, damp winters in the UK favor the survival of the pre-parasitic stages thus extending the period when horses are exposed to infection. Overstocking, bad pasture management and lack of a coherent control program followed by all owners sharing premises are common problems in many rented premises. Inappropriate use of anthelmintics occurs in both professional and private premises. With resistance of the Cyathostomes to two of the three anthelmintics groups and suspected *Parascaris equorum* resistance to the macrocyclic lactones more veterinary involvement in the design and monitoring of control programs would seem to be essential if we are to ensure the health and well-being of the horse population and the continuing effectiveness of the anthelmintics.

Effect of three levels of artificial *Haemonchus contortus* infection on the pathophysiology and worm populations of Criollo kids in Yucatan, Mexico.

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Artificial infection (AI) with 100 L₃ larvae/kg BW of a local *Haemonchus contortus* strain, followed by trickle infection trice weekly, failed to show evident pathophysiological effects in parasite naïve Criollo kids during previous studies in Mexico. A trial studied the effect of three levels of initial *H. contortus* AI, followed by a trickle infection, on the pathophysiology and worm burdens in Criollo kids. Twenty-four Criollo kids raised worm-free were randomly distributed in four groups with different initial AI levels: a) non-infected, b) 100 L₃/kg BW, c) 250 L₃/kg BW and d) 500 L₃/kg BW. Infected groups received a trickle infection with 200 L₃ larvae trice weekly for eight weeks. Infections were done with a local *H. contortus* goat strain. Weight, blood and faeces were collected weekly to determine LWG, PCV and FEC. At the end of the trial goats were humanly slaughtered to determine parasite burden (PB), female worm length (FL) and female worm prolificacy (PROL). LWG of group A was larger than C and D (P<0.05). No differences were found between A and B (P=0.09). PCV of group B was higher than C (P<0.01) and D (P<0.003). Group B had the lowest FEC (P<0.01), but no difference was found between groups C and D (P=0.97). Mean PB was higher in group D (115.15) (P<0.0005), followed by group C (58.48) (P<0.01) and group B (27.48). The FL was greater in group B (2.24 cm) than D (1.93 cm) (P<0.04). No differences in FL were found between C and D (P=0.41). PROL was similar in all groups (P>0.05). AI with 250 or 500 L₃/kg BW achieved clear pathophysiological effects.

A comparison of the periparturient rise in fecal egg counts of Santa Ines and Ile de France ewes.
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A temporary loss of acquired immunity to nematode parasites near the time of parturition and during lactation is common in ewes. However, breeds of sheep with resistance to nematode infection often display a reduced periparturient rise (PPR) in fecal egg counts (FEC) when compared with susceptible sheep. This trial was carried out to compare the resistance of Santa Ines, an indigenous Brazilian breed of sheep, and Ile de France ewes to natural infections by gastrointestinal nematodes, especially in the periparturient period. Lambing occurred in May and June/2002 and the lambs were weaned with 60 days of age. Fecal samples and blood samples were collected periodically from each animal. To prevent deaths, individual treatment with anthelmintics was provided to ewes with FEC higher than 4000 eggs per gram or with packed cell volume (PCV) lower than 21%. Ile de France ewes were more frequently treated with anthelmintic than Santa Ines ewes. Santa Ines ewes showed mean PCV values significantly higher than Ile de France one month before lambing ($P<0.05$) and two months after lambing ($P<0.07$). Santa Ines ewes also displayed higher mean plasma protein values ($P<0.01$) than Ile de France ewes two months after lambing. Larvae of *Haemonchus* spp., *Trichostrongylus* spp., *Oesophagostomum* spp. and *Cooperia* spp. were recorded from fecal cultures. Both breeds displayed a PPR, however, Santa Ines ewes showed a higher capacity to support nematode infections in an environment contaminated with large number of infective larvae of gastrointestinal nematodes (Study funded by FAPESP).

Resistance of Santa Ines, Suffolk and Ile de France lambs to naturally acquired gastrointestinal nematode infections.

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Nematode infections are one of the greatest causes of disease and lost productivity in sheep industry in Brazil. Breeding sheep for resistance to nematode infections can alleviate the problem. In this context, the breed resistance of Santa Ines (hair sheep), Ile de France and Suffolk male lambs, kept on a contaminated pasture, was evaluated over a 9-month period. Lambs were born from June to August/2000 and were weaned with two months of age. In late October/2000, lambs were placed in a paddock, where they stayed until August of the following year. Fecal and blood samples were taken from each animal every two weeks. In August/2001, all animals were slaughtered and the worms present in samples of the gastrointestinal contents were identified and counted. To prevent deaths, individual treatment with anthelmintics was provided to lambs with fecal egg counts (FEC) higher than 4000 eggs per gram or with packed cell volume (PCV) lower than 21%. Most of the Suffolk and Ile de France sheep received three to six anthelmintic treatments in a period of seven months, while most of the Santa Ines was not treated. Reductions in PCV and plasma protein values associated with high FEC and worm burdens were recorded, particularly, in Suffolk and Ile de France lambs. *Haemonchus contortus* and *Oesophagostomum columbianum* burdens and numbers of the nodular lesions caused in the large intestine by *O. columbianum* larvae were significantly lower in Santa Ines sheep. All three breeds showed similar *Trichostrongylus colubriformis* worm burdens. Relative resistance of Santa Ines young male sheep was superior to that of Suffolk and Ile de France sheep (Study funded by FAPESP, Grant 99/05774-5).

Comparison of serum pharmacokinetics and weight gain after administration of macrocyclic lactones via transdermal and subcutaneous delivery methods.

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Macrocyclic lactones (MLs) are frequently used to treat cattle for clinical and sub-clinical parasitosis. They may be administered by sub-cutaneous (SC), transdermal (TD) or oral methods. This study examined the pharmacokinetics and weight gain of animals treated with doramectin (DO), eprinomectin (EP), ivermectin (IV) and moxidectin (MO) when administered by the TD and SC routes. 160 weaned cattle were allocated to seven ML treatment groups (no SC group for EP) and one untreated (CO) group (n=20). All treated animals grew significantly more quickly in the month post treatment compared to CO animals. Over the duration of the experiment (119 days) only DO-TD, MO-TD, MO-SC and EP-TD grew significantly more quickly than CO animals, though all ML treated groups were heavier. The concentration of ML in serum was higher at 7 and 13 days post SC administration compared to TD treated animals, despite the lower dose rate for SC application. Detectable levels of ML in CO animals suggested that licking or rubbing of ML occurred from TD treated animals. The implications of these findings will be discussed

Endoparasites in dogs and cats in Germany 1999 – 2002.

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Infections with endoparasites in dogs and cats have been determined by analysing the results of fecal examinations (Flotation, MIFC, sedimentation, Baermann, smear, ProSpecT Giardia Microplate Assay). Samples of 8438 dogs and 3167 cats from the years 1999 until 2002 have been included in the investigation. 2717 dogs (32,2%) and 771 cats (24,3%) have been infected with endoparasites. In the infected dogs the following parasites have been identified: Class Nematodea: *Toxocara canis*: 22,4%, *Toxascaris leonina*: 1,8%, Ancylostomatidae: 8,6 %, *Trichuris vulpis*: 4,0%, *Capillaria* spp.: 2,3% *Crenosoma vulpis*: 0,9%, *Angiostrongylus vasorum*: 0,3%; Class Cestodea: Taeniidae: 1,2%, *Dipylidium caninum*: 0,4%, *Diplopylidium/Joyeuxiella*: 0,1%, *Mesocostoides*: 0,2%, *Diphylobothrium latum*: <0,1%; Class Sporozoea: *Sarcocystis* spp.: 9%, *Cystoisospora* spp.: 22,3%, *C. canis*: 8,0%, *C. ohioensis*: 17,0%, *Hammondia/Neospora*: 1,7% ; Class Zoomastigophorea: *Giardia* spp.: 51,6%. In the 771 infected cats the following prevalence of parasites were found: Class Nematodea: *Toxocara mystax*: 26,2%, *Ancylostoma tubaeforme*: 0,3%, *Capillaria* spp.: 7,0%, *Aelurostrongylus abstrusus*: 2,7%; Class Cestodea: Taeniidae: 2,6%, *Dipylidium caninum*: 0,1%; Class Sporozoea: *Sarcocystis*: 2,2%, *Cystoisospora* spp.: 21,9%, *C. felis*: 15,3%, *C. rivolta*: 7,9%, *Toxoplasma/Hammondia*: 4,5%; Class Zoomastigophorea: *Giardia* spp.: 51,6%.

Evaluation of a general situation of an invagination of fishes metacercariae of *Opisthorchidae* of some reservoirs of Ukraine.

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In during 2000-2001 we made the analysis of 348 fish (*Cyprinidae*) on invasion metacercariae of *Opisthorchidae* among them: *Abramis brama* - 66, *Blicca bjoerkna* - 71, *Rutilus rutilus* - 43, *Leuciscus idus* - 33, *Scardinius erythrophthalmus* - 65, *Tinca tinca* - 15, *Alburnus alburnus* - 55. Localization and quantity of metacercariae were detected in muscles and fins of fish (Sydorov, 1960). During the research on the availability of metacercariae the method of digestion of muscles was used (Kotelnikov, 1984). The general definition of larvas was based on the catalogue of the parasites of freshwater fish (Bauer O., 1987) and made by means of further biotests on tested kittens. In average the general percentage of invasion (*Opisthorchis felineus*, *Pseudamphistomum truncatum*, *Metorchis bilis*, *Metorchis xantosomus*) accounts for the Kyiv reservoir - about 25,0 %, the Kanev reservoir - 18,0 %, the Kremenchug reservoir - 10,0 %, the Poltava area - 40,0 %. Metacercariae was detected in: *R. rutilus* - 25,0 %, *L. idus* - 12,0 %, *S. erythrophthalmus* - 40,0 %, *A. alburnus* - 17,5 %, *A. brama* - 24,5 %, *T. tinca* - 7,5 %. The level of invasion in average is equal to 6,2 and varies within 1-17 larvas per a fish. It is necessary to take into account that the fish contaminated with helminthes threaten the health of people.

Transmission of anthelmintic resistance in sheep in West Java, Indonesia.

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Gastrointestinal nematode parasitism is a major limitation to sheep production in Indonesia. Regular administration of anthelmintics is a component of the standard protocol of government farms to control infection. The purpose of this study was to detect cases of anthelmintic resistance in sheep in West Java, and evaluate the potential for transfer of resistance from government dispersal farms to smallholders. Pooled fecal samples (about 200 g) were collected from a government farm, smallholder farms and livestock markets in West Java. All samples were tested for resistance to benzimidazoles using a larval development assay. Resistant to benzimidazole was relatively uncommon on smallholder farms (efficacy in all samples was estimated as 99-100%), and at livestock markets (efficacy 100%), but was present in all six smallholder farms (efficacy 34-94%) located near a government farm. These smallholders had received both stocks and advice on worm control from the government farm, which had severe benzimidazole resistance (efficacy 29-63%). This study suggests that animals dispersed from farms with benzimidazole resistance can transfer resistance to smallholders. A quarantine deworming policy is advised to prevent the dissemination of anthelmintic resistance to the smallholder sector.

Statistics of sickness of larval echinococcosis of the population and agricultural animals in the Russian Federation in 1989-2001.

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According to official statistics of sickness with echinococcosis of the population in Russia in 1989-2001 remains high with the tendency to increase from 0,1 up to 0,7 cases on 100 thousands person. The highest morbidity rate of the population (0,1-29,4 cases on 100 thousands person) was registered in Volga region, North Caucasian, Ural and West-Siberian regions with prevailing of affection of sheep (S) (up to 15,5%) and livestock (L) (up to 16,6%). Significant prevalence of affection of L in comparison with those of S was marked in Republic Dagestan (10,3 and 1,9% accordingly) and Karachaevo-Circassian Republic (7,6 and 3,8% accordingly). The affection of S in compared to those of L was distinctly higher in Volgograd region (6,8 and 1,6% accordingly), Republics Bashkortostan (13,3 and 5,4% accordingly) and Altai (14,5 and 2,9% accordingly). In other regions the average levels of affection of S and L were identical (up to 4,0%). These data allow to assume that in mentioned endemic regions the same highly invasive for human strain of *Echinococcus* parasitize in S and L. Relatively low morbidity rate of the population is distinctive for Central, Volga-Vyatka, Central Black Earth and Krasnodar regions (0,1-1,8 cases on 100 thousands person) in which prevails affection with parasite of pigs (up to 4,3%), that forms the basis for the assumption about existence of the less invasive for human pig strain of *E.granulosus* in these regions. The work was supported by INTAS grant 00-0685.

Changes of enzymes activity in urine of cotton rats infected with larval *Echinococcus multilocularis* at radical chemotherapy of experimental infection.

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The aim of the investigation was the development of new noninvasive method for treatment efficacy control at larval echinococcoses. Detected presence and changes of ketoso-1-phosphate aldolase (KPA) and phosphohexoisomerase (PHI) activity in urine (UR) of host at experimental infection with larval *E.multilocularis* (*Em*) in cotton rats (CR) subjected to radical chemotherapy with nocodazole (N). Enzymes were detected in average units of activity (U) in UR of adult CR divided into 3 groups (7-9 CR in each one): healthy (I), infected untreated (II) and treated (III). CR were infected intraperitoneally (i/p) with small larvocysts (L) of *Em* (50-300 mkm in diameter; 200 L per one CR). N was injected i/p once at dose level of 0,5 g/kg on 39 day post infection (PI). Viability and mean mass of L (MML) served as criteria of treatment efficacy at autopsy of CR in II and III groups on 68 day PI. Analysis of UR was carried out on 62 day PI. Results of autopsy showed that all L in all CR of III group were perished (MML=2,6±0,6 g), whereas all L in CR of II group were alive (MML=69,0±14,1 g). KPA activity revealed in UR of all CR in I-III groups was 2,6±0,4, 2,4±0,5 and 0,6±0,3 U accordingly. PHI activity in UR of CR in I and III groups was absent, but it revealed in UR of CR in II group and was 1,9±1,2 U. Thus, radical chemotherapy of *Em* infection was accompanied by pronounced decrease of KPA activity and normalization of PHI activity in UR of treated CR. The work was supported by INTAS grant 00-0685.

Estimation of protective activity of specific and nonspecific antigens at experimental secondary alveolar echinococcosis of laboratory rodents.

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Estimated protective activity of an whole extract from larvocysts (L) of *E. multilocularis* (*Em*) (WEL) from experimentally infected cotton rats (CR), complete Freund's adjuvant (FA) and WEL with FA in combination at experimental infection of CR and white rats (WR) of 2 months old with larval *Em*. In I experiment (Ex) CR and WR received WEL with FA, in II Ex CR received WEL, in III Ex CR received FA. The cycle of immunization consist of 3 subcutaneous (s/c) injections of WEL in rising concentration of protein (5-15 mg/ml) with intervals between injections of 14 and 7 days. FA introduced once s/c with WEL or physiological solution in quantity of 0,2 ml/rat (R). All experimental and control R were infected intraperitoneally with 100 (CR) or 5000 (WR) microscopic acephalocysts of *Em* in 2 days after the termination of an immunization cycle. All R were autopsied in 1 (CR) or 5,5 (WR) months post infection. The presence and mean mass of developed L (MML) per 1 R were determined. Results of autopsy have not revealed protective activity of WEL and FA. The susceptibility of all R to secondary *Em*-infection was 100 %. MML in immunized and control R was: in I Ex - $1,8 \pm 0,3$ and $2,8 \pm 0,4$ g (in CR), $2,4 \pm 1,1$ and $29,3 \pm 9,4$ g (in WR) accordingly; in II Ex - $18,6 \pm 4,8$ and $13,2 \pm 3,6$ g (in WR) accordingly; in III Ex - $2,4 \pm 0,5$ and $3,7 \pm 0,5$ g (in CR) accordingly. Only FA has caused delay of L growth up to 91,8 % in WR.

In vitro ovicidal activity of extracts *Annona squamosa* Linn against *Haemonchus contortus*.

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Annona squamosa Linn, popularly known as sugar apple, is used in folk medicine as anthelmintic. In the search for new anthelmintics to treat sheep and goats gastrointestinal nematodes, extracts of *A. squamosa* seeds were evaluated *in vitro* on *H. contortus* egg hatching. The crushed seeds were left in contact with methanol-water (90:10) for seven days. Part of this solution was evaporated to prepare the methanol-water extract. After that period the methanol was evaporated and the aqueous solution obtained was washed with ethyl acetate, resulting two extracts ethyl acetate and aqueous. *In vitro* egg hatching test was carried out with each extract, a negative control with tween 80, the extract diluent, and a positive control $1 \mu\text{g ml}^{-1}$ thiabendazole. The extracts were evaluated at five concentrations 50; 10; 2; 0.4; 0.08 mg ml^{-1} . The data were analysed using Tukey test ($p < 0.05$). The ethyl acetate extract was the most active inhibiting 100% of the egg hatching in 50 and 10 mg ml^{-1} concentrations. These results showed that *A. squamosa* is an alternative source for Haemonchosis control. Nevertheless *in vivo* tests are necessary to confirm this achievement.

Influence of management in benzimidazole anthelmintic resistance dissemination in sheep flocks.

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The control of gastrointestinal nematodes parasitism is made basically with anthelmintics. Control failure is the first sign of anthelmintic resistance development. The aim of this work was to accompany the impact of benzimidazole anthelmintic use and animals management in the dissemination of the anthelmintic resistance in sheep commercial properties of Medio and Baixo Jaguaribe region, in the State of Ceará during 2001 and 2003 years. The work was accomplished in 6 sheep farms. The data obtained were analyzed by the statistical program RESO. Anthelmintic resistance prevalence increased from 67 to 83% of the properties. In one of them there was an increase in oxfendazole effectiveness, suggesting resistance reversion. The genus *Haemonchus* was the more prevalent resistant parasite in 100% of the properties.

Association between *Ascaris suum* and *Salmonella enterica* in finisher herds.

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A possible association between infection with *Salmonella enterica* and *Ascaris suum* was investigated at herd and pig level. Individual pig data were obtained from the Danish Zoonosis Register and from meat inspection at 4 different abattoirs. *Salmonella* infection was measured by antibodies in meat juice samples taken at slaughter, expressed as an ELISA OD-value. *Ascaris* infection was measured by presence of white spots in livers at slaughter. Qualitative and quantitative associations were investigated using Mantel-Haenszel Chi-square analysis or multivariate regression, with correction for seasonality, abattoir and herd size. Data were collected in 2001, comprising 128.316 finishers. M-H analysis showed a significant association (Relative Risk=1.13, $P<0.0001$) between presence of *Salmonella* antibodies and presence of liver spots at herd level. In contrast, there was no association at herd level between the number of pigs seropositive for *Salmonella* and the number of pigs with liver spots. At individual pig level, animals with antibodies against *Salmonella* had a reduced risk of having white spots in the liver (RR=0.99, $P<0.05$). Pigs with liver spots had lower antibody levels against *Salmonella* compared with pigs without white spots ($P<0.0001$), but this association was only borderline significant ($P<0.10$) when only seroreacting animals were included in the analysis. The results did not reveal a causal relationship between *Salmonella* and *Ascaris* at herd or pig level. It cannot be excluded that the observed association can be explained by other herd or management factors.

Diffusion and residual activity of insecticide formulations in haircoat of dogs: An example with fipronil spot on and spray.

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Ecole Nationale Vétérinaire de Nantes.

The objective was to develop a model to evaluate the activity and diffusion of insecticides on the haircoat in dogs. 4 laboratory dogs, individually housed, were treated with commercial formulations of fipronil (3 spot on, 1 spray). Hair was clipped on lateral thorax on 12 consecutive areas on TO, 1,4 and 9h00 and Days 1, 2, 3, 7, 11, 25, 37 and 70, and on the site of application of the spot-on on Days 37 and 70. Untreated dogs served as negative control. 10 newly emerged fleas (*Ctenocephalides felis*) were placed in containers with 125 mg of each hair sample (in duplicate), then incubated at 26°C. Mortality was evaluated at TO+ 1,6,12 and 24h00 then 3 times a day (10 AM, 16 and 22 PM). Results were statistically analysed (Log Rank Test). On hairs from control dogs, the fleas have a progressive mortality (20% Day 3, 50% Day 8, 100% day 22). Comparison on day 2 showed the highest activity of spray formulation (100% active at 7h00, compared to 11 days for the spot-on), suggesting a limited and slow migration of the spot on. On day 37 the activity of the spot-on remained limited (50% mortality on back and thorax at 18 and 48h00, and 100% at 30h00 and day 9), whereas the efficacy of the spray remained very high (100% at 6h00). On day 70 the activity of the spot remained low on the thorax and decreased on the back (16.6% at 24h00). The spray formulation showed a much better activity for the control of invading fleas. The spot on probably never prevent bites or reproduction of fleas on most of the body surface which suggests that most of the control is due to the active passage of fleas on the skin where the drug was applied. This model could be used to evaluate insecticidal activity of haircoat in natural conditions.

