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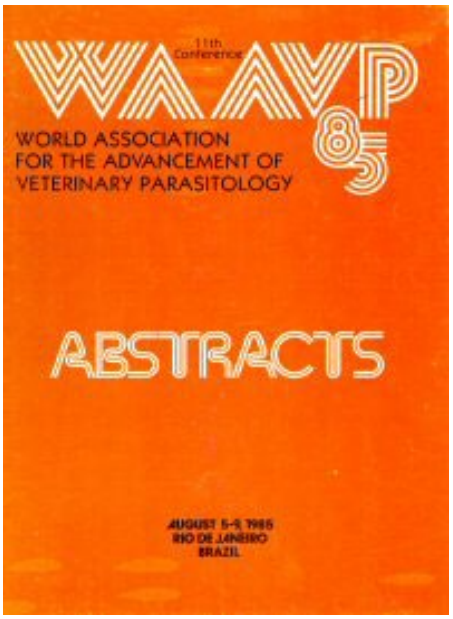

11th Conference

WAAVP 85

WORLD ASSOCIATION
FOR THE ADVANCEMENT OF
VETERINARY PARASITOLOGY

ABSTRACTS

AUGUST 5-9, 1985
RIO DE JANEIRO
BRAZIL

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Experimental Infection of Calves with *Bunostomum phlebotomum*.
ANTONIO CESAR R. LEITE*, M. P. GUIMARÃES, W. S. LIMA, H. M. A. COSTA and J. O. COSTA

Two groups (A and B) of helminth free 5 months old calves were infected with 10000 L_3 *Bunostomum phlebotomum* larva; group B was challenged with 40000 L_3 *B. phlebotomum* larva five months later and a third group was kept as control.

The development of the infection was followed through coprocultures, fæces and blood examinations and weight gains.

The prepatent period was of 7 and 8 weeks respectivelly in the groups A and B. The peak of LPG was between the 10th and 17th weeks with a maximum of 2300 LPG in the 15th week. No larva were found in the 22nd week after the infection. In the group B a peak of 3600 LPG appeared 4 weeks after the reinfection.

No differences were found in relation to hematological data between the infected and control groups.

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Some Pathophysiological Aspects of Cattle Affected with Clinical Type II Ostertagiasis Compared with Animals Previously Treated with Either a Morantel Sustained Bolus or Fenbendazole.
C. M. ENTROCASSO*, J. J. PARKINS, J. ARMOUR, K. BAIRDEN, and P. McWILLIAM

Some Pathophysiological aspects of cattle affected with clinical type II ostertagiasis compared with animals previously treated with either a morantel sustained bolus or fenbendazole ENTROCASSO, C.M.*, PARKINS, J.J., ARMOUR, J., BAIRDEN, K. and McWILLIAM, P.

Three groups of calves, grazed on pastures contaminated with bovine trichostrongyle infective larvae, were housed from October to May. One group had received fenbendazole at fortnighty intervals to maintain infection at a negligible level; one had received a morantel sustained release bolus to limit infection to a low level and the control group was only medicated when heavy infections accumulated sufficiently to cause clinical disease and had large burdens of arrested Ostertagia larvae at the time of housing.* Clinical type II ostertagiasis occurred in the heavily infected control group but not in the other two groups. Digestibility of the whole diet was poorer in the control cattle (in both phases of the type II disease) and particularly for dry matter, crude protein and energy fractions overall. Balance studies conducted throughout the winter showed that both increased faecal and urinary nitrogen outputs in the control animals to have contributed to a significantly reduced overall retention. The effects were most apparent during the type II phase of the disease.

* Presenter C.M. ENTROCASSO, INTA, BALCARCE, ARGENTINA.

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Pulmonary Lymphoid Granulomas in *Metastrongylus apri* Infection of Pigs.
V. KUMAR* and J. MORTELMANS

Metastrongylus apri infection remains a potential health hazard for pigs in countries where extensive system of swine husbandry is practiced and especially where the annelid intermediate-hosts of the nematode are present. In our infection experiments a primary infection of this nematode produced dose related pulmonary lesions of emphysema and hepatization. Barring heavy infections, this disease is selflimiting and is followed by more or less complete resolution of lesions. However, superimposed infection with M.apri leads to pulmonary hypersensitivity response with tissue damaging sequelae. This is manifested by the occurrence of chronic granulomatous lesions in pulmonary parenchyma which fail to resorb.

The pulmonary granulomatous lesions were studied histologically. In few instances miliary foci resembling tuberculous lesions were present. The lesions were initiated by the eggs of the nematode which are aspirated deep into the alveolar tissue. Eosinophils were the main infiltrating cells in the initial phase but with the evolution of the disease lymphocytes predominated in these circumscribed lesions.

To ascertain if these pulmonary granulomas were purely of inflammatory origin or these constituted sites of active immunoglobulin synthesis, a PAP test was performed on the histological sections of the lymphoid granulomas. No evidence suggestive of active immunoglobulin synthesis was present.

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Development of *Ascaridia galli* (Schrank, 1788) Life Cycle After Infection with Irradiated Eggs.
M. C. R. VIEIRA BRESSAN* and S. M. GENNARI

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**Instituto de Pesquisas Energéticas e Nucleares, CNEN-SP, Brasil.

Five groups of chicks were infected with 500 normal eggs of *Ascaridia galli* or eggs irradiated with a dose of 50, 100, 200 and 400 Gray (Gy). One group remained as non infective control. On Day 21 after infection half the animals from each group were sacrifeced and the remainder were challenged with 1000 unirradiated eggs and sacrificed 6 weeks later. During the experiment the chicks were weighted fortnightly. At autopsy the worm burdens were determined for each intestinal segment of chicks from the first and second slaughter. The development of larval stage and the worm length were determined in each different treatment. The results will be discussed.

Supported by CNPq (grant 403597-82VT) and CNEN-Brasil.

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Effect of Concurrent *Ostertagia* and *Trichostrongylus* Infection on the Growth Rate of Lambs.
R. L. COOP*, F. JACKSON and S. E. WRIGHT

The effect of concurrent O. circumcincta and T. vitrinus infection on food intake, growth rate, and serum constituents was studied in 3.5 month old cross-Suffolk lambs. Four groups of 7 lambs were dosed on 5 days each week for 12 weeks with either zero, 1000 T. vitrinus, 2500 O. circumcincta or infected concurrently with 1000 T. vitrinus/2500 O. circumcincta larvae. Overall liveweight gain was reduced by 17, 20 and 30 per cent in the T. vitrinus, O. circumcincta and concurrent groups respectively. A significant reduction in daily dry matter intake (10-13%) occurred between weeks 2 to 6 in the lambs which received Ostertagia alone. Plasma pepsinogen concentration increased in the O. circumcincta and concurrently infected lambs from week 3 onwards, the magnitude of the response being similar in the two groups. When given alone, T. vitrinus infection rapidly lowered the concentration of serum phosphorus (35% reduction by week 4), the values being significantly lower than controls until week 12. In contrast, the decline in phosphorus concentration was more gradual in

the concurrently infected lambs and only differed from the uninfected controls during the final 4 weeks of the trial. At slaughter (week 14) the mean numbers of worms recovered from the concurrent and single infections were 5099, 6656 (T. vitrinus) and 7469, 6727 (O. circumcincta) respectively. Although the extent and severity of the villous atrophy in the small intestine was similar in the T. vitrinus and concurrent group, all the lambs in the former group had large numbers of intraepithelial globule leucocytes in the mucosa of the small intestine (indicative of the development of resistance) whereas IGLs were absent in 4 out of 7 lambs which received concurrent infection. These observations, together with the differences in the rate of decline in serum phosphorus suggest that the lack of an additive effect on performance may be the result of delayed establishment of T. vitrinus in the presence of O. circumcincta.

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Effect of Treatment with Thiabendazole on Hormone Levels in Freshening Dairy Heifers.

T. W. SCHILLHORN VAN VEEN*, J. F. WILLIAMS, R. F. NACHREINER and H. A. TUCKER

Two groups of wormfree Holstein heifers, housed indoors, were used in this experiment.

The animals were allowed to calve. One group of 6 animals was treated with thiabendazole on the day of freshening, the other group was left untreated. Before the first milking a catheter was inserted in the jugular vein. Blood samples were collected at regular intervals from 2 hours before the afternoon milking to 1 hour after milking for 5 days after parturition, and again on days 41 and 42.

Concentrations of the following hormones were measured in the serum samples: gastrin, cortisol, thyroxins, prolactin and growth hormone. Differences in hormone levels were observed within the 2 groups, within the 5-day collection period and, to a lesser extent, between the groups. The gastrin levels generally rose substantially from day 1 to day 5 in most of the heifers. The difference in hormone concentration between the groups will be discussed with respect to a possible pharmacological effect of thiabendazole on milk production.

7

Hemathological and Biochemical Determination on Calves Infected with Parasites of "Tristeza Parasitária Bovina".

JANE G. PINHEIRO*, C. L. MASSARD, G. G. BOTELHO and L. BOECHAT

Twenty-seven one to three months old calves (HPB x GIR), were divided in three groups, to evaluate the hematological and biochemical values during the acute phase of the infection caused by cattle tick fever agents (Babesia spp. and Anaplasma marginale).

The hematological findings were associated with the phase of the infection, observing the first alterations at 5 to 7 days after the experiment start. During the acute phase, the erithrocytes were decreased in values. Morphologically, the red blood cells were macrocytic and normochromic.

The white serie of blood cells have no significative alterations, nor in the total number of these cells.

The biochemical analysis of serum iron, and total iron binding capacity and unsaturated iron binding capacity have no significative alterations, too.

8

IgE, Mast Cells and Other Cellular Reactions in Fascioliasis.

K. PFISTER

Intestinal nematode infections in rats are usually associated with an extensive, T-cell dependent accumulation of mucosal mast cells (MMC). Both, the increase of MMC during or after the expulsion of adult worms, and the systemic secretion of rat mast cell protease II (RMCPII) - a MMC-specific neutral proteinase - during the spontaneous parasite expulsion suggest an active participation of these cells in the host immune response.

Preliminary pathogenetic studies of F. hepatica infections in rats have revealed increased numbers of MMC in infected liver tissue. The possible role of these cells in the host immune response to F. hepatica and their relationsship to the IgE-levels has presently been further investigated:

In rats infected with 20 metacercariae (mc) of F. hepatica and reinfected (20 mc) 4 weeks later, the serum levels of RMCPII - detected by competitive ELISA - rose remarkably after reinfection when compared to primary infections. In order to investigate the origin of the systemic release of RMCPII, both the small intestines (SI) and the livers of infected animals have been processed into extracts. From these extracts, the amount of RMCPII/g of wet tissue has been determined. In primary infections, the SI-levels have increased on day 7 post-infectionem and decreased again on day 28, whereas no similar rise was detectable in the liver. In reinfected rats however, a remarkable increase of RMCPII occurred simultaneously in the small intestine and in the liver 2 weeks post-reinfection.

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Effect of Climate on Fascioliasis Disease Risk and Control in Louisiana.

J. B. MALONE*, T E. WILLIAMS and A. F. LOYACANO

Fasciola hepatica transmission to sentinel calves and snail population dynamics were evaluated over a five-year period to define seasonal transmission trends and to provide a data base for a climate forecasting system for use in Louisiana. Results indicate that most transmission occurs between the months of February - July and that the Thornthwaite water budget can be effectively used as an indicator of climatic effects on annual F. hepatica transmission risk. Using step-wise multiple regression, the average number of flukes found in calves for each 45-day grazing period was related to average or cumulative daily water budget variables calculated for the previous 1.5, 3, 4.5 or 6-month period. The best statistically significant fit to the data was provided by cumulative surplus water over the prior 4.5-month interval, followed by soil moisture storage in the top 2.5 cm zone, storage in the bottom 12.5 cm zone, and raw precipitation data over the prior 4.5 or 6-month period. Surplus water is proposed to be an appropriate indicator of standing water in habitats and flood dispersal of snails. A climate forecasting system based on the Thornthwaite system will be discussed and contrasted to modifications of the 'wet-day' and 'mt' forecasting models used under European conditions.

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The Role of a Paddy Field after Harvest Used by Cattle and Sheep in the Infection with *F. hepatica* in the Southern Region of Rio Grande do Sul, Brazil.

P. C. RODRIGUES, P. C. GONÇALVES*, MARY JANE T. de MATTOS, VIVIANI C. GUTIERRES, R. G. OLIVEIRA and H. UENO

The epidemiological studies on fascioliasis, in particular the importance of an irrigate paddy field used by cattle and sheep after harvest, in the infection with F. hepatica in Rio Grande do Sul, where alternated use of paddy fields and pasture, at intervals of 2 years, is a custom, was investigated and discussed. The experiment was carried out in a farm contaminated with F. hepatica in the border region of Brazil with Republic of Uruguay.

Six crossbred calves aged 3 to 4 month old were medicated twice with Nitroxynil during they had been Kept in a stable and they were iniciated to graze with a 80 beef cattle on a section (30 ha.) of a paddy field (300 ha.) 10 days after harvest (May 26, 1983).

Calves no. 1 and 2 were submitted to post-mortem examinations 33 days after grazing on the paddy field. Respectively 520 and 625 Fasciola were collected from the livers and revealed macroscopical lesions of acute fascioliasis. The most of these flukes were immature (2 to 8 mm long.), however Fasciola eggs were thinly observed in the uterus of 32 flukes (6.2%) from calf no. 1 and 42 flukes (6.7%) from calf no. 2, the maximum size beeing 12 to 14 mm long.

Calves no. 3 and 4 were necropsied 67 days after grazing on

the field and respectively 359 and 282 Fasciola, both immature (80 and 75%) and adult were collected from the livers with lesions. Calves no. 5 and 6 were medicated with Nitroxynil on account a sudden ematiation 47 days after grazing and the calves continue to graze. They were sacrificed 64 days after medication and 23 and 54 immature Fasciola, mainly 4 to 7 mm long were detected in the livers, respectively. The trial had clearly demonstrated that rice straw cutted by the harvestor and weeds grown in the irrigated paddy field, utilized for grazing cattle and sheep shortly after harvested were terribly contaminated with Fasciola metacercariae.

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Studies on the Epizootiology and the Control of Bovine Schistosomiasis japonica at the Region of Mo-Ping Lake, Hunan Province, P.R.C.

XU SHOUTAI*, WU WENMAO, TAI IHONG, and WONG DIPANG

Yukang Commune and its neighboring places along the western coast of Mo-Ping Lake are endemic and enzootic swamp areas of Schistosomiasis japonica that are very difficult to deal with. About 36 islets of the lake, with an area of 359,335 mu altogether and 205,130 mu snail-ridden, are flooded during the summer season but exposed when the flood retreats in winter. The exposed lake islets have been confirmed to be the disease foci of transmission, the schistosomes being perpetuated among water buffaloes and humans that seasonally frequent the islets, where there are so many Oncomelania snails on such a big area that their eradication through molluscicide is not practical.
A system of control measures has been devised and carried on since the end of 1981. It principally involves the medical therapy in accordance with the seasonal dynamics of the infection on the islets. The pilot area of the project covered a much wider area than ever before, because the bovines are usually grazing at far distances.
A survey made in the spring of 1985 revealed that the prevalence rates of water buffaloes had lowered from 7.33% (310/4229) in 1982 to 0.45% (19/4200) in 1985, a reduction of 93.86%. In Yukang Commune alone, the prevalence rates of 0-2 years' buffalo calves had lowered from 10.45% (14/134) in 1982 to 0.46% (1/117) in 1985, a reduction of 91.87%. The positive rates of the bovine faecal droppings on the lake islets had also lowered from 11.54% (104/901) in 1981 to 1.25% (6/479) in 1984, a reduction of 89%. In 1984, a survey on the intermediate host and the infectivity of natural water on grass islets revealed no positive Oncomelania snails and also no positive sentinel mouse.

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What is the Adult *Fasciola hepatica* Doing in the Bile Duct?

M. V. K. SUKHDEO, S. C. SUKHDEO, N. C. SANGSTER* and D. F. METTRICK

The adults of the common liver fluke Fasciola hepatica live in the bile ducts of their hosts. The nature of the worm's food and the mechanics of feeding is controversial. Histological study of specimens quick-frozen in situ show that the worms attach semi-permanently to the mucosa and browse on tissue and blood. [^{3}H]-polyethylene glycol, a marker molecule that is not generally transported across membranes, can be recovered from flukes after intravenous injection of the host rat. The indications are that a major source of F. hepatica nutrients is blood derived. Analysis of behaviour in vitro shows distinct and measurable changes in response to biliary products that may have an effect on the maintenance of site. Present studies will elaborate on uptake rates of blood by the flukes in vivo - a useful parameter in chemotherapy with albumin-bound flukicides.

(Supported by NSERC grant #4667 to DFM)

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Biology of *Lymnaea viatrix* (Orb., 1853).

S. I. M. LARA, G. MULLER*, and F. G. FERNANDEZ

Growth, period of incubation, eclosion, pre-laying and longevity of 224 mollusks of the Lymnaea viatrix species were studied in this work. The mollusks were assembled in four colonies, under laboratory conditions. Colonies 1, 2 and 3 presented three groups of 7, 14 and 23 mollusks respectively, while colony 4 presented two groups of 46 mollusks each. Daily temperature was taken and weekly measurement of shells made throughout the whole life period. Daily gathering of the ovigerous masses was also carried out. Incubation to estimate eclosion revealed a rate of 97,9% in 18.906 eggs and a period of 9,5 - 18 days under mean maximun and minimun temperatures of 18.1 - 22.8ºC and 14.4 - 17.8ºC. Mollusk growth in the four colonies ranged from 6.2 to 9.0 mm. Pre-laying ranged from 28 to 52 days, and longevity from 161 to 200 days.

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Serum Enzyme Activity in Sheep with Subclinical Infections with *Fasciola hepatica*.

GASTON VALENZUELA* and M. J. CLARKSON

In order to study the effects of subclinical infections with Fasciola hepatica on the concentration of serum Sorbitol Dehidrogenase (S.D.H.), Glutamate Dehidrogenase (G.D.H.) and Gamma glutamyl transpeptidase (G.G.T.), yearling welsh cross sheep were infected with low doses of Metacercariae and observed during a period of 21 weeks. Nine sheep were divided into three groups. Group A (uninfected control), Group B, infected with 100 Metacercariae and Group C, infected with 200 Metacercariae.
An increase in serum S.D.H. activity was detected in infected groups by week four after infection, with a peak of 46.9 i.u./l on week nine in Group B and 37.1 i.u./l in Group C compared with 5.5 i.u./l in Group A.
An increase in serum G.D.H. activity was detected by week five after infection in infected groups, with a peak of 46.2 i.u./l on week ten in Group B and 40.3 i.u./l in Group C, compared with 1.0 i.u./l in Group A.
An increase in serum G.G.T. activity was detected on week nine after infection in infected groups with a peak of 85.0 i.u./l in Group C, and 62.1. i.u./l in Group B compared with 14.2 i.u./l in Group A.
The results show serum enzyme activity as a good aid of subclinical infections and the S.D.H. and G.D.H. enzyme activity as a possible aid in the diagnosis of immature infections of Fasciola hepatica.

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Comparison of Indirect Fluorescent Antibody (IFA) with Immunodiffusion Test for Diagnosis of Ovine Fasciolosis.

JAWAD K. KADHIM*, AL-ATTAR and A. T. AYOB

Four lambs, about 10 months old, of Awasi breed, were infected with 1000 viable seven-day-old metacercariae of Fasciola gigantica each. Blood samples were taken from all animals weekly. The serum samples wre used to compare indirect fluorescent antibody (IFA) with immunodiffusion test for diagnosis of ovine fasciolosis. In the adult stage of parasite, digestive and genital secre-

tions were used as antigens for the IFA technique, while antigenic material for adult parasite was seperated for the immunodiffusion test. The IFA technique detected F. gigantica antibodies 1 to 2 weeks earlier than the immunodiffusion test. Both IFA and immunodiffusion test were capabale of recognizing the infection as early as 2 to 4 weeks postinfection. In general IFA titres were at relatively high levels of 1:128 to 1:32 in comparison with immunodiffusion test titres. Although both techniques are laboratory tests, the IFA technique is suggested to have advantages over immunodiffusion test in simplicity and accuracy.

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Comparative Effect of Two Nematode Control Programs for Cattle Grazing Native Pasture.

ALFREDO C. PINHEIRO*, R. A. MUNIZ,
J. B. R. R. MACEDO, and F. A. M. ECHEVARRIA

Seven-months old 1/2 Hereford X 1/2 Zebu calves born in the spring 1981 were weaned (autumn) and allocated at random in 3 groups of 10 animals each.For each treatment there were 2 replicates of 5 animals per paddock. To keep the stocking rate at about 0.7 to 0.8AU ha^{-1}, one animal per paddock was taken out of each of the 6 paddocks in March and again in September, 1983. During the 24 month experimental period 3 treatments were compared: T_1- three administrations of Paratec Bolus(PB) from weaning up to the slaughtering age of 2.5 years(PB at weaning, autumn; at one-year of age, spring and at 18 months of age, autumn); T_2- program recommended by EMBRAPA: 10 drenches from weaning up to the slaughtering age of 2.5 years (6 drenches with levamisole 3.75mg kg^{-1} and 4 drenches with oxfendazole 4.5mg kg^{-1}); T_3- control - treated only *in extremis*. Data on body weight and on worm egg counts were monthly collected from April, 1982 to April, 1984, when the animals were slaughtered. The level of pasture infectivity was determined by 1 tracer per paddock grazing during 3 weeks at every 2 months interval. T_1 and T_2 programs were signifi cantly superior (54kg/steer) to the control. There were non significant differences between T_1 and T_2. Only in one of the evaluations with tracers (spring 1982) it was found a signifi cant higher level of infectivity ($P < 0.05$) of the paddocks grazed by the controls as compared to those of the treated animals. The paddocks in which animals received PB showed a tendency of having lower worm burdens in the tracers during the period immediately after the administration of PB. The cost of EMBRAPA's program (T_2) is equivalent to the price of 4 to 5kg of live body weight per head and the cost of Paratec Bolus program is not known since it is not yet comercially available in Brazil.

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The Efficacy of a Program of Morantel Sustained Release Boluses for the Control of Parasitic Gastroenteritis in Cattle under Different Grazing Systems in Argentina.

RAUL A. MUNIZ*, C. LEDESMA and C. EDDI*

The efficacy of a program of morantel sustained release boluses (MSRB) for the control of parasitic gastroenteritis (PGE) was evaluated in cattle on continuous grazing conditions in Argentina. Simultaneous experiments were conducted from 1982 to 1983, on two farms in the Province of Buenos Aires with different grazing systems. In both trials the animals of the MSRB group received the first bolus in the fall at pasture turn out (April 1982) and the second in the spring (October 1982), while the medicated controls were treated strategically with therapeutic anthelmintics according to normal farm practice. Individual body weights and fecal samples for egg counts were taken at trial initiation and at monthly intervals thereafter. Each group of animals was rotationally grazed among two separate paddocks at time intervals determined by grass growth and farm practice. None of the animals in either group showed signs of clinical PGE throughout either experiment.

In one study, conducted in an extensive grazing system of native pastures (zona de cria), forty, 6 to 7 month-old Aberdeen Angus calves were evenly allotted to two treatment groups. At the end of the experiment (333 days) calves of the MSRB group had gained an average of 31 kg ($P<0.0001$) more than the controls that had received two doses of Levamizole (8 mg/kg). In the other study, conducted in an intensive grazing system of improved pastures (zona de invernada), eighty, 6 to 7 month-old Holstein calves were evenly allotted to two treatment groups. At the end of the experiment (306 days) MSRB medicated calves had gained an average of 61 kg ($P<0.0001$) more than the controls that had received two doses of Fenbendazole (6.6 mg/kg). Throughout both experiments, calves of the MSRB group had a significant reduction in the number of parasite eggs excreted in their feces. It was projected that the control animals from the two experiments would require seven and four additional grazing months, respectively, to reach the same weights as the MSRB groups.

These results demonstrate that the MSRB program tested was very effective in reducing the deposition of parasite eggs and therefore preventing the build up of infective larvae in the pastures, regardless of the grazing system used. The increase in the productivity (26% to 34%) of the animals medicated with the MSRB program, which occurred in the absence of clinical PGE, indicates that subclinical parasitic disease will result in severe and many times unnoticed, economic losses to the producer. Savings in the total grazing time needed to reach market weights in the intensive grazing areas will be economically attractive and will increase the flexibility in the management of these operations.