Insecticidal activity of haircoat of dogs treated by their owners with fipronil spot-on or spray.

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Most of the knowledge on efficacy of antiparasitic drugs on fleas is issued from experimental or monitored trials and infestation remains common in dogs, although treatment may have been applied by owners. The aim of this study was to evaluate insecticidal activity of haircoat of dogs treated by owners with spray or spot on formulations of fipronil. Dogs included were seen for skin diseases in the clinics DPMA in Veterinary school of Nantes. Lateral thorax was clipped and the hairs carefully placed in plastic bags then stored at -25°C. Insecticidal activity on *Ctenocephalides felis* was tested (in duplicate) using an *in vitro* method previously validated*. The results were statistically analysed (Log Rank Test) then compared to values obtained in positive controls *. 63 dogs (31 spot-on and 32 sprays) were grouped in series of delay of treatment (weeks: A < 1, B 1-2, C 2-4, D 4-8, E 8-16 and F > 16). Freezing during periods of 3 months did not modify the activity. When sprays were used by owners, the mortality of fleas after 24h00 was A= 94,5%, B= 29.7%, C= 8,8%. An insecticidal activity was perceived until at least 8 weeks. The results were different from those in positive control (A = 100%, C= 100%)*. When spot on were used by the owners the values were A= 42,5%, B= 14,1%, C= 33,5%, D= 5,3%, E= 1,67%, in comparison with control dogs A= 75,23%, C= 35,3 % E= 34,5%. These results confirm the limited migration of spot-on, unable to prevent infestation, and the better efficacy of spray formulations, although their residual activity is comparatively more altered in field conditions than the activity of spot on. This demonstrates also the difference between experimental and field conditions and the probable consequences of skin alterations and conditions of treatment on the efficacy of insecticides.

*Diffusion and residual activity of insecticide formulations in haircoat of dogs (see corresponding abstract)

Using Geographic Information System (GIS) to determine the risk to human health from canine fecal contamination in Baton Rouge, LA.

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With the increase in urban dog populations, the problem of canine excreta is a typical subject of concern for the urban environment and the quality of life. From a medical point of view, the role of the dog as a definitive host for a number of zoonotic parasites has been recognized as a significant public health problem worldwide. GIS analysis offers a new approach to planning and managing medical data and to investigate the influence of environmental factors. To study the prevalence of canine gastrointestinal helminths, and to define the potential risk for human health, a survey was carried out in an area of 15 Km² around the campus of Louisiana State University. The study area was divided in to 5 zones according to socioeconomic status. A systematic collection of faecal samples was performed from parks/playgrounds and individual yards for each area. A hand-held GPS was used to acquire and record the geographic coordinates of samples. A total of 138 faecal samples were collected and 49 (35%) were found to be positive for eggs of one or more gastrointestinal helminths. The final prevalence in all the five areas were *Toxocara* spp. 7% (10), Hookworms 29% (40) and Whipworms 13% (18). A local GIS was constructed using Arcview GIS 3.3 software for geographical representation, spatial analysis and to determinate the relationship between parasitological and socioeconomic/environmental data of the study areas. The differences parasite prevalence between the five areas were statistically significant P=0.02 (Statcalc Epiinfo 6.04).

Isolation and characterization of a Diclazuril resistant strain of *Eimeria acervulina*.

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A field strain of *Eimeria acervulina* (EA), isolated from a commercial broiler operation in Pennsylvania was characterized for its susceptibility to coccidiostats in battery cage studies using two-week old broiler chicks medicated with 5 commercially available compounds in feed (Monensin, Amprolium, Diclazuril, Robenidine, and Salinomycin) and a novel cGMP dependent protein kinase (PKG) inhibitor, 4-[2-(4-fluorophenyl)-5-(1-methylpiperidine-4-yl)-1H-pyrrol-3-yl]pyridine (Compound 1). Birds were infected with 15,000 sporulated oocysts of either the field strain or a laboratory adapted strain of EA 24 hours after coccidiostats were introduced to the diets. There were 5 birds per treatment group that included one uninfected, un-medicated control group and an infected, un-medicated group. The efficacy of each coccidiostat was assessed by calculating the anti-coccidial index (ACI) based on oocyst counts, mortality, weight gain and lesion scores. Results indicate that the EA field isolate is resistant to the 5 commercially available coccidiostats when used at the recommended dose levels. The isolate was resistant to Diclazuril at use levels of 1 ppm and 2 ppm, but a higher exposure of 4 ppm provided good control of oocyst output. This new isolate was susceptible to the novel PKG inhibitor. This is the first report of isolation of Diclazuril resistant *Eimeria acervulina* from commercial broiler operations in the United States

Evaluation of the growth of *Trypanosoma cruzi* in different culture media.

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With the aim to evaluate the growth and conservation of *Trypanosoma cruzi* in the laboratory, four different culture media (NNN, TOBIE, LIT and BHI) for Trypanosomatidae were tested: Eleven different strains of *T. cruzi*, previously maintained in our laboratory in NNN media, were inoculated in each media. Then, media were incubated at room temperature (23-26°C) during 35 days in average. Observations were made every 48 hours, until its declination and Newbaver chambers were used for parasite counting. All media were suitable for the growth of *T. cruzi*, however the LIT and BHI media showed the greatest rates of growth. It is concluded that, even the parasites have grown satisfactorily in NNN and TOBIE, the fact that LIT media does not need the addition of fresh blood, makes its elaboration simpler, but it will be decision of each laboratory which one media must be employed for satisfying its particular necessities.

Molecular characterization of *Giardia* from Italian dogs at the β -giardin locus.

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Previous studies have shown that dogs are infected with *Giardia* cysts that belong to four genetically distinct Assemblages, among which Assemblages A and B have a demonstrated zoonotic relevance, while Assemblages C and D are host-adapted and are probably unable to infect humans. However, considering the very limited number of isolates (~50, and only 2 from Europe) that have been characterized, the role of dogs in the transmission of giardiasis to humans in different parts of the world is still unclear. In this work, fecal samples were collected from dogs in Northern Italy and the presence of *Giardia* cysts was assessed by sodium nitrate/sugar flotation and microscopy. Cysts were then purified by immunomagnetic separation. For the molecular characterization, a 292 bp fragment of the small subunit ribosomal RNA (ssr-RNA) gene, and a 753 bp fragment of the β -giardin gene were amplified by PCR and fully sequenced on both strands. The sequence of ssr-RNA gene fragment was found to be identical to that described from isolates of Assemblage D. The β -giardin gene sequence was determined here for the first time, and a total of 31 synonymous and 2 non-synonymous substitutions were identified in a multiple alignment that comprised the homologous sequences of *Giardia* from Assemblages A, B and E. In agreement with studies of other genetic loci, a closer affinity was noticed between the β -giardin sequence of Assemblage B and D. To allow for a rapid discrimination of the different Assemblages, a β -giardin PCR-RFLP assay was also developed.

The ability of *Brugia pahangi* to migrate is not limited to life cycle stage.

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Lymphatic filarial nematode infection occurs following the deposition of L3 on the skin by a feeding mosquito. The larvae then migrate from the skin surface to the lymphatic system. It is likely that migrations also occur within the lymphatic system. Understanding the mechanisms associated with these migrations is of major importance. We have developed an in vivo model to study migration of *Brugia* through host tissues using intradermal (ID) inoculations of *B. pahangi* into the lower hind limb of gerbils. The larvae used were recovered either from infected mosquitoes (day 0 larvae) or from gerbils with IP infections (day 2, 4, 6, 8, and 10 larvae). Studies on IP worms indicate that the L3-L4 molt occurs between 6 and 8 DPI. Gerbils were injected with 50-100 *B. pahangi* L3 ID, then necropsied at 72 hours, when most day 0 *B. pahangi* L3 injected ID are localized in the popliteal lymph node (PLN). IP injected gerbils served as controls. Larvae of all ages were able to migrate away from the site of injection. However, localization of the larvae appeared to change with age. Day 0, 2, 4 and 6 larvae appeared to localize equally between PLNs and other lymph nodes and vessels (including renal lymph nodes, sub-inguinal lymph nodes and spermatic cord vessels). However, the mean number of worms recovered from PLNs following infection with day 8 and day 10 larvae was less than from other tissues. Day 28 worms (immature adults) sub-cutaneously inoculated into gerbils also migrate from the injection site to regional lymph nodes. Day 40 adult worms do not migrate. These data indicate that all early life cycle stages (L3, L4, and early adults) are capable of migration through tissues. Nonetheless mechanisms and molecules required for these migrations may vary with life cycle stage.

Are older horses more wormy?

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Older horses may need to be treated more frequently to control nematodes if their immunity wanes with increasing age. To investigate this potential problem faecal egg counts were monitored regularly on a horse property where 26 middle aged and old horses are kept. Blood parameters were measured at the time of their treatment with ivermectin. In addition rectal faecal samples were collected and the modified McMaster technique used to determine the egg counts in 200 horses being euthanased at a licensed abattoir. Their age was determined from their dentition. Although thirteen of the horses at the yard had a mean age of 11.3 years and 13 a mean age of 25.2 years, there was no statistical correlation between the age of the horses and their faecal egg counts. There was also no correlation between blood parameters and the faecal egg counts. 60% of the faecal egg count and thus pasture contamination was contributed by two of the horses. 18 weeks after treatment some horses were still not shedding eggs. At the abattoir there was no correlation between faecal egg counts and the age of the horses. Egg counts are the only indicators available for estimating nematode burdens. Whilst recognising the limitation of using faecal egg counts as predictors, it seems reasonable to conclude that no special treatment is required for nematodes in older horses. However, the high egg shedders should be identified and monitored and treated as required rather than giving a blanket treatment to all animals. Supported by Intervet UK.

Mechanical recovery of cyathostome larvae from the mucosa of the caecum of horses.

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Evaluation of anthelmintics against nematodes of horses requires the counting of the tissue stages of cyathostomes, the major intestinal pathogens. Digestion with pepsin HCl is usually used for the smaller inhibited L₃ stages whilst developing L₃ and L₄ stages can be seen with transmural illumination. Mechanical disruption of tissue was investigated as an alternative to digestion. Initial studies showed that L₃ nematode larvae withstood extensive periods in the 'Stomacher' (Seward Ltd.). Wormy horses at an abattoir were identified by looking for bots and tapeworms. After mechanical disruption, or treatment of 10 g samples of tissue with pepsin HCl, samples of mucosal tissue were filtered on a 35 µm sieve diluted and three 5ml aliquots counted. Following mechanical disruption the maximum yield of larvae was found after 20 minutes. Therefore the yield of larvae after 6 hours digestion with digestive fluid replaced every 2 hours was compared 20 minutes mechanical. Significantly more larvae (Student's T test) were found after mechanical disruption than digestion in three of five horses. In one horse more larvae were found following mechanical disruption and in one similar counts were obtained by both methods. Mechanical extraction of cyathostome larvae using the 'Stomacher' from mucosal tissue is much quicker and avoids the use of chemicals. It might be applicable to larval recovery from ovine and bovine material. This was a 4th year veterinary student project supported by Intervet UK.

In vitro breeding and testing of *Ctenocephalides felis* for insecticide resistance.

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Improved conditions are required to be able to breed flea isolates collected in the field for resistance testing. Bovine, equine, ovine and porcine blood plus as anticoagulants 40ml/l 20% sodium citrate, or 10ml/l 15% EDTA, or heparin (5 units/ml) or which had been defibrinated were fed to the fleas. The numbers of eggs per female over time were counted. Fleas were tested in contact tests and delineating doses determined for four insecticide groups. Fleas fed defibrinated porcine blood produced fewer eggs per female than fleas fed porcine blood with citrate or EDTA. Best results were achieved with heparin and porcine blood or with EDTA (mean eggs per original female, 48). Preliminary results suggest that reducing the percentage of males to females per cell increased egg production. Unfed adult fleas (mixed sexes) were collected within three days of emergence and placed on insecticide impregnated papers and the percentage mortality determined after 24 hours at 25°C. Papers (7.9cm²) were prepared by impregnating them with 100µl insecticide dissolved in acetone or acetone plus olive oil and 10 fleas are added per tube. Delineating/discriminating doses for the Langford isolate of *Ctenocephalides felis* were established for diazinon (0.001mg/ml), fipronil (0.012mg/ml), imidacloprid (0.1mg/ml) and permethrin (30mg/ml). Further susceptible isolates will be compared and attempts made to culture resistant populations of fleas to provide a 'library' of resistant fleas. Supported by Merial Animal Health.

***Wolbachia* in sucking lice.**

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Study of the associations between symbiotic bacteria and parasitic arthropods continues to elucidate an increasingly complex suite of relationships. Sucking lice (Insecta : Anoplura) depend on symbiotic bacteria that provide essential nutrients to supplement their blood diet. These bacteria have now been characterized as members of a group of gamma-Proteobacteria found in a variety of insects. Other symbiotic bacteria, particularly the rickettsia-like genus *Wolbachia* are being reported from increasing numbers of insect taxa where their role in cytoplasmic incompatibility, parthenogenesis induction, male killing, feminization and overall sex ratio distortion has received a great deal of attention. PCR amplification of nine species of sucking lice using the *wsp* gene primer set determined the presence of *Wolbachia*. Detailed sequencing information allowed the construction of a phylogenetic tree relating the isolates from the various louse species. Sequencing also established that each louse species harbours two or more strains of *Wolbachia*. Co-occurrence of at least two symbiotic bacteria in lice opens several questions regarding their role in louse reproduction and in the vector competence of various louse species.

Study to compare the efficacy and safety of FRONTLINE® Plus (fipronil/(S)-methoprene) and FRONTLINE® Spot-On against ticks in cats under field conditions in Japan.

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The efficacy and safety of a topical spot-on formulation of fipronil/(S)-methoprene combination (FRONTLINE Plus) was evaluated against natural infestations of ticks and compared to FRONTLINE Spot-On for Cats under field conditions. From a total of 11 clinics throughout Japan, investigators enrolled 44 cats of various breeds with at least one tick at the initial tick count and with no history of treatment with a tick-control product within the previous six weeks. Cats were randomly assigned to receive fipronil/(S)-methoprene spot-on or FRONTLINE Spot-On for Cats on Day 0. At Visit 1 (Day 0), Visit 2 (Day 2) and Visit 3 (Day 30), ticks were counted. Individual counts at Visit 1 (Day 0) ranged from 1 to >50 ticks and the geometric mean tick counts of fipronil/(S)-methoprene spot-on and FRONTLINE Spot-On were 2.34 and 1.97, respectively. Percent reductions in attached tick count for fipronil/(S)-methoprene were 92.9% and 96.8% at Visit 2 and Visit 3, respectively; for FRONTLINE Spot-On, percent reductions were 89.7% and 97.4% at Visits 2 and 3, respectively. No significant difference in tick counts was seen between the treatment groups at any visit. No statistically significant differences were detected between the two treatment groups at any of the visits for body condition, hair coat condition, general demeanor, application site condition, or pruritus. These data demonstrate that both products, a fipronil/(S)-methoprene spot-on (FRONTLINE Plus), and FRONTLINE Spot-On for Cats are both highly effective in controlling tick infestations in cats under field conditions.

Modulation of blood uptake by horn flies (*Haematobia irritans irritans*) following vaccination with recombinant thrombostasin.

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Adult horn flies blood-feed recurrently throughout the day and are major pests of livestock in many parts of the world. Unlike phylogenetically older hematophagous taxa such as mosquitoes and black flies that possess multiple anti-hemostatic factors in their saliva, horn fly saliva has limited activity with an anti-thrombin - thrombostasin (TS) – as the only anti-hemostatic factor identified to date. To determine if immunization with recombinant TS could alter the fly's ability to ingest blood, we immunized New Zealand white rabbits and after suitable titers were reached (1:32,000 or greater) used the recalcification time assay to determine that immune sera significantly neutralized TS activity *in vitro* ($p=0.0001$, t-test, $n=4$). Horn flies 5-20 hours old were then allowed to feed on immunized or non-immunized rabbits for 20 minutes and the amount of blood ingested compared between the two groups. Immunized rabbits were significantly more resistant to blood-feeding than the naïve control rabbits ($p=0.003$, t-test, $n=53-55$). Horn fly naïve Holstein calves maintained in a large animal isolation facility were then immunized with either recombinant TS or ovalbumin (OVA-control) and challenged with horn flies as before. Calves with titers of 1:32,000 or higher to TS were resistant to feeding with the amount of blood ingested reduced by 55.4% and 32.1 %, respectively, from the 1st to the 2nd feeding. The amount of blood ingested from OVA-immunized calves increased by 64.7% and 141%, respectively. Reduced blood uptake significantly delayed ovarian development of flies feeding on TS-immunized calves ($p=0.0001$, t-test, $n= 29-30$) compared to controls. These findings demonstrate proof of concept in both a laboratory model and the fly's natural host that immunization with a salivary factor modulates blood uptake and offers a unique approach to control of this important livestock pest.

The fish disease (*Ligulosis*) in the Kyiv reservoir (after the Chernobyl catastrophic).

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The Kyiv reservoir was constructed in 1964 on the upper segment of the Dnepr river. After the Chernobyl catastrophic in 1986 the Kiev reservoir appeared to be in the zone of intensive radionuclid contamination. Recently the because of high temperature of the water and the regular contamination of the reservoir with various contaminants (radiation, heavy metals and others) cases of fish disease ligulosis have become frequent. 6930 fish of different age (five kinds): *Abramis brama* - 1320, *Blicca bjoerkna* - 1750, *Rutilus rutilus* - 930, *Abramis ballerus* - 1500, *Leucaspisus delineatus* - 1430 fish were examined by us during 2000-2001. The general invasion level of the tested fish in average is 13,5 % and varies in *A. brama* within 3,3-29,0 %, in *B. bjoerkna* 6,0-18,5 %, in *R. rutilus* 7,2-24,4 %, in *A. ballerus* 7,1-18,3 %, in *L. delineatus* 8,4-21,6 %. The greatest concentration of the sick fish is registered on the shallow segments of the reservoir - 17,5 %. In this region *A. brama* - 24,0 %, *R. rutilus* - 19,1 % and *L. delineatus* - 19,4 % were mostly contaminated. At the low segment of the reservoir the level of contamination is about 4,1 %, *B. bjoerkna* - 11,6 % and *L. delineatus* - 11,3 % were registered with the highest level of contamination.

***In vitro* measurements of anthelmintic effects of tanniferous plants on third stage larvae of parasitic nematodes of the gastrointestinal tract.**

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Infection of the gastrointestinal tract with nematodes remains one of the major constraint on goat production in France. The usual mode of control is based on the repeated use of antiparasitic drugs but the increasing development of anthelmintic resistance in worm populations now severely impair the efficiency of anthelmintics in dairy goat flocks. Tanniferous plants represent one possible alternative to chemotherapy in goats as in sheep. The objective of the current study was to screen by *in vitro* methods the potential anthelmintic properties of some tanniferous plants which are consumed by goats. The effects of aqueous extracts of 4 plants: sainfoin (*Onobrychis viciifoliae*), leaves of oak (*Quercus robur*) or hazelnut tree (*Corylus avellana*) and bramble (*Rubus fruticosus*) on the third stage larvae of *Haemonchus contortus*, *Teladorsagia circumcincta* and *Trichostrongylus colubriformis* have been assessed using a larval migration inhibition assay (LMI). Levamisole was used as a positive control. Overall, *Haemonchus* larvae were more sensitive to the action of plant extracts than the 2 other parasite species. Sainfoin extracts were effective against larvae of *H. contortus* and *T. colubriformis* whereas extracts from oak and hazel nut leaves were inhibitory on larvae from the 2 abomasal species. These inhibitory effects were found to be dose-dependent. These results suggest that consumption of tanniferous plants present in forage or on rangeland vegetation offer an alternative to the exclusive reliance on anthelmintics.

The status of resistance to chemical ixodicides of the tick *Rhipicephalus sanguineus* (Acari: Ixodidae) in Spain.

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The brown dog tick, *Rhipicephalus sanguineus*, is a serious pest of domestic dogs and wild carnivores. In Spain, some areas have pestiferous levels of this tick, and a continuous acaricide pressure may have been generating a resistance towards the chemicals used against it. This fact has been already reported for several countries where the brown dog tick is a prominent problem in animal health. In this study, ticks from natural populations were collected in 17 sites of Spain, commonly in kennels. The purpose of the study was to use the FAO tea bag technique to know the resistance status of these strains to several chemicals commonly used against the tick. A laboratory strain kept in the laboratory for the last 10 years without treatment pressure was used as control. The chemicals were obtained as raw products (not in marketed form), and include Amitraz, Deltamethrin, and Propoxur. The flat adults of the 17 populations were obtained in the walls of the kennels, and then feed upon rabbits to obtain a homogeneous progeny of larvae. The larvae were used in lots of 100/bag when aged 20 days old. Probit analysis was used to measure the parameters of LD50, LD90 and LD95, and to compare data of experimental populations with those obtained from control group. All the 17 populations of *R. sanguineus* tested showed different degrees of resistance to Deltamethrin and Propoxur, but not Amitraz. For Deltamethrin, the LD95 was 3 to 9 times higher in experimental populations than in laboratory (control) one. However, in Propoxur, the LD95 for the strain of ticks collected in the field was in the range of 1.5-2.5 times higher than for control strain. All the tick populations used in this experience showed a high sensitivity to the Amitraz, and no resistances were detected against this chemical. Although Amitraz has been used in Spain for at least 15 years, the molecule is not generating resistances at least in the studied populations. Amitraz should therefore be considered as the first choice compound against dog ticks.

The next step in forecasting *Ixodes scapularis* habitat suitability: The 1 km model for the United States of America.

A. Estrada-Peña*.

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In recent years, many efforts have been devoted to map the known distribution of *Ixodes scapularis* in USA and to provide insights into the forecasted habitat suitability of this important tick in the concerned territory. Models based on different methodologies and using several climate variables have evolved, but none provided the necessary degree of accuracy as to be used as a tool for forecasting risk at local scales. New orbiting satellites sensing the Earth at high resolution as well as new statistical methods are now available as to erect a model of the distribution of *I. scapularis* with a resolution of 1 km. A Neural Network has been trained with a database of more than 1,200 records of the tick in the whole territory of USA, using digital maps with information about vegetation types, together with data for abiotic variables taken from ASTER and MODIS sensors from Earth-orbiting satellites. The information is completed with data about the distribution and habitat preferences of hosts obtained through the GAP initiative. The sensitivity and specificity of the model are, respectively, 96% and 98% when compared with the actual records of *I. scapularis*. The model is updated with new information about the abiotic variables as generated, obtaining a picture of the trend in the distribution of the tick according to climate change. Several layers of geographical information (roads, cities, census blocks, counties borders) have been added to the model forecast, and a software package as been developed to serve the information. This Neural Network framework provides the most accurate model currently available about the distribution of the deer tick in USA, to be used as a portable tool in personal and pet protection against the tick. It is also a powerful method to understand the recent changes in the distribution of the tick as a consequence of climate drift.

Responses of West African Dwarf goats to abbreviated escalating infections with *Haemonchus contortus*.

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Faecal egg count (FEC), is a reliable phenotypic marker for genetic resistance to GI nematodes in temperate breeds of sheep and goats. Little information is available on its value in tropical goat breeds. We have, therefore, used variations in FEC of *Haemonchus contortus*-infected West African Dwarf (WAD) goats to test the hypothesis that distinctive responder phenotypes exist in this breed. Forty two 9 month-old kids were used. 32 were trickle infected with 100 L3 per day, three days a week, increasing to 1500 L3 per day by week 4. Ten naïve controls were used. Infections were terminated with Fenbendazole on D32, followed by challenge with 4000 L3 on D46. The highest recorded pre-challenge FEC of individual goats were used to classify their responder status as High (<1000 = Class 1), Medium (1000-2500 = Class 2) or Low (>2500 = Class 3). Animals were necropsied on D35 after challenge. There were highly significant positive correlations between terminal worm burdens and FEC on D21 ($r_s = 0.40$, $P = 0.025$) and D34 ($r_s = 0.6$, $P < 0.001$) post challenge, with ranges of worm burdens of < 50, 50 -100 and > 100 for Classes 1, 2 and 3 goats, respectively. Average pre and post challenge FEC were also significantly positively correlated ($r_s = 0.44$, $P < 0.012$). Our data suggests that distinctive parasitological response phenotypes occur in *H. contortus*-infected Nigerian WAD goats.

Larvicidal activity of an ivermectin praziquantel combination against migrating *Strongylus vulgaris* larvae in equids.

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An oral gel containing a combination of ivermectin-praziquantel was tested for efficacy in horses against experimental mixed infection of 56 days *Strongylus vulgaris* and Cyathostominae larvae. Selected horses coming from contaminated pastures were ranked by decreasing order body weight (D-1) and randomly allocated to a treated or untreated group (n = 6). Horses were infected on D0 with an oral inoculum coming from 2 donors and containing 500 *S.vulgaris* and 21900 small strongyles L₃ infective larvae. A single treatment was administered on D56 and necropsy examination was performed 14 days later (D70). Ivermectin was highly efficient (100%) against the *S. vulgaris* arterial stage (no live form was recovered) and there was no interference between the two active ingredients contained in the tested product.

On the biology of *Eimeria macusaniensis*, an intestinal parasite of South American camelids.

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The present studies were performed to obtain data on the epidemiology and life cycle of *Eimeria macusaniensis*, an intestinal parasite of South American camelids. For this purpose, faecal samples were taken at monthly intervals for a 1-year period from llamas of different ages kept on a farm in Germany. The youngest animals to be found shedding oocysts were 2 months old. The highest prevalence of positive faecal examinations (67-71%) and oocyst counts per gram of faeces (OPG) were seen in llamas 2 and 3 months of age (OPG: 400-450). In mature dams and yearling males, the prevalence of faecal oocysts (16%, 26%) and OPG (24, 45) were lower ($p < 0.05$) compared with animals during first year of life. After in vitro incubation, a maximum of sporulated oocysts (85%) was obtained after 15 days at 30 °C and after 25 days at 16-18 °C. To study the prepatent and patent periods, llamas were reared parasite-free and orally infected with 20.000 (n=5 at 1 month of age) or 100.000 (n=1 at 2 months of age) sporulated oocysts. The prepatent period was 32-36 and the patent period 39-43 days. Mean total oocyst output was $3.3 \cdot 10^6$. The mean reproductive rate (MRR) after the initial infection was 1:310. Reinfections with 50.000 oocysts 2 or 3 weeks after the end of the first patency resulted in a prolonged prepatent period (37-40 days), a shortened patent period (20-23 days) and reduced OPG (MMR 1:125).

Frequency of *Oestrus ovis* in goats sacrificed in the municipal slaughterhouse of Culiacán, Sinaloa, México.

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The parasitosis is a problem that affect to the goats by being these more susceptible animals than other species given to its alimentary habits. in any of its phases the production causing large economic losses that result in the farm profit value of all kinds of businesses. The parasitic problems more serious, by its high one morbidity and to which himself has not it it given importance required, are the miasis cavitarias, of which emphasize them produced by the larvae of *Oestrus ovis* in goats. The infestation is during the epoch of heat and dry, is initiated when the *Oestrus ovis* fly, places its larvae (L1) crawl into the nasal and frontal sinuses of these animals which emigrate and develop to (L3) in the nasal cavities, maxillary, frontal breasts and shell etmoidales. This illness causes that the animal be permanently in stress, restless, shake the head or scrub its noses against the floor and, stop eating. The effect is seen reflected in a decrease of the profit of weight this added to the predisposition of other illnesses as sinusitis, rinitis chronic with mucus exuded, pleuroneumonae and some time death. In the Sinaloa state not yet have been reported works on the frequency of these parasitosis; by which; the objective of this work went to determine the frequency of larvae of *Oestrus ovis* in goats sacrificed in the Municipal slaughterhouse of Culiacán, Sinaloa, México. The samples were taken of females and male of different ages, weight and characteristic racial. The collect of larvae was carried out with intervals 7 days each one, taking the day the major number of animals; that are sacrificed; For it takes of samples an incision in the nasal cavity was carried out to externalize this area. The collection of the larvae was carried out with dissection forceps, the larvae obtained were placed in sterile flasks with alcohol identifying with the number of the animal, and were carry to the parasitology laboratory of Faculty of Veterinary Medicine and Zootechnic of Sinaloa autonomous University. These samples were process with the purpose to identify the worms by stages larval. the results were the following: 199 (100%) goats in total, the number of positive animals went of 57 (28.64%). As for the states of the larvae found, were observed a total of 140 larvae, of which 21 (15%) correspond to L1, 28 (20%) belong to L2 and 91 (65%) they were observed like L3. It is concluded that the prevalence of this parasitic is very high, if the presence of the larvae coincides with the clinical presentation of the illness, is high the economic loss that can cause and the predisposition to other illnesses.

Mites of the mange in dogs of Culiacán, Sinaloa, Mexico.

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The canine mange is a contagious complex of dermatitis caused by mites *Sarcoptes scabiei* (variety canis) and *Demódex canis*. The infestation is given almost always by intimate contact; *Sarcoptes scabiei* nests in the epidermis and is fed of the layers of the same one, while *Demódex canis* lives in the hair follicle, where is fed of the cells ephitelial. The human beings can contract a form of mange sarcóptica; as opposed to the kind *Demódex canis* that presents a high specificity for its guests. In our region dominates a tropical climate medium-dry and besides counts on the conditions climatológico and topographical that favor the development of the biological cycles of a variety of types parasitarias, which does necessary to identify them, to try to control them and to counteract their damaging effect in the economic aspect and of public health. With the objective to determine frequency of the Mites mange in dogs in Culiacán, Sinaloa, México. Were analyzed 147 samples of dogs scrape skin of different places of the city of Culiacán, during June 29 to 30 of September of the 2000. The results were the following : 15 samples (10.2%) positive to *Demódex canis* as only causal agent, 15 samples (10.2%) positive to *Demódex canis* combined fungus, 8 samples (5.4%) positive to *Sarcoptes scabiei* combined with fungus, 79 samples (53.7%) positive to *Sarcoptes scabiei* as only causal agent and 4 samples (2.72%) positive to *Sarcoptes scabiei* combined with *Demódex canis*. Concluding that a high exist frequency *Sarcoptes scabiei* (variety canis), that *Demódex canis* in the dogs of Culiacán. possibly at proper of humid climate that exists in the region. can be observed that many cases the parasitosis external is mixed whit problematic concomitant that this involves for an adequate diagnostic, processing and control the same. Therefore it is necessary that sample the animals for their parasitological diagnostic be carried out opportune, monitoring in an individual way and the nurseries through sanitary programs; in the public area of health is necessary to coordinate efforts among the biomedical areas, due to the cases reported of zoonosis in members of the family sinus.

Prevalence of enteric and external parasites in bees (*apis mellifera*) in Culiacán, Sinaloa, México.
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Mexico possesses 2.5 million beehives approximately of which are rustic 500 thousand, and technical or modern 2 million. It is estimated that Mexico produces the 12% of the total of the bee honey production in the world. The annual production of honey exports 85% toward: Germany western, United States of America and the United Kingdom, which places to Mexico as one of the main world exporters of this product; the national remainder of production, the 15% is consumed in the country. The bees suffer illnesses that, if not be treated opportunely, can be cause the disappearance of the colony, and even to contaminate to the most nearby. Two of the most important illnesses than affect to the bee are: nosemosis and varroasis, the first one, also called progressive paralysis; is produced by the protozoario *Nosema apis* that infects the internal middle of the adults. The second illness is produced by a mite, *Varroa jacobsoni* that is fed absorb the haemolymph (internal fluid) of the bees in its different stadiums. The most intense demonstration is during the spring but this present during all the year and its damage is more severe in weakness beehives. It given the importance of the apiculture. The objective of the present study were, determine the presence of nosemosis and varroasis in apiaries of the municipality of Culiacán, Sinaloa, México. The present work was carry out in three apiaries composed of 40 beehives each one, adding 120 beehives. By each apiary itself sampling the 6% of total number of beehives; being ten samples of a hundred bees each shows by apiary. The collect of samples were carry out utilizing flasks of glass directly of the beehive and subsequently transported to Parasitology Laboratory of the Veterinary Faculty of Medicine and Zootechnia of Sinaloa Autonomous University. For the identification of *Varroa jacobsoni*, the bees previously were submitted to washed and agitation with methanol, and subsequently the residues of sifting were observed directly through composed microscope and for the case of the *Nosema apis*, herself it retreat to the bees the abdomen, being marinated and being submitted to the technique of flotation for their microscopic observation; in both cases their identification carry out by means of their morphological characteristic. The results obtained indicated that 100% (30) of the samples analyzed negatives were found to *Varroa jacobsoni*, while for *Nosema apis* were found positive 100% (30) of the samples and 40% (12) positive to *Entamoeba spp.* Concluding that these apiaries require the preventive but frequent medicine programs application, with regard to the proximity that have these with points contaminated like drainage, channels and with the zones semi urban of the city.

***Dirofilaria immitis*: humoral response and cytokine mRNA expression in chronically infected dogs.**

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Heartworm disease (*Dirofilaria immitis*) causes polmonary hypertension and thromboembolism in chronically infected dogs. Here, three dogs with natural *D. immitis* infection and one control dog were studied. mRNA expression of different cytokines (IL-4, IL-10, IFN γ , TNF α) and of iNOS was determined by RT-PCR analysis and humoral response to synthetic peptides derived from adult worms and to Wolbachia Surface Protein (WSP) were analyzed by ELISA. Chronically infected dogs with either mild or severe polmonary hypertension showed weak humoral responses to Wolbachia, moderate humoral responses to worm proteins and high expression of IL-10. One dog with severe thromboembolism produced higher titres of anti-WSP antibodies, while titres against worm antigens were lower, as was IL-10 expression. TNF α and iNOS were comparable in all three infected dogs. The pathogenesis of filarial disease in humans and animals may depend on immune-mediated mechanisms with release of pro- and anti-inflammatory mediators. Gradual death of worms and slow release of endosymbiont molecules appear to produce immune-tolerance, while massive worm death associated with severe thromboembolism appears to favor pro-inflammatory responses, in particular against endosymbiont molecules.

Seroprevalence of *Toxoplasma gondii* antibodies in the rodent capybara (*Hydrochoerus hydrochoeris*) from Brazil.

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Capybaras (*Hydrochoerus hydrochoeris*) are one of the largest rodents used for meat in South and Central America. Prevalence of anti-*Toxoplasma gondii* antibodies in 149 feral *H. hydrochoeris* from the state of São Paulo, Brazil was evaluated using the indirect immunofluorescent antibody test (IFAT) and the modified agglutination test (MAT). Using IFAT, antibodies ($>1:16$) were found in 104 (69.8%) capybaras, in titers of 1:16 in 3, 1:32 in 3, 1:64 in 1, 1:128 in 11, 1:256 in 10, 1:512 in 23, 1:1,024 in 27, 1:2,048 in 23, 1:4,096 in 2 and 1:8,192 in 1. With MAT, antibodies ($>1:25$) were found in 63 (42.3%) capybaras, in titers of 1:25 in 21, 1:50 in 26, 1:100 in 12, 1:200 in 2 and 1:400 in 2. This is the first report of prevalence of *T. gondii* antibodies in this host.

Prevalence of *Giardia* spp. in dogs and humans in northern and central Italy.

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A cross-sectional coprological study on giardiasis in dogs and humans was carried out in central and northern Italy to collect prevalence data and potentially related risk factors. A total of 616 dogs (436 from central Italy and 180 from northern Italy) and 300 humans (central Italy) were examined. Two coprological tests were performed in order to maximize the chance of finding *Giardia* cysts: a centrifugation and flotation technique, combined with a sedimentation technique in Abruzzo region, and with MIF procedure (Meridian Diagnostic Inc.) in the Veneto region. The strength of the relation between giardiasis and potential risk factors was estimated by the Prevalence Ratio (PR), and its importance for the population was expressed by the Attributable Proportion for the exposed dogs (APe). The overall prevalence was 21.3% in dogs and 2% in humans. No differences were noted between the prevalence in dogs of central and northern Italy (22.2% and 19.4%, respectively). Increased prevalence was significantly associated with kennel dogs (PR=2.13, APe=53%), young dogs (PR=1.99, APe=50%), and those with altered faeces (PR=1.86, APe=46%). Screening of dogs for giardiasis, particularly puppies, and their treatment to prevent eventual human infection is highly recommended.

***Haemonchus contortus* genome map**

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Genomic resources for trichostrongylid parasitic nematodes are currently confined to EST sequences. Whilst these are immensely valuable there is an urgent need to develop genome maps and ultimately full genome sequence in order to fully exploit “post-genomic” technologies and parasite genetics. *Haemonchus contortus* is one of the most economically important and well studied pathogens of this group. We are developing a *H. contortus* genome map to use in genetic studies and to provide the first step towards full genome sequencing. We are constructing an integrated HAPPY map and physical BAC clone map of the inbred ISE strain. HAPPY mapping is a physical analogue of meiosis which is comparable to genetic mapping (linkage analysis) but measures the frequency of induced breaks between markers rather than the frequency of recombination. The aims of the project are: 1. Produce 10-fold coverage BAC libraries and obtain 3000 BAC end sequences. 2. Construct a HAPPY map of 3000 markers (2000 BAC ends and 1000 ESTs) 3. Place polymorphic microsatellite markers on the map. 4. Obtain full sequence of 4 BAC clones 4. Establish a database with a WWW interface. 5. Undertake comparative genomic analysis with *C. elegans* to determine the extent of short range and long range synteny and investigate *H. contortus* genome organization. 6. Develop genetic mapping strategies to locate anthelmintic resistance loci.

A reproductive safety study with EQUIMAXTM Paste (1.87% ivermectin / 14.03% praziquantel) in mares.

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This study evaluated the reproductive performance and safety effects of EQUIMAX Paste administered to healthy mares biweekly at 3X the recommended dosage through one gestation. Twenty-eight proven mares began treatment biweekly *per os* with either a placebo paste (n=13) or EQUIMAX Paste (n=15) at 0.6mg/kg IVM / 4.5mg/kg PZQ, 3X the recommended dosage. Twenty-one mares completed the study (placebo paste n=10; EQUIMAX Paste n=11). Each mare was monitored through breeding (up to three successive heats), gestation, and until her foal reached ~90 days of age. Assessed variables included clinical and reproductive indices, foal vitality, and adverse drug events. Variables with continuous outcomes were assessed by repeated measures ANOVA (SAS[®]); non-continuous outcomes by non-parametric methods. Differences between groups were deemed statistically significant if P < 0.10. There were no significant group differences relating to length of estrous cycle and diestrus, number of breeding attempts needed to achieve pregnancy, length of gestation, or the health of foals produced. No adverse drug events were reported. Differences in clinical pathology were deemed not relevant. In this study, EQUIMAX Paste at 3X the recommended dosage was safe for use in pregnant mares and did not adversely affect their reproductive performance or the viability and growth of their foals.

A survey of anthelmintic drench efficacy in U.K. goat farms.

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Gastrointestinal parasitic nematodes of sheep and goats are of major economic importance worldwide. The control of parasitic nematodes, in both domestic livestock and man, is dependent upon the strategic use of anthelmintic drugs, such as the benzimidazoles, levamisoles and ivermectins. However, for parasitic nematodes of sheep and goats, resistance to these drugs is becoming increasingly common. For many parts of the world, drug resistance in sheep nematodes has been preceded by drug resistance in goat nematodes, suggesting that goats may be a source of resistant parasites for sheep. The current prevalence of anthelmintic resistance in U.K. goats is unknown. Consequently, we are undertaking a survey of goat farms to determine anthelmintic treatment efficacy and identify resistant parasite populations. We are conducting a postal survey which includes a questionnaire on parasite control measures on each farm and a drench efficacy test based on pre and post dosing faecal egg counts. Although this is not a definitive measure of anthelmintic resistance it should identify farms with potential anthelmintic resistant parasites which can be further investigated. In addition, we are conducting egg hatch assays on anaerobically stored faecal samples to independently verify suspected cases of benzimidazole resistance.