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Production and Carcass Studies with Control Cattle Exposed to Trichostrongyle Infection Compared with Treatment with Either a Morantel Bolus of Fenbendazole.

JAMES J. PARKINS*, C. M. ENTROCASSO,
J. ARMOUR, K. BAIRDEN and P. N. McWILLIAM

Production, parasitological and carcass studies were conducted over a two year period with Friesian steers following their exposure to trichostrongyle infection (controls) and treatment with either a Morantel sustained release bolus (MSRB) or Fenbendazole (Clean) in each of two consecutive grazing seasons. In the second grazing season the mean liveweight gains of the clean, MSRB treated and a control group of cattle were 105, 131 and 109 kg respectively. The cattle were slaughtered following an indoor final fattening period. At post-mortem the weights of the abomasa and abomasal mucosa together with the pH of the fluid contents were significantly greater in the control cattle compared with either of the two treated groups. Carcass examination showed the dressed carcass weight, major skeletal and leg measurements to be superior in the clean and MSRB treated groups. Importantly, 80% of the clean and MSRB treated cattle graded satisfactorily and qualified for the Beef Premium Scheme subsidy payment whereas less than 30% of the control cattle were successful. Examination of an indicator rib joint showed a lower total weight, eye muscle weight and area together with a higher bone content in the control cattle compared with either of the other two groups.

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Cost/Benefit of Anthelmintic Treatments of Weaned Beef Calves in Different Periods.

WALTER DOS SANTOS LIMA* and M. P. GUIMARÃES

For one year four groups of ten weaned zebu calves in Northeast of Minas Gerais State-Brazil, naturally infected with *Cooperia, Haemonchus, Oesophagostomum* and *Trichostrongylus* were drenched with anthelmintic in different periods.

Monthly the animals were weighed and sampled for faeces in order to make EPG counts and coprocultures.

The calculation of the cost/benefic of the different

treatments was done according to MORRIS(1969). The results are presented below:

Weight gain, periods of anthelmintic treatments and cost/benefit calculations of the four groups of zebu beef calves

GROUP	Treatment period	Weight gain(x)	Return ($)	%
A	July	142kg	164.00	1.55
B	November-April	148kg	171.00	5.40
C	August-December-April	171kg	197.00	21.49
D	-	139kg	160.00	0.00

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The Use of Ivermectin and Levamisole in Beef Cattle Under Pasture and Dry-Lot Conditions.

IVO BIANCHIN*, M. R. HONER, E. G. CARDOSO and Y. A. NASCIMENTO

In Brazil the parasitic helminthosis in beef cattle is more accentuated from weaning until the age of two years. Older animals may also have lower performance due to parasites, mainly when raised in cultivated pastures at high stocking rates. The objective of the present work was to study the vermifuge effect on the performance of 30 to 38 months old steers under pasture and feedlot conditions. In the pasture experiment the steers were kept for 135 days (two consecutive years) in **Brachiaria decumbens** grass in a stocking rate of 2 heads/hectare, from November to March. The steers were distributed to 12 paddocks. Ivomec (22,23 di-hidro avermectin B_1) was applied to the steers in six paddocks and the other six were kept as control. In feedlot, 90 steers were equally distributed to three treatments, during 141 days: 1) The animals were treated for screwworm and ticks; 2) The animals received Ripercol'L besides treatment for screwworm and ticks; 3) The animals received only Ivomec. The dosed steers, under grazing conditions gained 20 kg and 9 kg more than the control group, respectively, in the first and the second years, and it was economic to treat the steers. The feedlot steers in treatments 2 and 3 gained 13,6 kg and 17,5 kg more than the control group ($P<0.01$) and both were economically viable.

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Cattle Parasitosis in the Zona da Mata Region of Minas Gerais State, Brazil: III. A Bio-Economic Analysis of the Use of Anthelmintic in Calves.

JOHN FURLONG*, A. M. da SILVA, R. da S. VERNEQUE, A. L. GARDNER and N. R. BROCKINGTON

During 392 days, 48 castrated male calves (age range 7-12 months) were used to estimate the "Cost/benefit" relation of the use of anthelmintic (Oxfendazole). The treatments were: T1 control, T2 drenched in April and September, similar to the region farm anthelmintic management, T3 drenched strategically in April, July, September and December, T4 drenched every 28 days. Each treatment had three replicate paddocks, with four animals per paddock, blocked by initial body weight. The animals were weighed at 28 day intervals, when faecal and blood samples were also taken. Treatment means for weight gain were: T1 0.285, T2 0.290, T3 0.336 and T4 0.479 g/day. The mean for T4 was significantly different from the means of the other treatments wich did not differ among themselves ($P < 0.05$). The "Cost/benefit" analysis showed that the marginal gain of net benefit was: T2 166% better than T1, T3 1.749% better than T2 and T4 1.054% better than T3. Considering that the value of replacement heifers does not depend only on body weight, but mainly on genetic and body development parameters in the context of whole-herd performance, the analyses of the potential benefits was made using a stochastic simulation model of a dairy production system, representative of the region. This showed that T2 was less economic than T1, T3 was 605% better than T1 and T4 was 497% better than T3. In both analyses, T3 showed the highest net benefit, with optimization of the invested capital.

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Biological Control of Verminosis on Ruminants.

F. G. FERNANDEZ, M. C. A. MEIRELES and A. M. COIMBRA

The biological control of gastrintestinal verminosis is possible with the use of the predator capacity of some fungus against the larva L-3 of nematoid worms.To no-parasitary phase, out of the animal, at the field,is the place where occurs the fight "fungus x larva".The objective is to reduce the infection rate of the pastures by biological control by fungus of the infecting gastrintestinal nematoids,verifying at the same time what is the more effective variety of fungus with the best pondering development. The most appropriate methodology is studied and the most convenient management of the pastures and of the animals within the subject "Biological control".Three parcels of field were previously infected by 8000 L-3/m² of gastrintestinal nematoids.To the first one were added 8000 conidiums/m² of Arthrobotrys oligospora fungus and to the second one 8000 conidiums/m² of Dactylaria thaumasia, the third parcel remains only with L-3.Fifteen days after the contamination of the parcels three lambs free from infection, were put on each parcel. Once a week it was made the control OPG, coproculture and avaliation of the ponderal development. When in any of the parcels the development is affected by the infection rate,it was made the dosification.This treatment will be repeated twelve times during two years.The first four repetitions (August 84 - May 85) showed that the medium period of protection at the parcels with fungus,was 59 days compared to 30 days of the control; the Dactylaria thaumasia was 25% more efficient than Arthrobotrys oligospora; the pondering development of the animals on the parcel with D.thaumasia was 91% superior compared to the control; finally the pondering development of the animals on the parcel with A.oligospora was 76% superior compared to the control.

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Assay on the Anti-Helminthic Activity of Closantel, at the Oral Doses of 10 mg/kg and 25 mg/kg, Against Gastrintestinal Nematodes in Naturally Infected Cattle.

ALVIMAR J. COSTA*, U. F. ROCHA, I. MELITO and D. J. RESENDE

Two groups of calves naturally infected with gastrintestinal nematodes were treated "per os" with a 30% Closantel solution at the doses of 10mg/kg and 25mg/kg respectively and to a 3rd similar group was given only a placebo.
Seven days later the 21 calves were slaughtered, all especies of helminths found were counted "in totum" from each segment of the digestive tube. The abomasa and small intestines were artificially digested. The results were expressed in classes of efficiency (ARMOUR, *J. Pharmacol. basis larg. An. Med.*, 174-209, 1983), as follows:

Especies	Efficiency classes			
	10mg/kg		25mg/kg	
	adults	immature	adults	immature
Haemonchus contortus	A	A	A	A
Haemonchus similis	A	A	A	A
Cooperia punctata	B	A	C	A
Cooperia pectinata	B	U	C	U
Cooperia spatulata	C	A	D	A
Trichostrongylus axei	D	D	C	C
Bunostomum phlebotomum	A	A	A	A
Oesophagostomum radiatum	A	A	A	A
Agriostomum wryburgi	U	U	U	U
Trichuris discolor	D	U	D	U
TOTAL	B	A	B	A

No activity was found against *Dictyocaulus viviparus*, but some efficiency became evident against *Mammomonogamus laryngeus*. No toxic effect was apparent through haematological or haemochemical criteria.

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Seasonal Variation of the Larval Stages of *Dermatobia hominis* on the Santa Catarina Plateau.

V. BELLATO*, C. G. PALOSCHI, A. P. SOUZA, A. A. SARTOR and C. I. RAMOS

In the period from January to December 1985, a group of ten cattle of crossed European breads, five, black hair and five light, were kept in the same paddock with native pasture, without treatment for D. hominis. Every 30 days nodules were counted on the right side each of the animals. At the some time mean monthly temperature and relative humidity were registered. The infestations remained at a low level (average per animal less than 16 nodules) in November in each year; the highest levels, of infestation were seen in January and February. The animals with black hair showed the highest rate of infestation.

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Seasonal Variation of *Boophilus microplus* (CAN. 1887) on the Santa Catarina Plateau.

A. P. SOUZA*, J. C. GONZALES, C. I. RAMOS, C. G. PALOSCHI and A. N. MORAES

During the period from March 1979 to February 1982, a group of 12 adult Flemish cattle was maintained in the same pen with native pasture, without tick dipping. Every 15 days, the young and engorged female stages on the right side of each animal were counted. At the same time, mean monthly temperatures and humidity were recorded. The infestations on the animal showed low levels in the months of August and November, whire the most significant infestation intensities were recorded from January to April. This seasonal fluctuation showed, by simple linear regressive analysis, a strong similarity between the three years, superior to 76%.

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Fluctuation in the Adult Population of *Cochliomyia spp.*.

V. BELLATO*, A. P. SOUZA, A. A. SARTOR and C. M. B. OLIVEIRA

During 1983/84, the fluctuation in the population of adult Cochliomyia spp were measured in a area of 200 ha at Agro-Veterinary Centre (CAV-Lages SC) with wind oriented traps, baited with putrifying liver. Twice a week all captured insects were remove from each trap. In 1983, 29,429 Diptera were captured, of which 9 were C. hominivorax and 67 C. macellaria. In 1984, 40,894 Diptera were captured, of which 11 were C. hominivorax and 367 C. macellaria. The longest C. hominivorax e C. macellaria captures occurred from Novem ber to March.

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Larvae Infesting Power of *Boophilus microplus* (CAN. 1887) under Natural Conditions.

A. P. SOUZA*, C. G. PALOSCHI, V. BELLATO, A. A. SARTOR and C. I. RAMOS

In order to confirm the infestive power of Boophilus microplus larvae in different periods, two groups of five bovines of the Friesian Holstein breed were utilized, free of ticks. After removal of all the animals from a paddock that had a grazing density and management utilized in the area, at intervals of 18 days, a group of five animals was placed in the paddock during 3 days being infected with tick larvae. Afterwards, the animals were removed to a special stable which, permited the collecting of teleoginas. In the periods from December/1982, February/1984 and October/1984, the reduction of the larval populations with infes - ting power were 81.6% in 104 days, 71,3% in 80 days and 89.9% in 127 days, respectively.

28

Arthropods Affecting Livestock and Their Control in Iran.

H. RAK

Systematic studies and determination of Arthropods and Arthropoddborne diseases of livestock in Iran started since 1960. Since then many species of harmful Arthropods have been recorded. Forty species of mites and 38 species of lice and many species of ticks, flies and mosquitoes have been recorded from Iran. The pathogenecities of these arthropods have been studied and efforts have been carried out to erradicate these parasites. According to these investigations mites cause sever damage and losses in livestock and in some cases the severity is so that affects many herds at the same time. Ticks cause sever economic reduction in livstock,s production and without tick control it would be virtually impossible to raise livestock in Iran. Some most important diseases which are transmitted by arthropods in Iran are listed below: Theileriosis, Anaplasmosis, Leishmaniosis, Eperythrozoonosis, Richetsiosis Lecocytozoonosis, different viral diseases in which arthropods play important role as intermediate host both in helminthosis and protozoan diseases. For the control of arthropods(Acarina and Insects) chlorinated hydrocharbon, Phosphorate and Carbamate compounds have been used which in most of the cases the results have been satisfactory.

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Incidence of *Przhevalskiana silenus* (BRAUER) in Goats in South-Eastern Italy.

V. PUCCINI*, P. TASSI and A. GIANGASPERO

Infestation by larvae of goat warble flies Przhevalskiana silenus is wide-spread and its presence has been reported in several countries of the Eastern mediterranean basin (Albany, Greece, Turkey, Israel, Cyprus). In Italy warble-flie infestation was reported in goats by Romboli (1950); he found an overall prevalence of 2-3 per cent infestation of animals slaughtered in Sicily. Larvae could be detected under the skin starting from December. Recently Pugliese and Zanchi (1984) described the presence of warble-flie larvae in goats in Central Italy. In neither case the identification of specie/s involved was given.

Beginning from November 1984 several flocks of goats in South-East Italy were examined for the presence of warbles.

Two hilly areas, 300-800 m a.s.l., and separated by a 200 km flat area were found to be infested. First walnut-sized lumps were evident on backs of goats at the end of December 1984. Grubs begun to fall from the second week of February until the beginning of April 1985. No larvae were found on any goats since then.

Inside individual flocks, the incidence of infestation ranged from 5 to 30 per cent of animals. No relationship appeared to exist between the age of goat and the presence of warbles. The number of warbles on each infected animal ranged from one to twelve.

Eighty-two third instar larvae were obtained from living goats and they were identified as Przhevalskiana silenus (BRAUER). Differences on presence, number, position and size of teeth above the mouth-dots and ventral spinulation of the fifth body segment confirmed morphological variability of the specie.

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Prevalence and Intensity of Infestation by *Boophilus microplus* (Canestrini, 1887), under Natural Conditions, in Buffalos in State Mato Grosso do Sul, Brazil.

WILMA A. STARKE*, U. F. ROCHA, R. Z. MACHADO and M. C. ZOCOLLER

In order to study prevalence and intensity of infestations, by *Boophilus microplus* (Canestrini, 1887) under natural conditions, in buffalos in State Mato Grosso do Sul, Brazil were taken 10 buffalos (7 males and 3 females), mixed (Murrah x Mediterranio), they're born in the months of January to March of 1982. During the period of one year, from August of 1983 to August of 1984. Weekly, these animals were reunited in order to collect parasitic stages from ticks (larvae, nymph, males and females) following the methodology proposed by OBA y ROCHA (1971). Furthermore, the instar partenogina (more than 4,5 mm long) were counted, adopting the left side of the animal. Thus, it was verified that the peak of infestations by *B. microplus* ticks in buffalos occurred during the dry season (with pluvial precipitation alternating from 0,0 to 60,7 mm, from April until August, reaching the peak in the month of May, in that region. On the other hand, the buffalos were consideres resistants to *B. microplus*, considering that from the ticks counted, only 4,03% reached the adult stage. The monthly average number of the instar partenogina kept in relatively low levels just about the whole year.

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Control of Helminthosis in Sheep by Strategic Treatment with Closantel and Broad-Spectrum Anthelmintics.

K. M. DASH*, S. LOVE, E. HALL and R. L. NEWMAN

Haemonchus contortus and Trichostrongylus colubriformis are the most important nematode parasites of sheep in the Northern Tablelands of New South Wales. Broad-spectrum anthelmintic treatment of ewes in August (pre-lambing) and November, and of lambs in November and February (weaning), has been shown to be effective in controlling infections in lambs with T.colubriformis but to be relatively ineffective in controlling H.contortus. The failure to control H.contortus was probably a major reason why sheep producers abandoned this 'traditional' program in favour of frequent anthelmintic treatment, often at intervals of 4 weeks or less in lambs and 8 weeks or less in ewes. Resistance to some of the commonly used broad-spectrum anthelmintics is now prevalent in field strains of T.colubriformis.

Treatment of ewes and lambs with closantel (7.5 mg/kg) at these 'traditional' times was found to be highly effective in controlling infections with H.contortus but ineffective against T.colubriformis. Concurrent treatment with broad-spectrum anthelmintic and closantel was effective against both species.

A strategic treatment program (the Wormkill program) was developed based on the 'traditional' program with the addition of closantel to control H.contortus. Our aim was to reduce the frequency of treatment with broad-spectrum anthelmintics and so retard selection for anthelmintic resistance. The program, supported by a comprehensive advisory and diagnostic service, was introduced to sheep producers in July 1984. In a survey conducted in August-October 1984, 74 per cent of producers sampled indicated that they had adopted the program for all sheep on the farm. In February 1985, 78 per cent indicated that they intended to begin or continue the program in 1985/86.

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***Nematodirus spathiger* Resistance to Benzimidazole in Sheep an Rio Grande do Sul, Brazil.**

U. C. da COSTA*, S. F. BENEVENGA and M. A. M. SANTIAGO

An anthelmintic test was carried out in sheep at Uruguaiana, Rio Grande do Sul, Brazil to confirm the resistance of Nematodirus spathiger to benzimidazole. Thirty five naturally infected sheep were distributed in seven groups. Febendazole (5,0 mg/kg); thiabendazole (44,0 mg/kg); parbendazole (15,0 mg/kg); albendazole (3,8 mg/kg); oxfendazole (4,5 mg/kg); febantel (5,0 mg/kg) and a control group were used. These drugs eliminated respectively 75.8%; 70.7%; 48.2%; 42.6%; 12.3% and 10.2% of the helminth population.

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Anthelmintic Activity of Ivermectin in *Haemonchus contortus* Resistant to Benzimidazole and *Trichostrongylus colubriformis* Resistant to Levamizole.

M. A. SANTIAGO*, U. C. da COSTA and S. F. BENEVENGA

A comparative trial with Ivermectin oral and injectable at 200 mcg/kg dosage was done in a group of Haemonchus contortus resistant to benzimidazole. Ivermectin oral and injectable eliminated 100% of Haemonchus contortus.
Albendazole eliminated 56.9%; Fenbendazole 33.6%; Febantel 30.6% Parbendazole 16.1%; Oxfendazole 13.7%.
The elimination of Trichostrongylus colubriformis resistant to Levamisole was of 100% with Ivermectin oral and 93.9% with Ivermectin injectable. Levamisole oral at 7.5 mg/kg dosage eliminated only 43.9% of these strains.

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Synergistic Action of Albendazole, Fenbendazole and Profenofos in the Treatment of Benzimidazole-Resistant Adult *Haemonchus contortus* in Sheep.

FLÁVIO A. M. ECHEVARRIA* and A. C. PINHEIRO

The anthelmintic efficacy of albendazole (ABZ) and fenbendazole (FBZ) associated or not to the organophosphate profenofos (PROF) was tested against a benzimidazole resistant strain of *Haemonchus contortus* in sheep.
Sixty-four one year old Corriedale wethers were infected *per os* with 5.000 *H. contortus* third stage larvae of a benzimidazole resistant strain (BZ-R). On day 28 after infection, on the basis of their worm egg counts (EPG), they were allocated to eight treatments and orally drenched as follow: 1- ABZ, 5mg/kg; 2- FBZ, 5mg/kg; 3- PROF, 10mg/kg; 4- ABZ/PROF combination, 5/10mg/kg; 5- FBZ/PROF combination, 5/10mg/kg; 6 and 7- PROF + ABZ and PROF + FBZ mean concurrent administration of profenofos drench with respective doses of Valbovino (ALB) and Panacur (FBZ); 8- untreated controls. The dose of anthelmintic administered to each sheep was calculed from its body weight and 7 days after the treatment all animals were slaughtered for total worm counts.
The mean worm burden from the animals treated with ABZ and FBZ at 5mg/kg were not significantly different from the worm counts in the control group ($P > 0.05$) which stresses the high degree of benzimidazole resistance in the strain of *Haemonchus* used in this trial. Profenofos when administered alone had an efficacy of 85.3% which was not significantly different ($P>0.05$) from the reductions obtained with ABZ/PROF combination (95.5%) and with associations of ABZ + PROF (92.6%) and FBZ + PROF (93.4%). The FBZ/PROF combination was significantly ($P < 0.05$) better than others as it reduced the worm burdens by 98.9%. These results showed that the efficacy of the benzimidazoles can be improved quite markedly when they are associated to profenofos for the control of BZ-R adult *H. contortus* in sheep.

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The Paratect Bolus System: Assessment of the Effect of its Continued Use on the Susceptibility of Field Strains of *Ostertagia ostertagi* and *Cooperia oncophora* to Morantel.

R. M. JONES

The Paratect bolus system for the control of parasitic gastroenteritis in grazing cattle has been under trial on the Pfizer research farm in Kent, U.K. for seven consecutive years and on four commercial farms, two in U.K., one in Austria and one in Sweden, since 1979. These studies were undertaken primarily to assess the effectiveness of the system in continuous use by comparing the performance of bolus treated animals consecutively grazing one half of divided pastures with untreated animals grazing the other half. However the susceptibility to morantel of the exposed and unexposed populations of parasites was also measured year by year and the results are the subject of this paper. At the research farm half of each of the two groups of principal calves (which had grazed throughout the season) were given a discriminating dose of morantel tartrate at housing. All the animals were slaughtered one week later, and comparison of the helminth burdens of dosed and undosed Paratect bolus treated and dosed and undosed control animals, gave a measure of the relative susceptibility of the two populations of Ostertagia ostertagi and Cooperia oncophora at the end of each year of bolus use. At the commercial farm groups of tracer calves were put out onto the bolus and control paddocks with the principals towards the end of the grazing season and subjected to the procedure described for principal animals above to assess relative susceptibilities.

Results indicate that there has been no change in the susceptibility of O.ostertagi and C.oncophora at any site.

Also the progressive reduction in pasture contamination produced by the bolus has resulted in low helminth burdens in animals grazing the bolus pastures. This means that the procedure of using groups of 10 calves on each paddock and their further subdivision into groups of 5 does not now permit a valid definitive assessment of relative susceptibilities on farms after the bolus has been used for four years or more. It is proposed that future assessments will be made using an in-vitro larvicidal screen.

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Morantel Sustained Release Bolus – Effects on Infection, Pasture Contamination and Performance During Six Years Use in First Year Grazing Cattle.

M. TORNQUIST* and S. T. TOLLING

Twentyfour to thirty calves were allotted into two groups and turned out at the end of May on a pasture divided into two equal areas. Each group grazed their separated area of the pasture every year. The M.S.R.B. was administered to one group on the day before turnout. The fecal egg-output, the herbage larval contamination and the weight was registered every third week. After housing in October each group was kept in boxes and fed controlled rations of concentrates, whey and hay. The calves were weighed at monthly intervals until the first animals were sent to slaughter. The parasitic infections of the calves varied from year to year. No cases of clinical ostertagiasis type I were observed in the control calves during the grazing season, but one year (1983) clinical signs occurred two weeks after housing. The number of overwintering larvae was influenced by the pasture contamination the previous season and the climatic conditions during winter and spring. The fecal egg-output during the grazing season did not reflect the level of pasture contamination at turnout. The build-up of pasture contamination during the later part of the grazing season was influenced by the climatic conditions. The fecal egg-output of the treated calves was low during the entire grazing season resulting in a significantly reduced pasture contamination. A significantly reduced live-weight gain in the control calves could be demonstrated at housing five of the six years. When heavily infected at housing the performance of the control calves was still influenced negatively during the fattening period indoors.

37

Development of a Biochemical Assay for the Detection of Benzimidazole Resistance.

ERNEST LACEY

The occurrence of resistance to benzimidazole (BZ) anthelmintics is a major therapeutic problem in the treatment of domestic animals for strongylid nematode infections. Recently, work in this laboratory has demonstrated that resistance is due to a reduced affinity of the benzimidazoles for the tubulin of resistant strains of Haemonchus contortus, Trichostrongylus colubriformis and Ostertagia circumcincta. This observation has enabled the development of a rapid in vitro diagnostic assay for the detection of nematode susceptibility and resistance to this class which possesses a number of inherent advantages over existing techniques such as egg-hatch, faecal egg depression and drench/slaughter assays.

Based on the stability of the benzimidazole carbamate - nematode tubulin ligand to charcoal extraction, the binding of tritiated BZ's to tubulin can be readily assayed, S binding from 5 to 60 times the quantity of label to that of R isolates depending on the BZ used. The binding can be carried out using either adult, larvae or egg tissue with the sensitivity to detect resistance in an individual adult nematodes or 1,000 L_3 larvae. Using this technique, the extend of BZ resistance in field isolates subjected to various anthelmintic treatment(s) has been investigated to illustrate the method.