Prevalence and intensity of *Haemonchus* species from bull fighting animals at the Plaza Mexico.

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With the aim to identify the species of *Haemonchus* present in bull fighting animals from different states of Mexico and collected after their sacrifice at the Plaza Mexico, 524 contents of abomasums were taken. and properly handled to collect the worms. All nematodes were fixed in a 70% alcohol and afterwards being placed in lactophenol to clarify their structures for better identification. From the 4,543 collected parasites 3,796 were female and 747 were male. Identification of species was carried out on males. The results showed that species identified were *Haemonchus contortus* and *Haemonchus placei*. The corresponding prevalence was 30.38% for *H. contortus* and 69.61% for *H. placei*. With the regard to the intensity, from the 747 male worms collected, 227 were identified as *H. contortus* and 520 specimens corresponded to *H. placei*. It was concluded that the prevalence and the intensity were higher for *H. placei*.

***Echinococcus multilocularis* in Wallonia (Southern Belgium): spatial distribution of carriage by the red fox (*Vulpes vulpes*) and preliminary results in the musk rat (*Ondatra zibethicus*), a potentially important intermediate host.**

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E. multilocularis is a small tapeworm which uses different species of foxes and rodents as final and intermediate hosts respectively. In humans, infection with the metacestode stage can result in a potentially lethal liver condition (alveolar echinococcosis). The purpose of this study was to evaluate the spatial distribution of this tapeworm in Wallonia (Southern Belgium) and its prevalence in the red fox (*Vulpes vulpes*). Additionally, preliminary data on the role of the musk rat (*Ondatra zibethicus*) as intermediate host were collected. Between 1998 and February 2002 709 foxes killed in Wallonia were available for direct parasitological examination of the gut content. A total of 20.2% of the foxes were found to be infested. Differences were observed between the different geological areas; the highest prevalence (33%) was observed in the Ardenne, a hilly area (altitude +500 m) and the lowest (0%) on the Herve plateau. In 2003, 349 muskrats caught in different parts of Wallonia were necropsied. The metacestode stage was identified by gross and microscopic examination of the liver. In total, 10.91% were found to be infested. In conclusion, these results indicate that *E.multilocularis* is widely distributed in Southern Belgium. Furthermore the musk rat can be regarded as a very efficient intermediate host. As the metacestode stage is not infective to man, the musk rat could represent a convenient and safe tool to study the epidemiology of this infestation.

The effect of *Amblyomma cajennense* and *Rhipicephalus sanguineus* saliva on the *in vitro* proliferative responses of T lymphocytes from BALB/c mice.

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Tick saliva has been shown to contain a variety of pharmacologically active molecules, including those with immunosuppressive activities. There is increasing evidence that the non-specific suppression of host immunity by tick saliva is exploited by tick-borne pathogens, e.g. the saliva-activated transmission (SAT) of some tick-borne viruses. Several studies have revealed that T lymphocytes and cytokines play a crucial role in determining the outcome of parasitic infections in terms of protective immunity. In this study, we investigated tick saliva effects on T cell proliferation, an event associated with host immune defence mechanisms. The proliferative response of lymphocytes from BALB/c mice exposed to the saliva of *Amblyomma cajennense* and *Rhipicephalus sanguineus*, were therefore compared *in vitro*. We determined that *A. cajennense* tick saliva inhibited Con-A induced splenic T cell proliferation. Tick saliva diluted twenty times (75 µg/ml) inhibited Con-A induced T cell proliferation by 91%. *Rhipicephalus sanguineus* tick saliva diluted twenty times (64 µg/ml) also inhibited both Con-A induced splenic T cell proliferation by 56%. These data suggest that the facilitating effect of saliva on the establishment and transmission of some tick-borne pathogens might be associated with the suppression of the host innate resistance mechanisms.

Effect of worm burdens in goats on the livelihoods of smallholder farmers.

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In the Philippines, pre and post-weaning mortality rates of small ruminants are so high that goats make only a small contribution to the livelihoods of smallholder farmers. Much of the mortality is attributable either directly or indirectly to gastrointestinal parasitism, principally by *Haemonchus contortus*. A participatory evaluation of practical methods for control of parasitism has shown that mortality rates can be substantially reduced by simple husbandry changes and judicious use of anthelmintics. Here we evaluate the effects of these interventions using a stochastic demographic model to simulate the productivity of goat herds. Using baseline mortality rates, a small herd of goats rarely grows to a substantial holding, and the cash flow from sales is erratic. Using mortality rates estimated from goats with lower exposure to parasites, a smallholder farmer can attain a substantial holding in three years, and thereafter produce a regular income stream. If gastrointestinal parasitism is reduced, raising goats for meat can provide a pathway out of poverty for smallhold farmers.

Protein supply to lactating ewes affects in vitro larval establishment of abomasal nematodes.

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Protein supply can improve expression of immunity to gastrointestinal nematodes in periparturient sheep, and this may be reflected in changes in larval establishment, nematode fecundity and/or nematode expulsion. Here, we assess whether host protein supply affects *in vitro* larval establishment. Two groups of eight twin-bearing ewes each were infected with *Teladorsagia circumcincta* (TC) L₃ (10000/day, 3 days/wk) between day₋₇₀ and day₁₆ (relative to parturition, day₀), and were fed iso-energetically at 0.60 (L) or 1.20 (H) times protein requirements during lactation. On day₂₁, six pieces of abomasal tissues ($\pm 4 \text{ cm}^2$) were obtained from the ewes and also from 4-wk-old parasite naive lambs (control). These tissues were placed in a 100:1 Hank's and Hepes solution, and incubated with 2500 L₃ of either *T. circumcincta* or *Haemonchus contortus* (HC) for three hours in a dark, oxygenated box at 37°C. Larvae were then counted in the solution (A) and from the tissue (B), and rate of establishment was calculated as $(B/(A+B)) \times 100\%$. Rate of establishment did not differ between HC and TC but averaged 52.2, 44.9 and 24.4% for the control lambs, L- and H-ewes, respectively (s.e.d. 9.65, $P < 0.05$). On day₂₁, FEC and total worm burden were 207 (121-355) epg and 22652 (18286-28061) for the L-ewes and 29 (14-59) epg and 8192 (5885-11403) for the H-ewes, respectively ($P < 0.01$). The data suggest that periparturient protein supply can improve expression of immunity to abomasal nematodes through affecting the rate of larval establishment and that this effect does not seem to be nematode species specific.

Some data about *in vitro* culture of *Polygyra* sp intermediate host of *Muellerius capillaris*..

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The aim of the present study was to evaluate different data about *in vitro* cultivation of land snails, intermediate hosts of pulmonary nematodes like *M. capillaris* that infect goats and other ruminants. Collection of land snails and soil was made at Tepetzingo, Morelos, Mexico and transported in small bottles to the Parasitology laboratory at FMVZ, UNAM. Seventy four mollusca were collected: 10 of the genus *Succinea* and 64 *Polygyra*. *In vitro* cultivation - In plastic containers petri dishes with earth were settled to shelter 10 to 15 *Polygyra* sp snails per container. The mollusca were fed with lettuce and oat and keep in at 16 to 14°C and 80% humidity. The first *Polygyra* sp generation were infected with L1 of *M. capillaris* and then euthanized to confirm the presence of L2 and L3 of this nematode. During the study 64 layings were registered with 8 to 12 eggs each and 63% of hatching with 33% of mortality. The snails had a development of 0.5-1mm of diameter per week. The *in vitro* culture of *Polygyra* sp was successful with suitable conditions of management and environment.

Determination of the effective dose of an experimental fasciolicide in experimentally infected cattle.

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The aim of the present study was to determine the effective dose of an experimental fasciolicide called compound Alpha or 5-chloro-2-methylthio-6-(1-naphthoxy)1*H*-benzimidazole in experimentally infected cattle. Twenty four, free-fluke heifers were infected each with 800 metacercariae of *Fasciola hepatica* and re-infected on day 45 with other 600 cysts per animal. On day 75, when the animals had 4 and 10 week-old-flukes respectively, they were divided in 4 groups (G) of 6 animals each according to fluke egg counts. Groups 1 to 3 received compound alpha at 10, 12 and 14 mg/kg per os, respectively. G4 remained as untreated control. Twenty days after treatment, the animals were sacrificed for recovery of flukes. Efficacy was assessed as percentage of egg or fluke reduction relative to the untreated control. Results showed a percentage on egg reduction of 97.3, 100 and 100%, respectively. The percentage of efficacy for adult flukes was of 98.5, 100 and 100, and for immature flukes of 90.1, 100 and 100, for groups 1, 2 and 3, respectively. Compound Alpha showed to be effective at 12 mg/kg/p.o.

Treatment of *Neotrombicula* associated dermatitis in dogs using topical permethrin-pyriproxyfen combination.

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Few data are available on dermatological consequences and treatment of *Neotrombicula autumnalis* infestation in dogs. The objective of this study was to evaluate in naturally *Neotrombicula* infested dogs the parasitocidal and clinical efficacy of two topical formulations of the permethrin-pyriproxyfen combination (Duowin Spray® or Duowin Contact®, Virbac S.A.). Dermatological and parasitological condition of the dog was assessed on D0, D8 and D21 by quotation of pruritus, lesions (erythema, papules, pustules, scales and crusts) and the *Neotrombicula* population. All dogs were affected with moderate to severe pruritic dermatitis. Mean pruritus and lesions were reduced by more than 60% and *Trombicula* population by more than 75% within 1 week and by 97 to 99% 3 weeks after treatment ($p < 0.05$, Wilcoxon tests), with no significant difference in both treatment groups. At the end of the study, 14 out of 15 included dogs were parasitologically and clinically cured. In most of the cases, successful treatment was reached within 1 to 3 weeks after only one topical application of a permethrin-pyriproxyfen combination. Two applications were necessary in a few cases, then careful follow-up is required. Efficacy and tolerance of both formulations were excellent. Existence of a real *Neotrombicula* dermatitis, with possible hypersensitivity reactions to the parasite, should lead to its systematic inclusion in the differential diagnosis of pruritic dermatitis in dogs.

Expression and identification of *Eimeria tenella* gene TA4.

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Coccidiosis is one of the diseases that cause severely economic damages in poultry industry of China. Many control methods including recombinant vaccine have been explored due to the increasing emergence of drug-resistance and the consumers appeal for more green food. The antigen TA4 is a 25kDa protein composed of 2 polypeptides of 17kDa and 8kDa linked by a disulfide bond. It is located on the surface of sporozoites and synthesized throughout the latter half of sporulation. The TA4 gene of *Eimeria tenella* BJ strain has a 99% homology compared with the data of GenBank. When expressed with the fusion expression vector pGEX-2T, it is about 43kDa instead of 51kDa shown from the western-blot result. This means that the disulfide bond linking the 17kDa and 8kDa polypeptides will be broken during the boiling treatment of samples before SDS-PAGE, and only the 17kDa polypeptide is linked to the fusion 26kDa GST protein. In the large-scale purification of the recombinant protein, the cells were lysed supersonically, the inclusion bodies were denatured and dissolved in 8M urea solution containing reduced glutathione. SDS-PAGE with the recombinant protein purified with glutathione Sepharose 4B showed 2 bands of 51kDa (primary) and 41kDa (secondary) each. This means that the disulfide bond wouldn't be cleaved completely in our purification conditions. In the further investigation, when the purified protein was treated boiledly, the content of 51kDa decreased while the content of 41kDa protein increased simultaneously. This means the purification conditions will affect the structure of recombinant TA4 protein. Further investigation should be done to compare the immune-protective effects of the different kinds of fusion proteins.

Clone and sequence analysis of gene Et1A of *Eimeria tenella* BJ strain.

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In order to clone the gene Et1A, the total RNA of *Eimeria tenella* BJ Strain was extracted and used as template for RT-PCR. The primers were designed with the software Oligo6.0 according to the published database. It involved an EcoRI or HindIII cleavage site respectively at its upper or lower primer in order to be easily ligated to the plasmid later. After RT-PCR, the amplified Et1A was ligated to the vector pGEM-T and transformed JM109 competent cell. The positive clones were used to determine their nucleotide sequences. The results indicated that, the full-length of Et1A was 1978 bp in *E. tenella* BJ Strain, which had an ORF of 1944 bp. Compared with the Et1A sequence from GenBank, mutation occurred at 7 bases of 6 regions and the homology was 99.5%. Et1A and Ea1A had a 79.3% identity. The derived protein of Et1A is functional similarity to nucleotide transhydrogenase. It is a speculated energy support during the invasion of sporozoites into host cells. The gene Et1A was ligated to the eukaryote expression vector pcDNA3.1 and used as DNA vaccine for coccidial treatment in latter experiment

Improved diagnosis of isosporosis in suckling piglets.

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Isospora suis is a cosmopolitan enteropathogen of suckling piglets and can cause considerable economic losses in pig production. However, the disease is commonly overlooked since the clinical signs do not frequently coincide with the onset of oocyst excretion, and parasitological examination is not always included in the routine diagnostic procedure. On the basis of experimental and field studies a scheme for the improved diagnosis of isosporosis was developed. The correct time for sampling and the correct treatment of samples can considerably improve the sensitivity of coproscopy. Additionally, a range of new techniques for *intra vitam* and *post mortem* diagnosis are available, including autofluorescence, histology and molecular biological techniques. The proper application of these techniques should lead to an improved evaluation of the prevalence and importance of *I. suis* on piglet farms.

Seasonal variations in the growth and maturation of *Acanthocephalus anguillae* (Müller 1780) in fishes from the Vistula river with particular reference to ide *Leuciscus idus* (L.) and bream *Abramis brama* (L.).

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Acanthocephalus anguillae: the most common acanthocephalan in Polish freshwater fishes can be pathogenic. The seasonal growth and maturation of this parasite mainly in ide *Leuciscus idus* and bream *Abramis brama* from the middle Vistula river were studied for the first time in Poland. Asp *Aspius aspius* (L.) and barbel *Barbus barbus* (L.) were minor sources of the parasite. 686 specimens of the parasite were studied using standard methods. Female parasites from ide were considerably longer in relation to their counterparts from bream, but males from bream were substantially longer compared with those from ide. The length of the parasite from ide was related to fish size, but between the different hosts the nature of the host seemed to be the most decisive factor. The seasonal growth profile and maturation cycle of the parasite, were different between the two main hosts. Mature eggs only occurred in parasites from ide, asp and barbel, making them suitable hosts. The absence of eggs in parasites from bream makes it unsuitable. Male parasites from bream were longer-lived compared with their female counterparts, which contradicts mainstream belief that female acanthocephalans are longer-lived in relation to the males. This study shows that the life span of each sex relates to host suitability, which affects either sex's energy use priorities. Absence of mating in bream appears to tilt males' energy economy more towards growth and repair in favour of an extended life span. Two terms: 'police host' and 'police hosting' are suggested to define precisely the regulatory niche of the unsuitable host on the annual turnover of *A. anguillae* in the habitat studied, and also its effect on the growth and development of the parasite.

Oxibendazole efficiency against fenbendazole-resistant horse strongyles in Lithuania.

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The present study was performed to assess the efficiency of oxibendazole on horse strongyles in Lithuania. Because fenbendazole resistance has been determined, only anthelmintics from benzimidazole class were used for a few consecutive years. The oxibendazole efficiency was determined according FECR and percentage of animals with negative egg counts after treatment. Fifty six naturally infected with strongyles horses have been selected for the experiment. They were divided into 3 experimental groups and control group of 14 horses in each (Groups 1-4). The average of EPG before treatment in Groups 1-4 was 1225, 1415, 944, 937 of strongyles eggs, respectively. Group 1 was treated with a single dose of oxibendazole (10 mg/kg of BW) orally, Group 2 was treated twice with an interval of 24 hours, Group 3 was treated 3 times with 24 hours interval. At day 10 after treatment the average of EPG in Groups 1-4 was 18, 9, 7 and 863 of strongyle eggs, respectively. In groups 1, 2 and 3 FECR was very high and similar (98.5%, 99.4%, and 99.2% respectively), therefore single dose of oxibendazole was sufficiently effective against horse strongyles. However the results from this study indicate that horse strongyles are developing resistance to oxibendazole in horse farms in Lithuania.

***Anaplasma (Ehrlichia) phagocytophilum* infection in a UK fallow deer (*Dama dama*) herd.**

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Anaplasma (Ehrlichia) phagocytophilum (AP) is a tick-transmitted, obligate intracellular bacterium that invades the neutrophils of many mammalian species. AP has been found in several wild ruminants: Moose (*Alces alces*), Red Deer (*Cervus elaphus*) and Roe Deer (*Capreolus capreolus*) but not Fallow Deer (*Dama dama*). In this study we examined the infection rate of AP in a melanistic population of *D. dama* inhabiting woodland near Exeter in Devon, England. Deer (n=29) were shot as part of a controlled culling exercise in the autumns of 2001 (n=9) and 2002 (n=20). In addition, samples from fresh road traffic accident (RTA) cases (n=2) were collected. DNA was extracted from the anti-coagulated blood samples within 24 hours of death and AP infection was determined by a sensitive, specific polymerase chain reaction assay. Three of eleven samples (27 %) in 2001 and 0 out of 20 samples in 2002 were shown to contain AP DNA. Interestingly, the sample from one of the RTA animals was extremely parasitaemic (as judged by the amount of DNA product) perhaps suggesting that biological “fitness” is influenced by AP infection. As *D. dama* is not native to the UK these findings may have implications for the increasing fallow deer farming sector in the UK. These data may also indicate large yearly swings in AP infection rates, although the subjective tick load on the animals was similar from year to year.

Importation of exotic reptile ticks, and associated pathogens, into the UK.

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The growing interest in keeping exotic reptiles as pets has led to an increase in the international trade in reptiles. Many animals are wild-caught and are transported with their associated parasite fauna. Concerns have been raised about the biological impact of these transfers, particularly with respect to the discovery of *Cowdria ruminantium* infected *Amblyomma* spp ticks in Florida, USA associated with reptile movement. Although the climate in the UK will not support these exotic ticks, the maintenance of animals in vivaria, and the routine exchange of pets between enthusiasts, led us to investigate the risks to reptile health associated with reptile tick importation into the UK. Reptiles imported via Heathrow airport, London, were investigated on an *ad hoc* basis and any ticks seen were removed and identified. Ticks were analysed by broad range PCR to determine the presence of *Babesia*, *Hepatozoon* and related apicomplexan protozoa, and *Ehrlichia/Anaplasma* spp. 15 ticks (all *Amblyomma* or *Aponomma* spp) were collected from ten animals (lizards, snakes and tortoises). 12/15 ticks were shown to be carrying apicomplexan parasites, 6/15 carried *Ehrlichia/Anaplasma* spp. DNA sequencing revealed the presence of various *Hepatozoon*-like species and an unnamed *Ehrlichia* described previously in African ticks. This pilot study shows the potential for transfer of pathogens from wild-caught reptiles to unadapted, captive-reared animals since ectoparasite removal is not routinely practised on imported reptiles.

Characterization of microneme-rhoptry associated protein of *Theileria orientalis*.

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Parasites have a characteristic intracellular structure named apical complex consisting of several rhoptries, dense granules and micronemes, which play critical roles in the invasion into host cells. However, biological roles in the erythrocyte invasion process and the biogenesis of the rhoptries and micronemes are still poorly understood. *Theileria orientalis* is a tick-born protozoan parasite known as a causative agent of bovine piroplasmosis in Japan and Korea. The parasite causes anemia as intraerythrocytic piroplasm. In this study, a *T. orientalis* cDNA encoding a polypeptide showing homology to the microneme-rhoptry protein of *T. parva* (P15711) was identified and immunologically characterized. The cDNA clone containing 627 bp open reading frame was subcloned into a baculovirus transfer vector and a polypeptide referred to as *T. orientalis* microneme-rhoptry associated protein (ToMRAP) was expressed in insect cell. A 20 kDa native protein was detected from the *T. orientalis* piroplasm lysate with a mouse serum raised against the recombinant product expressed in *E.coli* in Western blot analysis. Indirect fluorescent-antibody test using confocal laser microscopy revealed that the antigen was expressed during developmental erythrocytic stages by a part of piroplasm population. Shedding of this molecule from piroplasms and its association with infected erythrocyte membranes were observed. Membranes attached by ToMRAP did not retain intact size and structure. An *in vitro* binding assay showed that the recombinant AcToMRAP protein bound to TritonX-100-treated bovine RBC membranes, which suggested that ToMRAP can interact with RBC membrane skeleton proteins. Biological significance of this interaction is now under investigation in order to determine whether this molecule is involved in RBC membrane destruction and escape of parasites from the RBC.