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Resistance of Indigenous Sheep in Zimbabwe to *Haemonchus contortus*.

R. L. McKENZIE

A group of indigenous sheep that had not previously been exposed to helminths was artificially infested with approximately 5 000 third stage larvae of the helminth Haemonchus contortus. For comparative purposes a group of Dorper sheep (a breed developed from crossing Black Head Persian with Dorset Horn), was similarly infected. Faeces samples for determination of helminth egg counts were collected at 5 day intervals from all sheep in both groups for a period of 10 weeks.

Both groups of sheep were housed on concrete during the period of the trial and were not allowed access to natural grazing. They were fed on a concentrate containing 16% protein with free access to hay. The animals were not stressed nutritionally during the trial. The faecal egg counts in the indigenous group peaked 4 weeks after infestation to a level of 2,300 E.P.G., dropping at the end of the trial to 490 E.P.G. The E.P.G. in the comparative group was continuing to rise when the trial was discontinued and was at a level of 1 775 E.P.G.

Both groups of sheep were slaughtered at the end of the trial and the number of adult parasites present determined by examination of the abomasal ingesta and by digestion of the abomasal mucosa.

An average of 107 adult H. contortus were detected in the indigenous group and 282 in the Dorper.

This trial would indicate that the indigenous sheep have an innate resistance to this particular parasite, which is not related to previous exposure.

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Glucose Transport of Benzimidazole – Sensitive and Resistance Adult *Haemonchus contortus in vitro:* Effects of Benzimidazole and Known Microtubular Interrupters.

ROBERT S. REW* and K. PRICHARD

Dose-response curves generated following 'in vitro' expo-

sure of H. contortus to one of three benzimidazoles (BZ), colchicine (COL), one of three colchicine analogs (COL-A) or podophyllotoxin (PD), for 4 hours demonstrated dose-related inhibition of ^{14}C-3-O-methyl glucose transport from a salt medium containing 2 mM D-glucose. Concentration ranges for 0-40% inhibition of total transport were as follows: mebendazole (0.1 - 10μM), PD and oxfendazole (0.5 - 50μM), and thiabendazole, COL, and COL-A (1 - 100 μM). Glucose transport of a BZ-resistant strain of H. contortus was less effectively inhibited than a BZ-sensitive strain by all of the compounds tested. Concentrations of drugs needed to inhibit 3-O-methylglucose to an equivalent extent in the BZ-resistant strain were 1 to 8 times higher than in a BZ-sensitive strain. These data indicate that under the conditions of assay, BZ-resistant H. contortus can transport glucose more effectively in the presence of the drug than BZ-sensitive worms. This property may aid the resistant strain to survive under drug pressure, and, since microtubular interrupters (COL, COL-A, PD) and BZ's show similar inhibition responses, the mode of resistance may involve an alteration in microtubular structure or microtubular-dependent functions.

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The Significance and Control of Tick-Borne Diseases in British Sheep.

G. M. URQUHART*, T. A. BRODIE and P. H. HOLMES

In the United Kingdom, the tick Ixodes ricinus is responsible for the transmission to sheep of tick-borne fever (TBF), a rickettsial infection caused by Cytoecetes phagocytophila and louping-ill, an arbovirus infection, and is indirectly associated with tick pyaemia, a common staphylococcal infection of young lambs.

The role of TBF as a pathogen in its own right and its significance in predisposing to pasteurellosis will be discussed and experimental results describing a hitherto undescribed fatal syndrome associated with concurrent TBF and louping-ill presented.

Finally, observations on the control of tick pyaemia with acaricidal dips and with tetracycline antibiotics will be reviewed.

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The Effect of Sulphur on the Parasite Burden of *Boophilus microplus* (Canestrini, 1887) in Cattle.

JOHN FURLONG*, M. de S. DAYRELL and J. C. VILAS NOVAS

In order to verify the influence of Sulphur on the parasite burden of B. microplus in cattle, a trial was conducted using 20 steers 7/8 Holstein x Zebu, with initial average body weight of 214 kg, allocated in two treatments (A and B). The animals were fed a diet composed of chopped elephant grass (Pennisetum purpureum, Schum), ad libitum, plus 1 kg/animal/day of wheat meal. Treatment (A) received .9% of flowers of Sulphur (96% of S) in the concentrate and Treatment (B) concentrate alone. Five days after commencing this diet, four infestations of B. microplus were done, at fortnightly intervals, with approximately 20.000 lavae (1 g of eggs). After allowing the tick populations to come into equilibrium during the period of the first two infestations, the number of engorged females (4.5 - 8.0 mm) on the right side of each animal was counted daily, from the 19th to the 23th day, following the third and fourth infestations. The analysis of variance showed no significant difference between the treatments ($P > 0.05$). The estimated mean number of ticks per animal was 119.04 in treatment (A) and 156.32 in treatment (B), with a coeficient of variation of 45.78%.

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New Approach to *Dermatobia hominis* Control.

L. F. URIBE

Dermatobia hominis, Linnaeus, Jr., 1781 (L. Jr.), the warble fly larva of the Latin American continent, is one of the parasites responsible not only for great amount of production losses in cattle reared normally between 200 to 1,500 mts. altitude where the fly is most predominant, but for limiting the selection or the introduction of more selected cattle breeds into these areas. Control of D. hominis has not been easy, having been restricted to the use of several types of insecticides to kill the larval stages in the reservoir host, without providing any type of protection against reinfestation.

The new compound ivermectin (IVOMEC®, MSD AGVET) has been very effective in the control of D. hominis. This compound belongs to the group of the avermectins, substances obtained from the fermentation of a novel species of actinomycete, Streptomyces avermitilis, which have exhibited a potent activity against endo- and ectoparasites.

To confirm previous results, three closely controlled trials were conducted on the efficacy of the compound, and two on its persistent effect against the different larval stages of the fly D. hominis (L. Jr.) in cattle. (In one trial comparison was made to ivermectin in another formulation, and in another, comparison was made with closantel.)

The overall efficacy of the compound, at the therapeutic dose rate of 200 mcg/kg, against the three larval stages (L_1, L_2, L_3) of the parasite in Zebu, Angus and local (Romosinuano and cross) breeds of cattle was 99%. The mean efficacy against the individual larval stages was L_1 and L_2--100% and L_3--98%. In respect to its persistent effect measured on very susceptible breeds of cattle (Angus and Romosinuano) to the parasite and in the presence of continuous natural challenge, as evidenced by untreated or closantel control treatment groups, no reinfesting larvae were observed up till day 44 and only on day 59 the first L_2 larvae were detected infesting 16.7 to 20% of the cattle, while the presence of the first L_3 larvae were only observed on day 72 post-treatment infesting only 33.3 to 40% of the cattle treated with one dose of the compound at the therapeutic level of 200 mcg/kg.

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The Use of Amitraz in Integrated Methods for Control of Sarcoptic Mange and Lice in Swine.

S. M. GAAFAR* and R. E. WILLIAMS

A system of double spraying of all animals in the herd and dipping of the weanlings in 0.05% concentrations of Amitraz has been devised to integrate with the routine operations of swine farms. Any animals added to the herd and sows before farrowing have to be sprayed twice with 10-14 days between the sprayings. This system was successful in four farm operations in Indiana, USA, when it was carefully followed. It was easily accepted by the swine breeders as it minimally interferes with the other procedures practiced in the herds. Spraying of the pregnant sows and new additions coincided with moving them to different quarters and dipping of the piglets was done at the time of weaning.

Amitraz is effective, comparatively safe, and has a desirable residual effect. When its use was coupled with strategic timing and consistency, the method controlled sarcoptic mange and lice infestations in the herds during the past 2 years.

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Characterization of Alphamethrin as a new tickicide for use in cattle in Brazil.

E.M. ROCHA and L. GRISI*

The efficacy of alphamethrin (FMC 65318) a synthetic pyrethroid was evaluated *in vitro* and *in vivo* against *Bocphilus microplus* in Rio de Janeiro State, Brasil. *In vitro* studies using engorged females a IC_{50} of 2.6 ppm was obtained, demonstrating a high activity for the inhibition of egg-laying, as well as sterilization of eggs. Unfed larvae showed a high sensibility to the pyrethroid, since a LC_{50} of 0.052 ppm was observed.

In stable tests, treatments of cattle with a spray formulation at 30 ppm, 35 ppm and 40 ppm showed a rapid

decrease on the percentage of females surviving treatment from second day post-treatment, reaching a reduction of 100% from the third day at 40 ppm. Four field trials were conducted on cattle naturally infested with *B. microplus* with various concentrations of alphamethrin using a manual pump for spraying. The cumulative efficacy of alphamethrin at 50 ppm was 99.5% from day 4 to 24 after treatment, with a residual period of activity of 7 to 11 days. Alphamethrin showed an excellent activity against all stages of the cattle tick *Boophilus microplus*.

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The Control of Cattle Mange Mits in Southern Africa Using the Systemic Parasiticide, Ivermectin.

M. D. SOLL*, I. H. CARMICHAEL, G. E. SWAN and H. SCHERER

Seven trials involving 768 cattle were conducted in South Africa and South West Africa/Namibia to evaluate the efficacy of the systemic parasiticide, ivermectin, when administered subcutaneously at a dose rate of 200 mg/kg, against sarcoptic (Sarcoptes scabiei var. bovis), psoroptic (Psoroptes ovis var. bovis), and chorioptic (Chorioptes bovis) mange mites and when administered orally at 200 mg/kg against S. scabiei.
Efficacy of ivermectin following subcutaneous injection against sarcoptic mange was 100% seven days after treatment. Given orally it did not result in complete elimination of the mites.
Ivermectin given subcutaneously against psoroptic mange was 100% effective 56 days after treatment. The number of cases in two large herds of which 42.4% of 724 animals were clinically affected prior to a single treatment was reduced by 99.3%. Among the 666 cattle mustered 17 to 27 weeks after treatment, mites were recovered from one animal. The cattle were not individually identified and thus the affected individual may not have been treated under the extensive conditions of the trial.
Chorioptic mange mites were markedly reduced in number following either a single ivermectin treatment or a repeated treatment 14 days later, but they were not completely eliminated. This is ascribed to the more superficial feeding habits of these mites.
The apparent prevalence of cattle mange and prospects for control and eradication in southern Africa are discussed.

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Use of Insecticidal Ear Tags in Cattle and Swine.

RALPH E. WILLIAMS* and S. M. GAAFAR

Trials have been conducted evaluating insecticides impregnated in ear tag devices for use on beef cattle and swine. In cattle, efforts were made to evaluate control of face flies, Musca autumnalis De Geer, and horn flies, Haematobia irritans (L.), in pasture situations. In swine efforts were made to control hog lice, Haematopinus suis (L.), and sarcoptic mange mites, Sarcoptes scabiei (De Geer). In the cattle trials ear tags impregnated with amitraz, crotoxyphos, deltamethrin, fenvalerate, flucythrinate, and permethrin were tested. These trials were conducted on mixed breed Angus and mixed breed Hereford females with calves on beef farms operated by Purdue University's Agricultural Experiment Station. Ear tag treatment were applied in June or July in each trial and fly counts made weekly through mid-September. Fly control varied considerably depending on the insecticide tag treatment used. In trials with tags incorporating pyrethroids (deltamethrin, fenvalerate, flucythrinate and permethrin) face fly control averaged from 46-97% and horn fly control averaged from 87-99%. In trials using crotoxyhos ear tags face fly control averaged from 0-41% and horn fly control averaged from 53-73%. Very little control was obtained from amitraz ear tags (face fly- 3%, horn fly- 24%). In the swine trials ear tags impregnated with amitraz, flucythrinate, and permethrin were evaluated. In all trials total control of both hog lice and sarcoptic mange mites were obtained with the treatments.

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Efficacy of Ivermectin in Control of Louse *(Haematopinus tuberculatus)* in Buffaloes,

HUGO D. LAU* and N. P. SINGH

The roll of ivermectin in control of buffalo louse is not well documented. In view of the especies differenciation, a study on the efficacy of ivermectin for the control of buffalo louse in naturally infested cases was thus undertaken. Three lots of buffalo calves, each with 20 animals of 2-6 months age and both the sexes were used as: untreated control (Lot I), treated with ivermectin 0.2 mg/kg live weight (Lot II) and 0.4 mg/kg of live weight (Lot III), administered subcutaneously The number of louse present was counted on each animal at day 0 and thereafter on days 7, 14, 21, 33 and 45. All the animals remained together throughout the whole experimentation under similar conditions of management. The percent efficacy of the treatment on post-experimentation days was observed respectively to be 85, 80, 50, 45 and 0 in Lot II and 100, 100, 70, 50 and 50 in Lot III. All the animals in Lot I remained infested with louse for throughout the study. Statistically Lot III presented a significant decrease in louse population as compared to Lot II or I. The treatment being 100 per cent effective in Lot III upto 14 days, it is considered that reinfestation at the later stages occured through the control group contact. A dose of 0.4 mg of ivermectin per kg live weight presented a better control measure for pediculosis in buffaloes.

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The Anti-Tick Activity of an Orally Administered 30% Solution of Closantel Upon *Boophilus microplus* (CANESTRINI).

ALVIMAR J. COSTA*, O. T. VASCONCELOS, U. F. ROCHA and D. J. RESENDE

24 Holstein cows naturally infested by *B. microplus* were submitted to the counting of tick females longer than 4mm on their left side, after what they were ranged into 4 groups of 6 cows each according to their decrescent average length. From each of these groups one cow was sorted as control and the other three were casually destined to be treated respectivelly with a closantel drench at the doses of 20,0mg/kg, 22,5mg/kg and 25,0mg/kg on the days 0 (zero), 30 and 60 of the experiment. The control cows were drenched with a placebo. From the first to the 100th days dayly counts of tick females 4mm long or larger were registered for each cow; every 5 days larvae, nymphs and adult tick samples contained in a 10cm circle drawn on each cow were collected and counted; also at every 5 days the largest engorged tick females eventually found on the cows were collected and put in a vial to lay their eggs; the incubation of such eggs was observed under laboratory conditions to determine the fertility rate. The assay results were statistically analised and interpreted as follows: 1- at the employed doses Closantel exerted expulsion activity against nymphs and adult forms of *B. microplus*, but not against larvae, no significant difference being found for different doses; 2- the drug showed a negative period of 13, 10 and 10 days, after the 1st, 2rd and 3rd treatments respectively; 3- engorged tick females that

eventually survived in treated hosts did not show any significant difference in egg-laying capacity when compared with controls, but their eggs were significantly less fertile, so revealing an ixodostatic anti-embryogenic effect of Closantel upon *B. microplus*; 4- in four different occasions haemochemical exam (urea, GOT, GPT, creatinina LDH, glycose and seric protein), showed no significant alterations in the animals treated with Closantel.

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Examination of Boticide Effects of Strongid Plus (Pfizer) in Hungarian Sport Studs Infected by Unknown Degree of *Gasterophilus intestinalis* (de Geer, 1776).

EGRI BORISZ

Author's examinations were made on 81 heads of o,6-5 years old stud-colts, on 3 heads of 12-14 years old stallions, 14 heads of 3-14 years old castrated horses;altogether on 98 heads of Nonius, Hungarian/Kisbér/-halfbred and Gidran species. "A" trial group contained mainly Nonius, "B" trial group contained halfbreds of Kisbér and Gidran, 49-49 heads in them alike.The Gasterophilus intestinalis larva-infectedness of the stock was unknown, but from the author's previous observation the egg-number put onto the groups of horses was known/in "A" group 6425 pieces, in "B" group 397 pieces/.The examined stocks were treated per os by 1 ml/1o kg bwth Strongid Plus/Pfizer/ specific contained pyrantel pamoat and trichlorfon.The application of Strogid Plus for the 98 heads of horses required 93 minutes.After the application of the specific during 72 hours in two-hours intervals were examined the process and intensity of the larva-emptying of horses.In course of this test 2941 pieces of excrement-sample were analysed. In the excrements 3082 G.intestinal larvae (L_2+L_3) were found ,from which $L_2$was 194 pieces (6,294 %). The total quantity of larvae by stock was the following: In group "A":2918 pieces (average 62,08 larvae/horse),in group "B": 164 pieces (average 3,35 larvae/horse). The most intensive larva-emptying was observed in group "A".between the 33-37 hours of the trial (444 L_3+L_2),in group "B"between the 42-48 hours (57 L_3). During the use of specific (which can be applicated and dosed safely and adheres to the tongue of horses well) as side-effect increased flatulation was observed at 31 horses (31,64 %) and diarrhoea at 9 horses (9,18 %).

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Regional Distribution of Helminth Parasites of Domestic Animals in Brazil.

HELIO MARTINS DE A. COSTA*, A. C. R. LEITE and M. P. GUIMARÃES, W. S. LIMA

It is presented a check list of helminth parasites of domestic animals of Brazil with more than 600 references. 44 species of helminth parasites of horses, 10 of donkeys, 19 of mules, 51 of cattle,22 of bufallos, 46 of sheep, 33 of goats, 27 of pigs, 29 of dogs, 26 of cats, 5 of rabbits, 1 of guinea pigs, 48 of hens, 9 of pigeons, 15 of ducks, 18 of turkeys, 10 of wild ducks, 1 of geese, 5 of peacocks; 3 of faisons and 9 of guinea fowl are listed.

The species of helminths are listed accorging to the hostw, the place of origin, the parasitized organ and the references are given.

The citations follow Yamaguti's "Systema Helminthum" (1958-1961).

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Epidemiology and Control of the Principal Helminths of Laboratory Mice

I. C. SILVA SANTOS*, C. J. SCAINI, R. P. REGINATO and V. H. CERESÉR

The present study has been conducted in a Bioterium located near Porto Alegre city, State of Rio Grande do Sul, Brazil. The investigations were done to identify and to control helminths naturally found in mice from the Bioterium. Parasithological exams in feces by salt-flotoation and cellophane-tape anal smear technique were carried out for diagnosis of Oxiurides. 113 out of 240 mice showed positive results (47.08%). Investigations were made when mice were one to five weeks and two to eight months old. Results have been completed with necropsy findings of mature and imature worms. Imature worms Syphacia obvelata RUDOLPHI, 1802, were found in 33,40% of 3 weeks old mice. Infection by Aspicularis tetraptera were seen in 4 weeks old mice, extending to the 32nd week. It was found 58.34% of infection by Aspicularis tetraptera in 8 months old mice. Hymenolepis nana V.SIEBOLD, 1952 was detected in 4 weeks old mice, reaching 78% in mice at the age of two months. It was also found two species of tapeworms belonging to the family Hymenolepedidae that are object of studies. It was concluded from parasithological exams of feces, that domestic rats Mus musculus brevirostris, WATERHOUSE, 1837 and Rattus rattus alexandrinus, I.GEOFFROY, 1813 are very important in the epidemiology of helminthosis in laboratory mice. A drug of Dietilendiamine compound was used against Oxiurids infection, 417 mg/250 ml of water given to 10 mice, showing 100% efficiency against Syphacia obvelata. The efficiency of this compound against Aspicularis tetraptera will be studied.

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Survival and Migration of Larvae of Bovine Gastrointestinal Nematode During the Dry and Wet Seasons in the Cerrados of the Federal District, Brazil.

THELMA M. SAUERESSIG

Trials were carried out during the dry and wet seasons in the tropical savanna (Cerrados) area of the Federal District of Brazil in order to observe development and migration of larvae of bovine gastrintestinal nematode on plots of two grasses species i.e.,Brachiaria decumbens and Andropogon gayanus. Dung pats of 2 kg were deposited monthly in the centre of grass plots measuring 2m². Following inoculation, samples of dung and grass were collected and analyzed at weekly intervals. Samples of A.gayanus were stratified into three heights from soil surface (15, 30 and 40 cm) in order to observe the migratory process of infective larvae on the grass. Metreological data were recorded from the principal station of the Research Centre. Infective larvae survived for a longer period on the pasture during the wet season. In B.decumbens the maximum period of survival of infective larvae was 16 weeks on both dung pats and grass plots. In A.gayanus the maximum period of survival was 18 weeks on grass plots and 19 weeks on dung pats. It was also observed that migration and survival of infective larvae tended to be higher at heights of 15 and 30 cm on A. gayanus. Larval migration from dung pats to pasture was prevented in the absence of rains or under low rainfall conditions. It was observed in the region studied that dung pats offer survival conditions to free living stages of gastrintestinal nematodes during the dry season.

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Geographical Distribution of *Mammomonogamus spp.* Ryzhikov, 1948, in Domestic Cattle from Chiapas State, Mexico.

EMILIA VALERIO-CUENCA and R. ANGEL MEJIA-GARCIA*

This paper reports the geographical distribution of Mammomonogamus spp. in cattle from five of the seven differents geographical regions in which Chiapas State, Mexico, is divided. Larynx and pharynx from 456 slaugthered cattle were collected and examinated. Parasites were found in samples from 77 animals. A total of 517 coupled specimens, males-females, were recovered. The species identified were M. laryngeus (52.2%) and M. nasicola (47.8%).
M. laryngeus was present in only four regions. The percentage was higher in the south coast side than in the north and the middle regions. The study showed that M. laryngeus appeared mostly in flat region near the seashore.
M. nasicola was found in samples from five regions and its main distribution was in the north and in the middle of the State.
Both species were found in the north and in the middle regions.

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Prevailing Helminths in Bovines of North-East Sandy Zone of Paraná State, Brazil.

WALDIR HAMANN and BRAZ FREITAS FERNANDES*

Beef cattle properties in Paraná State are concentrated in north-east region. That region is characterized by a hot climate, moderated rainfall, sandy soils and the pasture is basically constituted by cultivated grass(Panicum maximum). The cattle is extensivelly raised and the prevailing breed is Brahman(Nelore). There is no data about helminths in Paraná State, so it was decided to start an experiment to study the prevalence of bovine endoparasites in that region. Up to now it was analysed 320 fecal samples from cattle of different ages. They were submited to an egg research, fecal culture and larvae identification. It was found the folowing prevalences rates: Haemoncus sp 47,68%, Cooperia sp 72,18%, Trichostrongylus sp 42,18%, Oesophagostomum sp 36,56%, Strongyloides sp 30,62%, Bunostomum sp 21,50%. Moniezia sp 17,81%, Trichuris sp 16,87% and Eurytrema sp 2,18%. Strongyloides with the mean prevalence of 30,62% had, as it was expected, an irregular distribution; in calves with less than 6 month the prevalence was 57,7% decreasing until zero level in animals above two years old. For others helminths the differences in prevalence observed according to the different ages were not significants. The low prevalence of Eurytrema does not reflect the reality since this parasite, in spite of being present in that region it is very difficult to demonstrate in fecal examinations. An interesting fact was the absence of Neoascaris in calves in that region contrasting with the high prevalence normally found in the coast and in others regions of Paraná State.

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Some Considerations About Bovine and Buffalo Helminthiasis in Coast of Paraná State, Brazil.

BRAZ FREITAS FERNANDES* and WALDIR HAMANN

The coast region of Paraná State is chacaracterized by a hot climate, high humidity, montains with plain and marshy slopes, where we can find abundant grass species giving support to dairy and beef cattle. Due to the climate, buffalo also is being raised in that region and mainly because of higher resistance to parasites. It is the general opinion that the endo parasites, specially Fasciola hepatica, is a threat to bovine husbundry in that region. That's why it was decided to start an experiment with the purpose of to get an idea about the occurrence of this endoparasite in cattle and buffalo.One hundred and fifty eight properties (30 buffalos and 128 bovines) were visited and one thousand three hundred and seventy one feces samples were collected. These samples were examined for parasite eggs and larvae culture and identification were made. The following genera were found: Strongyloides, Neoascaris, Haemoncus, Cooperia, Ostertagia, Trichostrongylus, Nematodirus Oesophagostomum, Bunostomum, Trichuris, Capillaria, Moniezia, Eurytrema e Fasciola.One hundred and twenty nine samples(7,9%) from twenty eight farms(7,5%) were positive to F.hepatica.Additionally the following genera were identified: Neoascaris vitulorum, Mammomonogamus laryngeus e Dictyocaulus viviparus , collected by necropsy in a buffalo calf from that region.These helminthiasis are subclinical infections since that the animals are in aparent good health, except some calves that got sick and die due to a Neoascaris massive infection.

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Dynamic of Helminthic Infections of Calves in the Region of Campos das Vertentes – Minas Gerais State Brazil.

MARIA FLÁVIA LOBO FERREIRA*and WALTER DOS SANTOS LIMA

In order to study the behaviour of helminthic infections, 22 newborn crossed Holstein x Zebu calves were divided in two groups of 11 animals each. The group A was the control one and those of group B were treated in the 60th, 90th, 120th and 180th days after birth with anthelmintic.

Weighing, eggs per gram of faeces (EPG) and coproculture of all animals were done monthly.

The EPG counts started beeing positive for Cooperia when the animals were 2 months old,for Haemonchus when 3 months old, for Bunostomum when 5 months old and for Oesophagostomum when 7 months old.

The EPG counts were influenced by rain and air temperature variations.

There wasn't a significant statistic difference ($P < 0,5$) in the gain of weight between the groups A and B, maybe due to the low infection of the calves that never exceeded 600 EPG.

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Gastrointestinal and Lung Parasitism Related with the Age in Brown Swiss Calves Under Subtropical Humid Climate Conditions.

ISMAEL ESCUTIA-SÁNCHEZ*, R. CAMPOS and H. QUIROZ

In order to know the gastrointestinal and lungworm parasites in Brown Swiss calves a study was carried out in the Animal Research Center at Tecuala, Nayarit, México. Monthly Faecal samples were collected of sixty calves whose ranged between 1and 360 days old. Calves were divided in six groups of 10 animals each based in their age. Mc Master, Baermann and faecal culture techniques were used in this trial over a 12 months period. Data obtained of trichostrongylid egg and Eimeria spp oocyst counts from calves were statistically analyzed. Trichostrongylid egg counts in calves from 121 to 360 days old were higher than those counts in calves from 1 to 120 days old ($P<0.05$)Strongyloides spp eggs and Eimeria spp oocysts were detected in calves faeces of all age groups and there were not statistical differences between the groups ($P>0.05$) Larval of Haemonchus pp, Cooperia spp, Trichostrongylus spp,Bunostomum spp, Oesophagostomum spp and Strongyloides spp were recovered from faecal cultures. The genus Haemonchus spp was found in all age groups and reached a peak when calves were 301 to 360 days old. Cooperia spp were detected in five groups and their percentage increased when calves were 121 to 180 days old. Trichostrongylus spp observed in all age groups and reached a peak when calves were 121 to 180 days old. A low percentage of Bunostomum spp larvae were detected in calves with less than 180 days of age, in older animals from 181 to 300 days old percentages over 6% were observed with except in calves from 301 to 360 days old in which a 4.0% was found. Oesophagostomum spp was only observed in calves from 121 to 360 days old and reached a peak when calves were 121 to 180 days old. A high percentage of Strongyloides spp were observed in calves with less

than 60 days old and followed by a drop in it level in all other experimental groups.
No evidence of Dictyocaulus viviparus infestation was detected.

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Development and Hatching of the Eggs of Cattle Gastrointestinal Nematodes.

G. S. da S. MARQUES*, M. R. HONER

The development and hatching of the eggs of the bovine gastrointestinal nematodes Haemonchus contortus, Cooperia punctata and Oesophagostomum radiatum was studied under controlled and environmental conditions. Eggs were obtained either by the dissection of previously identified females ("pure" cultures) or from faeces of infected animals ("mixed" cultures). The volume of the eggs was calculated during 24 hours or hatching and these observations do not confirm the theory that the smallest eggs develop and hatch first.

Eggs of Oesophagostomum radiatum did not hatch under the controlled conditions at $4^{o}C$ and 100% relative humidity (RH); $12^{o}C$ and 100% RH, $18^{o}C$ and 100% RH but hatched at room temperature. Under the same conditions, Haemonchus contortus hatched only at room temperature, While C. punctata hatched at $25^{o}C$ and 100% RH as well as at room temperature. It was concluded that the species studied are quite different among themselves, and with regard to the literature, as far as the conditions necessary for development and hatching.

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Development and Survival of Eggs and Larvae of Gastrointestinal Nematodes of Buffalos, in Cerrado Pasture Conditions, in the Country of Selviria, State of Mato Grosso do Sul, Brazil.

WILMA A. STARKE*, R. Z. MACHADO and M. C. ZOCOLLER

The studies about development and survival of eggs and larvae of gastrointestinal nematods of buffalos in cerrado pasture were done in the county of Selvíria, State of Mato Grosso do Sul, Brazil. For these studies, 10 to 20 young buffalos were used as feces donors. The feces were collected directly from the anus of these animals and were deposited on the pasture (experimentaly area of approximately 250 m^2) composed by brachiaria grass (*B. decumbens*). Thys way, 2 amounts of feces, identified as "test" and "control", were deposited monthly on that pasture, during the period of one year, from March of 1984 to March of 1985. Weekly samples of the feces and samples of the grass around of the "test" feces, it were pucessed, in order to identify the nematods larvae present. The "control" feces were examined after the "test" feces showed negative for two consecutive weeks. This way the identified nematods were of the following genus: *Cooperia*, *Haemonchus*, *Paracooperia*, *Trichostrongylus*, *Bunostomum* and *Oesophagostomum*. The genus *Cooperia* and *Paracooperia* were the most identified in the feces and on the grass. On the seventh day after the setting of the feces on the pasture, the infectant larvae were abready found in the feces and on the grass. All amounts of feces supplied infectant larvae, even during the dry season (April to August). The longest period of larvae survival on the grass was 23 weeks and in the feces was 24 weeks.

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An Outbreak of Coccidiosis in Mice in Response to a Live Oral Malaria Vaccine.

J. M. BAFORT

Laboratory-bred Anopheles stephensi fed a fortnight earlier on Gif/TB mice infected with Plasmodium berghei Anka strain were killed and homogenized. The sporozoites were harvested by a centrifugation method and diluted as necessary. An infective dosis of 1×10^{6} sporozoites was given to Gif/TB mice by direct application into the stomach. This strain was selected for its high sensitivity to malaria sporozoites. Prior to the administration the animals received an antiacid. Appropriate controls were used. During the follow up several mice became ill and developed clinical symptoms of an acute infection. None of the controls showed signs of acute illness. Macroscopic examination of the experimental group revealed an acute inflammation of the bowels. Histological sections of the gut showed numerous cysts of a coccidia sp. No development of the malaria parasite was seen in the mucosa or the liver. This was the first and only observation of coccidiosis within the laboratory animals. Never during their 7 years of intensive use had the mice, obtained every other week from the SPF breeding laboratory of the University of Louvain, shown signs of coccidiosis. Neither had coccidiosis ever been found in the breeding unit. In addition the quality control reports by a laboratory of pathology in the Netherlands corroborated these findings. Outbreaks of cryptic coccidiosis in laboratory mice have been occasionally reported. In this particular case the initiating factor seems to be the administration of live malaria sporozoites in an attempt to induce immunity to another coccidian parasite through attenuation by use of an aberrant route of inoculation.

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Observations on *Giardia* in Western Australia.

R. C. A. THOMPSON*, JILLIAN M. SWAN and B. P. MELONI

The public health significance of Giardia is being increasingly recognised throughout the world. Giardia is the most common intestinal parasite of humans in the UK and USA. The situation is similar in Australia where giardiasis is considered to be the most important human parasitic disease in terms of morbidity, with the prevalence of infection greatest among infants and children. Although many human infections in Australia are acquired directly under circumstances which favour direct faecal/oral transmission, or indirectly via contaminated water, no attention has been given to the possible role of animals in transmitting the disease to humans. This is surprising in the light of increasing evidence from other countries which suggests that Giardia is a zoonosis. We therefore carried out a survey of different populations of dogs and cats in the Perth metropolitan area and found that overall, 21% of dogs and 14% of cats were infected with Giardia. Dogs and cats, therefore, represent a signficant potential reservoir of infection to humans. In order to provide some clues on the zoonotic capability of Giardia of dog and cat origin, we compared animal and human isolates of the parasite using developmental and morphological criteria. Cross-transmission studies have also been undertaken. Although the developmental pattern and morphology of Giardia of animal and human origin were similar, several interesting differences were found.

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Bovine Babesiosis: Vaccination with Culture-Derived Exo-Antigens.

SONIA MONTENEGRO-JAMES*, M. TORO, E. LEON, R. LOPEZ and M. RISTIC

Vaccination with culture-derived soluble Babesia bovis exo-antigens, when supplemented with a potent saponin adjuvant,

has been shown to provide strong protection against bovine babesiosis following challenge exposure with virulent B. bovis organisms. Susceptible yearling cattle were immunized either with immunogens derived from B. bovis or B. bigemina cultures, or were administered varying dosages of a combined immunogen containing antigens of both Babesia species. A similar number of nonvaccinated controls were included in each group. Cattle from each group were needle-challenged with fresh blood containing 10^9 virulent Babesia organisms of the respective homologous species. Likewise, animals given the combined immunogen were simultaneously challenge-exposed to both B. bovis and B. bigemina parasites. Parameters used to evaluate protection were: prepatent period; presence, level and duration of parasitemia and fever; maximum PCV reduction; fibrinogen and cryofibrinogen concentrations; serum antibody levels; net gain in body weight. Results showed significant protection with the Venezuelan-derived B. bovis and B. bigemina immunogens after challenge exposure. Vaccinated animals showed less PCV reduction, fever, mean total temperature rises and greater weight gains after challenge as compared with control cattle. Furthermore, a good anamnestic antibody response was observed in all vaccinated animals. When the combined B. bovis-B. bigemina immunogen was administered, immunized animals showed significant differences from controls with regard to all clinicopathological parameters monitored during the post-challenge period. Optimal responses were observed in cattle vaccinated with doses equivalent to 10 ml of crude supernatant fluid. Additionally, a sandwich ELISA was developed and proved useful for the detection and quantitation of antigenic activity in different antigen preparations. Vaccination with these exoantigen-adjuvant immunogens has shown that adequate protection can be provided against acute Babesia infections.

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The Use of Monoclonal Antibody Profiles for Selection of *Theileria parva* Stocks in Immunization Against East Coast Fever.

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A method of immunization against East Coast fever (ECF), Theileria parva infection of cattle, utilising lethal sporozoite challenge and a simultaneous treatment with a long-acting oxytetracycline (infection and treatment) has been available for over a decade. The immunity engendered following immunization results in protection against a homologous challenge but not necessarily against a heterologous challenge. We have utilised an in vitro method of differentiating strains of T. parva using monoclonal antibody (MAb) profiles and selected 2 key stocks of T.parva from several isolates originating from the Coast Province of Kenya for immunization of cattle in the field.

Using these stocks we immunized different breeds of cattle by infection and treatment and exposed them to unlimited tick/parasite challenge in 4 different field sites where ECF is endemic. All immunized cattle survived ECF challenge but 87% of controls died of the disease. A pilot study carried out at one site showed that the acaricidal spraying schedule for control of ticks could be safely increased from twice-a-week to once every 3 weeks in the immunized cattle, whereas in susceptible cattle even twice-a-week spraying did not control ECF.

The field isolates made from the exposure sites revealed a heterogeneous population of T.parva on the MAb profile. Of the 2 stocks used for immunization T.parva Marikebuni was found to show the widest protection and we think it might represent a key immunizing stock for vaccination in the coast area of Kenya.

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Effect of Infection by *Babesia* on Oviposition, Hatching and Survival of Larvae of *Boophilus annulatus*.

H. OUHELLI, V. S. PANDEY* and A. ABOUGHAL

Boophilus annulatus ticks were engorged on calves artificially infected with Babesia bigemina and Babesia bovis. The oviposition, hatching and survival of newly hatched larvae were studied at the constant temperatures of 16, 25 and 35° and the relative humidity of 93%. The mean weight of engorged females was 267 mg (range 250-284mg). The mortality in infected females was higher than in the controls. At a given temperature preoviposition period was identical in infected and uninfected females. The oviposition period of infected ticks incubated at 25 and 35°C was shorter than those of controls. Both preoviposition periods decreased with the increase of temperature. The hatching did not occur at 16°C. The infection reduced the hatching by 50% at 25°C and by 75% at 35°C. The incubation period was shorter in eggs infected and held at 35°C but not in those held at 25°C. The survival period of infected larvae was significantly shorter at incubation temperatures of 25 and 35°C but not of 16°C. The results indicate that infection by Babesia has a cytopathogenic effect on engorged females, eggs and larvae of B. annulatus.

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Theileria Infectivity of *Hyalomma* Ticks in Haryana (India).

A. K. SANGWAN, M. B. CHHABRA and S. SAMANTARAY

Theileria infectivity of Hyalomma ticks (mainly H.anatolicum anatolicum) in Haryana was assessed in whole salivary glands by methyl green pyronin and Feulgen's staining methods. Of 1662 ticks screened, 546 (32.85%) were found Theileria positive. Positivity in 935 female ticks (36.90%) was more than that of 727 male ticks (27.65%). Level of Theileria infection (no. of infected acini per positive tick) was also higher in female ticks. Theileria positivity of ticks varied greatly at different sites of collection. Frequency distribution of Theileria positive acini in positive ticks revealed, in general, a low level of infection per positive tick, as could be expected in a largely stable endemic situation. Only a single salivary acinus was found infected in 16.6% of the positive ticks; about 70% had upto 10 positive acini, while only about 10% had over 25 positive acini per tick. In vivo assessment of Theileria infection in ticks was studied by exposing batches of susceptible calves to tick attachment or by injecting with GUTS/salivary gland homogenates. Clinical manifestations, typical of T.annulata, and death were produced in calves depending upon the quantum of infection transmitted by these methods.

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Evaluation of Infection Caused by Parasites of Babesiidae Family with Emphasis on *Babesia bovis* (Babés, 1888) in Calves in Brazil.

E. A. de REZENDE FILHO and C. L. MASSARD

The haematozoarian complex called "tristeza bovina", consisting especially of Babesia bovis (Babés,1888),was studied by means of blood smears and brain fragments, in Red and White Friesian cattle and RWF x Guzerá, including the following crosses: 7/8,3/4,5/8,1/2 and 1/4 RWF.

It was observed that for B. bovis the red corpuscles in the peripheral circulation are percentually less infected than those in the capillary circulation of the central nervous system, where a predominance was noted for capillaries of the cerebral cortex, followed by the cerebellum and the horns of Ammon.

Of the animals studied, 68% showed parasites identified as Babesia sp.,in the encephalitic capillaries without their being present in the peripheral blood. Including all the different diagnostic method which were used, all animals were positive for Babesia bovis and/or B. bigemina. It was noted also that animals between 3 and 5 months were percentually more infested than those animals older than 6 months. B. bigemina infections appear more frequently between the 4th and 5th month, decreasing with increasing age.

In terms of a seasonal variation, B. bigemina and Anaplasma marginale were found in all months of the year,

while B. bovis was absent only during the months of January and February, in all the different crosses studied with brain fragments.

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***Ehrlichia bovis:* Identification of Infection in Calves in Brazil.**

CLAUDETE de A. MASSARD and C. L. MASSARD*

Blood smears from 296 dairy cattle from the States of Rio de Janeiro and Minas Gerais, were stained with Giemsa stain and showed *E. bovis* in 9,8% of the animals.

Haemathological studies at light microscopy demonstrated inclusions only in the cytoplasm of mononuclear leukocytes. These inclusions stained in purple, lilac or blue. Three morphological forms, initial bodies, elementary bodies and more commonly morula were seen. These studies also showed monocytic and lymphocitic monocytosis, eosinopaenia and large number of vacuolated monocytes.

Clynical signs in calves positives for *E. bovis* were consisted of fever, enlargement of peripheral lymphonodes , apathy, loss of appetite and loss of weight.

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Evaluation of the Safety and Tolerability of a Triclabendazole/Fenbendazole Combination,

R. JONATHAN RICHARDS

Data on the safety and tolerability of fenbendazole are briefly reviewed.
Triclabendazole is a recently developed benzimidazole compound for the treatment and control of fascioliasis in sheep and cattle. The acute oral LD50 in rat and mouse is greater than 8'000 mg/kg and in both sheep and cattle the maximum tolerated dose is 200 mg/kg. Both fenbendazole and triclabendazole have been shown to be free of any teratogenic effects.
The safety evaluation of a 1:1 mixture of triclabendazole and fenbendazole is reported. The acute oral LD50 in rat and mouse is greater then 5'000 mg/kg. The results of other acute toxicity studies are also favourable.
After administering a combined dose of 400 mg/kg in sheep, a transient reduction in appetite was observed. 3 days post treatment slight to moderate increases in plasma cholesterol, BUN, creatinine and leucocyte count were also found.
In a large teratology trial 4 groups of sheep were treated on two specified days between days 12 and 28 of pregnancy. On each occasion a total dose of 5o mg/kg, of a 1+1 mixture was administered.
4 groups were given a placebo. No teratogenic effects were found.
It is concluded that a 1+1 mixture of triclabendazole and fenbendazole is safe and well tolerated in target animals.

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Studies on the Mode of Action of Triclabendazole in Immature and Adult *Fasciola hepatica*.

PETER KOHLER* and JAMES L. BENNETT

Under in vitro conditions in a balanced salt solution (Hedon-Fleig's medium, HFM) triclabendazole (TCBZ) was found to accumulate in significant amounts in both, immature (3 week old) and adult Fasciola hepatica. It was shown that a viable parasite is needed to concentrate the drug but a significant percentage of it was also bound by the dead parasite. More importantly, the drug could penetrate into life worms even when the oral route had been closed off by ligation indicating that the drug can be easily taken up by the parasite through its tegument.
Further experimental work showed that the drug has a dramatic effect upon the parasite's motility and resting membrane potential. In addition to other conditions, these effects were found highly dependent on the medium composition and the tissue/medium ratio. As an example, when samples of 4 immature flukes were cultured for 24 h in 2 ml of HFM containing 10 µM TCBZ they were totally immobilized, their resting membrane potential increased from -51 mV to -11 mV and the final drug concentration present within the organisms was calculated to be in the range of 2 mM. Under similar conditions employing 2 worms in 40 ml of HFM, TCBZ was also found to significantly stimulate glucose-dependent acetate and propionate production by adult F. hepatica. Such an elevation of the parasite's glucose metabolism may be interpreted as a response to the interaction of the drug with some other, as yet unknown, molecular target(s). This observation in conjunction with other data shows that the drug's action is not likely to be associated with inhibition of the worm's energy-conserving pathways.
Our in vitro studies have clearly demonstrated that TCBZ is a slowly acting fasciolicidal drug and that relatively high amounts of the drug have to be accumulated within the organism to initiate its immobilization and death. Further studies are required to elucidate the precise mechanism of TCBZ-induced immobilization and killing of immature and adult liver flukes.

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The Efficacy of a Triclabendazole/Fenbendazole – Combination on Helminths in Sheep Under Laboratory Conditions.

GOTTFRIED BUESCHER* and D. DUEWEL

The efficacy of a triclabendazole/fenbendazole-combination was tested in sheep after artificial infection with helminths. Each of the time and dosage groups included 11 animals.
The trial schedule was arranged according to the recommendations of the 'World Association for the Advancement of Veterinary Parasitology' (1982).
The oral application of a combination at 10 mg/kg body mass (i. e. 5 mg of each active ingredient/kg) resulted in the following reductions (in %) of helminth burdens:

species and stage	3rd stage	4th stage	adult
Haemonchus contortus	99.9	99.9	100
Ostertagia circumcincta	100	94.0	100
Trichostrongylus colubriformis	99.3	99.9	100
Cooperia oncophora	99.6	99.4	100
Chabertia ovina	98.8	99.1	99.8
Dictyocaulus filaria	99.9	99.9	100
H. contortus, BZ-resistant	59.4		
T. colubriformis, BZ-resistant	88.1;86.2	80.3	60.4

species and age (weeks)	4 w.	6 w.	8 w.	12 w.	14 w.
Fasciola hepatica	100	100	94.8	100	
F. gigantica	91.7		99.3		100

Thus, the combination of fenbendazole and triclabendazole at this dosage is highly efficient in sheep.

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Efficacy Evaluation of Triclabendazole/Fenbendazole – Combination in Sheep,

J. ECKERT

Triclabendazole(Fasinex^{R}),a new anthelmintic of the benzimidazole group,has a high and specific efficacy against immature and mature Fasciola in ruminants but does not sufficiently in-

fluence other helminths at safe dose levels.In order to evaluate the efficacy of combined treatment with a fasciolicide (triclabendazole)and a nematocide(fenbendazole)several field trials were carried out.
In trial A 24 sheep(ewes),infected with F.hepatica and the common genera of gastro-intestinal nematodes(GIN)(Haemonchus, Ostertagia etc.) and kept on a contaminated permanent pasture, were submitted to a control programme during nearly one year (Nov.82-Oct.83)based on strategic treatments at intervals of 5 to 8 weeks.Triclabendazole was applied as 5% suspension at a dose of 5 mg/kg body weight(b.w.),immediately followed by 2.5% fenbendazole(Panacur®)suspension at 5 mg/kg b.w.
All six treatments were well tolerated,they significantly reduced intensity of Fasciola egg excretion and lowered the rate of infection extensity from 96% to 23% or less.Fasciola burdens of slaughtered animals were low at the end of the contro programme.Egg counts of GIN decreased after each treatment but increased some time later.
Trial B comprised 211 sheep with chronic fasciolosis treated in three groups (No.1-3) with triclabendazole/fenbendazole-mixture at various doses of each 2.5, 3.75 and 5.0 mg of active ingredient per kg b.w.,respectively.As a control one group of 64 sheep (group No.4) was treated with 7.5 mg/kg albendazole(Valbazen®).Extensity rates of efficacy were 68, 77 and 100% for groups 1-3, and 50% for group 4 as assessed 4-8 weeks after treatment.In the same trial reduction of egg excretion in GIN was satisfactory. No adverse effects were observed or reported.
It is concluded that treatment of sheep with triclabendazole/fenbendazole-combination at a dose of each 5.0 mg/kg active ingredient is safe and effective against F.hepatica and the common gastro-intestinal nematodes.

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Experiences with Two Triclabendazole (TCZ)/Fenbendazole (FBZ) – Combinations in Field Trials in Cattle.
B. TIEFENBACH

TCZ/FBZ pellets 3% (1.5% TCZ+1.5% FBZ) and TCZ/FBZ susp. 20% (10% TCZ+10% FBZ) were tested in field trials in naturally infected cattle after their first and/or second grazing period (dose: 15 mg/kg). Applicability, tolerance and efficacy against gastrointestinal nematodes, Moniezia spp., F. hep. and D. viv. were evaluated. If possible, albendazole (ABZ) pellets 2.5% were used in comparison as well as ABZ-susp. 10% (dose: 10 mg/kg).- Efficacy was evaluated by faecal examinations once or twice before treatment, and about one week, 3-4 6 and 8 weeks after treatment. Besides monitoring the excretion of eggs or larvae (flotation, sedimentation, Baermann techn.) the larvae in pooled stock samples were cultured and identified.- Results: The suspensions could be dosed and administered easily with common drenchers. The pellets offered, were well accepted by most of the cattle, even between normal feeding times. All drugs were well tolerated. The following extense efficacies (EE) have been evaluated:

	Drugs / Cattle	Egg excreting cattle		EE % after treatment 1 week	3-4 weeks	6 weeks	8 weeks
83/84	TCZ/FBZ	GIS:	77	100.0	96.0	n.u.	n.u.
	pell. 3%	Mon.:	24	92.0	96.0	n.u.	n.u.
	105	F.h.:	3	100.0	100.0	n.u.	n.u.
1984/85	TCZ/FBZ	GIS:	238	97.4	100.0	n.u.	96.7
	pell. 3%	Mon.:	13	100.0	84.2	n.u.	84.2
	338	F.h.:	68	92.5	100.0	98.5	94.0
	TCZ/FBZ	GIS:	203	100.0	96.1	100.0	91.7
	susp.20%	Mon.:	31	100.0	81.1	100.0	94.4
	326	F.h.:	95	95.5	95.5	95.5	99.0
	ABZ	GIS:	71	100.0	93.0	n.u.	83.2
	pell.2.5%	Mon.:	3	100.0	100.0	n.u.	100.0
	98	F.h.:	54	64.8	40.7	33.4	50.0
	ABZ	GIS:	91	100.0	90.1	n.u.	100.0
	susp.10%	Mon.:	7	28.3	100.0	n.u.	100.0
	116	F.h.:	29	92.8	76.0	58.8	20.8

EE against Nematodirus and D. viv. was 100 % in all cases. Ostertagia, Cooperia, Haemonchus, Trichostr., Oesoph. were only identified by differentiation of L_3 before treatment.