A case of imported *Spirocerca lupi* infection in a dog from Italy: Histological and immunohistochemical report.

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Spirocerca lupi is a spiruroide nematode that is responsible for the formation of oesophageal nodules in the several animal species, including the dog. At a private veterinary clinic in Milan, a 10 year-old, female Golden Retriever was euthanized following progressive vomiting and weight loss. The dog had lived in Singapore before arriving in Italy several months previously. At necropsy, three firm, whitish-grey nodules ranging from 1-7 cm in diameter were found in the caudal portion of the oesophagus. At sectioning, a varying number of small, reddish nematodes were observed within a fibrous tissue. Histology revealed numerous nematodes surrounded by an inflammatory infiltrate and connective tissue. Immunohistochemical staining showed infiltrating cells to be made up predominately of plasma cells, T lymphocytes and proliferating fibroblasts. *S. lupi* infection has been reported as endemic in certain areas of the Middle and Far East while case reports of infection in Italy have been sporadic and mostly anecdotal. This case was likely imported, even if it is not clear if *S. lupi* is stably present in Italy. It would be interesting to conduct epidemiological surveys in the future. *S. lupi* infection, which responds well to macrocyclic lactones, should always be considered in the differential diagnosis of oesophageal disease in the dog.

Expression of *Babesia equi* EMA-1 and EMA-2 during merozoite developmental stages in erythrocyte and their erythrocytic binding affinity.

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Babesia equi is a tick-transmitted haemoprotozoan disease of equids. Equi merozoite antigen (EMA) -1 and -2 have been identified as major immunodominant merozoite surface expressing proteins. In the present study, we investigated cellular localization and expression behaviors of EMA -1 and -2 of *Babesia equi* during the asexual erythrocytic-developmental stage of merozoite using the anti-rEMA-1(t) or -2(t) mono-specific mouse serum. Indirect fluorescent antibody test demonstrated that the EMA-1 and EMA-2 were not expressed in all the erythrocytic-developmental stages of the merozoites and these two antigens were co-expressed during the early developmental stages. Additionally, it was shown that the EMA-1 and EMA-2 were mutually expressed on the surface of extra-erythrocytic merozoite and also that the intra-erythrocytic merozoite shed only EMA-2 antigen in the infected erythrocytic cytoplasm or inside membrane surface. Further it was found that EMA-2 and not EMA-1 has affinity to bind to the horse erythrocyte membrane skeleton. We are studying this erythrocyte binding behavior of EMA-2 and results will be discussed.

Examination of the strongylid community of brood horses in Ukraine by the diagnostical deworming method.

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Commonly, the intestinal helminth communities of horses are studied *post mortem*, by autopsy methods. The aim of our investigation was to study the structure of the intestinal strongylid community of trotters from Dubrovsky horse farm after deworming using two anthelmintic drugs. The investigation was carried out on 24 horses (strongyle EPG>400) divided into three age groups: 8 foals younger than 1 year old, 6 two-year old foals, and 10 brood mares, 4-6 years-old. Animals were treated with “Nemasektin” (1% aversektin) and “Univerm” (0,2% aversektin). Faecal samples (200 g each) were collected 24 hours after treatment, and all strongyles expelled were selected. From 200 up to 790 worms per horse were collected and identified. Twelve cyathostome species were found in foals younger than 1 year old, the most prevalent were *Cylicocyclus nassatus* and *Cyathostomum catinatum*. These species composed 45.8 % and 40.4 % of the total burden of cyathostomes, respectively. Fourteen cyathostome species were found in two-years-old foals. *C. nassatus* (46.3%), *C. catinatum* (14.6%) and *C. calicatus* (9.4%) were the most prevalent. Fifteen cyathostome and 2 strongylid species were found in mares. *C. nassatus* (34.6%), *C. catinatum* (34.5%), *C. leptostomus* (8.7%) and *C. longibursatus* (6.7%) predominated. No significant difference in species composition between the groups treated with different anthelmintic drugs was observed. The results obtained confirm the possibility of horse intestinal strongylids investigation the *in vivo* by the method of diagnostic deworming. The structure of strongylid community and the predominating species observed in present study appeared to be similar to those reported by Dvoynos and Kharchenko (1994) for the horses from Ukraine in general.

Use of different antiparasitic drugs in the treatment of experimental murine encephalitozoonosis.

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Microsporidiosis, including that caused by *Encephalitozoon cuniculi*, has become an important opportunistic infection in immunocompromised individuals, such as HIV-positive patients. This study was developed to determine the efficacy of different drugs in the treatment of experimental encephalitozoonosis. Adult Balb-C mice, immunosuppressed with cyclophosphamide (100 mg/kg, twice a week) during all experimental period, were inoculated with 1×10^7 *E. cuniculi* spores per animal by intraperitoneal route (ip) and developed clinical signs of wasting and lethargy at 15 days. On the 25th day post-inoculation, a seven-day antiparasitic treatment was initiated with one of the following drugs: albendazole (ABZ - 400 mg/kg/day, oral route), albendazole sulfoxide (SO-ABZ - 50 mg/kg/day, ip), metronidazole (MTZ - 100 mg/kg/day, ip) and cyclosporine (CsA - 50 mg/kg/day, ip). Mice were killed and necropsied at 3, 10 and 17 days after treatment has finished. Tissue samples were collected and processed for histopathological analysis. No treatment was able to completely eliminate the protozoans, although SO-ABZ proved to be most effective drug to reduce the infection, followed in decrescent order by ABZ and MTZ. CsA treatment was ineffective to control the infection.

Detection of *Cryptosporidium* oocysts in stools of opossums from a deforestation area around São Paulo (Brazil).

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Ecological disturbances can exert an important role on the emergence and dissemination of zoonotic parasitic diseases, including cryptosporidiosis. *Cryptosporidium*, an enteric protozoan of man and a wide range of other mammals, represents a great challenge to the supply of safe drinking water. We performed a preliminary survey of occurrence of *Cryptosporidium* species in faecal samples of captured wild animals (n=30) in an area of deforestation for a water reservoir construction in the state of São Paulo, Brazil. We focused our study on marsupials and small rodents taken from this area to assess whether they may represent environmental sources of *Cryptosporidium*. Faecal specimens were examined for *Cryptosporidium* oocysts using the modified Kinyoun's acid-fast staining technique. A PCR-based approach that permitted genetic characterization via sequence analysis was applied to these samples. Preliminary results revealed stools containing *Cryptosporidium* small-subunit (SSU) ribosomal DNA in 2 from 10 opossums (*Didelphis aurita*). PCR products were identified as *Cryptosporidium parvum*, identical to genotype 2 (bovine). This study emphasises the importance of wild animals, particularly opossums, as a potential source of *Cryptosporidium* to human and animal populations from deforested areas.

Evaluation of non-chemotherapeutic approaches to the control of pasture borne parasites in cattle.

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Control of nematode parasitic infections in young cattle is an important issue in Sweden. In this country there is an increasing demand towards organic production, and according to the rules of organic farming prophylactic anthelmintic treatments are not allowed. A 3-year grazing trial involving cattle both during their first and second grazing seasons was started in 2002. The following non-chemical treatments will be evaluated during their first grazing season: 1) strategic nutritional supplementation with concentrate and roughage at turnout and 4 weeks onward, and 2) turn out of calves on pastures grazed the previous year by older cattle followed by a mid summer move to parasite free aftermath. These alternative control strategies are compared to one untreated and one anthelmintic treated set stocked control group representing minimum and maximum productivity, respectively. In addition, performance and parasitological variables will be monitored during the second grazing season in a communal paddock. Throughout the housing periods animal performance along with a range of parasitological variables are recorded. To assess the numbers of infective larvae on herbage, parasite naïve animals are turned out on the experimental pastures, both at the beginning and at the end of the grazing season. Final results will be obtained after 3 years. However, preliminary results from the first grazing season indicated that subclinical infections were present in the supplemented group and in the untreated control group.

Treatment of cattle with an abamectin pour on had no adverse effect on dung beetle populations in Australia.

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Endectocides are known to be excreted via the faeces of treated cattle. Because of their insecticidal activity, endectocides have been implicated in adverse effects on dung fauna. Several papers have reported detrimental effects on adult dung beetles or their developing stages when studied in artificial situations. These papers contribute little to understanding the broader ecological question of any impact on dung beetle populations under typical field conditions. In order to evaluate the effect on dung beetle populations in the field, a study was designed in which eight replicate groups of four cattle were grazed separately in paddocks. Half the groups were treated with abamectin (500µg/kg; Virbamec Pour-On for Cattle) on Days 0 and 42, while the other four groups were left untreated. Faecal pats (2-3 days old) were collected approximately weekly for 84 days and the beetles recovered for enumeration and identification. Eleven species of beetles representing native and introduced species were recovered. There was no apparent effect of endectocide treatment when beetle populations from the treated and the untreated groups were compared statistically. These results indicate that the treatment of cattle with an abamectin pour on does not adversely effect dung beetle population. These results are not surprising as insect populations must be sufficiently resilient to withstand adverse environmental conditions. The application of an endectocide to cattle for parasite control on two occasions six weeks apart would represent a minor environmental insult.

Occurrence of *Thelazia callipaeda* (Spirurida, Thelaziidae) in dogs in the Basilicata region (Southern, Italy): An epidemiological puzzle?

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Thelazia callipaeda is a spirurid nematode which causes ocular infections in dogs and man and, occasionally, in cats, foxes and rabbits. The vector of *T. callipaeda* in natural conditions is still unknown. For a long time *T. callipaeda* was reported only in the Russian Federation and the Far East, but recently it has also been found in Northern Italy. In order to investigate the spread of *T. callipaeda* in Italy, a survey was carried out in a mountainous area (altitude: 548 to 1,367 m asl) in the Basilicata region (Southern Italy), comprising twelve municipalities where dog thelaziosis was occasionally reported. The orography of this area is characterized by the presence of a ring of sandstone mountains surrounding a woodland that borders on all the municipalities examined. From October 1999 to January 2003, 457 dogs were examined and the eyeworms collected were identified using morphological keys. One hundred and eighty seven (40.91%) of the dogs examined were found to be infected with eyeworms, with prevalence ranging from 29.03% to 68.59% in different municipalities. All the nematodes collected were identified as *T. callipaeda*. These results indicate that *T. callipaeda* is not confined to Eastern Europe and Asia but that it has spread to the Old Continent, and to Southern Italy. Considering the high prevalence of infected dogs reported it can be assumed that one or more vectors are significantly present in the areas under investigation. Furthermore, there is good reason to believe that *T. callipaeda* is also present in other European countries.

Detection and identification of *Cryptosporidium* species in dairy farms in southern China.

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Cryptosporidiosis, a zoonotic protozoan disease, has been diagnosed in a wide range of vertebrates including cattle. An epidemiological survey was carried out on 10 dairy farms in Guangdong province, southern China. A total of 1087 rectal fecal samples were collected from each calf and analyzed by the Modified antiacid staining and saturated sucrose centrifugal flotation technique. To identify the species and genotype, DNA was extracted from cryptosporidium oocysts by wizard DNA clean-up system, and amplified by PCR using two pairs of primers based on the 18s rRNA and HSP70 sequences (Gasser et al, 2001), and autosequenced by Bioasia Biotechnology (Shanghai) and analysed by BLAST with both Anhui *C. muris* and Nanjing *C. parvum* as control. The average prevalence of *Cryptosporidium* sp in the region was 8.46% with infection rates of 9.61% in autumn and winter compared to 6.86% in spring. The highest infection rate was 10.82% in 1-3 months old calves. Two fragments of about 290 bp and 440bp were amplified respectively by PCR. The sequence analysis reveals that Guangdong *Cryptosporidium* strains were confirmed as *C. muris* (calf genotype) whilst the Nanjing and Anhui *Cryptosporidium* strain were *C. parvum* (human genotype) and *C. muris* (calf genotype) respectively. This work was supported by National Science Foundation of Guangdong Province (grant no. 010354).

Skin immune response in cattle after primary and secondary infections with *H. lineatum* (Diptera: Oestridae) larvae.

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Hypoderma larvae penetrate the skin of their hosts and undergo a migration in subcutaneous tissues. Resistance develops after primary infections, killing larvae soon after they enter the host. Cellular immune response, including CD3⁺ T lymphocytes, BAQ44A⁺ B cells and IgG⁺ plasma cells, was examined in the skin of cattle after primary and secondary experimental infections with *H. lineatum* larvae. Skin biopsies were taken at 0, 6, 12, 48 and 96 hours post infection (h.p.i.). Perivascular infiltration with CD3⁺ T lymphocytes was marked in infected groups, but especially in previously infected animals, with a significant increase with respect to uninfected controls at 48 h.p.i. B cells remained close to control values during primary infections, while they increased significantly after 12 h.p.i. in reinfected animals. IgG⁺ plasma cells were also very abundant during secondary infections, with significant differences from primary infected and uninfected animals from 6 h.p.i. onwards. Those results suggest that secondary infections allow cellular responses which may be effective in killing some of the entering larvae, resulting in a degree of resistance. Partially supported by the research project PGIDT00PXI26102PR

Hard ticks (Acarina, Ixodidae) found on domestic carnivores in Belgium : A survey conducted during three consecutive years.

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A survey was conducted in Belgium between 2000 and 2002 in order to assess the presence and relative abundance of hard ticks found on dogs and cats submitted to local practitioners. A total of 25 practices distributed all over the country were involved. In total 1478 ticks were collected and identified from 338 dogs and 149 cats. Most of the ticks were found on the head and on the neck (42.56 and 17.05 % respectively) *Ixodes ricinus* and *I. hexagonus* were the two dominant species (53.45 and 46.01% respectively) Adults of *Rhipicephalus sanguineus* and *Dermacentor reticulatus* were found on dogs only and in low numbers (0.40 and 0.14% respectively). These two species are important vectors of animal pathogens (i.e. *Babesia canis*, *Ehrlichia canis*, *Babesia equi*). Their presence could explain the recent occurrence of indigenous cases of clinical canine and equine babesiosis in different parts of the country.

Experimental production of necrotic enteritis and its use for studies on the relationships between necrotic enteritis and coccidiosis in chickens.

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Necrotic enteritis is a potentially fatal disease of poultry, and is both a welfare and economic problem. The disease is an enterotoxaemia caused by *Clostridium perfringens* types A and C, and manifests itself when the presence of high numbers of bacteria coincides with significant damage to the gut epithelium. Gut damage caused by various species of the coccidian genus *Eimeria* has been implicated. A new method for the experimental production of necrotic enteritis in chickens is described, and this was used to examine the relationship between clostridial and coccidial infections. Groups consisted of an uninfected control, a group which received *Cl. perfringens* only, another which received *Eimeria maxima* only, and a fourth which received *E. maxima* followed by *Cl. perfringens*. In all cases the *Cl. perfringens* was administered directly to the intestine using a catheter, and the disease monitored. Parameters measured were clinical symptoms, lesions and weight gain. Results: Coccidiosis caused by virulent *E. maxima* exacerbated lesions of necrotic enteritis and other clinical effects caused by a subsequent challenge of virulent *Cl. perfringens* type A. This group had the highest lesion score, and also a highly significant weight difference when compared to all other groups.

Selective changes in cholinergic receptor subtypes associated with levamisole resistance in *O. dentatum*.

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We are investigating the mechanisms of levamisole resistance. We have observed biophysical and pharmacological evidence that acetylcholine receptors in nematode parasites are separated into different subtypes. In *Ascaris suum* we have distinguished: buphenium-sensitive, *B*-subtypes; levamisole-sensitive, *L*-subtypes; and nicotine-sensitive, *N*-subtypes. In this study we have examined concentration-response relationships of levamisole-sensitive (SENS) and levamisole-resistant (LEV-R) L3 *O. dentatum* larvae using migration inhibition assays. Levamisole produced *EC*₅₀s: in SENS 26μM, in LEV-R 114μM, (resistance ratio 4.4). Pyrantel produced *EC*₅₀s: in SENS 36μM, in LEV-R 150μM, (resistance ratio 4.2). Nicotine produced *EC*₅₀s: in SENS 3.1mM, in LEV-R 3.6mM, (resistance ratio 1.2). Methyridine produced *EC*₅₀s: in SENS 0.7mM, in LEV-R 1.1mM, (resistance ratio 1.6). We interpret these observations to suggest that the *L*-subtype but not the *N*-subtype are reduced in the LEV-R isolates and that the anthelmintic methyridine has a selective effect on the *N*-subtype. This suggests the potential for methyridine for the treatment of some types of levamisole resistance. NIH to RJM: RO1 A147194-02.

Morphological studies on the extra-cellular structure of the midgut of a tick, *Haemaphysalis longicornis* (Acari: Ixodidae).

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In the present study, morphological observations on the extra-cellular structures found on the apical surface of the midgut epithelium, known as the peritrophic membrane (PM) or glycocalyx, are described in *Haemaphysalis longicornis* females and larvae. These structures have been hypothesized to provide protection to the microvilli of epithelial cells of the digestive tract. Our aim was to determine whether the extra-cellular structures are important in the digestion of the blood meal and/or as a protection against infection or injury. The PM was detectable in the midgut of engorged larvae by electron microscopy, but not in engorged females. However, a PM-like structure stainable with toluidine blue was observed in females by light microscopy. From the results of confocal laser scanning and electron microscopic observations with wheat germ agglutinin (WGA lectin) staining for chitin of the PM, however, the structure was clearly recognized. The structure in the female is likely to be PM because staining with WGA lectin in the presence of N-acetyl-D-glucosamine indicates the presence of chitin and various morphologies of PM have been reported in insects and ticks. These results show morphologically that different types of PM-like structure are formed in larvae and females of *H. longicornis*.

Identification of stage specific transcripts from reactivated cyathostomin fourth stage larvae.

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Cyathostomins are common, pathogenic nematodes of horses. These parasites enter the large intestinal wall, where they undergo a period of arrested development. Arrested larvae are pivotal to cyathostomin-associated disease as millions of larvae can accumulate and reactivate synchronously to cause severe intestinal damage. This presents as diarrhoea, weight loss, oedema and, in over 50% of cases, death. Horses could be prevented from developing this disease if the mechanisms for parasite arrest or reactivation were disrupted. The aim here was to investigate molecular triggers involved in exit from the arrested stage by identifying messenger RNA's specific to, or enriched in, larvae undergoing reactivation. RNA was isolated from adult parasites, infective third stage larvae (L3), mucosal late L3, mucosal developing fourth stage larvae and reactivated larvae (harvested from the diarrhoea from clinical cases). Next, complementary DNA was made from each stage and used in differential display-PCR to identify transcripts up-regulated in reactivated L4. Two transcripts were isolated: one with identity to a LIM domain-containing protein of *Caenorhabditis elegans* and one with identity to a *Strongyloides stercoralis* immunogenic protein. Their expression patterns were validated by RT-PCR using gene-specific primers and by Northern blotting. The genes were detected in the cyathostomin genome by Southern blotting and by PCR amplification from genomic DNA isolated from individual worms of several cyathostomin species.

Treatment of varroosis with oxalic acid: Effectiveness and toxic consequences.

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Thirty Langstroth hives with homogeneous honeybee colonies of *Apis mellifera* naturally infected with *Varroa destructor* were used in groups of ten. No brood was present in the moment of the assays. A group was treated with a 3% oxalic acid solution of water and sugar solution (50% w/w), while the control group only received the sucrose solution and the other reference group coumaphos at the dose recommended. Good efficacies were obtained with oxalic acid (>80%) although a little lower than the reference coumaphos (96%). Bee mortality mean in hives treated with coumaphos was higher than in control group of natural mortality and the highest bee mortality registered was in hives treated with oxalic acid. The contact toxicity of 10% oxalic acid to *Apis mellifera* was studied with laboratory assays. LD₅₀ value was determined in adult honeybees at 24, 48 and 72 hours. At 24 hours, LD₅₀ was 0.62 (fiducial limits 0.57-0.70); at 48 hours 0.53 (fiducial limits 0.48-0.62) very similar to 72 hours 0.53 (0.48-0.57). The 72 hours LD₅₀ was the most reliable due to the narrower fiducial limits. Pathological repercussions of topical application of oxalic acid were demonstrated in different internal *Apis mellifera* organs. Irreversible lesions appeared 48 hours in different bee organs with an increasing cellular damage after 72 hours. It is indicated that the effect of the oxalic acid continues after the initial contact to cause permanent lesions in digestive and excretory organs in the bee. Tissue distribution of the acid in the different bee organs after topical administration suggests a double route of penetration, part of the acid is absorbed through the cuticle and part of it is ingested somehow by the bee. This work was supported by MICYT-INIA (API 01/012).

Synergistic effects of pyrantel and the febantel metabolite fenbendazole on adult *Toxocara canis* worms.

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The effects of pyrantel and the febantel metabolite fenbendazole – pyrantel and febantel are both constituents of Drontal Plus[®] and Welpan[®] - against *Toxocara canis* in-vitro were investigated by studying changes in worm motility and tissue damage. Pyrantel (P) (range: 12.2, 25 or 50 µg/ml) and fenbendazole (F) (range: 50, 100 or 200 µg/ml) were added to the worms at different concentrations for 8h either as single drugs or in combination (P/F: 12.2/50, 25/100 or 50/200 µg/ml). These drug concentrations correspond to plasma levels in different target animals obtained after oral dosing of the single drugs. Regarding motility changes there were no significant differences observable between pyrantel or fenbendazole given as single drugs and the pyrantel/fenbendazole combinations. By contrast, when changes in tissue damages were studied there were significant differences detectable. Thus, hypodermis, muscles, gut, genital organs and nervous system got damaged severely at the concentrations of drug combinations P/F of 25/100 µg/ml. Similar effects could only be seen with the individual compounds at their highest level of concentration, e.g. 50 µg/ml of pyrantel or 200 µg/ml of fenbendazole. In comparative analyses of irreversible tissue damages the synergistic effects observed were regarded as being so important that the conclusion must be drawn that these effects are also be present in-vivo in Drontal Plus[®] and Welpan[®] treated dogs resulting in complete worm destruction.

Safety study on pregnant mares orally treated with a combination of ivermectin praziquantel.

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A blinded field study was conducted to evaluate the clinical and reproductive performance effects of pregnant mares orally treated with an anthelmintic containing a combination of ivermectin praziquantel and to assess the viability of their neonates. Forty parasite-affected and confirmed pregnant mares were selected from one stud yard. They were randomly allocated into two groups, one treated and one placebo (n = 20), and dosed at three times the therapeutic dose rate (yielding ivermectin 0.6 mg.kg⁻¹ and praziquantel 4.5 mg.kg⁻¹) fortnightly until parturition. Physical examinations were performed on both groups of mares and their neonates after birth (on D30, D60 and D90), the goal being to identify a dose-related effect. As an aid in assessing general health, haematological parameters and blood serum chemistry were monthly recorded on mares. Minor alterations in blood constituents were observed without biological significance. Reproductive performance was not affected by the unusual treatment duration, the high dose level of use, although administered during the crucial 30 to 60 days of the equine embryonic period. Neither side effect on mares nor abortion was reported. The follow up on foals for a 3-month period did not detect any abnormality. The safety of the combined product orally given to pregnant mares was fully demonstrated and documented in this study.

Recombinant chicken IFN- γ inhibits broiler coccidiosis and enhances immunity of coccidial vaccine.

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These studies were performed to assess the activities of recombinant chicken IFN- γ (rChIFN- γ) against chicken coccidiosis and enhancing immunity of coccidial vaccine. In the first trial, broilers were injected with rChIFN- γ at the age of 6 and 7 days with different ways and dosages, challenged with 5×10^5 oocysts of *Eimeria tenella* at 14 days. The results show that birds injected with 5000U rChIFN- γ intramuscularly have the better effect on chicken coccidiosis. The relative weight gain of rChIFN- γ -treated birds is 88.4%, ACI is 149.4, while the relative weight gain of infected control is 78.1% ($P < 0.05$), its ACI is 81.2 ($P < 0.05$). The second trial consists of immunized group with rChIFN- γ treatment, immunized control, infected control and untreated control (n=40). Broilers of the first two groups were immunized by 1000 and 5000 oocysts of *Eimeria tenella* at the age of 7 and 14 days respectively, and simultaneously injected with 5000U rChIFN- γ intramuscularly twice, then all birds except untreated control were challenged with 5×10^5 oocysts of *Eimeria tenella* at 21 days. At the age of 28 days, the relative weight gain of birds injected with rChIFN- γ is 89.9%, ACI can reach 158.9, while the relative weight gain of immunized control and infected control is respectively 72.4% and 61.2%, ACI is 137.4 and 80.2. After the secondary immunization, lymphocyte transformation rate, sera LSZ level, nitrite level of birds injected with rChIFN- γ can reach 0.882, 16.35ug/ml and 0.184ug/ml, while the data of immunized control is 0.762, 14.21ug/ml and 0.134ug/ml, the data of infected control is 0.607, 10.3ug/ml, 0.108ug/ml. We concluded by T test that the immunized group with rChIFN- γ treatment resulted in significantly enhanced ($P < 0.05$) body weight gain, ACI, lymphocyte transformation rate, sera LSZ level and nitrite level compared to immunized control and infected control. These results suggest that rChIFN- γ is a good candidate as a therapeutic agent and potential adjuvant.

An overview of past, present and future research into donkey parasitism.

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The occurrence and pathogenesis of internal parasite infections in donkeys (*Equus asinus*) has been considered to be similar to those in horses (*Equus caballus*) and donkeys have been treated as small horses. In the past and present gastrointestinal parasites have been indicated as a major problem in donkeys worldwide. The Donkey Sanctuary started scientific trials on donkey parasitism in Greece in 1981 and has continued to study all aspects of donkey parasitism both in developing countries and the UK. In project countries anthelmintic treatment is administered bi-annually along with any other treatments that are required. The donkey's condition has improved in all project areas. Studies have shown that if control of strongyles is to be achieved, without build up of resistance, strategies have to be carefully programmed and monitored. Strongyles are the most prevalent internal parasite at the Donkey Sanctuary, thus a resident population of 3000 donkeys has required continued monitoring. An overview of the methods used in the past (monitoring faecal egg counts, the factors affecting egg reappearance period, efficacy of ivermectin and moxidectin against strongyles, pasture larval contamination), present studies (identifying constant shedders) and the potential of future non-intrusive research is discussed.

Effects of long-term storage on Brazilian nematode trapping fungi isolates.

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Biocontrol of helminths parasites of livestock is an alternative to the use of anthelmintics, and its main goal is to reduce the amount of infective larvae in the pasture. Continuous maintenance of the fungi isolates' predatory activity is one of the prerequisites for a successful control. We analyzed the behavior of I31 isolates of *Arthrobotrys robusta* and NF34a isolates of *Monacrosporium thaumasium*, submitted to different long-term storage methods after 18 months. There was no difference in production of biomass by the isolates when stored at a temperature of 4°C and frozen (-196°C) with added cryoprotectants. Silica gel storage and freezing without cryoprotection seemed to interfere negatively with the fungi's capacity to produce biomass. Storing NF34a at 4°C and freezing it with DMSO were the treatments in which the largest *in vitro* reduction of infective larvae was obtained. Storage of the isolates in silica gel and freezing without cryoprotection interfered negatively in their predatory capacity, but they were still able to reduce the population of infective larvae. When the passage of isolates through the gastrointestinal tract of bovines was tested, the administration of 20 g of mycelium was enough to recover fungi and for a peak reduction of the number of infective larvae in feces 24 hours after the administration. The NF34a isolate was responsible for the largest reduction rates in larvae populations following passage through the gastrointestinal tract of the animals, and storage at 4°C was the treatment in which the largest reduction rate was observed.

Comparative resistance to *Haemonchus* parasites, productivity and efficiency of Red Maasai and Dorper sheep in a sub-humid and a semi-arid environment in Kenya.

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The resistance to haemonchosis, the productivity and efficiency of Red Maasai (RM) and Dorper (D) sheep and their backcrosses were evaluated at the sub-humid Diani in coastal Kenya and at the semi-arid Kapiti in the highlands. Live weight (LWT), packed cell volume (PCV) and faecal egg counts (FEC) were recorded for both ewes and lambs. At the coast RM had a significantly ($p < 0.05$) higher overall reproductive rate than the D while in the highlands the difference was less obvious. The D ewes were heavier ($p < 0.05$) than RM ewes at both sites but this was more evident in the semi-arid conditions. RM ewes were more resistant than D at both places as shown by their significantly ($p < 0.05$) higher PCV and lower geometric mean FEC (gFEC). RM lambs had a significantly higher PCV than D lambs at 3 and 6 months of age. The RM had significantly lower gFEC than D at 6-months, but at 3-months a significant breed effect was seen only at Kapiti. The D lambs were about 50% heavier than the RM lambs at Kapiti compared to only 5 -10% at the coast and D lambs suffered a much higher mortality rate than RM lambs at the coast than at Kapiti. In general the $\frac{3}{4}$ RM and $\frac{3}{4}$ D lambs showed additive breed effects for LWT, PCV, gFEC and mortality rates. At the coast the RM were about 3 fold more productive than the D based on either the number or weight of sheep for sale. In the semi-arid area there were only 20% more RM for sale than D but in terms of weight the D was more productive than the RM by 25%. Efficiency, estimated as kg total offtake per carrying capacity unit (CCU) per year was about 5 fold higher in RM than the D at the coast while there was no breed difference in the semi-arid environment. These results show important breed by environment interactions for live weight, mortality and reproductive rates and efficiency in *Haemonchus* endemic areas.

Population biology studies on *Isospora suis* in piglets.

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Isospora suis may cause disease and economic loss in intensive piglet production units. Field studies have shown that the severeness of the disease varies between litter mates, although initial infection pressure can be considered to be identical in a particular farrowing pen. Experimental studies were conducted to evaluate the course of isosporosis under controlled clinical conditions. Piglets artificially infected at the age of 3 days each with 10^4 sporulated *I. suis* oocysts suffered from diarrhea from 2 days post infection (dpi) until 9 dpi while oocyst excretion lasted from 6 to 13 dpi. A lower infection dose (1×10^3 oocysts) resulted in onset of diarrhea at 6 dpi with a prolonged period of disease (10 days) and of oocyst excretion (4-16 dpi). The application of only 100 oocysts within 24 hours after birth caused severe disease starting at 7 dpi. Clinical isosporosis lasted for 6 days and oocysts were excreted from 5 to 14 dpi. Infection at an age of 11 days induced mild diarrhea for a maximum period of 2 days and only few oocysts were detected at 4 to 6 dpi, in one piglet from 7 to 9 dpi. It is concluded that the course of isosporosis is not so much related to the infective dose but to the age of the piglets. Infection of 30 % of a litter with 1×10^3 oocysts per piglet at the age of 3 days resulted in rapid spread of isosporosis across the whole litter. However, oocyst excretion and clinical disease was less pronounced in litters when only two piglets initially received a low dose of 100 oocysts. Thus, initial contamination of the farrowing pen is obviously related to the course of isosporosis in the respective litter.

Efficacy of toltrazuril against artificial infections with *Eimeria bovis* in calves.

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Eimeria bovis causes catarrhalic to haemorrhagic diarrhea, sometimes lethal, in calves. Two randomized blinded studies were conducted to examine the efficacy of toltrazuril (5 % oral suspension, single application) on experimental *E. bovis* infection. Sporulated oocysts of a pathogenic field strain were orally inoculated at a dose of 5×10^4 (study 1) or 1×10^5 (study 2) per calf (1-5 weeks old). Calves were allocated to groups of 8 to 9 animals as follows: A: sham treated control (both studies); study 1 (toltrazuril at 14 days post infection, dpi): B: 5 mg/kg body weight (bw), C: 15 mg/kg bw, D: 25 mg/kg bw; study 2 (15 mg toltrazuril/kg bw): E: treatment at 12 dpi, F: treatment at onset of clinical coccidiosis (18 dpi). General health, fecal consistency, oocyst excretion (opg) and body weight were assessed. In study 2, two to three calves each were necropsied for the pathomorphological examination of the intestines at dpi 16, 20, 28 (groups A and E) or at dpi 20, 28, 35 (group F). In study 1 onset of clinical coccidiosis was observed in the sham treated controls (A) at dpi 18 to 21 with mean oocyst counts of 4511 opg. Toltrazuril distinctly reduced the prevalence and severeness of diarrhea. Oocyst excretion was suppressed in most calves (14 out of 26) of groups B, C and D, the remaining calves excreting only few oocysts. Consequently, the mean opg were low with values of 106 (B), <1 (C) and 2.5 (D). Early treatment (E) controlled the infection and prevented clinical disease while the effect of late treatment (F) was limited. The efficacy of toltrazuril was positively dose-correlated. The application of 15 mg toltrazuril/kg bw within the prepatent period recommended for the control of *E. bovis* infection.

Tissue immune response to *Toxoplasma gondii* infection in pigs.

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Toxoplasma gondii (Tg) infection induces a strong Th1 response in pigs with immune pathology that quickly resolves (Dawson et al., 2002). Our current work evaluates local responses against acute toxoplasmosis. Pigs were infected with 4.5×10^6 Tg oocysts and various tissues were collected at 2, 4, 7 and 14 days after infection (DAI). Tg organisms were detected in mesenteric lymph node (MLN) as early as 2DAI and also in liver, spleen, lung and ileum at 4 DAI by IHC and Real-Time PCR. At the same infection times changes in inflammatory and Th1 immune mRNA expression were observed by Real-Time RT-PCR. Increased IFN- γ mRNA and protein expression and production were observed in MLN and hepato-splenic (HS) LN cells. Changes were observed at IL1 β , IL-6, NRAMP1, IFN- γ INDO and STAT-1 expression at 2DAI. Response was more intense at 4DAI and also included TNF- α , Arginase, IRF-1, IL-10, SOCS-1, SOCS-3, and IFN- α activation. Liver showed the most intense changes in gene expression in response to Tg infection and PMBC had the lowest changes. High serum haptoglobin and NO levels at 4DAI ($p < 0.01$) confirms inflammatory and macrophage activation. Up-regulation of inflammatory and Th1-dominated markers indicates mechanisms involved to the host defense against acute toxoplasmosis.

The role of *Isospora suis* in the ethiology of diarrhoea in suckling piglets.

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Various studies have confirmed the notable spread of *Isospora suis* in Italy but the role of the primary pathogen in enteric diseases during the neonatal period remained unclear. In this study, wide ranging investigations (parasitology, bacteriology, virology) were carried out on 21 pools of faeces from suckling piglets with diarrhoea and 18 control suckling piglets from farms with reported problems. Three *I.suis*-positive animals were sacrificed in order to assess the anatomy, pathology and histology. The results obtained excluded bacteria and viruses as the cause of the disease. The recorded observations in pathology, confirming the role of *Isospora suis* as primary pathogen in the rise of piglets diarrhoea.

Ked (*Melophagus ovinus*) transmission: Burden on lambs from affected flocks and remnant populations after shearing.

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Sheep ked is an emerging disease of flocks in Patagonia. However, little is known about the transmission dynamics, effects of reservoir and shearing in relation to control practices. In a preliminary study, we determined the burden over the body of ewes and their lambs, and the effects of shearing on ked populations. Migration of keds (MK: number of keds which daily reach a lamb) from 5 high ked (HK) burden ewes (average > 200) and 4 low ked (LK) burden ewes (average < 40) was calculated between lambing (day 0) and marking (day 18 to 36). Since the pupal period of the keds lasts approximately 21 days, natural increase may be discounted as of significance in contributing to the population on lambs. MK on HK was 3.8 and on LK was 0.3, showing a direct relationship between ked abundance and transmission between ewes and lambs. We also looked at the effects of shearing on reservoir ewes, given that shearing leaves practically no cover for keds or puparia. 3 groups of 6 sheep infested with *M. ovinus* were sheared and ked burden was compared. Results showed a drastic reduction in ked population, between 76.6 to 87.8 % on day 14, reaching 84.5 to 94.5 % on day 70 after shearing. Shorn sheep were freed of their original burdens. Re-establishment cannot take place for some months after shearing, when it does, it takes place from the lambs. According to our results, if the section of the flock maintaining the population were rid of this parasite at periods of reduced parasite stability, re-infestation is unlikely, and infestation should die-out. In practice, the attack on the adult foci would be advisable after pre-lambing shearing with an effective insecticide.

Morphological identification of *Rhinoestrus purpureus* vs. *Rhinoestrus usbekistanicus* nasal bot flies of horses: more doubts than evidences.

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Nasal myiasis caused by *Rhinoestrus* spp. larvae has been reported in Italy, firstly in Sicily and, recently, in Apulia in autochthonous horses. Two species of *Rhinoestrus* (i.e. *Rhinoestrus purpureus* Brauer and *Rhinoestrus usbekistanicus* Gan) parasitize horses, donkeys and zebras. The morphological differentiation of these two species is based on the presence, in *R. usbekistanicus* L3 of posterior peritremes as higher as broad and on the presence on the dorsal side of the third segment of two rows of spines which are narrowly interrupted medially. Following the Zumpt classification peritremes of *R. purpureus* are higher than broad and complete rows of spines are present dorsally on the third segment. Eighty-three L3 of *Rhinoestrus* spp. were collected from 8 native horses in Apulia region (Southern Italy). Three L3 presented both the morphological characteristics of *R. usbekistanicus* (morphotype 1) and 52 L3 those of *R. purpureus* (morphotype 2); 23 L3 presented posterior peritremes as higher as broad but a complete rows of spines on the third segment (morphotype 3) while 5 L3 presented peritremes higher than broad and two rows of spines narrowly interrupted medially on the dorsal side of the third segment (morphotype 4). The presence of mixed features on the L3 of *Rhinoestrus* collected from the same animals could be explained by the existence of a unique species of *Rhinoestrus* presenting different morphotypes, as previously demonstrated for other three species of *Przhevalskiana*. Molecular characterization of gene markers possibly will allow to solve the many doubts that remain on the identification of *Rhinoestrus*.

Efficacy of Nilzan Plus® on the bovine paramphistomosis.

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Paramphistomum sp. is a gastric trematodosis affecting young ruminants, causing digestive problems and loss of appetite and weight. To evaluate the efficacy of chemoprophylaxis using Nilzan Plus® (oxyclozanide + levamisole) on the bovine paramphistomosis, one dose (7 mg kg p.v.⁻¹ oxyclozanide + 3.5 mg kg p.v.⁻¹ levamisole) was administered to 10 Rubia Gallega autochthonous breed naturally infected and maintained under field conditions. Faecal and blood samples were individually collected from each animal for 28 weeks. The efficacy of the fasciolicide was evaluated by coprological and immunoenzymatic probes. Leukocyte, erythrocyte and haemoglobin counts were estimated. All the sheep passed *F. hepatica*-eggs by faeces prior to the chemoprophylaxis. One week after the administration of the anthelmintic the egg-output was suppressed, but *Paramphistomum* eggs were again observed 5 weeks after treatment, although in low numbers. The IgG response reduced 2 weeks after treatment, whereas the haematic parameters increased the following week to the chemoprophylaxis, specially the haemoglobin. No side effects were observed. These results point out the efficacy of Nilzan Plus® on the bovine paramphistomosis, which makes it very advisable. Trial financed by Schering-Plough Animal Health (Madrid, SPAIN), and the research Projects XUGA 5070AC6064100 (Xunta de Galicia, Spain) and DCICYT 5070AI2864100 (Ministerio de Ciencia y Tecnología, Spain).

Efficacy of oxclozanide (Zanil®) on natural ovine fasciolosis.