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The Anthelmintic Efficacy of the Triclabendazole/Fenbendazole Combination Against Naturally Acquired Infections of *Fasciola hepatica* and Gastrointestinal Nematodes in Sheep.
FLÁVIO A. M. ECHEVARRIA

The efficacy of a triclabendazole/fenbendazole combination (TCBZ/FBZ) administered at dose rates lower than the normally used were tested in sheep naturally infected with *F. hepatica* and gastrointestinal nematodes. Thirty 16-month-old wethers were allocated according to their worm egg counts to three groups of ten animals as follow: 1- TCBZ/FBZ 2.5mg/kg; 2- TCBZ/FBZ 3.75mg/kg and 3- untreated controls. The drug was given as an oral drench and 15 days post-treatment all sheep were slaughtered and the efficacy determined. The TCBZ/FBZ combination at 2.5mg/kg reduced worm burdens of *H. contortus O. circumcincta, T. axei* and *T. colubriformis* by 98.3; 91.9; 99.7, and 99.9% respectively. At 3.75mg/kg the reduction was 98.7; 99.2; 100 and 100% repectively. Both dose rates were 100% effective against *O. venulosum* and *F. hepatica. Cooperia* spp, *Capilaria* spp, *N. spatigher* and *T. ovis* were present in low numbers in the untreated controls which does not allow conclusions of the efficacy of the TCBZ/FBZ combination against those parasites. The results obtained in this trial show that the triclabendazole/fenbendazole combination used at dose rates of 2.5 and 3.75mg/kg may play an important role as a new alternative in large spectrum anthelminthics for the control of mixed infections of gastrointestinal nematodes and *F. hepatica* in sheep.

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Fasinex (Triclabendazole) in the Treatment of Immature *Fasciola hepatica* in Naturally Infected Cattle.
D. RAPIC*, N. DŽAKULA, J. BRGLEZ, D. SAKAR, JELENA POMPE-GOTAL and J. BEŠVIR

The performance of triclabendazole was studied in cattle suffering from naturally acquired acute or subchronic fascioliasis. Animals were selected on the basis of faecal examinations and the elevated GLDH values. The drug was given orally in the form of a bolus at dose rate of 12 mg/kg body weight. The liver examinations at slaughter, 9 weeks post treatment, revealed a 96,89% reduction of the immature fluke compared to the untreated controls. The efficacy of triclabendazole was compared to that of nitroxynil given subcutaneously at 10 mg/kg body weight. Both products were well tolerated.

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Efficacy of Albendazole Against Immature *Fasciola hepatica* in Sheep.
VASSILIOS J. THEODORIDES*, J. F. FREEMAN and M. S. LANDI

Intraruminal administration of 5 mg/kg b.w. albendazole from days 1-7 and 8-14 post-infection with Fasciola hepatica afforded 90% and 80% fluke reduction; efficacy at 3 and 4 weeks post-infection lacked consistency. (V. J. Theodorides et al, W.A.A.V.P., 10th Conference, Perth, 1983, page 21). The objective of this experiment was to determine efficacy ABZ against later stages of flukes. Twenty eight (3-4 month old) lambs were allocated in groups of 4, bedded on concrete pens and fed a maintenance diet.

Five hundred metacercariae were administered orally in a gelatin capsule to each lamb (250 metacercariae in the morning and 250 in the afternoon of the same day).

Group 1 non-infected non treated control;
Group 2 non-infected-treated control;
Group 3 infected non-treated control;
Group 4 infected-treated daily between days 29-35 post-infection;
Group 5 infected-treated daily between days 36-42;
Group 6 infected-treated daily between days 43-49;

Group 7 infected-treated daily between days 50-56 Albendazole 5 mg/kg b.w. was administered intraruminally. The animals were weighed weekly and blood taken for complete blood, chemistry and enzyme evaluations. At the completion of the experiment, 12 weeks post-infection, the efficacy of albendazole was as follows: 26% protection in lambs dosed from day 29-35, post-infection, 42% in lambs days 36-42, 69% in lambs days 43-49, and 23% in lambs dosed days 50-56. There was marked eosinophilic response in all infected animals, first noticed at 15 days post-infection and positive change in the AST, SGOT, and GGT serum levels beginning 21 days post-infection.

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Efficacy and Safety of Clorsulon Administered Orally to Cattle for *Fasciola hepatica*.

G. W. BENZ, D. H. WALLACE, and R. L. KILGORE

Clorsulon given orally to cattle at 7 mg/kg was shown in four controlled efficacy trials conducted in the U.S. to be 93.4% effective against immature (8-week-old) Fasciola hepatica and 100% effective against adults. Four field trials were conducted with 421 cattle given clorsulon at 7 mg/kg and 137 control cattle given vehicle; substantial reductions occurred in fecal egg counts at trial termintion. No adverse reactions occurred during the efficacy trials, and none were observed in safety trials when clorsulon was given orally up to 21 mg/kg in three consecutive daily administrations, or when given once orally at 175 mg/kg (25 x use level). Breeding cow safety was evaluated in the three months preceding breeding and in the last six months of pregnancy by administering clorsulon orally at 14 mg/kg at monthly intervals; no effects on conception rate or pregnancy were observed.

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The Effects of Fasinex (Triclabendazole) on Wool Production in Sheep Infected with *Fasciola hepatica*.

F. L. BOWEN*, T. FRIEDEL, and M. B. STRONG

The effect of liver fluke infection on the wool production of sheep has been a subject of some debate, with much of the controversy resulting from the variability of infection of the test animals. Hence the need or desirability of routine treatments with a flukicide has been questioned.
In this study merino sheep were artificially infected with metacercaria of Fasciola hepatica each week for a 12 month period.
Individuals in each of seven groups were then routinely treated with either Fasinex (2 dose rates) or one of 5 currently available flukicides, while an eighth group remained as untreated control. Treatments were administered at the frequency and rates recommended by the label (or promotional literature) associated with each product.
Faecal egg counts, liveweights, blood PCV, plasma GLDH and ultimately wool production and wool value were the parameters used to monitor the response to infection and treatment.
Sheep untreated with a flukicide, showed the classic symptoms of chronic fascioliasis, i.e. ill-thrift, anaemia, weight loss and mortality (40%).
All flukicide treatments prevented these gross clinical symptoms.
The sub-clinical effect of infection on wool production was also reduced by flukicide treatment and the degree of that reduction correlated with the reported flukicidal activity of the various products.
Triclabendazole at the recommended dose rate of 10 mg/kg, with its superior efficacy against early immature and immature F. hepatica, produced the greatest advantage in wool growth.

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Observations on the Efficiency of Thiabendazole, Albendazole and Brotianide Against Natural Dicrocoeliasis in Sheep and Goats in Iran.

A. A. SHAHLAPOUR*, M. N. RAHNOU and J. H. NAZARY

Thiabendazole at dose rates of 150 to 200 mg/Kg. has to been used for treatment of dicrocoeliasis in sheep and goats in Iran. The effect of Albendazole at dose rates of 15 and 20 mg/Kg. and Brotianide, 5 to 25 mg/kg. in controled tests were compared with Thiabendazole activities in naturally infected animals with small liver parasit. In 2314 treated animals, Albendazole showed a better result in comparism with Thiabendazole, and Brotianide did not have significant effect against Dicrocoelium in our experiment. The use of Albendazole for control of helminth parasits in Sheep and Goats in Iran is discussed.

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The Evaluation of a New Way and Efficiency of Anthelmintic Administration in Sheep.

I. JR. KOHEK*, M. S. P. OBA and G. A. HORTA

This experiment was done to evaluate a new way and efficiency of administration of Monobasic Phosphoric acid salt of Tetrahidrofenilimidazotiazol. This product was administrated at the dose of 7,5 mg/Kg body weight by sub-cutaneous route at auricular base, back dorsum and thoracic region in sheep in Rio Grande do Sul, Brazil. For each administration route were used seven animals and one control group allotment, totalizing twenty eight animals. The evaluation of the anthelmintic effect was done by post-mortem examination of one of the treated animals and one of the control group, three days after drug administration. Gastrointestinal nematodes were isolated, counted and identified. The efficiency data observed demonstrate having no interference on the product absortion. No reactions were observed in the site of administration. The anthelmintic efficiency was estimated according to Moskey and Harwood (1941):
98,5% for Haemonchus contortus; 99% for Trichostrongylus axei; 100% for Ostertagia ostertagi; 100% for Cooperia sp and 86,6% for Trichuris ovis

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Comparison Between Pour-on and Injectable Levamisole Treatments to Reduce the Worm Burden of Yearly Calves.

HERMANO J. H. de MELO*, H. S. RIBEIRO, M. M. LIMA and F. PAIVA

Thirty two Zebu calves, eight to twelve months of age naturally infected by gastrointestinal helminths were used in a controlled test in order to evaluate

the efficacy of a levamisole pour-on formulation compared with an injectable levamisole product comercially avaiable. Group A (eight animal) was he control group-not treated; Group B (eight animals) treated with levamisol pour-on at 7.5 mg/Kg; Group C (eight animals) treated with levamisol pour-on at 5.0 mg/Kg; Group D (eight animals) treated with injectable levamisole at 3.75 mg/Kg. There was a statistically significant difference in favor of treated animals compared with not treated(control) ($p < 0.05$), but no statistically significant difference was found between treated groups($P > 0.05$) However, Group B, treated with levamisole pour-on at 7.5 mg/Kg, showed a greater reduction of the worm burden, when compared with group C and D. No skin adversal reactions were observed in the pour-on and injectable levamisole treatment may be successfully used to reduce the worn burden of early calves.

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Evaluation of EPG Reduction of Levamisole Pour-on Formulation, Levamisole Injectable, Albendazole and Ivermectin in *Cattle Under Field Conditions in Brazil.*

A. H. ACUNA* and B. HEES

176 beef-cattle calves males and/or females have been involved in a Controlled Anthelmintic Test by Egg Counting Method which has been divided into 5 trials carried out in 5 differents farms comparing a Levamisole Pour-on Formulation to Levamisole Injectable, Albendazole and/or Ivermectin commercial formulations. After being individually identified animals in each trial have been divided into four uniform groups regarding pre-treatment EPG and live weight. All anthelmintics tested showed an excellent EPG reduction at 3 and 7 days post-treatment. Weight gain performance figures show that there are no differences among anthelmintic treated groups however they are better than those of the untreated group, especially when considering the 28th day live weight data. Levamisole pour-on showed high EPG reduction with no adverse skin reaction. Environmental temperature at treatment time was over 24ºC.

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Evaluation of "pour on" Preparations of Levamisole and Tetramisole as Anthelmintics for Swine.

ORIVALDO T. VASCONCELOS*, A. J. COSTA, U. F. ROCHA and I. MELITO

50 pigs aged three to four months were ranged according to the decreasing egg counts in their foeces and the 24 ones with the higher number of eggs per gram of foeces (an average of three counts) were selected to be used in the experiment. Then the four animals with the top egg counts were randomly destined each to one of four groups, after which the following four piglets in the decreasing egg count sequence were also randomly distributed to those four groups and so on until such groups contained 6 pigs each in a randomly balanced stratified order based in the parameter "number of eggs per gram of foeces". The following step in the design was the random sorting of the four groups of pigs to each of four experimental destinations:

Group I — Control group, each animal received a "pour on" placebo;

Group II — A 20% solution of Levamisole was applied on the lumbar skin of each pig in the exact "pour on"volume to convey the dosis of 5mg of the drug per kilogram of body weight;

Group III — Levamisole "pour on", 10mg/kg;

Group IV — Tetramisole "pour on", 10mg/kg.

On the zero day and on the 2d, 5th and 6th days after treatments, egg count averages were compared within and between groups, and reductions were as follows:

I Control Group - no significant egg count decrease;
II Levamisole 5mg/kg Group - 79% egg count decrease;
III Levamisole 10mg/kg Group: 72% EPG decrease;
IV Tetramisole 10mg/kg Group: 65,1% EPG decrease.

On the 7th experimental day all the pigs were slaughtered and their worms counted. The percentual decrease in the infections for each treatment as compared with the control group were determined for each species found of worms:

Group	Treatment/ dose	Percentual Efficiency	
		Ascaris suum	*Oesophagostomum dentatum*
II	Levamisole 5mg/kg	85,7	74,6
III	Levamisole 10mg/kg	94,3	74,6
IV	Tetramisole 10mg/kg	57,1	50,7

No toxic effects were found through biochemical examinations.

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Avermectin B_1 as an Antiparasitic Agent in Cattle.

P. G. SCOTT, R. O. BURROWS, I. K. HOTSON* and J. L. COX

Compounds of the avermectin family of antiparasitic agents are macrocyclic lactones, derived from the mycelium of Streptomyces avermitilis. One member, ivermectin (dihydroavermectin B_1), has shown a broad range of activity against both internal and external parasites of animals and man.

Avermectin B_1 has been examined in an injectable formulation for use in cattle, and shows high efficacy at 200 mcg/kg against the adult and immature stages of the lungworm Dictyocaulus viviparus and against gastro-intestinal nematodes Ostertagia ostertagi (including arrested larval stage) Haemonchus placei, Trichostrongylus axei, Cooperia spp., Oesophagostomum radiatum and Trichuris sp. This formulation also controls sucking lice and aids in the control of the single-host tick Boophilus microplus.

The product was shown in a series of laboratory and field studies to be well tolerated by cattle.

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Efficacy of Ivermectin Against the Abomasal Nematode *Mecistocirrus digitatus* in Naturally Infected Cattle.

P. MENDOZA de G., R. NAJERA F.*, D. HERRERA R., R. MEJIA G. and R. A. RONCALLI

Activity of ivermectin (IVOMEC, Merck and Co., Inc.) against the abomasal nematode Mecistocirrus digitatus was evaluated in a controlled trial. Ten male zebu calves naturally infected with this parasite were allotted to the following treatments by restricted randomization on bodyweight: untreated control or ivermectin, subcutaneously at a dose level of 200 mcg/kg.

The calves were necropsied 14 or 15 days after treatment for counting of parasites.

No parasites were found in the animals treated with ivermectin, while in the untreated control animals 3570 adults were found. Thus efficacy against M. digitatus was 100%. The geometric mean for the control group was 521.2 adult parasites, and the treatment effect was statistically significant ($p = .0079$). Other genera of nematodes were also found in the control animals but these were not included in this study. No adverse reactions to treatment were observed in this trial.

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Comparison of Trichlorfon, Morantel, Fenbendazol and Ivermectin Against Nematodes of Adult Horses.

GEROLD SIEVERS*, M. MANRIQUEZ and E. WEGMANN

The trial was carried out with 50 naturally infected adult horses. These were stabled, thus preventing reinfection, and divided into 5 groups of 10 animals; 4 of these groups received a single dose of one of the following anthelmintics: thrichlorfon 30 mg/Kg. p.o., morantel 7,5 mg/kg p.o., fenbendazole 7,5 mg/kg p.o. and ivermectin 200 mcg/kg i.m. the fifth was an untreated control group. Faecal samples for egg-counts were collected weekly during 10 weeks.
The control group maintained a high faecal output during the trial (average 1.200 epg) which tended to rise during the period of observation. Trichlorfon did not significatly reduce egg counts relative to those of the controls ($p > 0.05$) despite showing lower average egg-counts. Morantel treatment decreased egg counts significatly ($p < 0.05$) until the 42nd day post treatment (p.t). Ivermectin or Fenbendazole treatment reduce egg counts to zero until the 63 nd and 35 th days p.t. respectively.
The Ivermectin treated group egg counts were lower than those of the fenbendazole treated group from the 49 th to the 63 nd day p.t., when the observation period ended.

Research sponsored by the Dirección de Investigación y Desarrollo of the Universidad Austral de Chile.

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Control of *Strongyloides westeri* in Foals with Ivermectin.

GEROLD SIEVERS*, M. URIBE and J. NUÑEZ

On a horse breeding farm of Southern Chile the following trial was carried out: 27 mares with their corresponding foals were divided in three groups: A) Control group; B) Group in which the foals were treated with 200 mcg/kg of Ivermectin at the beginning of the S.westeri egg-output, and C) Group in which the mares were treated with the same doses inmediately after parturition.
Faecal egg-counts (epg) of S. westeri of the foals were regularly performed from the 8th. to approx. the 100th. day of life. The egg-counts obtained from the control foal group reached the mean of 11.700 epg, and were significantly different ($P < 0.05$) from the other two groups, which showed egg-counts not higher than 700 and 500 epg respectively. The dayly weight gains of the foals from the treated mares (1.12 kg/d) were significantly higher ($P < 0.05$) than the dayly gains of the other two groups (Control foals: 0.91 kg/d; treated foals: 0.99 kg/d).
After the treatment of the mares, a significant reduction ($P < 0.05$) of the strongyle egg-output was observed. The egg-output level of the untreated mares was reached two month later.
In order to avoid infections with S.westeri in the foals, and also to eliminate the gastrointestinal parasites of the mares, the treatment of the mares with 200 mcg/kg of Ivermectin inmediately after parturition is recommended. This system permits the reduction of high pusture contaminations with the mentioned parasites.

Research sponsored by the Dirección de Investigación y Desarrollo of the Universidad Austral de Chile.

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Netobimin (Totabin-SCH) Efficacy against *Gaigeria pachyscellis* Railliet & Henry, 1910 in Sheep.

I. G. ARANTES and A. A. do NASCIMENTO*

Sixty weaned lambs,raised and maintained worm free,were infested percutaneously, at 90 days of age with individual doses of 600 infective larvae of Gaigeria pachyscelis Railliet & Henry.Twenty four days after infestation, two groups of 10 lambs each, received Netobimin (5% solution), orally, at doses of 7.5 mg and 20 mg/kg of body weight, respectively.After 80 days, two other groups, also of 10 animals each, received the same doses, with the remaining 20 used as controls. From 7 to 8 days after the treatments, all the lambs were slaughtered and examined for immature and adult nematodes, according to conventional methods.At necropsy, efficacy was 100% against adult worms at both dosages.Concerning immature stages, (fourth stage larvae), efficiency was between 99.93 and 100.0%.

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Netobimin (Totabin-Sch) Reproduction Safety in Ruminants, Brazil.

C. M. SANTIAGO

The influence of Netobimin(Totabin-SCH) at 20 mg/Kg-oral dose in 251 sheeps during the last third pregnancy period and in their lambs was studied.Pregnancy and parturition were followed.Lambs were studied as to survival,"causa mortis" in case of losses, body weight,bone,skin,and teeth formation, and vision reflex.No difference between treated and control group was noticed.

Netobimin(Totabin-SCH) was studied at 7.5 mg/kg and 12.5 mg/Kg dosages (oral and subcutaneous) in 70 cows during the pregnancy period and in their calves. Pregnancy,Parturition and post parturition of cows were observed as well as the survival, weight, ponderal development, teeth skin formation, vision reflex of calves.There was no difference between treated and non-treated groups.

Netobimin(Totabin-SCH) was studied in bulls at 12.5 mg/Kg dose, subcutaneous, as to the sexual behavior and fecundity using heifers. Results were not different from the control group.

We can conclude that Netobimin (Totabin-SCH) has no influence on the reproduction, fetal development, and in newborn bovines and ovines.

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Seasonal Helminth Parasitism in Goats in the Sertão of Inhamuns, Ceará, Brazil.

C.A. FAGONDE COSTA*, L. DA S. VIEIRA and M.E. BERNE.

The present study was conducted on a private ranch in Tauá county, Ceará, Brazil, from January 1982 until December 1983. Of the 5-6 goats sacrificed and necropsied monthly, 2-3 were born on the ranch (resident) where they remained without any antihelmintic treatment until necropsy at approximately 12 months of age. The other 2-3 were transported to the area already nematode free (introduced) and necropsied after a 30 day grazing period on the ranch's pastures. The helminths identified in the resident animals and their mean prevalencies and infection levels respectively were: Haemonchus contortus 98% and 168.7; Trichostrongylus colubriformes 95% and 72.7; Strongyloides papillousus 86% and 43.8; Oesophagostomum columbianum 81% and 17.6; Taenia hydatigena 71% and 1.68; Trichostrongylus axei 65% and 17.3; Trichuris sp 46% and 1.5; Skrjabinema sp 37% and 13.7; Moniezia expansa 12.7% and 0,44; Trichuris globulosa 6% and 0.29; Moniezia sp 3.2% and 0.1; Cooperia punctata 1.6% and 0.02. The nematode species identified in the introduced animals were: H. contortus, T. colubriformis, S. papillosus. O. columbianum, T. axei, Skrjabinema sp, Trichuris sp e C. pectinata.It can be conclused from the results obtained from the resident animals that nematodal parasitism of the gastrintestinal tract of goats occured throughout the year. However, based on the data from the introduced goats, the period of transmission is restricted only to the rainy season.

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Effect of Anthelmintic Treatments of beef cattle in five farms in Northeast Minas Gerais State, Brasil.

MARCOS PEZZI GUIMARÃES*, P.A.S. LIMA and W.S. LIMA.

The helminthic infections in five herds of beef cattle was followed for one year by the EPG counts of the calves and adult animals in five neighbouring farms (one having 250 animals, 3 farms having 500 animals and one having 2000 animals) in a same region (Northeast of Minas Gerais State-Brazil). As the EPG counts of the animals reached 1000 they were drenched with anthelmintic.

The results showed that the EPG of adult animals were about 300 during the year, while the counts of calves reached 1000 for several times, depending on the farm. In two of the farms two drenchings were necessary, while in 3 of them five drenchings were given during the year.

The genera of helminths identified by the L_3 from coprocultures were *Cooperia, Haemonchus, Oesophagostomum, Trichostrongylus* and *Bunostomum;* there was a difference of prevalence of these genera in calves and adult cattle faeces.

It seemed that the differences in rearing the animals was the main factor that interfered in the different degrees of infection of the animals.

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Use of Invermectin in the Control of Endo and Ectoparasites in cattle: Epidemiological Implications and Effect on Weigh Gains.

PEDRO E. STEFFAN*, C.A. FIEL, R.R. AMBRUSTOLO and C.A. BIONDANI.

The effect of ivermectin on weight gains in steers and on pasture contamination, under natural grazing conditions in the southeast of the Province of Buenos Aires (Argentina), was assessed during 2 consecutive years. Steers treated with ivermectin at 200 mcg/kg live weight in two groups at different intervals, were compared with an untreated control group and another where a commonly used sanitary program was applied.

In the first year the treatments and final mean weight gains were as follows: 1) Ivermectin every 2 months: 190 kgs; 2) Ivermectin every 4 months: 179 kgs; 3) Fenbendazole every 4 months, with a treatment for mange: 150 kgs; and 4) Control, no treatment: 143 kgs. The EPG counts varied according to the treatment and were lower than the control group, where a different larval pasture contamination with regard to all treatment groups was also determined.

In the second year the same paddocks were used, but the treatments in groups 2) and 3) were strategically distributed over the year and groups 1) and 2) interchanged their original paddocks. The mean weight gains reached were: 1) 169 kgs; 2) 168 kgs; 3) 151 kgs and 4) 113 kgs. The EPG levels and pasture contamination were lower than the first year. Epidemiological implications, weight differences and other results reached in both years, in the different groups, are analyzed. The following parasites were found: Cooperia sp., Ostertagia sp., Trichostrongylus sp., Haemonchus sp., Oesophagostomun sp., Nematodirus sp., Psoroptes communis var. bovis and Damalinia bovis.

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Seasonal Variations of Internal Parasitism in cattle, in the Southeast of the Province of Buenos Aires (Argentina) with special Reference to Hypobiosis.

CESAR A. FIEL*, P.E. STEFFAN, R.R. AMBRUSTOLO and C.A. BIONDANI.

Seasonal variations of cattle internal parasites were studied in yearling steers, under natural pasture grazing conditions. Faecal egg counts showed an autumn winter rise, attaining maximum levels in July-August, and a progressive fall in spring and summer. Similar results were observed in pasture larval contamination.

In the total parasite load, Ostertagia held a marked predominance over Trichostrongylus and Haemonchus, whilst Cooperia was the principal intestinal species. An important percentage of Ostertagia arrested larvae was observed in spring and summer.

The serum pepsinogen values increased rapidly in late autumn and reached their peak in winter and early spring, coincident with the highest levels of parasitism.

Dictyocaulus viviparus were found in autumn and winter, with the greatest loads from June to August.

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Correlation Between worm egg Counts and Worm Burdens in Calves.

JÉEA B.R.R. DE MACEDO*and A.C. PINHEIRO.