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Galicia (NW Spain, Europe) offers climatic conditions very suitable for the developing of the trematode parasite *Fasciola hepatica*, so it is necessary to have efficient fasciolicides. To determine the efficacy of oxclozanide against ovine fasciolosis, two doses (15 mg kg p.v.⁻¹) of the fasciolicide were orally administered to 10 sheep maintained under field conditions, with an interval of 6 weeks. Faecal and blood samples were individually collected from each animal for 17 weeks. The efficacy of the fasciolicide was evaluated by coprological and immunoenzymatic probes. Leukocyte, erythrocyte and haemoglobin counts were estimated. All the sheep passed *F. hepatica*-eggs by faeces prior to the chemoprophylaxis. Two weeks after the administration of the oxclozanide, the egg-output reduced significantly, and the number of eggs maintained low to the end of the trial. The IgG response also diminished 2 weeks after chemoprophylaxis, whereas the haematic parameters increased significantly. In view of these results, we confirm the high efficacy of the oxclozanide for the treatment of natural ovine fasciolosis. We consider this fasciolicide very suitable and convenient for the chemoprophylaxis of this trematodosis. The immunoenzymatic indirect-ELISA technique is very appropriate to evaluate the effect of the oxclozanide on natural ovine fasciolosis. Trial financed by Schering-Plough Animal Health (Madrid, SPAIN), and the research Projects XUGA 5070AC6064100 (Xunta de Galicia, Spain) and DCICYT 5070AI2864100 (Ministerio de Ciencia y Tecnología, Spain).

Monthly prevalence of strongylid infection in thoroughbred horses from four farms in the states of Aragua and Carabobo, Venezuela.

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Several studies have been performed on the prevalence of strongylids in horses and they show a decrease in prevalence of *S. Vulgaris* (compared to prevalence in former years) and the raising of cyathostome infection. Nevertheless no studies had been performed in Venezuela, under field conditions. The purpose of this research was to determine the monthly prevalence of strongylid infection in thoroughbred horses under routinary anthelmintic program using Levamisole, Pyrantel and/or Ivermectin and the relationship between prevalence and age, sex, management, anthelmintic treatment, or climatic factors. Prevalence, mean of strongylid eggs per gram (epg) and coproculture composition was determined monthly by faecal examination of 120 thoroughbred horses coming from four farms of Aragua and Carabobo State (Venezuela) using the Mc Master modified Method and Baerman technique. We considered 4 groups: 1) Stallions; 2) Mares; 3) Yearlings (males and females); 4) Foals under one year of age (males and females). Prevalence levels were less than 50% in farm 1; 80-100% in farm 2; 50-90% in farm 3 and 42-82% in farm 4. There were no significant differences in the prevalence levels for age, sex, the anthelmintic used and method of administration (tube or paste). Veterinary assistance, deworming of the whole group, and the use of the same flock for animals of different ages determined significative differences ($p < 0,01$) on prevalence level when comparing one farm to the other. Cyathostomes were the most prevalent larvae on cultures.

Parasitism prevalence in breeding puppies around weaning.

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In breeding, puppies are much more exposed to parasitism which can cause economic losses for breeders, these losses could be increased around weaning. However, a few studies were done on parasitism in breeding puppies, therefore, we studied parasitism excretion of 45 litters around weaning from 9 French breedings. For each litter, breeders picked up faecal samples before and after the weaning. Samples were analyzed by Mac Master method, using a saturated Magnesium sulphate solution and also, to detect *Giardia* cysts, by diethyl ether and formalin sedimentation. We found 36% of faecal samples positive for *Giardia duodenalis*, 31% for *Isospora ohioensis* complex, 25% for *Isospora canis*, 17% for *Toxocara canis*, and only 2% for *Trichuris vulpis*. The excretion was up to 4275 EPG for *I. ohioensis* complex, 510 EPG for *I. canis*, and 1680 EPG for *T. canis*. Comparison of our results before and after the weaning show that *I. ohioensis* complex and *T. canis* excretion decrease after weaning whereas *G. duodenalis* and *I. canis* excretion increase. Thus, around weaning, breeding puppies can be exposed to giardiasis, coccidiosis, and toxocarosis. Moreover, the prevalence of *T. canis* and *G. duodenalis* is preoccupying for public health. It is necessary to adapt to each breeding specific control and preventing methods against these parasites.

***In vitro* evaluation of inhibitory potential of plant nematode biocontrol agents and plant pathogenic fungi against *Arthrobotrys musiformis*.**

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Soil is biologically the most complex of all the environments. Several organisms with ability to suppress disease causing organisms are potential alternatives to chemical control measures. *Trichoderma harzianum* and *Paecilomyces lilacinus* are some of the best characterized antagonists against a number of plant pathogenic fungi and nematodes, respectively. Recently, *Arthrobotrys musiformis* was characterized for its suitability as a biocontrol agent against animal parasitic nematodes. For field applications, however, it is necessary to study the impact of environmental factors and complexity of interaction that occurs between the biocontrol agent and its surrounding. In the present study, efficacy of growth of *A. musiformis* under *in vitro* condition was studied against plant biocontrol agents (*P. lilacinus* & 3 strains of *T. harzianum* : Th-1, Th-2, Th-3) and some commonly found plant pathogenic fungi (*Fusarium oxysporum*, *Aspergillus niger* and *Lasioidiplodia theobromae*) by 'Dual Culture' technique. The results showed a strong suppression of mycelial growth of *A. musiformis* by all the strains of *T. harzianum* viz. Th-3, Th-1 and Th-2 (89.59, 88.56 and 87.5% respectively). *L. theobromae*, *F. oxysporum*, *A. niger* and *P. lilacinus* showed relatively low suppression of growth (7.31% to 15.62%). The study indicates that *A. musiformis* could perform well in the soil environment, in the absence of *T. harzianum*.

Treatment of *Toxoplasma gondii* infections in Pallas's Cat (*Otocolobus manul*) kittens with clindamycin.

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Pallas's Cats (*Otocolobus manul*), felids from Central Asia, are kept and bred in zoos worldwide. However, kittens are commonly affected by infections with *Toxoplasma gondii* which is highly pathogenic for these cats. The majority of kittens die within 8-12 weeks after birth from acute, disseminated toxoplasmosis. The course of infection and possibilities of treatment were investigated in a litter born in the Schoenbrunn Zoo in 2001. From the 5th week of life when the animals leave the litter box for the first time and start to feed on the provided mice up to the age of 5 months fecal and serum samples were examined for anti-*Toxoplasma* antibodies and oocyst excretion, respectively. One kitten displayed symptoms of cerebral toxoplasmosis at the age of 12 weeks and died after 2 days despite immediate treatment with clindamycin. In the following period all kittens received daily treatment with clindamycin (20-40 mg/animal weighing ca. 1 kg) through medicated mice. Based on antibody titres it can be assumed that the animal that had died had acquired the infection by ingestion of tissue cysts 9-10 weeks after birth; prenatal infection could be excluded. Its litter mates received clindamycin treatment for 5 months without any side effects. Two animals showed seroconversion during that time but no oocyst excretion. The remaining three animals seroconverted after treatment without clinical symptoms. Long term therapy with clindamycin is therefore recommended for the prevention of toxoplasmosis in Pallas's Cat kittens.

Presence of *Polygenis gwyni* (Fox 1941, Siphonaptera Rhopalopsyllidae) on *Ototylomys phyllotis* (Rodentia Muridae) in Yucatan, México.

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The aim of the present study is to inform about fleas found over *Ototylomys phyllotis* from Yucatán. The material consisted of fleas collected over *Ototylomys phyllotis* derived from a project named "Study of populations of small rodents in the jungle from Yucatán", so; Sherman traps and the marking system of capture and recapture were used. A total of 12 rodents were obtained (7 females and 5 males) on 1996 until 1998. The fleas were obtained by brushing and then placed in properly marked glasses containing 70% alcohol. All glasses containing fleas were transported to the Veterinary Faculty of the National University Autonomous of Mexico (UNAM). They were mounted using sintetic resine, the fleas were identified as *Polygenis gwyni* (Fox, 1914). A total of 25 fleas were observed, these fleas have been found in other hosts as: opossum and *Peromyscus gossypinus* also *Rickettsiae* sp. has been isolated from these fleas. As the *Ototylomys phyllotis* has been observed as peridomestic rodent it concluded that is necessary to pay attention on this flea as the fleas are not specific ectoparasites, therefore these fleas could be a contact with domestic animals and man.

Effect of the weight gain and egg elimination in calves treated with ivermectin.

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The aim of the present work was to determine the difference on the weight gain and the reduction of eggs of gastrointestinal nematodes (GIN)) in grazing weaning calves treated with ivermectin. Twenty-four calves were divided in two groups each having natural infection of GIN in a region with warm humid climate in the Gulf coast of Mexico. Both groups were enclosed in the trial without statistical difference in weight and egg per gram (epg). Every 56 days from May to November the animals were sampled for feces and they were analyzed by the McMaster technique and larval coproculture to obtain the percentage of nematode genus. Group 1, was treated with ivermectin at 200 mcg/kg/sc, and the Group 2, was the control, treated only once with albendazole at the beginning of the study. The difference on the average weight gain was 30.8 kg per calf *versus* the control ($P \leq 0.05$). In the Group 1, the mean epg initiated with 2133. Afterwards it changed from 0 to 2604. In the Group 2, the mean epg at the beginning was 2400, and it moved from 70.8 to 4741 epg. The genus observed were *Haemonchus* 22%, *Cooperia* 35 %, *Trichostrongylus* 12 %, *Oesophagostomum* 3%, *Strongyloides* 28 % and *Toxocara* was only positive in the first sample.

The relationship between larval length and larval mass of a reference strain of *Lucilia sericata* (sheep blowfly).

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Blowfly strike (traumatic myiasis) of sheep is a widespread problem throughout flocks of the UK and if not treated, can cause considerable suffering and mortality within a flock. Effective treatments are available, so a flock master could face prosecution for animal cruelty if he neglects to prevent or treat for strike. This study investigates the potential for estimating the age of strike lesions (and the period of neglect) by comparing the mass to length ratio of larval instars of *Lucilia sericata* (Sheep blowfly) at different larval incubation temperatures. Parameters such as blowfly strain, larval instar, and population density were standardised. Cultures were incubated at one (constant) temperature within a range covering the skin temperatures of healthy sheep and those expected of a sheep carcass in the field. Samples of the developing larvae at each test temperature were transferred to relaxing fluid to ensure larvae were fully extended for measuring. The relative length, mass and instar of larvae in each sample were deduced before calculating their mass to length ratio. The rate of change of the ratio was relatively constant within 15°C - 35 °C, but significantly reduced at 12 °C and below. Growth curves of larval mass to length ratio versus incubation temperature provide a means of producing an estimate of age of blowfly larvae, given the larval weight, length and the animal/carcass temperature. The age of strike lesions can therefore be determined, where the temperature has been constant.

Treatment of sarcoptic mange in cattle with topical eprinomectin: Effects on productivity and behaviour.

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Sixteen bull calves which were experimentally infested with *Sarcoptes* mites were formed into replicates of 2 bulls based on Day -1 BW. Within replicates bulls were randomly allocated to groups G1: non-treated control or G2: treated with 0.5 mg eprinomectin/kg BW (EPRINEX[®] Pour-On, Merial) on Day 0. Mites were counted at two-week intervals. Body weights and feed consumption were measured and serum samples were collected. On Days 0 and 56, the animals were videotaped to record behaviour. Adrenocortical reactivity was tested by ACTH-stimulation on Day 58 (= study end). Differences between variables were declared significant if $p \leq 0.05$. G2 bulls became mite free from Day 28 whereas G1 bulls maintained infestations throughout the study. Lesions of the G2 bulls decreased and were significantly lower than for the G1 bulls from Day 28 on. The antibody levels closely followed the mite counts and lesion scores. The G2 bulls gained significantly more weight from Day -1 to Day 56 than the controls. Feed consumption was not significantly ($p > 0.10$) different between the two groups, but the G2 bulls had significantly higher feed conversion efficiency. The G2 bulls had significantly fewer rubbing and scratching incidents and had a tendency ($p = 0.0754$) to spend more time lying down at Day 56 than the controls. The plasma cortisol response to ACTH-stimulation was not significantly different between the two groups, however, the overall response of the glucose levels was significantly higher for the G2 bulls than for the controls. The results of the study indicate that eprinomectin treatment significantly improved the productivity and well-being of cattle suffering from sarcoptic mange.

Prevalence of and factors associated with shedding of *Cryptosporidium* spp in domestic cats.

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Fecal samples from 154 domestic cats were examined for the presence of *Cryptosporidium* and *Giardia* spp. using a direct immunofluorescent assay. Prevalence and 95% CI were determined for each parasite. Prevalence for *Cryptosporidium* was 16% (24/154; 95% CI = 7-22%) while that for *Giardia* was slightly higher at 20% (30/154; 95% CI = 14-27%). Twenty-two cats were concurrently shedding cysts and oocysts of both parasites, 8 cats were shedding *Giardia* cysts only, and 2 cats were shedding *Cryptosporidium* oocysts only. Consequently, the odds of having a sample positive for *Cryptosporidium* oocysts was significantly greater for cats concurrently shedding *Giardia* cysts ($p < 0.001$). The odds of having a sample positive for *Cryptosporidium* oocysts was also significantly greater ($p < 0.001$) when diarrhea was present and kittens (< 6 months) were more likely to be shedding *Cryptosporidium* oocysts than older cats ($p < 0.001$). There was, however, no association between type of housing (indoor only, indoor with multiple cats, indoor/outdoor, outdoor only) or gender and presence of *Cryptosporidium* oocysts. Our study found a strong association between *Cryptosporidium* and *Giardia* infections in cats presenting the possibility that infection with *Giardia* may predisposes cats to concurrent infection with *Cryptosporidium*. Identification, using genotyping techniques, of the *Cryptosporidium* species present is in progress.

Tegumental surface changes in adult flukes by scanning electron microscopy following treatment in sheep with an experimental compound.

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The effect of most commercially fasciolicides have been studied, nevertheless the specific mode of action of these drugs in the parasite is still unknown. The effect of the 5-chloro-2-methylthio-6-(1-naphthiloxy)-1H-benzimidazole (compound alpha) on the tegument of *Fasciola hepatica* had been examined in his natural host. Nine crossbreed sheep were infected orally with 200 metacercariae of *F. hepatica* each. Twelve weeks postinfection 6 animals were treated with 12mg/kg/po of compound alpha and 3 of them remained as untreated controls. Changes on the tegument were assessed at 6, 12 and 24 h posttreatment. Adult flukes were recovered from the liver of the infected animals and fixed for 24 h in 4% glutaraldehyde, then washed repeatedly in cacodylate buffer and dehydrated through acetone, critical point dried in carbon dioxide and mounted on aluminium stubs and coated with gold. At 6 h posttreatment the tegument of adult flukes appeared blebbed, swollen and with some desorganisation, some deep furrows can be seen. After 12 h treatment the spines were submerged by the tegument and spine loss was appreciated around the ventral sucker. At 24 h posttreatment deep furrows occur in almost all the tegument and in some areas the tegument was completely sloughed away. The results obtained in this study may suggest that the tegument could be an important target organ for the action of compound alpha. Further studies need to be done to confirm the mode of action of this experimental drug in the fluke.

Putative prediction of macrocyclic lactones *in vivo*-disposition using an original pharmacological parameter [Vp50] obtained from transport experiments in P-glycoprotein-expressing cells.

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The structurally related molecules of the macrocyclic lactones class (ML) display a wide range of pharmacokinetics parameters in animals. Studies on Ivermectin, have clearly implicated the membrane transporter P-glycoprotein (P-gp) in regulating the intracellular/extracellular ratio of the drug, thus controlling its *in vivo* behaviour and efficacy. In this study we used a recombinant cell line that over-expresses the murine P-gp [gift from Dr. A. Schinkel] to indirectly measure the transport of five molecules of the ML class, and to compare it to those of the reference P-gp substrate: Valspodar. Using the Hill mathematical model, we defined our calculated "Vp50" variable as the concentration of a test drug needed to produce 50% of the rhodamine-transport antagonizing potency of Valspodar used at a concentration of 5 μ M on the same cellular model. We report that the potency for P-gp transport raises from Moxidectin to Eprinomectin [Moxidectin << Selamectin << Doramectin << Ivermectin << Eprinomectin]. These observations are consistent with results of *in vivo* half lives ($t_{1/2B}$) observed in cattle, in pig and in horse for Moxidectin, Doramectin, Ivermectin and Eprinomectin. These results strongly suggest that "Vp50" *in vitro* measurement might represent a relevant approach to predict the *in vivo* pharmacokinetic behaviour of a drug of the ML class towards the P-gp and, ultimately, a crucial component of its biodisposition in animals. Indeed, Eprinomectin displays the shorter *in vivo* half life of the ML class in connection with the strongest P-gp transport while for Moxidectin, the strongest persistence in the body and the mildest P-gp transport are observed.

Flea allergy dermatitis (FAD) in the cat: Establishment of a functional in vitro test (FIT).

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The cat flea, *Ctenocephalides felis felis*, is the most important ectoparasite of cats and dogs. In some individuals exposure to fleas leads to the condition of flea allergy dermatitis (FAD). It is assumed that type I hypersensitive reactions to antigenic components contained in the saliva of fleas play a major role in FAD. Intracutaneous testing may be used to support a presumptive diagnosis of FAD. Yet *in vitro* methods are comparatively attractive, as there is no allergen boosting of patients. Moreover they can be tested despite of severe skin disease, and sedation is usually not required. As determination of allergen specific free serum antibodies including IgE have very little clinical relevance we are developing a more reliable and for the patient stress-free allergy test in the cat: The functional *in vitro* test (FIT) is monitoring exclusively those antibodies sensitizing basophiles and mastcells known as the prime initiators of type I allergies. By means of their Fc-receptors they accumulate antibodies of selected isotypes on their surface. Depending on their specificity these antibodies may bind the “fitting” antigens as bridging “allergens” causing the release of various mediators and, thus, the induction of type I allergy reactions. Histamine is one of these mediators and the only one being stored in considerable amounts in basophils and mastcells exclusively. By means of histamine release the triggering of basophiles from cats can be quantified in a radio immunoassay. Initial results of applying the FIT on a population of flea-infested laboratory cats shall be presented.

Echinococcosis in Sardinia (Italy).

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Sardinia Island (Italy) is located in the Mediterranean sea, and as many countries of this area, has a long history about Echinococcosis-Hydatidosis disease. Many papers have been published on this parassitosis but at the present time, there aren't epidemiological data on the diffusion of this cestoda in its most important final host, the dog. For this reason the aim of this work is to supply an update on the epidemiological trend of Echinococcosis in its definitive host as well as in sheep. Since January 2003, liver and lungs samples have been taken of 250 sheep of the Sardinian breed, butchered by various slaughterhouses in the Provinces of Sassari and Nuoro, and their age and provenience have been determined. The number, location, type and fertility of the cysts have been determined in the lab. Moreover faecal samples of 159 dogs coming from the aforesaid zones have been examined. The macro and microscopical exam was performed on the faecal samples, after frozen to -80°C for 96hrs, to respectively assess the presence of proglottids (and/or adult worms) and of Taeniid eggs through the sedimentation and flotation technique. At the same time Enzyme-linked Immunosorbent Assay (ELISA) with different protocols was used for the detection of *Echinococcus granulosus* coproantigens in dogs faeces. For the coproantigens extraction, two gram of faeces were added to 8 ml of PBS 1X PH. 7,4 (ratio 1:4), after suspension and centrifugation at 4000 rpm, the supernatant was stored at -20°C for further use. Three ELISAs were used: one with polyclonal antibodies, available in commerce (Ekinotest, Bommeli) and two monoclonal systems (EmA9 and EgC3), set up in lab. ELISAs positive samples were stored at -20°C for further DNA extraction and specie-specific PCR (work in progress) to confirme immunoenzimatic diagnosis. A prevalence of 67,6% has been found in the examined sheep; however the percentage of sheep with fertile hydatids was of 8,6% and 17,5% respectively in Sassari and Nuoro Provinces ($\chi^2 = 13,17$; $P = 0,0002$). In the dogs, the copromicroscopic exam has high-lighted only six positive samples for Taeniid eggs (3,7%), while the results of the ELISAs test shown a prevalence of 4,4% for the commercial kit and of 8,1% and 10,6% respectively for the two monoclonal systems ($\chi^2 = 4,51$; $P = 0,033$).

Tick-transmitted infections in New Caledonian dogs: A geographically isolated canine and tick population.