One hundred and eight one-year old Hereford calves were divided in groups of six animals and slaughtered at every two months intervals. At this ocasion the number of eggs per gram of faeces were counted using a McMaster technique. The total number of worms in the abomasum and small intestine was calculated from total counts of a 10% aliquot. All the worms in the large intestine were counted. For the recovery of immature nematodes from the abomasum a digestion technique was used and a 10% aliquot also counted. The values for helminths (HELM) and worm egg counts (EPG) were log transformed to LHELM and LEPG because they were not normally distribueted. LHELM in relation to LEPG shows a linear tendency when the negative worm egg counts are discarded. This means that the values of LHELM increases with the values of LEPG with a tendency to aproximate linearity for animals with heavy worm burdens but, in the other hand, for animals with lower worm counts the linear correlation does not ocurr. This may be explained by the low sensitivity of the egg counting technique. Based on the results obtained in this trial we can conclude that the technique normally used for the determination of nematode egg counts in cattle may be of relative value only when the egg counts are high.

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Recent Developments in Parasitic Diseases of Cattle in Zimbabwe.

V.S. PANDEY.

Trypanosomiasis and tick borne diseases have been of major importance in cattle in Zimbabwe. Some other parasitic diseases such as fascioliasis, schistosomiasis, parasitic gastro-enteritis, screwworm etc. although of economic importance have caught little attention.

The war of independence between 1972 and 1980 had serious effects on tickborne diseases and trypanosomiasis. During this period callapse of dipping services in the communal tribal lands led to the epizootics of babesiosis, anaplasmosis, theileriosis and heartwater with a death toll of about one million heads of cattle, nearly one third of cattle in these areas. The disruption of chemoprophylaxis and insectide spraying to control trypanosomiasis led to mortality of thousands of cattle and reinfestation of vast areas by tsetse fly previously freed of the vector by an aggressive tsetse and trypanosomiasis control policy. The return of peace after independence in 1980 led to the gradual recovery of veterinary services and allowed the resumption of dipping and tsetse control programmes. Unfortunately drought prevailed for three years and accounted for loss of cattle. Tsetse fly control has reclaimed the parts lost in the north west of the country but the areas in the north and north east have yet to be reclaimed. An international programme with the assistance of EEC gives the hope of eradication of tsetse fly from Zimbabwe. Dipping services have gradually been reestablished to a great extent. However, the sad experience during the war has thrown doubts on the full reliance on dipping as the only control measure for tick borne diseases. Active research is going on in Zimbabwe on tick borne diseases.

There has been very little work on other parasitic diseases but it seems that some helminthic diseases are on the increase and are cause of heavy although not dramatic loss in production. Liver fluke alone leads to condemnation of about 50% of livers. When major fatal diseases are brought under control the attention will return to debilitating diseases which certainly account for heavy losses in production.

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Canine Filariasis in Mediterranean Countries.

R.A. RONCALLI*and P. TASSI.

Canine filariasis has been reported in a number of countries of the Mediterranean basin. In Italy, the incidence of the disease can be as high as 50%, especially in some marshy areas. Canine filariasis has been reported in northern and southern Italy, Sardinia and Sicily. In France, canine filariasis is a regional disease and is observed in hot, humid and marshy areas such as Camargue, Crau, Dombes, Sologne and Roussillon. In Spain the disease has been reported in Alicante, Ciudad-Real, Cordoba, Granada and Huesca. Canine filariasis has been reported in marshy areas of Portugal and it is particularly frequent in the region of Alcacer do Sal. The disease has also been reported in Greece; the incidence in that country is quite low. Dirofilaria immitis is the most common filarid; however, D. repens has been reported in some countries and is particularly frequent in Italy. Dipetalonema spp have also been observed in dogs of several Mediterranean countries.

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Effect of Anthelmintic Treatments on Weight gain of goats in Bahia, Brazil.

R. BATISTA NETO*and N.M. SANTOS.

Sixty kids, 6 to 9 months old from six forms located in the region of Senhor do Bonfim, State of Bahia were divided in two groups.One group was treated with anthelmintic every three months and the other group was kept as controls. Fecal samples were collected monthly for determination of number of eggs of helminths per gram of feces. During the study six animals from each group were necropsied and helminths present were recovered and identified.

After nine months the average body weight of the group which received anthelmintic treatments was 22.6 Kg, as the non-medicated group average 14.4 Kg body weight. The average number of gastrointestinal nematodes at necropsies was 974 and 11.270, on medicated and non-medicated animals, respectively. Haemonchus contortus, Trichostrongylus axei, T.colubriformis, Oesophagostomum sp., Cooperia curticei were the most common gastrointestinal nematodes recovered.

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Seasonal changes in the Gastrointestinal Helminths of Naturally Infected goats in Baghdad, Iraq.

I. AL-SAQUR*, W. ALI, S. AL-ABASSY and J. TARISH.

Two hundred fourty complete alimentary tract of goats sloughtered at Baghdad a bbatoris were examined from December 1983 to November 1984.The results revealed the presence of twenty four species and fifteen spcies were reorded for the first time in Iraq.The most prevalent genus was Ostertagia, and the highest worm burden was found during June, it was followed by Haemonchus contortus which was most abundent during July in term of infection rate and worm burden.Genus Nematodirus was predominant in the small intestine, while Skrjabinema ovis was in the large intestine.

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Gastrointestinal and Pulmonary Helminths in Sheep on the Santa Catarina Plateau.

C.I. RAMOS*, C.G. PALOSCHI, S. PERUSSOLO and R.H. DE S. FREITAS.

In order to determine the principal genera and species of parasites in adult sheep in the Campos de Lages (Santa Catarina State) area, the contents of the digestive tract and lungs were collected, and the carcasses and heads of 31 sheep slaughtered at the Agostini Slaughterhouse were examined in the period of November 1984 to January 1985. The genera identified and their respective intensities of infection were: Trichostrongylus (abomasum) 1,598.7, Muellerius (adult and immatura females) 1,163.8, Trichostrongylus small intestine) 404,8, Cooperia 246.1, Haemonchus, 135.2, Ostertagia 97.9, Capillaria 12.3, Oesophagostomum 8.1, Strongyloides 7.4, Oestrus ovis 3.9, Trichuris 2.1, Bunostomum 2.1 and Moniezia 0.2. The most common species in percentages were Haemonchus contortus 61,3% Trichostrongylus axei 54,8%, Ostertagia circumcincta 25,8%, Trichostrongylus colubriformis 48,4%, Capillaria spp 48,4%, Trichostrongylus longispicularis 25,8%, Oesophagostomum columbianum 38,7%, Oesophagostomum venulosum e Trichuris ovis 32,3%, Oestrus ovis 51,6% e Muellerius spp 19,4%.

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Scanning Electron Microscopic Observations of Calves Vaccinated and Challenged with *Dictyocaulus viviparus*.

B. IOVANNITTI*, R. BAIN, J. ARMOUR and H.M. PIRIE

The surface features of the lower respiratory tract in calves infected with lungworms were studied by scanning electron-microscopy. Ten Fresian cross calves aged 10 weeks. were divided into three groups. Group I was 4 calves not vaccinated but challenged with 30 larvae/kg of Dictyocaulus viviparus. Group II comprised 4 calves vaccinated with DICTOL and challenged at the same time as Group I with the same dose of D. viviparus. Group III consisted of 2 calves vaccinated with DICTOL. One calf from each of Group I and Group II was killed at the following days after challenge 14, 25, 34 and 45. The calves of Group III were killed on equivalent days. 4 and 14. The changes observed in the luminal surface of the trachea. as well as bronchi, bronchioles and alveoli of both the cranial and caudal lobes of the right lung, were recorded in the three groups of animals. In general similar changes were seen in Group I and Group II, but they were more extensive and severe in Group I. One change observed in those groups was loss of cilia in the trachea and large bronchi. in addition many microorganisms were often seen colonising these surfaces. These features were insignificant in Group III. In Group I, eggs and parasites were seen on the luminal surface of the bronchi and bronchioles. The relative proportion of epithelial ciliated cells and non-ciliated cells was altered at these levels. The surface of the non-ciliated cells was covered with microvili. some of these cells were considered to be regenerating ciliated cells. Alveolar surfaces had areas covered with inflammatory cells and secretions. In the challenged animals some of these areas contained parasitic debris. In Group III the lung parenchima was in general clearer and the characteristic type I and type II alveolar epithelial cells and alveolar macrophages were easily distinguished. Some nodules resulting from vaccination were seen.

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Possible Role of *Ascaris suum* Larvae and Fenbendazole in Immunizing Pigs Against Ascariasis.

T.B. STEWART*, M.E. BESSETTE, T.J. ROWELL and L.L. SOUTHERN

Forty-eight weanling pigs were divided into 6 groups of 8 pigs on the basis of weight, sex and origin. Three groups of pigs were placed in lots previously contaminated with Ascaris and 3 groups were placed in pens in a barn with concrete floors. Barn pigs were each infected by mouth with 2,000 A. suum eggs on the first day of weeks 1, 3 and 5. Matched groups from lot and barn were given fenbendazole (FBZ) in feed for 3 consecutive days on weeks 2, 4 and 6 (3x3x3 mg/kg body weight). A second pair of groups from lot and barn were given Banminth (BAN) in feed (96 g/ton feed) during weeks 2-5. The third pair of groups from lot and barn received no medication. All pigs were challenged with 100 A. suum eggs 7 days after termination of FBZ treatment. All pigs were killed 60 days after challenge and worms recovered. Pigs fed FBZ gained weight faster (P<.02) than BAN or control pigs. FBZ pigs had fewer Ascaris than controls (P<.01) as did BAN pigs (P<.02). FBZ reduced the number and length of male and

female Ascaris (P<.01); BAN reduced the number and length of male Ascaris (P<0.3) and of female Ascaris (P<.02) compared to controls. Three treatments of FBZ for 3 days was more effective in reducing numbers of worms and increasing daily gain than BAN given for 28 days. In a follow-up experiment, 12 pigs each were given third stage A. suum larvae recovered from the lungs of donor pigs at the rates of 660, 1075 and 643 on days 1, 12 and 23 respectively. FBZ was given to each of 6 of these pigs for 3 consecutive days beginning 7 days after each infection (3x3x3 mg/kg body weight). On the 48th day, the 12 pigs and an additional 6 uninfected pigs were each challenged with 100 A. suum eggs. All pigs were killed 22 days after challenge and worms recovered. Three larval inoculations followed by FBZ reduced the challenge-derived population by 64% compared to controls. The presence of adult Ascaris in infected-non treated pigs reduced the challenge-derived population by 98%. Results indicate that partial immunity to challenge infection with A. suum can be induced by repeated abortion of infections during the liver-lung migration or by bypassing migration and aborting infections after the molt to 4th stage.

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Ollulanus tricuspis – Frequently Overlooked or Nonexistent?

M.A. HASSLINGER

The very small stomach worm of the cat, O.tricuspis, is difficult to see with the naked eye. Males reach a length of 0,7 to 0,8 mm and possess strong, relatively short spicules. Females, up to 1 mm long, contain eggs, first-, second-, and third-stage larvae, wich are released into the gastric lumen of the host; females and L 2 - L 4 are characterized by five cusps.

O.triscuspis is post mortem macroscopically overlooked. Fecal examination methods such as flotation, sedimentation or migration have failed to diagnose the infection intra vitam. The coproscopical diagnosis is generally not successful.

O.tricuspis infections of the cat or other unusual hosts are demonstrable post mortem by examination of gastric fluid or gastric mucosal scrapings and by peptic digestion of the stomach. Intra vitam the examination of vomitus or stomach irrigation has proved to be suitable.

Apart from Europe there is little known about the distribution. O.tricuspis has been reported from Canada, the United States, Chile, Australia, New Zealand and the Sovjet-Union. In 1984 we have found the stomach worm in Egypt; this is the first report from the African continent. It is still unknown whether in a great number of countries of Middle- and South-America, Africa and Asia this interesting nematode with an extraordinary life cycle occurs. To our opinion is O.tricuspis existent, but so far frequently overlooked.

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102

Transmammary Transmission of *Strongyloides papillosus* (Wedl, 1856) Ramson, 1911, in Dairy Calves.

JOHN FURLONG* and M.R. MONTEIRO

To study the transmammary transmissibility level of S. papillosus larvae, 100 ml foremilk samples were collected during the first 21 days of lactation from 173 multiparous and 34 primiparous cows, simulating the common pratice of let the calf to suck before milking, in order to liberate the milk let down. From 3.633 samples belonging to multiparous cows, 43 were positive (1.18%) and from 714 samples of primiparous cows only one was positive (0.14%). The higher larvae concentration occurred between the 6th to the 10th day of lactation. More than one larvae was met in each positive sample.

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Gastric Pathology of *Heteropneustes Fossilis* (B1) After Infection With Nematode *Procamallanus spiculogubernaculus* (Agarwal).

CHITRA SINHA and A.K. SINHA*

Procamallanus spiculogubermaculus (Agarwal) is attached to the stomach wall of Heteropneustes fossilis (Bl.) by buccal capsule. The mucosal tissue lodged in the buccal capsule of the nematode is ulcerated, desquamated and is undergoing lysis. The nematode has entered in the stomach wall of the fisch through basal zone of the ridge.There is total destruction of the stomach wall at the site of entry of the nematode. The nematode is surrounded by a number of cellular elements inside the stomach wall. Blood supply of the infected stomach has been increased. Widespread haemorrhage is also seen in infected stomach.

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Pathogenecity of *Genarchopsis goppo* (Ozaki) in the Stomach Wall of Fresh Water Fisch *Channa gachua* (Ham).

A.K. SINHA

Genarchopsis goppo (Ozaki) is attached to the stomach wall of Channa gachua (Ham) by oral and ventral suckers forming plug like projections. The fluke has entered in the stomach wall by dissolving the mucosa. Capsules containing the fluke are seen in the mucosa and submucosa of the stomach wall. A number of lymphocytes,fibroblasts and eosinophils are present around the capsule. Lymphoidal tissues are also seen near the capsule. Epithelial cells of infected stomach possess lesser amount of PAS positive mucoidal substances. They have more mucoidal materials in the lumen and around the fluke. Repairing areas are also seen in the infected stomach.

105

Efficacy of Injectable Invermectin Against Endoparasites of Sheep.

J.M. PRESTON*, D. BARTH, A. BATTY, B. KLUS, B. ROBIN, D. ROSS and P. SCHINDLER

Ivermectin administered subcutaneously as a 1.0% w/v solution has broad spectrum antiparasitic activity in cattle and pigs. Nine controlled studies[1] were conducted to evaluate efficacy of this formulation against endoparasites of sheep. In all, 48 naturally or artificially infected sheep of various breeds and ages were injected subcutaneously with ivermectin at a dose rate of 200 mcg/kg bodyweight, and 48 treated with an equivalent volume of vehicle or left untreated. Evaluation of efficacy was based on parasite recoveries at necropsy. Apart from transient pain reaction at the time of injection in some animals, no adverse reaction attributable to treatment was observed. Good efficacy was demonstrated against a range of adult and immature (4th larval stage) gastrointestinal nematodes and large lungworms, adult Protostrongylus rufescens and all the larval stages of Oestrus ovis.

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The use of Ivermectin in the Control of Bovine Thelaziosis.

I.H. CARMICHAEL, M.D. SOLL* and H. SCHERER

Thelazia spp. are ubiquitous spiruroid parasites found in the eyes of a number of domestic and wild animals. Manifestations of infection are conjunctivitis and lachrymation, which may progress to keratitis and ulceration of the cornea. Ivermectin in an injectable formulation was administered to 50 cattle to evaluate the level of control of Thelazia spp. in three trials involving a total of 100 cattle. Simmentaler cattle with confirmed natural infections of Thelazia spp. were used in the three studies. In each trial the cattle were paired by the number of

Thelazia spp. counted within categories of sex, age or number of infected eyes. The cattle within each pair were randomly assigned to an untreated control group or a group treated with ivermectin at 200 mcg/kg, once subcutaneously. The number of Thelazia spp. was counted in situ, separately for each eye of each animal, on Day 0, the day of treatment. On Day 8, the Thelazia spp. were collected from each eye separately.
In each study, significantly ($p \leq 0.01$) fewer Thelazia spp. were collected on Day 8 from ivermectin-treated cattle than from controls, the reductions being 100%, 97.7% and 100%, respectively. The overall reduction in the three studies was 99% ($p < 0.05$).
It is concluded that ivermectin administered subcutaneously is effective against Thelazia spp. in cattle.

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An Assay of Different Productivity Parameters of Sheep in the Argentine Patagonia, Treated with Ivermectin.

CARLOS A. SERVANT* and G.M. BULMAN.

With the purpose of evaluating various productivity parameters of range fed sheep in the Patagonia (Rio Gallegos, Province of Santa Cruz, Argentina), treated with ivermectin, a total of 128 Corriedale adult non-pregnant ewes, with an average weight of 44 kg, were teethed, individually weighed and then randomly allocated to 4 equal sized groups and the following treatments:

I: Control, no treatment.
II: Ivermectin, 300 mcg/kg, sc, days 0 and 7.
III: Ivermectin, 200 mcg/kg, sc, days 0 and 7.
IV: Ivermectin, 300 mcg/kg, sc, day 180.

The trial commenced on April 20, in autumn before ram service, and ended with the shearing of the groups on December 20, 1984. The winter months, because of feed scarcity and extreme cold were unusually severe, but no feeding or housing was employed. Wool samples were taken and all animals weighed every 60 days.
The results were as follows: lambing rates reached 86.2% in II and IV, 78.6% in III and 71.4% in I (Control); over the whole 8 month period of the trial, mortality in sheep and lambs was lower (9.4%) in II and IV, and equal (12.5%) in III to I (Control); at shearing, all the treated groups reached similar to or higher average body weights to those initially registered, whilst controls lost an average of 2.37 kg (5.7%); and finally, the group mean fleece weights were highest in III, followed by IV and II, all with advantage over the untreated group I.
These results are analyzed and their economic significance projected to a typical sized flock in the Patagonia.

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Efficacy of Ivermectin Against Gastrointestinal Parasites of Swine.

JOSE S. TOLOSA*, M. VAZQUEZ, C. DEGIOVANNI, A. SBAFFO, A. CAPRA, R. CASAL, A. IHDE and G.M. BULMAN

A controlled test was made in Rio Cuarto, Córdoba(Argentina), to evaluate the efficacy of Ivermectin in swine naturally infected with Ascaris suum, Macracanthorhynchus hirudinaceus, Oesophagostomun dentatum and Trichuris suis. A total of 10 pigs, 70 kg b.w., were divided into 2 groups, the first as untreated controls and the second, injected subcutaneously with a single dose of ivermectin, 300 mcg/kg b.w.. The animals were kept in individual pens and supplied feed and water ad-libitum. In the treated group faeces were collected daily to determine the number of eliminated parasites,whilst coprological examinations were made to establish morphological changes in eggs. Necropsies of test animals were carried out in 3 treated and 2 controls on day 12 post-treatment,whilst the remaining 2 treated and 3 controls were killed on day 18. Faecal examinations showed elimination of A.suum between days 1 and 6, O.dentatum between days 2 and 7, and T.suis from day 1 up to day 12. Morphological changes in A.suum eggs were seen after 24 hours.
On comparison of parasites found at necropsy in the 2 groups, 100% efficacy was obtained against Ascaris suum and Oesophagostomun dentatum, and 90,99% against Trichuris suis; no action was observed against Macracanthorhynchus hirudinaceus.

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Efficacy and Weight Gains in Cattle Following Antiparasitic Treatments with Ivermectin.

H. CIORDIA

Two separate field trials involving cows and their first-season grazing calves were carried out under conditions of sub-clinical infection with gastrointestinal nematodes. During the first year, a group consisting of 110 cows and 108 calves served as nonmedicated control. A second group of 127 cows was treated with ivermectin (200 µg/kg) in late spring and 124 calves were treated twice, once in late spring and again in midsummer. Cattle were weighed at approximately 28 days intervals and rectal fecal samples for egg counts were obtained from 25% of the cattle. Treated calves gained ($P < 0.05$) more weight (15.9 kg average weight gain advantage) and had lower egg counts than controls. There was no statistical difference between treated and control cows and regard to weight gain and egg counts. Although the same pastures were used and many of the cows appeared in the second trial, the treatments were not orthogonal in an effort to avoid residual effects from previous year's treatment. A total of 466 cows and calves was used in the second trial. The control group comprised 118 cows and 112 calves. A second group of 121 cows was treated with ivermectin (200 µg/kg) early in July, and 115 calves in early August. Weights and fecal samples were obtained every 28 days. Calves treated gained significantly ($P < 0.05$) more weight (12.5 kg average weight gain advantage) and had lower egg counts ($P < 0.01$) than controls. There was no difference in weight gain nor egg counts of cows. No adverse reactions attributable to treatment were noted in either trial. An anthelmintic treatment of calves in late spring may be advantageous for beef production in Georgia, U.S.A.

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Ivermectin in Heartworm Prophylaxis: Results of Studies with Experimentally Induced and Naturally Acquired Infections.

JOHN W. McCALL*, MICHAEL T. DZIMIANSKI, RAYMOND E. PLUE and R. LEE SEWARD.

Previously reported studies from our laboratory and others have indicated that a single, oral dose of ivermectin was 100% effective in preventing experimentally induced Dirofilaria immitis infection in dogs when given one month postinoculation (PI) and when given monthly to dogs exposed under field conditions. The studies reported here were designed to confirm previous findings in experimental infection studies (i.e., 30 days PI treatment) and critical field trials (i.e., monthly treatment in naturally acquired infections); they also expand the experimental infection studies to include evaluation of single, oral treatment at 45 or 60 days PI and expand field trials to include treatment at two month intervals. A total of 180 Beagles were used, with six to eight dogs per treatment and control groups In the experimental infection studies, administration of dosages of 3.3 mcg/kg or higher at 30 or 45 days PI was 100% effective in suppressing infection. Complete suppression of infection by treatment at 3.0 mcg/kg at 30 days PI was evident even when one year was allowed for the worms to develop and migrate to the heart. A dosage of 3.3 mcg/kg was only partially effective (81.5%) when given at 60 days PI, but dosages of 6.0 mcg/kg and higher were consistently effective, with the exception that one dog given 12.0 mcg/kg had five male worms at necropsy. In the critical field trial, monthly treatment at 1.0 mcg/kg or higher was 100% effective in preventing infection, but this dosage was only 78.6% effective when given every two months. All control dogs had worms, but the average worm burden was only 12 worms per dog. It is quite likely that a monthly dosage higher than 1.0 mcg/kg would be required in field conditions where worm burdens are higher.

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Ivermectin and Insecticide Ear Tags in the Control of *Parafilaria bovicola*
TORBJERN B. WALLGREN

Parafilaria bovicola, a parasitic nematode in cattle, has become a problem in the red meat industry in South Africa and Sweden. The adult parasite can cause extensive lesions in the muscular and subcutaneous tissues of the host rendering the meat unfit for human consumption. Various Musca spp. act as intermediate hosts in different parts of the world. Parafilaria bovicola is also prevalent in the Far East and Mediterranean Europe. The tissue lesions it causes can be controlled by use of ivermectin or nitroxynil. Both drugs are effective against the adult parasite only. Ivermectin ('IVOMEC' Injection) given subcutaneously to cattle at 200 micrograms per kilogram bodyweight late in the life cycle of P. bovicola when all the worms are adult, produces a 90% reduction of meat losses. No bleedings due to Parafilaria are seen on treated animals. Tissue lesions take up to 90 days to heal. Pyrethroid impregnated ear tags give a good control of Musca autumnalis, the intermediate host of Parafilaria in Sweden, reducing slaughter lesions by 75%. Ear tagging all cattle in an area results in almost total control of the parasite.

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Efficacy of topically administered Ivermectin Against Cattle Parasites.
I.K. HOTSON*, W.J. BLISS, J.L. COX, R.A. RONCALLI and I.H. SUTHERLAND

Ivermectin is a parasiticide with a broad spectrum of activity against internal and external parasites of animals and man.
The injectable formulation of ivermectin for use in cattle as a single dose of 200 mcg/kg bodyweight has high efficacy against adult and immature stages of lungworms and gastro-intestinal nematodes (including arrested stages of Ostertagia), larval stages of flies such as Hypoderma spp., Dermatobia hominis and Chrysomya bezziana; mites; and sucking lice. Treatment also aids in control of biting lice and the single-host tick Boophilus spp.
Topical formulations provide a convenient means of administration of medication to cattle, and have been developed for delivery of a number of specific active ingredients for the control of nematode, louse or tick parasites of cattle. A topical formulation of ivermectin is in development that seems to have a spectrum of activity similar to that of the injectable formulation.

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Therapy of Coenurosis in Sheep With Droncit.
A.S. BESSONOV* and N.S. ARKHIPOVA

I8 lambs with patent clinics of coenurosis (spontaneous infection) were treated with droncit (praziquantel). 5 animals (Ist group) were treated twice with the interval of 24 hours at the dose-rate of 50 mg/kg of body weight, 7 animals (2nd group) - thrice (three days running) at the same dose-rate, 6 lambs did not receive the drug (control). The animals were feeded according to the accepted scale; symptomatic treatment was not prescribed. 3 lambs from the Ist group, I lamb from the 2nd died 2, 6, I5 and 2 days after treatment respectively. All 6 control lambs died during 9 days of the experiment. From 2 to 5 large Coenurus cysts were found in brain of the dead lambs, most of the cyst were viable. 8 survived lambs were killed 58 days after treatment. 2-3 degenerated C.cerebralis or scars at the site of resolved larvae were found in brain of each of these lambs. Weakening of clinics of coenurosis and gradual recovery of lambs were noted 7-I0 days after treatment. During the period of observation (58 days) the lambs put on weight from 2.I to 5.9 kg.

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An Alternative Approach to the Control of *T. solium* Taeniasis/Cysticercosis.
Z.S. PAWLOWSKI

In some countries, human neurocysticercosis which results from human taeniasis is still one of the most serious endemic diseases with high mortality and disability rates.

None of the control measures which have contributed to eradication of T. solium infection in Europe (regular meat inspection, improvement of general economic and sanitary conditions and indoor pig husbandry) can be effectively or promptly introduced into areas endemic today. Thus, the most realistic solution for the control of human cysticercosis may be the use of mass- or selective- chemotherapy against human taeniasis with modern, effective and safe anthelmintics such as niclosamide or praziquantel. Primary Health Care infrastructure can be actively involved in executing and monitoring local control activities.

Areas hyperendemic for T. solium taeniasis/ cysticercosis can be localized easily by tracing back human or porcine cysticercosis cases. High mortality related to human cysticercosis justify mass-therapy of the whole indigenous populations even if the prevalence rates are as low as 1% (usually 1-5%). Reduction of T. solium transmission can easily be monitored by periodic examination of local pigs; diminished incidence of human cysticercosis will be visible after a few years.

Pilot operational research is needed to demonstrate whether active control of human cysticercosis by mass-treatment of human taeniasis is feasible and effective in T. solium highly endemic areas.

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Fractionation of *Cysticercus cellulosae* Scolex Antigen and Evaluation of Different Immunodiagnostic Tests for the Diagnosis of Porcine Cysticercosis.
D. KUMAR* and S.N.S. GAUR

In order to enhance the sensitivity & Specificity of the diagnostic tests for the diagnosis of porcine cysticercosis, an attempt was made to fractionate the saline extract of Cysticercus cellulosae scolex antigen on sephadex G-200. Three fractions, F_1, F_2 and F_3 were obtained which were utilized for immunodiagnostic tests. The sensitivity & specificity of Immunoelectrophoresis (IEP), Counter immunoelectrophoresis (CIEP), Enzyme linked immunosorbent assay (ELISA) and Indirect fluorescent antibody test (IFAT) were evaluated & compared with Indirect haemagglutination test (IHA) using C.cellulosae scolex, its F_1 & F_2 and Taenia solium eggs as antigens. The highest sensitivity was observed in IHA,ELISA and IFAT with scolex, F_1 and T.Solium egg antigens, respectively. However, CIEP gave better results as compared to IEP. ELISA was found to be the test of choice as it gave 95.8% sensitivity and 96.2% specificity with F_1 antigen.

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Comparative Evaluation of Immunodiffusion, Indirect Haemagglutination and Bentonite Flucculation Tests in the Diagnosis of Porcine Cysticercosis.

K.M.L. PATHAK* and S.N.S. GAUR

Double diffusion (DD), indirect haemagglutination (IHA) and bentonite flocculation tests (BFT) were evaluated and compared for sensitivity and specificity in the diagnosis of porcine cysticercosis caused by cysticercus of Taenia solium in 40 pigs. The overall sensitivity of the tests was:DD:62.5% IHA 92.5% and BFT 70%. The specificity of the tests was investigated by testing all the sera against Taenia hydatigena scolex antigen and all the three tests gave cross reaction with this antigen. The possible reasons for the high sensitivity of IHA were discussed.

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Methodological Problems in Standardizing a Pharmacological Model With Protoscolices of *Echinococcus granulosus in vitro*.

RODOLFO LORENZINI* and ANNA RUGGIERI

Importance of echinococcosis/hydatidosis by Public Health and economic point of view is evident. Even if prophilaxis criteria have been well studied and established diffusion of the disease is increasing in some areas. However therapy has a great relevance but experimental trials on animal models in vivo require very long time.

We report experimental strategy and first results of a pharmacological study carried out on protoscolices in vitro to standardize conditions to screen various drugs never tested against Echinococcus granulosus. Media as PBS, Hanks solution, manteinance temperature, different pH and concentrations of various solvent have been tested. Mebendazole has been chosen as pharmacological standard reference. Viability of protoscolices has been considered to value pharmacological activity.

Best conditions have been obtained employng Hanks solution and propylene glycol at low concentrations. Mebendazole has not been completely active at hematic levels concentration reported in human therapy.

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Studies on Trematodes of the Family Heterophyidae (Odhner, 1914) in Iran: I. Preliminary Epidemiological Surveys in man and Carnivores in Khuzestan

J. MASSOUD

Trematodes of the family Heterophyidae in man and carnivores were studied in Khuzestan, south-west Iran. Eight hundred and eleven stool samples from a population of 3400 in 13 villages in a swampy area located in central Khuzestan were examined by the formalin-ether concentration technique. The following helminths were found: Ascaris lumbricoides 7% Trichostrangylus spp.53%, Hookworms 4%,Trichuris trichiura 5%, Hymenolepis nana 12% and heterophyid spp. 8%. Post-Mortem examination of carnivores revealed that 14.2% of Jackals, 33.3% of foxes and 2.5% of dogs were infected with heterophyids,namely Metagonimus Yokogawai, Heterophyes heterophyes and H.Katsuradai. The freshwater snails Melanoides and Melanopsis spp. and brackish water fishes Barbus spp. and Mugil spp. were thought to be the intermediate hosts of these flukes in this area. This is the first report of heterophyid infection in man and carnivores in Iran.

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***Eurytrema* spp. In Cattle From the County of Umuarama, Paraná.**

S.T. EKO, S.I.M. LARA* and G. MULLER

The object of this study was to estimate incidence and intensity of infection with Eurytrema spp. in bovines. Two hundred and thirty-eight pancreas from bovine cattle killed in private slaughter-houses of Umuarama, Paraná, were examined. Thirty-four percent of the contaminated organs yielded all their parasites which were fixed in formaldehyde at 10% for later counting and identification. Of the examined bovines, 83.19% were infested with Eurytrema spp. 50% presented an intensity which ranged from 61 to 696 parasites. The highest rates of infection were 2.923 to 3.241 parasites, with a representativeness of 4%.

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***Fasciola hepatica* Infection's Time in Sheep Throughout Santa Vitória do Palmar County in Rio Grande do Sul State (Brazil).**

DANIEL S.S. RASSIER*, M.E.R. RIBEIRO, J.V. ARNONI, H.S. CRUZ and A.M. COIMBRA

The main objective of this rearch was to determine the period of the year in which Fasciola hepatica infection occurs in sheep. This research was conducted during 24 months in three different farms in the county of Santa Vitória do Palmar. It was utilized three animals every 45 days in each one of those mentioned farms. Each one fo theose animals,so called tracerssheep, were substitued by another one every 45 days in each farm during two years. It can be concluded by the results that the infection's peak occurred mainly during the end of the winter season, throughout the whole spring and at the beginning of the summer. It was also found a large variability in the infection's intensity among studied farms.

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Evaluation of Flumethrin Pour-On, a Novel Concept for Tick Control.

W. STENDEL

Results of experimental studies with flumethrin pour-on are reported. In in vitro-tests an especially developed pour-on formulation of flumethrin was highly effective against different strains of Boophilus spp. (including a DDT-resistant strain) at doses of 0.09-0.66 µg a.i./tick and against multihost ticks (Rhipicephalus, Amblyomma, Hyalomma) at doses of 0.8-1.9 µg a.i./tick.

In in vivo-tests at doses of 1.0 mg a.i./kg body weight flumethrin pour-on was 100% effective against all parasitic stages of B.microplus, B.decoloratus, B.annulatus, R.appendiculatus, R.evertsi, A.hebraeum, A.cajennense, H.truncatum of cattle. The onset of action occurs within a few hours after application and is irreversible.

Flumethrin pour-on was well tolerated by cattle. Even tenfold the recommended dose was not irritating to skin or to mucous membranes and caused no general symptoms.

The pour-on application of flumethrin constitutes a real advantage in tick control compared to traditional methods of application of tickicides: It is cost saving, convenient to the user and reduces stress of the animals usually encountered during the dipping or spraying procedure.

Our results have been fully confirmed by extensive field trials in Australia, Africa and Latin America. In these tests

flumethrin pour-on proved effective against all tick species, under various climates and varying degrees of tick pressure.

Flumethrin pour-on is now available under the label of Bayticol(R) Pour-on as a simple and convenient method for controlling one- and multi-host ticks. The recommended dose is 1 mg a.i./kg body weight, i.e. 1 ml of the 1% ready for use formulation per 10 kg body weight.

Bayticol(R) Pour-on = registered trade mark of Bayer AG, Leverkusen.

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The Efficiency and Safety of Flumethrin pour on for the Control for *Boophilus microplus* in Australia.

TERENCE J. HOPKINS

The synthetic pyrethroid flumethrin was tested against all known Australian strains of Boophilus microplus in spray trials and in larval packet tests. Flumethrin was unaffected by organophosphate or amidine resistance. As with other synthetic pyrethroids a laboratory reared pure DDT resistant strain did show cross resistance to flumethrin invitro. Subsequently twenty trials with more than 420 treated cattle were done to evaluate pour on formulations of flumethrin, formulations which acted by spreading over the skin surface. A 1%w/v formulation was found to be more than 99% effective in controlling cattle tick infestations on heavily infested cattle at a dosage of 60.3mg flumethrin per square metre of surface area. This is equivalent to 1mg/kg bodyweight for 220kg beast. Pure DDT resistant ticks required 120.6mg flumethrin per M^2 - equivalent to 2mg/kg.
Due to a long residual action these dosages were found to protect cattle from reinfesting larvae for several weeks after a single treatment. Critical safety trials showed that the product had extremely good dermal and general tolerance with no contra-indications related to age, sex, breed or body condition. Field trials showed that complete tick control could be obtained using retreatment intervals of 4 to 6 weeks.

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The Control of Larvae of *Dermatobia hominis* in Beef Cattle With Ivermectin.

ANTONIO A.M. MAIA* and MARCOS P. GUIMARÃES

Ivermectin 200mcg/kgbw was given to nelore cows at intervals of 60, 75, 90 and 120 days during on year in order to control *D. hominis* larvae infestation. It was found an efficiency of 72.5 to 100.0% according to drenching intervals. 90 days of intervals was the period of choice to control the infestations.

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Field trials with Flumethrin Pour-On Against *Boophilus microplus* in Argentine, Brazil and Colombia: A New Method of Tick Control in Cattle.

HUBERT DORN*, M. PULGA, A. ROMANO and F. RODRIGUEZ

Flumethrin pour-on represents an entirely new concept in the treatment of cattle ticks. The preparation contains the known tickicidal substance flumethrin as an active ingredient. The new feature of the product is the formulation which for the first time permits a successful treatment against cattle ticks by the pour-on method.

Flumethrin pour-on was evaluated against all stages of the cattle ticks Boophilus microplus under field conditions in naturally infested cattle in Brazil, Argentine and Columbia. The tickicidal effect of flumethrin pour-on was assessed by measuring the reduction of female ticks and the ovicidal effect or the inhibition of viable larvae production of ticks apparently surviving the treatment.

Highly effective tick control was obtained at dosage above o.5 mg/kg. By virtue of the pronounced residual effect of flumethrin pour-on it is possible to extend retreatment intervals and thus to reduce the number of treatments per tick season. Flumethrin pour-on is very safe to all types of cattle. Dosages far in excess of the therapeutic dose level did not produce any local or general side effects.

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Multi-Host Tick Control With Flumethrin Pour-On Under South African Field Conditions.

H.D. HAMEL

A new concept of tick control was tested, using a novel ready-to-use formulation of flumethrin pou-on 1% m/v against multi-host ticks (Amblyomma hebraeum, Hyalomma spp., Rhipicephalus appendiculatus, R. evertsi) and Boophilus decoloratus.

In all trials a use rate of 1 mg/kg b.w. poured along the backline from withers to tail base, controlled ticks at all their species-specific predilection sites. Cattle were freed from ticks within 1 - 3 days, depending on species and attachment sites. The protective period, even under heavy tick pressure, was 12 - 14 days.

The product is non-systemic, as revealed by residue analyses from milk and edible tissues. All samples were below a detection limit of 0,05 mg/kg b.w.; thus no withdrawal period is required under R.S.A. Remedy Regulations.

The formulation has a good dermal tolerance up to twenty times the recommended use rate in young Friesian calves.

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Topically Applied Ivermectin: Efficacy Against *Boophilus microplus* in Cattle.

L.G. CRAMER*, L.A.F. CARVALHO, A.A. BRIDI, N.K. AMARAL and R.A. BARRICK

The systemic efficacy of topically applied ivermectin against B. microplus in cattle was determined in comparison with the injectable route. Twenty calves with induced infestations were allocated, by restricted randomization on the sum of counts of engorged female ticks dropping through a slatted floor on days -3, -2 and -1 to the following treatment groups of 4 animals each: unmedicated control, ivermectin subcutaneously at 200 mcg/kg, and ivermectin topical at 200, 500 or 1000 mcg/kg bodyweight. The topical application was made as a thin stream applied along the top line from withers to tailhead.
Individual tick collections were made three times a week up to five weeks after treatment. No larval infestation was made after treatment. After collection, ticks were counted, weighed and a sample was incubated for egg laying and larval hatchability. An index of reproduction (IR) was calculated on the basis of these data.
Ivermectin reduced the average tick weight over the 35-day period ($p<0.01$) regardless of the formulation or dose used. The larval hatchability was statistically significantly ($p<0.05$) reduced, although the reduction was no more than 21% in the treated groups averaged for the entire post-treatment period.
Overall efficacy of topically applied ivermectin, from day 1 to 35, at 200, 500 and 1000 mcg/kg, based on number of ticks collected, was 50%, 85% and 91%, respectively. According to the total weight of ticks collected or IR, efficacy was 79%, 93% and 96%, or 84%, 94% and 95%, respectively. During the same period, ivermectin injection showed an efficacy of 80%, 93% or 94% based on number or weight of ticks collected, or IR. For these variables, ivermectin (topical) 200 mcg/kg was statistically significantly different ($p<0.01$) when compared to 500 and 1000 mcg/kg. No statistically significant difference ($p>0.05$) was found in the comparison of topically applied ivermectin 500 and 1000 mcg/kg, and the injectable 200 mcg/kg vs topical 500 and 1000 mcg/kg

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Results From a Comparison Between The Use of Injectable Ivomec (Ivermectin) and Oral Seponver (Closantel) in The Control of *Dermatobia* in Cattle.

BRÁS DE FREITAS FERNANDES* and WALDIR HAMANN

The efficacy of Ivermectin in the control of Dermatobia hominis larvae in cattle is enough known. But a comparison of this drug with others of similar effect was necessary. In this experiment 36 females were used with 1 to 4 years old, extensively raised, Holstein and Charolais/Brahman cross-breeds, naturally infested with Dermatobia larvae (5 to 20 larvae/animal). Each animal was identified and weighed; after they were divided in three homogeneous groups according to their ages, body weights and levels of parasitism as follows: GROUP A - 12 animals treated with Ivermectin subcutaneously, dosage of 200 mcg/kg b.w.; GROUP B - 12 animals treated with Closantel orally, dosage of 20 mg/kg b.w.; GROUP C - control. Six days after the treatment there were no infested animals in Group A and B. This condition remained unchanged until the 60th day when the animals from Group presented the first signs of infestation. This group presented an increase in body weight of 8.37%. At that time, there were no infested animals within Group A and they presented an increase in body weight of 8.42%. Prior trial had indicated reinfestation in cattle only 80 days after treatment with Ivermectin. Group C had a body weight increase of 3.67% and all the animals remained infested during the experiment. There were no significant differences in weight gain between Groups A and B. However, as demonstrated in previous experiment, IVOMEC has a far greater residual effect (80 days) when compared with SEPONVER (60 days).

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Residual Effectiveness of Ivermectin in Controlling *Dermatobia hominis* Larvae on Cattle.

A. SANAVRIA* and G.E. MOYA BORJA

A preliminary experiment was carried out at the Universidade Federal Rural do Rio de Janeiro to determine the duration of residual protection afforded by ivermectin against Dermatobia hominis larvae. Eight Zebu crossbred calves were treated subcutaneously with ivermectin at 200 mcg/kg bodyweight, and a control group of eight calves were treated subcutaneously with the formulation vehicle at the rate of 1 ml/50 kg bodyweight.
Groups of four cattle - 2 medicated and 2 controls - were infested with 30 first instar larvae of D. hominis per animal, 10, 14, 20, 29 and 40 days after treatment. Infestations made at 20 and 40 days post treatment were carried out in different sides of the same animals.
Complete protection against Dermatobia larvae was obtained when the ivermectin treated calves were exposed to infestations 10 or 14 days after treatment. No detrimental effect on larval development was observed when infestations were conducted 20, 29 or 40 days after treatment. Larvae dropped from either medicated or control animals showed similar results related to pupation and emergence of adult flies.

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Netobimin (Totabin-Sch) Efficacy in Ruminants in Ohio, U.S.A.

R.P. HERD*, W.R. SCHWARZ and L.E. HEIDER

Netobimin is a versatile nitro-phenylguanidine drug with activity against nematode, cestode and trematode parasites. The efficacy of an oral formulation at dosages of 20 mg/Kg and 7.5 g/Kg was evaluated in cattle and sheep naturally infected with gastrointestinal nematodes, including a high percentage of worms in winter hypobiosis. Cattle studies were done on 30 seven-month-old Angus X Hereford calves; sheep studies were done on 30 one-year-old crossbred ewes. Animals were divided into three groups of 10 (20mg/Kg, 7.5 mg/Kg, control) and treatments given 7 days after transfer from pasture to a worm-free environment indoors. All animals were necropsied 12-15 days after treatment in order to differentiate hypobiotic and normally developing larvae. Total worm counts were done of all abomasal and small intestinal worms, including worms recovered from pepsin/hydrochloric acid digests of the abomasal wall.
Cattle - Netobimin (20mg/Kg) showed high efficacy against both adult (98.8-100%) and hypobiotic stages (91.3-99.9%) of Ostertagia ostertagi, Cooperia oncophora, and Nematodirus helvetianus, as well as against adult Trichostrongylus axei (100%) The results suggested high efficacy against Haemonchus placei Bunostomum phlebotomum and Moniezia benedeni, but infection rates in the controls were too low for a definite conclusion.
Netobimin (7.5 mg/Kg) showed variable efficacy against both adult (74.4-81.5%) and hypobiotic stages (19.1-87.7%) of O. ostertagi, C. oncophora and N. helvetianus, but good activity against adult T. axei (93.4%). The results indicated that a dosage of 20 mg/Kg should be used under conditions that favour seasonal hypobiosis.
Sheep - Netobimin at both the 20 mg/Kg and 7.5 mg/Kg dosage showed high efficacy (97.6-100%) against adult and hypobiotic H. contortus and N. filicollis, and adult T. axei and T. colubriformis. The results also suggested high activity against Strongyloides papillosus, but there were low infection rates in the controls. Efficacies of 84.4% (20 mg/Kg) and 69.1% (7.5 mg/Kg) against hypobiotic O. circumcincta may be related to the fact that O. circumcincta in this region is strongly resistant to thiabendazole and fenbendazole. It appeared that a dosage of 20 mg/Kg should be used in areas with a benzimidazole drug resistance problem.

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Netobimin (Totabin-Sch) Efficacy in Ruminants in Rio Grande do Sul, Brazil.

M.A. SANTIAGO*, U.C. DA COSTA and S.F. BENEVENGA

Bovines - Trials on anthelmintic activity at 5.0 , 7.5 and 10.0 mg/Kg doses, orally administered, were performed. Trails with 10.0 , 12.5 and 15.0 mg/Kg doses, injectable, were also performed. The efficacy of the drug against Haemonchus placei, Ostertagia spp, Trichostrongylus axei, Cooperia spp and Oesophagostomum radiatum has presented 100% reduction via oral and varied from 99.7 to 100% in injectable form. It also has presented 100% reduction against Neoscaris vitulorum in critical test performed at 7.5 mg/Kg oral dose and 12.5 mg/Kg injectable dose. These same doses were used against Moniezia benedeni with 100% effectiveness.

Ovines - Tests were performed at 7.5 and 20.0 mg/Kg oral doses The 7.5 mg/Kg dose has eliminated 68.5% of Haemonchus contortus, 99.1% of Nematodirus sp and 100% of Ostertagia spp, T.axei , Trichostrongylus colubriformis, Cooperia spp and Oesophagostomum venulosum The 20.0 mg/Kg dose has eliminated 98.3% of H.contortus and 100% of Ostertagia spp, T.axei, T. colubriformis, Cooperia spp, Nematodirus sp and O.venulosum. It must be considered that the H.contortus strain was partially resistant to benzimidazoles, therefore the low reduction results with the 7.5 mg/Kg dose. There was a 82.8% reduction in the hypobiotic forms of H.contortus at 7.5 mg/Kg dose and a reduction of 96.2% at 20.0 mg/Kg dose.

In the several immature stages of H.contortus, there was an average reduction of 85.6% at 7.5 mg/Kg dose and 97.1% at 20.0 mg/Kg. The efficacy against Thysanosoma actinioides (cestodes) was 100% at 20.0 mg/Kg dose.

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Netobimin (Totabin-Sch) Efficacy in Cattle in Argentina.

C. EDDI*, R. NIEC, R. McLOUGLIN, C. CARCAGNO, R. DUGHETTI, C. CORBELLINI and A. BENITZ

Thirty-three head of Hereford cattle of approximately 8 months of age and naturally infected with gastrointestinal parasites were divided in 3 lots of 11 animals each. Each group was kept in separate pasture grounds divided by electric wire fences and a furrow in the perimeter.

Lot 1 was the control group and received no worming treatment. Lot 2 was wormed monthly in order to keep it free of parasites.Lot 3 was wormed based on 2 variables:when the animals would have an EPG average above 150 and/or when an statistical significant difference in weight gain was noted in group 3 in relation to Lot 2 (P less than 0.1).

Netobimin was the anthelmintic compound used, given SC at a dose of 12,5 mg/Kg of body weight.

Faecal samples were collected monthly, to determine E.P.G., larvae culture and the Baerman Technique was followed to diagnose Lung Worms.Further, blood samples were also collected from all the animals to determine hematocrit,hemoglobin, pepsinogen,albumin, and total proteins.

Individual body weights were recorded on the day of sampling and grass was collected from the three separate pasture grounds to evaluate the density and the tendency of the seasonal evolution of L3 in the pastures.

Body weight statistical analysis was done by Analysis of Variance and Tukey Test.

This study done during the months of June 84 and May 1985, in Escuela Agrotecnica de Pergamino, Provincia de Buenos Aires Republic Argentina.

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Netobimin (Totabin-Sch) Efficacy in Cattle in Louisiana, U.S.A.