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There is little information on the effect of geographical isolation on the diversity of ticks, and the spectrum of tick-transmitted infections affecting dogs. New Caledonia is situated in the South Pacific Ocean approximately 1500 kms from both Australia and New Zealand. The native fauna and flora has evolved in isolation and the native dog population (30,000 animals) is effectively closed due to minimal import /export of animals. EDTA blood samples were taken from a convenience sample of pet dogs (n=127) from 5 veterinary clinics in Noumea, Païta and Bourail. Ticks (n=204) found on these dogs were collected into ethanol and identified morphologically. DNA was extracted from blood samples and screened by genus-specific PCR analysis for *Babesia*, *Ehrlichia*, *Anaplasma* and *Rickettsia* species. Adult ticks (n=177) were PCR screened using a degenerate assay for *Babesia* and *Hepatozoon* apicomplexan species, and genus-specific PCR analysis for *Babesia*, *Ehrlichia*, *Anaplasma* and *Rickettsia* species. Positive *Anaplasma* samples were analysed using species-specific PCR and DNA sequencing. Of the blood samples, 3/127 were positive for *Anaplasma platys* but negative for DNA of other organisms. All ticks were identified as *Rhipicephalus sanguineus* and 18/177 (10%) collected from 12 dogs were positive for *Anaplasma platys*, 7/177 (4%) from 2 dogs were positive for *Rickettsia* species and 18/177 (10%) from 7 dogs were positive for *Babesia* and/or *Hepatozoon* DNA. Although species are not yet fully characterised, the spectrum of pathogens carried by *Rhipicephalus sanguineus* is more like that reported in northern Australia than SE Asia.

Diagnosis and prevalence of tapeworms in horses in the southwestern USA.

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Tapeworms are common gastrointestinal parasites of horses and mules with worldwide distribution. Recent studies have linked heavy tapeworm infections with colic, intussusception and other intestinal pathological lesions. Prevalence of infection is variable depending on geographic location and method used to detect the presence of parasites. Tapeworm eggs appear to be shed sporadically, and fecal flotation techniques are inefficient in detecting eggs. The prevalence of *Anoplocephala perfoliata* infection in horses from various locales in the southwestern USA was determined through postmortem evaluation of GI tracts and fecal flotation of rectal contents. Tapeworms were visualized near the ileo-cecal junction in 22 of 148 horses (15%; 95% confidence interval 9-21%) with a tapeworm density averaging 33 adult worms/horse (range 1-160 worms). All worms were morphologically identified as *Anoplocephala perfoliata*. Examination of horses infected with *A. perfoliata* revealed lesions ranging from inapparent to grossly visible multifocal hemorrhagic ulcerations, particularly at the sites of tapeworm aggregations. Using a centrifugal fecal flotation method (sugar solution, sp. gr. 1.27), tapeworm eggs were detected in 8 of 22 infected horses (36%). All positive fecal samples were from horses with tapeworm burdens greater than 40 adult worms. Improved methods of diagnosis and treatment are needed to control this equine parasite.

The prevalence of anthelmintic resistance in nematode parasites of cattle in São Paulo State, Brazil.
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A survey is being carried out in the west region of São Paulo State, Brazil, to determine the prevalence of anthelmintic resistance in beef cattle nematodes. Anthelmintics being tested, at registered dose rates, are levamisole phosphate (Ripercol®, Fort Dodge), albendazole sulphoxide (Ricobendazole, Fort Dodge), ivermectin (Ivomec®, Merial) and moxidectin (Cydectin®, Fort Dodge). From April/2002 to March/2003, 12 beef cattle farms were evaluated. Based on fecal egg counts (FEC), steers were allocated to each treatment group or in a control group, not treated. Seven to ten days after the anthelmintic treatment, fecal samples were collected from each animal for pos-treatment FEC. Fecal cultures for larval differentiation were made for each group. Arithmetic mean FEC reduction (FECR) of the treated groups in relation to control group, after the treatment, was calculated in each farm. This survey is showing that nematode populations of *Cooperia* spp. and *Haemonchus* spp. resistant to ivermectin are very common in the region. FECR was lower than 90% after ivermectin treatment on 11 farms. On four of the 11 farms, there was an increase in mean FEC after the treatment. In contrast, moxidectin provided 100% FECR on eight farms. On the other four farms, the FECR ranged from 90.0% to 97.2% after moxidectin treatment. In the evaluation of ricobendazole, the FECR was higher than 90% on nine farms and lower than 90% on three farms (FECR from 47.4% to 84.6%). Levamisol provided FECR higher than 90% on all farms, excepting one with FECR of 47.4%. Anthelmintic resistance in beef cattle in Brazil may become as severe as that seen in sheep flocks if the selection pressure through the use of anthelmintic is maintained.

No increase in serum acute phase proteins in subclinical *Trichinella* infection in reindeer (*Rangifer t. tarandus*).

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Six female reindeer calves, age 10 months, were inoculated intraruminally with various doses of *Trichinella* muscle larvae. Four calves were inoculated with *T. nativa*, receiving 15,000 (n = 1), 5,000 (1), and 2,500 (2) larvae each. Two calves were inoculated with 5,000 *T. spiralis* larvae each. Serum concentrations of acute phase proteins haptoglobin and serum amyloid A did not increase although all the reindeer seroconverted and a small rising trend in total white blood cell count and especially in eosinophiles was observed. Few muscle larvae (max. 0.08 larvae/g) were found in the animals inoculated with *T. nativa* and about 4 and 6 larvae/g from the masseter muscles of those inoculated with *T. spiralis*. The reindeer did not show clinical signs of disease. However, no temperature or heart rate monitoring were carried out because the animals were semi-domesticated and kept in a spacious corral. Although all animals had subclinical trichinellosis they did not have increase in acute phase proteins, which we have observed after *Escherichia coli* endotoxin challenge. This may be due to low doses of *Trichinella* larvae or their poor ability to cause acute phase response in reindeer. In conclusion local reaction to *Trichinella* larvae seemed not to cause clear liver mediated acute phase response. It remains to be seen if clinical parasitic infections do give rise to acute phase reaction in reindeer.

Cloning and expression of the major secreted cathepsin B from juvenile *Fasciola hepatica* and analysis of immunogenicity following liver fluke infection.

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The functions of the cathepsin B-like proteases in *Fasciola hepatica* are unknown and analysis has been hindered by a lack of protein for study, since the protein is produced in small amounts by newly-excysted juvenile fluke. To circumvent this, a cDNA encoding the major secreted cathepsin B from juvenile *F. hepatica* was isolated and characterized. The predicted pre-pro-protein is 339 amino acids in length, with a mature protease predicted to be 254 amino acids long, and shows significant similarity to parasite and mammalian cathepsin B. Only one of the two conserved histidine residues essential for cathepsin B exopeptidase activity is predicted to be present. Recombinant preproprotein was produced in yeast and it was shown that the recombinant pro-protein can undergo a degree of self-processing to the mature form *in vitro* which is active against gelatin and synthetic peptide substrates. The recombinant cathepsin B protein is antigenic in vaccinated rats and antibodies to the protein are detected early after infection of rats and sheep with *F. hepatica*. The kinetics of the response to cathepsin B and cathepsin L after infection of sheep and rats confirms the temporal expression of these proteins during the life-cycle of the parasite.

Detection of anti-Ex-*Toxocara vitulorum* IgG antibodies in colostrum and serum of buffalo calves and cows by immunoblotting.

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Toxocara vitulorum is a nematode parasite of small intestine of cattle and water buffaloes particularly buffalo calves between one and three months of age causing high morbidity and mortality. The purpose of this research was the characterization of soluble larval extract (Ex) antigen of *T. vitulorum* by SDS-PAGE and Western blot (WB), using immune sera and colostrum of buffaloes naturally infected by *T. vitulorum*. The parasitological status of the buffalo calves was also evaluated using sequentially coprological examinations. The results showed that this antigen revealed eleven (11, 13, 16, 22, 25, 32, 43, 53, 68, 82 and 96 kDa) protein bands by SDS-PAGE. The majority of these bands were recognized by sera and colostrum of all groups of infected animals (buffalo cows one day post parturition and buffalo calves at one day of age and during the beginning of *T. vitulorum* infection) when analyzed by WB. However, only the fractions of higher molecular weight (96, 82 and 68 kDa) persisted in the groups of buffalo calves at the peak of egg output, as well as during the period of rejection and post-rejection of *T. vitulorum* by the feces of the calves. On the other hand, sera of buffalo calves at one day of age, after suckling the colostrum and at the beginning of infection reacted with the same bands detected by serum and by colostrum of the buffalo cows.

Population dynamics of *Toxocara canis* in pigs receiving a single or multiple infection.

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The population dynamics of *Toxocara canis* in pigs, and their immune response to a primary and a challenge infection, were studied by parasitological and haemato-serological parameters. Seventy pigs were divided into four groups; thirty-five pigs received a primary infection (group A), 15 pigs received both a primary and a challenge infection (group B), 15 pigs received the challenge infection only (group C), and 5 pigs served as helminth-free controls (group NC). A dose of 50 000 eggs was administered for the primary infection (day 0) and a dose of 10 000 eggs was given for the challenge infection (day 28). On days 7, 14, 21 and 28 p.i., five pigs of group A, and on days 35, 42 and 49 p.i., five pigs of the group A, B and C were necropsied. Numbers of recovered larvae were widely varied in 5 pigs of each group at each necropsy. *Toxocara canis* larvae were recovered predominantly from the lungs; migration of larvae to other organs or tissues from the lungs was restricted. In group A, the larval burden in the lungs peaked on day 14 p.i., even though the larval densities significantly decreased over time; thereafter, the majority of larvae were recovered from the lungs until the end of experiment (day 49 p.i.). A few larvae were found in the muscles and brain until day 42 p.i., and 2 larvae were found in the eyes of 2 pigs on day 35 p.i. There was little evidence of protective immunity to a challenge infection in this experiment; however, the acute eosinophilia did not occur in all pigs after challenge infection following a primary infection in contrast to the challenge control. The relevance of these data to the population biology and immunology of porcine and human toxocarosis is discussed.

Premunization of Criollo kids by use of a single viable dose of *Haemonchus contortus* before natural infection with gastrointestinal nematodes.

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Attempts to vaccinate young lambs against *H. contortus* by use of a single dose or trickle infections with viable parasites have failed. However, no work has been reported in goats. Premunized kids (single dose) may benefit from supplementary feeding as it can improve resilience and resistance against GIN infection in non-premunized kids. The effect of supplementation in premunized browsing Criollo goats was investigated. 14 nine month-old female goats, raised nematode free, were dosed with 100 *H. contortus* L₃ larvae/kg BW (goat strain). Sixty days post-infection goats were randomly distributed in two groups (n=7): a) premunized and supplemented (P-S) and b) premunized and non-supplemented. A control group, neither premunized nor supplemented (NP-NS), was made with nematode free male kids (same age as females). Goats browsed native vegetation (seven hours daily) during 152 days of the wet season. Animals in P-S were fed 100g fresh basis of supplement daily (74% sorghum meal:26% soybean meal). Weight, feces and blood sample were collected every 14 days. LWG of P-S animals (5.43±0.7 kg) were larger than P-NS animals (2.7±0.6 kg) (P=0.01). Both groups had higher live weight gain (LWG) than NP-NS (0.4 kg±0.8 kg) (P<0.0003). P-S kids showed a tendency to have lower faecal egg counts (FEC) than P-NS and NP-NS (P>0.05). Premunization improved resilience of kids but supplementation further improved resilience of premunized kids. No significant effect was found in resistance parameters (FEC and peripheral eosinophil counts).

Molecular detection of *Anaplasma (Ehrlichia) phagocytophilum* comb. nov. (Rickettsiales, Anaplasmataceae) in dogs and ticks.

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Dogs can be infected by species belonging to the *Anaplasma* and *Ehrlichia* genera which may cause asymptomatic to clinically severe infections. Three different PCR assays were used to evaluate the occurrence of *Ehrlichia canis*, *Anaplasma (Ehrlichia) platys* comb. nov. and *Anaplasma (Ehrlichia) phagocytophilum* comb. nov. in dogs from kennels located in the province of Teramo (Central Italy) and in their ticks. Out of 50 blood samples, 11 were PCR-positive for *A. (E.) phagocytophilum*, while all the samples were negative for *E. canis* and *A. (E.) platys*. Twenty-two *Rhipicephalus sanguineus* salivary glands and 9 tick pools were found to be positive only for *A. (E.) phagocytophilum*. The PCR assays confirmed that *A. (E.) phagocytophilum* is present in dogs and their ticks. In consideration of the high molecular homology rate detected *A. (E.) phagocytophilum* appears to be the etiological agent of both a form of canine granulocytic ehrlichiosis and human granulocytic ehrlichiosis and thus our findings on the evidence of *A. (E.) phagocytophilum* in dogs may be of potential epidemiological importance. Currently it is not possible to state that dogs act as a reservoir of granulocytic ehrlichiosis for humans, although this cannot be definitely ruled out. In Europe, *Ixodes ricinus* is suspected to be the biological vector of *A. (E.) phagocytophilum*; our findings raise the possibility that *R. sanguineus* might also be involved in the transmission of *A. (E.) phagocytophilum*.

Progress of the international work of the “Imidacloprid Flea Susceptibility Monitoring Team”.

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The “Imidacloprid Flea Susceptibility Monitoring Team” has aim to develop and validate a bioassay to effectively monitor and document susceptibility of cat flea (*Ctenocephalides felis*) isolates to imidacloprid. A larval bioassay was developed, standardized and validated and agreed upon by the team as the reference diagnostic test kit as research has shown that the proposed WHO adult test was not reliable. The selected 3 ppm discriminating dose, determined from evaluating year 2000 field isolates, was approximately 2 times the highest LC₉₅ of the control laboratory flea strains. During 2001 and 2002 this standardized bioassay was used to test a number of field isolates, with app. 130 field isolates collected from the USA, UK and Germany in 2002. One field isolate derived from a multi-cat household in California with a recorded history of no flea control products used, was intensively studied. The results obtained showed some survivorship at 3.0 ppm in the larval bioassay. A full dose-titration assay (0.005 to 3.0 ppm) determined an elevated LD₉₅ for this isolate, which was no higher than a baseline field isolate tested in the previous year. All field collected flea isolates were determined to be susceptible to imidacloprid. The results obtained clearly demonstrated the importance of close cooperation between the pharmaceutical industry and academia in assuring the continued efficacy of marketed insecticides.

Efficacy of an experimental fasciolicide against immature and mature *Fasciola hepatica* in artificially infected calves.

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The efficacy of 5-chloro-2-methylthio-6-(1-naphthyloxy)-1*h*-benzimidazole, called compound alpha, was tested against groups of 3 days and 2 weeks, 3 and 4 weeks, 6 and 8 weeks and 10 and 12 week-old *Fasciola hepatica*, respectively. Thirty-two fluke-free calves were divided into 8 groups of 4 animals each. Infections and re-infections with 150 metacercariae of *F. hepatica* per animal were given to adjust timings for the respective treatments. Groups 1, 3, 5 and 7 were treated with a single oral dose of 12 mg/kg of compound alpha. Groups 2, 4, 6 and 8 served as non-treated controls. Two weeks after treatment the animals were sacrificed and the livers were removed in order to collect parasites. Efficacy was assessed according to the number of flukes present in the treated animals relative to controls. The results indicated a fluke reduction of 100%, 96.4%, 99.2 % and 100% for groups 1, 3, 5 and 7, respectively. It is concluded that compound alpha shows high efficacy against immature and mature *F. hepatica* induced infections in cattle.

Safety of ivermectin and praziquantel on the reproductive performance of stallions.

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Twenty four healthy mature stallions were randomly allocated to two equal groups and treated orally on Days 0, 7 and 14 with a vehicle paste or an ivermectin/praziquantel paste (EQUIMAXTM Paste, Virbac) using a dosage of 0.6 mg/kg ivermectin and 4.5 mg praziquantel/kg (3 times the label use). Physical examinations, bodyweight measurements, complete breeding soundness examinations, reproductive hormone measurements, hematology and blood chemistry analyses were performed from acclimation until Day 79. All data were analyzed by repeated measure analysis of variance or by an exact permutation test. Physical examination results, body weights, rectal temperatures, hematology and serum chemistry values were within the expected ranges. Some statistical differences were shown between groups (respiration rate, a few hematological and serum chemistry parameters) but none of them was of biological significance. The semen quality was excellent in both groups. On Days 5 and 75, gel volume in treated stallions was significantly lower and higher, respectively, than stallions in the control group. Sperm concentration was significantly higher in the treated group versus placebo. On Days 13 and 19, the treated group had a significantly greater number of animals with increased sperm motility. No effects of treatment on time to erection, time to ejaculation or number of mounts were detected. Frequency of pawing and striking was significantly higher in treated animals without affecting the ejaculatory process. No statistically significant difference was shown between groups for total testicular volume, total scrotal width and blood hormone levels: LH, FSH. Testosterone levels were significantly lower in the treated animals on Day 40. Treatment with ivermectin and praziquantel at this dosage did not adversely affect the reproductive performance of stallions.

Hints for transmission of feline leukemia virus (FeLV) by the cat flea (*Ctenocephalides felis*).

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The feline leukemia virus (FeLV) is a naturally occurring and wide spread retrovirus among domestic cats. The virus is mainly transmitted horizontally through saliva, blood and other body fluids by close contact between cats. Other vectors than cats, e.g. blood sucking parasites, have not been reported. This study tested the vector potential of the cat flea (*C.felis*) for FeLV. In a first artificial feeding, fleas were fed for 24 hours with blood from an FeLV-infected cat with persistent viraemia. FeLV-RNA could be detected in the fleas, as well as in their feces. Fleas were then divided in two populations and fed in a second feeding for 5 and 24 hours, respectively, with uninfected non-viraemic blood. FeLV-RNA was again detected in the fleas and their feces. In addition, the two resulting blood samples of the second feeding were subsequently tested, and both samples were positive for FeLV-RNA. Therefore the fleas transmitted feline leukemia virus RNA directly from one blood sample to another. In a third feeding, the same populations of fleas were fed again with uninfected non-viraemic blood for 5 and 24 hours, respectively. This time, neither in the fleas, nor in the flea feces or blood samples FeLV was detectable. Results show that the cat flea *Ctenocephalides felis* is a vector for feline leukemia virus RNA in vitro and may also serve as a vector for infectious virus particles.

The proteome of *Toxoplasma gondii* rhoptries: composition, function and comparative proteomics.

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Along with *Eimeria* spp., *Neospora caninum* and *Cryptosporidium parvum*, *Toxoplasma gondii* is one of several apicomplexan parasites that cause disease in farm animals. These apicomplexan parasites are characterised by the presence of secretory organelles called rhoptries at their apical end which are thought to be important in the invasion of these parasites into host cells. The composition and function of these organelles is largely unknown, with the exception of a family of proteins (ROP 2-8 in *Toxoplasma gondii*) that appear to be involved in the recruitment of host cell mitochondria to a position close to the parasitophorous vacuole. As part of a project to understand rhoptry composition and function, we have characterised the proteome of a highly purified fraction of rhoptry organelles from *T. gondii*. Rhoptry proteins were separated by both SDS-PAGE and two-dimensional electrophoresis (2-DE). We found rhoptry proteins to be relatively poorly resolved using standard 2-DE methods, presumably because of their hydrophobic nature (in contrast to *T.gondii* dense granule proteins that we have mapped clearly by 2-DE). Specialised solubilisation conditions improved the resolution of rhoptry proteins in 2-DE gels, but we could not be certain that all components had entered the IEF gel. Further analysis of the rhoptry proteome was therefore undertaken by SDS-PAGE fractionation followed by liquid chromatography tandem mass spectrometry (LC-MS/MS). Peptide fragmentation data was used to search genomic and EST databases, including the latest release of Toxogen. We have identified a large number of hitherto unknown rhoptry components and derived partial or complete coding region sequences (based on a combination of genome and cDNA sequencing) and are confirming their localisation using anti-peptide antibodies and immunofluorescence staining. Some of these proteins have clear homologues in other Apicomplexa, while others appear so far to be unique to *Toxoplasma*. This analysis of the proteome of *T. gondii* rhoptries will be crucial to determining the ultimate role of these organelles in apicomplexan parasites as well as the means by which proteins are specifically targeted during transit through the secretory pathway.