J.C. WILLIAMS*, J.W. KNOX, K.S. MARBURY, M.D. KIMBALL, E.R. WILLIS, T.G. SNIDER and J.E. MILLER

An evaluation of the anthelmintic efficacy of Netobimin (Totabin-SCH)against naturally-acquired gastrointestinal parasitism in cattle was conducted during spring in Louisiana. Cattle used in the experiment were crossbred yearling beef heifers.Forty-three head of cattle were grazed together on contaminated pastures between March 1 and April 18. Slaughter and analysis of worm population characteristics in 3 monitor cattle on April 17 indicated sufficient presence of inhibited larvae of Ostertagia ostertagi and other worm genera and species to initiate the evaluation.Forty head of cattle were removed from pasture on April 18 and held in confinement until May 7. They were allotted into 4 treatment groups based on an equal distribution of body weights on April 24.On April 25 the 4 groups of 10 cattle per group were treated as follows:
(1)untreated controls,(2)Netobimin at 7.5 mg/Kg by oral drench,(3)Netobimin at 15.0 mg/Kg by oral drench,(4) Netobimin at 20.0 mg/Kg by oral drench.Similar numbers of cattle from each group were killed over a 3 day period between May 8 - 10 (13-15 days post-treatment).Mean numbers of O.ostertagi recovered from untreated controls were:adults 8,279, developing L4 stages - 2,806 and inhibited early fourth stage larvae - 12,070. The mean percent inhibition was 51.2.Means for significant numbers of other parasite genera recovered from untreated controls were:Trichostrongylus axei,adults 42,260, immature - 1,118,Haemonchus sp adults - 979, and Cooperia spp - 588. Percent reduction of parasites at the 7.5 , 15.0 and 20.0 mg/Kg dosages, respectively, were: O.ostertagi, adults - 94.9 , 98.7 , 99.2 , developing L4 - 83.3 , 86.8 , 91.0 , inhibited early L4 - 60.2 , 74.7 , 81.5; T.axei, adults - 99.7 , 99.9 , 99.8 , immature - 100.0 , 100.0 , 100.0;Haemonchus sp, adults - 95.1 , 100.0 , 100.0; Cooperia spp - 89.5 , 98.3 , 96.6. Variability of efficacy against O.ostertagi inhibited larvae was observed at all dosage levels.

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Netobimin (Totabin-Sch) Efficacy in Sheep in Australia.

J.W. STEEL*, D.R. HENNESSY, P.J. WALLER, R.J. DOBSON, R.K. PRICHARD and A.D. DONALD

The efficacy of Netobimin against benzimidazole (BZ) - susceptible and resistant strains of Haemonchus contortus and Trichostrongylus colubriformis was assessed in Merino sheep by single oral dosing and sustained intraruminal administration.In the first experiment,sheep infected with BZ-resistant strains (VRSG) were orally dosed with 5,10,15 and 20 mg Netobimin/Kg or 44 mg thiabendazole/Kg. T.colubriformis counts were significantly reduced by 91.4% and 97.5% at 15 and 20 mg Netobimin/Kg respectively. H.contortus counts were reduced by 98.6% at 20 mg Netobimin/Kg.Thiabendazole was ineffective against both parasites.

In the second experiment, efficacy against the same resistant strains was tested using a 10-day intraruminal infusion of 1,2 and 3 mg Netobimin/Kg/d. Faecal egg count declined progressively throughout the infusion period and by the 10th day significant reductions of 93.6 and 99.8% were observed at 2 and 3 mg/Kg/d respectively.A significant reduction in the counts of H. contortus (98.6%) and T.colubriformis(94.0%) was achieved at 3 mg Netobimin/Kg/d.

In the third experiment,sheep infected with BZ-susceptible (McMaster) strains of the two parasites were given intraruminal infusions of Netobimin over 10 days at 0.079, 0.138, 0.238 and 0.412 mg/Kg/d and above. A decline in faecal egg count occurred on all treatments with > 98% reduction by the 10th day at 0.138 mg/Kg/d and above. Reduction in worm count on the four treatments was, respectively, 56 , 94 , 99 and 100% for H.contortus and 4, 62 , 97 and 100% for T.colubriformis. LD_{99} of Netobimin was estimated at 0.21 mg/Kg/d for the former and 0.26 mg/Kg/d for the latter parasite.

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Netobimin (Totabin-Sch) Efficacy in Swine in Brazil.

L. GRISI*, B.E.S. PEREIRA and C.S. PIMENTEL

An evaluation of the anthelmintic efficacy of Netobimin (Totabin-SCH) against gastrointestinal nematodes in swine was conducted at the following levels by oral drench:2.0mg/Kg, 3.5 mg/Kg , 5.0 mg/Kg , and 7.5 mg/Kg of body weight. The compound was also evaluated at the following concentrations mixed in feed: 3.0 ppm, 7.5 ppm, 11.5 ppm and 15.0ppm during 10 days.Based on the results of these studies which involved eighty pigs, two trials to assess the efficacy of Netobimin (Totabin-SCH) with twenty-eight pigs was conducted at concentration of 9 ppm in feed during 56 days.Netobimin at 9 ppm was 100% effective against Ascaris suum, Oesophagostomum dentatum, and Oesophagostomum quadrispinulatum.At 11.5 ppm it was also 100% effective against Trichuris suis.Fecal egg counts of Strongyloides sp. was depressed by the presence of Netobimin at 9 ppm. No adverse reactions were noticed at the different dose levels.

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Netobimin (Totabin-Sch) Efficacy in Ruminants in U.K.

J.L. DUNCAN*, J. ARMOUR and K. BAIRDEN

In a number of controlled trials carried out in Scotland the anthelmintic efficacy of Netobimin (Totabin-SCH) against gastrointestinal helminths of ruminants was assessed.
In cattle, using experimental infections,Netobimin administered orally at 7.5 mg/Kg showed efficacies of 90 - 96% against adult Ostertagia ostertagi, 98 - 100% against adult Dictyocaulus viviparus and 88 - 97% against adult Cooperia oncophora with efficacies against developing larvae of O.ostertagi, D.viviparus and C.oncophora of 98% , 97% and 100% respectively.When tested against naturally acquired burdens of inhibited O.ostertagi larvae the compound showed an efficacy of 79% at 7.5 mg/Kg and 87% at 20 mg/Kg.
Two trials in cattle with the parenteral formulation of Netobimin administered at 12.5 mg/Kg against experimental infections showed efficacies against adult O.ostertagi, D.viviparus and C.oncophora of 91 - 92%, 98 - 99% and 64-65% respectively.
In sheep, two trials were carried out in which lambs, experimentally infected with Haemonchus contortus,Ostertagia circumcincta and Trichostrongylus colubriformis, were treated at dose rates of 5.0 mg/Kg and 10 mg/Kg bodyweight.In one trial treatment was on day 4 and in the other on day 25 to assess efficacy against larval and adult stages.The results of both trials showed that Netobimin was 99 - 100% effective at all dose rates. An additional trial against Fasciola hepatica has shown Netobimin to be 99 - 100% effective against 12 week-old flukes at 15-20 mg/kg bodyweight.

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Netobimin (Totabin-Sch) Efficacy in Cattle in Ireland.

N.E. DOWNEY* and J. O'SHEA

The efficacy of the anthelmintic Netobimin (Totabin-SCH) for the seasonal control of trichostrongylid infection in calves was assessed. Using a dosage level of 7.5 mg/Kg body weight, the compound was given at three and six weeks after spring turnout (May 7th).

Pasture grazed by control calves showed a marked increase in trichostrongylid infection in mid-August, while numbers of infective larvae (L3) on the treated calves' pasture remained at a low level until early October. A peak level of 72,400 L3 per Kg dry herbage (L3/Kg) occurred on the control pasture on October 8th, corresponding to a peak of 18,247 L3/Kg on pasture grazed by the treated calves. The differences in levels of infection on the herbage evidently resulted from lower worm egg output ($P < 0.01$) by the treated calves in June and July. These animals gained significantly ($P<0.01$) more weight than the controls up to October 11th, but nevertheless the amount of infection they eventually acquired indicated that the regimen of treatments did not adequately control trichostrongylid infection throughout the season.

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Netobimin (Totabin-Sch) Efficacies in Ruminants in Rio Grande do Sul, Brazil.

P.C. GONÇALVES*, A.C. PINHEIRO, J. PINHEIRO, F. ECHEVARRIA, G. MACEDO, VAZ and A. RISCH

A. Cattle - A controlled trial with Netobimin at 20.0 mg/Kg parenterally and orally in calves naturally infected with hypobiotic Ostertagia showed efficacies of 35% subcutaneous and 87% orally.

   A field trial in lactating cows with three treatments of Netobimin at 20.0 mg/Kg orally revealed an increase in milk production of 266 Kg per cow during 90 days.

B. SHEEP - Netobimin was highly efficacious against M.expansa at 10.0 and 15.0 mg/Kg orally. In the most important nematodes of lambs the doses from 5.0 to 15.0 mg/Kg were highly effective, except for H.contortus similar results obtaind with 10.0 and 15.0 mg/Kg orally.

   A field trial with Netobimin and Ivermectin (20.0 mg/Kg and 200 µg/Kg respectively) revealed a good control for nematodes and Fasciola of sheep with 2 and 4 drenches respectively during a 11 month period.

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An Efficacy Study With the New Compound Netobimin (Totabin-Sch) Against *Dicrocoelium dentriticum* in Sheep.

F. SANZ, J.M. TARAZONA*, R. JURADO, J. FRIAS and J.V. TARAZONA

An efficacy trial with the anthelmintic Netobimin(Totabin-SCH) against D.dentriticum was done in sheep.

Twenty naturally infested sheep,from a flock where the incidence of the parasite was high,were selected in basis of the egg counts in faeces.From the mean values of three egg counts before treatment, two groups of ten sheep,with similar counts (P lower than 0.8) were made. One of these groups received an oral dose of 20 mg/Kg body weight of Netobimin, and the other group remained as controls.

The values of egg in faeces were determined on Day 0,7 and 14. All the sheep were sacrificed on Day 14, and D.dentriticum present in liver, gall bladder and small intestine were collected and counted.

A strong reduction of fluke burdens in the treated group against the control one was observed.The number of D.dentriticum collected in treated group was 11,7 flukes, while in the control group was 1166,33. The difference between respective means was very highly significant (P lower than 0.00001). The efficiency index of Netobimin against D.dendriticum was of 98.99 per cent.

No toxic symptoms were observed in treated sheep with the dose of 20 MG/KG B.W.

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Histology of Salivary Gland of *Amblyomma cajennense* (Fabricius) Males Tick (Acarina: Ixodidae)

J.A. OLIVIERI MARADEY and N.M. SERRA FREIRE*

The salivary gland of male tick (Amblyomma cajennense) had been drawn out surgically from 30,90 and 120 days fasting samples mantained under laboratory controled temperature at 27°C and relative humidity higher than 80%, and from feeding samples, manually detached from milk bovine host in intervals from six hours of its attachment until 120 hours; and after 120 hours the detachment happened each 24 hours until 14 days including. The material had been fixed in Zenker solution during 12-18 hours, washed with water for 24 hours, embedded the salivary gland individually in a solid block of parafin wax, and the histological cuts of nearly five micra thickness and stained by hematoxilin and eosin stain, giemsa stain and periodic acid (PAS). The structure interpretation had made possible to identify four types of alveoli: 1) alveolous type I localized in the intermediate and superior part of the principal salivary pipe and some branches, its non-granular alveolous but it had been vesicles with acidophilic material; 2) alveolous type II, granule-secreting alveolus localized principally in the front part of salivary gland it had been identified the cells type "a","b" and "c" with subtypes "C^1" and "C^2". In the 30 days fasting period its size had been 27x24 micra and in the 150 days fasting period its size had increased to 32x29 micra. During the parasitical phase its size had been 36x32 micra for the first day feeding and had increased gradually until 45x42 micra for the last day feeding; 3) alveolous type III, granule-secreting alveolus it had been identified "d","e" and "f" cells type. In the 30 days fasting period its size had been 33x30 micra and in the 150 days fasting period its size had increased to 38x33 micra During the parasitical phase its size had been 39x33 micra for the first day feeding and had increased gradually until 49x33 micra for the last day feeding; 4) alveolous type IV, granule-secreting alveolus it had been identified "g" and "h" cells type and another cell type had named "i", its looklike "f" type cell from alveolus type III. The "a", "d" and "g" cells type had been granule-secreting vacuoli had stained in purple by hematoxilin and eosin stain. The "h" cell type had granule-secreting vacuoli had stained in orange.

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Laboratory Study of Non Parasitic Stage of The Tick *Amblyomma cajennense* (Fabricius) – Equine Strain (Acarina: Ixodidae)

J.A. OLIVIERI MARADEY, E. DAEMON and N.M. SERRA FREIRE*

It had been used engorged teleogina weighing between 226.0 and 898.0mg (average of 629.8mg) obtained by manual detachment within naturally infested equine and mantained in a laboratory controlled temperature at 27°C and relative humidity higher than 80%. After pre-egg laying period that had variation between five and 12 days, each five days intervals it had been taken each female, its mass of eggs and three groups of 50 eggs. All teleoginas had laid within the first five days, while 96% had laid until the 10 days, 83% until the 15 days and only 17% until the 20 days.In the first 10 days it had been laid 83% of the eggs and the average weight of one egg had been calculated in 0.05254mg. The average of the period of hatching had been 33 days for the eggs laid within the first five days, and 32 days for the other intervals. The average of the emergement had been six days for the eggs laid withen the first five days, and five days for the other intervals. The reproductive efficiency index (REI) had been 52.73%, and the nutritional efficiency index (NEI) had been 66.80%. It had been emerged an average of 83% of the eggs from the total laying. Despite the teleoginas hadn't been detachment naturaly the correlation between

the weight of the teleóginas and its laying had been 0.87 (P<0.01)

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Laboratory Study of Non Parasitic Stage of The Tick *Amblyomma cajennense* (Fabricius) Bovine Strain (Acarina: Ixodidae)

E. DAEMON, J.A. OLIVIERI MARADEY and N.M. SERRA FREIRE*

It had been used engorged teleógina weighing between 203.0 and 923.4mg (average of 594.4mg) obtained by manual detachment within naturally infested bovine and mantained in a laboratory controlled temperature at 27°C and relative humidity higher than 80%. After pre-egg laying period that had variation between four and nine days, each five days intervals it had been taken each female, its mass of eggs and three groups of 50 eggs. All teleóginas had laid within the first ten days, while 94% had laid until the 15 days, 81% until the 20 days, 50% until the 25 days,29% until the 30 days and only 10% until the 35 days. In the first 10 days it had been laid 79% of the eggs and the average weight of one egg had been calculated in 0.048284mg. The average of the period of hatching had been 34 days for the eggs laid within the first five days, and 31 days for the other intervals. The average of the emergement had been three days for the eggs laid within the first five days, and four days for the other intervals. The reproductive efficiency index (REI) had been 56.10%, and the nutritional efficiency index (NEI) had been 69.63%. It had emerged an average of 80% of the eggs from the total laying, and had been observed fertility of 3.13%, and zero per cent the following intervals 26 to 30 days and 31 to 35 days respectively. The correlation between the weight of the teleóginas and its laying had been 0.78 (P<0.01).

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The Pathology of The Skin in *Dermatobia hominis* (Diptera: Cuterebridae) Infection in Cattle.

A. SANAVRIA*, J.A. OLIVIERI MARADEY, C.W.G. LOPES, N.M. SERRA FREIRE and G.E. MOYA BORJA

Experiments were conducted to evaluated and determine the pathological feature and the integumentary tissue, especially the skin during D. hominis infection. In areas where lesions were observed, biopsy of the skin was performed on the lateral aspect of the body. In these experiments there were evidence of suppuration in the epidermis at 24 hours (hs) post infection (PI). The first change was edema associated to inflamatory cells, basically, neutrophils around the parasitic lesions. Areas of spongiosis were than observed involving the prickle layer beneath the suppurative areas. By 96 to 168 hs PI, this reaction persisted around the parasitic wounds and there was an intese netrophilic accumulation beneath the the inflamed areas where eosinophils and a few macrophages were presented around de dermal blood vesels. Acanthosis and extensive intercelular edema was observed in proximity to the dermal-epidermal junction at 192 hs PI. By 216 to 536 hs PI the endothelial cells of the sebaceous glands were hyperthrophic while granulation tissue increased around the parasitic area. Crusts of inflamatory cells debris and bacterial collonies were observed in adjacent hair folicles while decreased the granulation tissue and eosinophils at 537 to 600 hs PI. By 792 hs PI, regeneration of the epidermis was observed in the wound by reorganizing of the basal layer and replacement of the granullation tissue by fibrosis in the dermis.

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Histology of Salivary Gland of *Amblyomma cajennense* (Fabricius) Female Tick (Acarina: Ixodidae)

J.A. OLIVIERI MARADEY and N.M. SERRA FREIRE*

The salivary gland of the female tick (Amblyomma cajennense) had been drawn out surgically from fasting samples and feeding samples, manually detached from milk bovine hosts in intervals from six hours of its attachement until 120 hours; and after 120 hours the detachment happened each 24 hours until complete feeding on mine, ten, 11,12,13 and 14 days including. The material had been fixed in Zenker solution during 12-18 hours, washed with water for 24 hours, embedded the salivary gland individually in a solid block of paraffin wax, and the histological cuts of nearly five micra thickness and stained by hematoxilin and eosin. The structure interpretation had made possible to identify three types of alveoli:1)alveolus type I localized in the intermediate and superior part of the principal salivary pipe and some branches, characterized by being nongranular alveoli. Its size varied from 26x19 to 47x38 micra within fasting period. After the first six hours of attachment to the bovine,the size of this alveoli had maintained between 26x21 to 35x29 micra during the parasitical phase;2) alveolous type II, granule-secreting alveolus localized principally in the front part of the salivary gland, in the fasting period its size had been 30x28 micra and had increased gradually during the parasitical phase, reaching the maximum of 108x92 micra. On the seventh day after continued attachment to the host, it had been identified the cells type "a","b" and "c" with subtypes "C^1" and "C^2"; 3) alveolus type III, also granule-secreting alveolus localized principally in the back labulated mass of the gland or inserted between the type II alveoli in the third part behind it. Its size within fasting period had been approximately 42x32 micra, and during the parasitical phase had grown gradually till reaching the size of 117x99 micra on the eighth day of continued attachment.It had been identified "d","e" and "f" cell type.

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The Effect of Haller's Organ Section in The Reproductive Activity of The Tick *Amblyomma cajennense* (Fabricius) (Acarina: Ixodidae)

D.W. CUNHA, J.A. OLIVIERI MARADEY and N.M. SERRA FREIRE*

Experiments had been conducted to evaluate the function of Haller's organ in the reproductive activity of Amblyomma cajennense.From this study three groups of tick had been named I,II and III, with sexual relation 1:1 had been infested experimentaly rabbits using ears bags.The Haller's organ of the group I had been drawn out surgically from males ticks the Haller's organ of the group II had been drawn out surgically from the females ticks; and the group III caracterized both males and females ticks with Haller's.The infestation had been repeted three times for each group with 20 ticks. The parasitic time had been 10 days to group I and II and 12 days to group III, without variation between the meanrate (P<0.01) the attachment period mean to group I and II had been 64 hours to males and 76 hours to females; the same period to group III had been 94 hours to males and 55 hours to females. For group I and II males moviment had been 78% and 89% more than females; to group III the females hadn't had moved. For all three groups the males had started to change position around six or seven days after infestation. The non parasitic phase studied under laboratory controlled temperature at 27°C and relative humidity higher than 80% showed that: the females of the group I had been weight 22.2-264.8 mg with average 96.3 mg; the females of group II had been weight 61.1-483.3mg with average 198.4mg and the females of group III had been weight 86.4-505.2mg with average 296.3mg. The period of pre-egg laying to all three groups had been eight days. The reproductive efficiency index (REI) had been 38.21%, 43.58% and 52.95% to groups I,II and III; the nutricional efficiency index (NEI) had been 48.42%,57.70% and 70.20% to groups I,II and III.

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Identification of Some Tabanidae and Seasonal Fluctuation of *Diachlorus bovittatus* in The Restinga de Marambaia, Rio de Janeiro, Brazil.

M.A. AGUIAR*, R.R. GUIMARÃES and G.E. MOYA BORJA

Seventeen species of Tabanidae were collected in the Restinga de Marambaia, Rio de Janeiro State, Brazil and Seasonal fluctuation of the most important specie.Diachlorus bivittatus, was studied. Insect population was determined

using four Manitoba traps and the data were registered at weekly intervals. D. bivittatus was more abundant and active during the humid and relatively hot season (October, 1981 - May, 1982).

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The Activity and Survival of *Boophilus microplus* Larvae on Several Species of Grass.

M.E.A. BERNE*, M.A.M. SCHENKE and D. EVANS

The activity and survival period of Boophilus microplus larvae were observed using six grasses: Brachiaria humidicola, B. decumbens, Hyparrhenia rufa, Andropogon gayanus and Melinis minutiflora, planted in $1m^2$ plots with seven repititions pasture species.

A single dose of 20.000 B. microplus larvae was applied to each plot on day zero. Larval activity was observed three times a day at 7:30, 13:00 and 16:00 hs. Grass samples were colleted on days 7,14, 21, 35, 49, 63 and 84. For the rainy and dry seasons respectively host seeking activity on day 7 for each of the grasses was 100 and 75% B. humidicola; 98 and 60% B. decumbens; 80 and 50% B. brizantha and A. gayanus; 75 and 30% H. rufa; 20-5% M. minutiflora, and larval survival period in days was 14 and 21 M. minutiflora; 21 and 49 B. decumbens, B. brizantha and H. rufa; 35 and 49 A. gayanus; 49 and 63 B. humidicola These findings showed that during the rainy season, a period of elevated ambient temperature, the larvae presented a higher activity level, which resulted in a more rapid energy expediture and conseguently lower survival period. M. minutiflora inhibited larval activity and decreased survival period possibly by secreting a substance with repeleant and larvacidal actions. The grass species which most favored B. microplus larval activity and survival was B. humidicola.

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Population Vaiance of Cochlyomyia hominivorax (Coquerel, 1858) in The County of Capão do Leão, RS.

M.M. WIEGAND*, P.B. RIBEIRO, J.G.W. BRUM and P.R.P. COSTA

Mensal populatio. variance of adults of the Cochlyomyia species was estimated from february 1983 to january 1985 using two wind oriented traps suspended to trees 300 m apart at a height of 1.0 to 1.2 m. The bait was a piece of deteriorated bovine liver 50% of which was replaced every 10 days to ensure renewal of the attraction principle. Captured insects were identified and counted 2 to 3 times a week. In the above mentioned period 317.458 diptera were captured: 781 C. hominivorax and 7.812 C. macellaria, C. hominivorax presented greater density of population in the months of march, april and may, while in july, august and september there was no capture. It was observed that in temperatures inferior to 18ºC, C. hominivorax population decreases rapidly as it does when pluviometric precipitation goes beyond 2 mm, even in favourable temperature conditions, increasing immediately afterwasds. C. macellaria was captured mainly from novembar to january, and diptera from other groups shiwed a populational behaviour similar to that of C. hominivorax. It was concludet that mean mensal temperature and mensal precipitation have a considerable influence on the population variance of C. hominivorax.

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The Free-Living Phase of *Boophilus microplus* (Can. 1887) in The Santa Catarina Plateau Area.

A.P. SOUZA*, J.C. GONZALES, C.I. RAMOS, C.G. PALOSCHI and A.N. MORAES

From March 1979 to February 1983, two groups of 5 g of Boophilus microplus engorged female ticks monthly Boophilus microplus exposed to the environment in Petri dishes protected from direct sunlight. Egg production, pre-oviposition, oviposition, pre-hatching and neolarval period, and the longevity of the infesting larvae, were noted twice a week. Mean monthly temperature and relative humidity were also registered. The minimum periods of pre-oviposition, oviposition, pre-hatching, neolarva and longevity, of the infesting larvae were 4, 17, 15, 3 and 30 days respectively, while the maximum periods were 87, 67 185, 14 and 286 days respectively. The average egg mass varied from 2, 352 g to 0,056g. The eggs derived from engorged female exposed to the environment from April to August were infertile. It was also observed that during the months of January and February a certain concentration of hatching of larvae took place from groups of engorged females with fertile egg masses.

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Comparative Study of The Hematology of Experimentally Induced *Babesia bovis* and *Babesia bigemina* Infections in Splenectomized Calves.

CARLOS A.A. VALADÃO, R.Z. MACHADO* and C.R. MACHADO

Babesia bovis and *Babesia bigemina* were isolated from blood of naturally infected animals. The blood parasites were inoculated in splenectomized calves and complete hemogram, rectal temperature and parasitemia were comparatively studied. Parasites were first detected on 7th day after inoculation with *B. bigemina* and on the 9th day of inoculation with *B. bovis*. Maximum parasitemia occurred on day 10 (*B. bigemina*) and on day 14 (*B. bovis*) when the average counts were 15% and 2% respectively. Concomitant with the raise in parasitemia an increase in body temperature was observed. The temperature top values were 40.5ºC for *B. bovis* and 41ºC for *B. bigemina*. The strain of *B. bigemina* used in the present study caused significant decrease in total erythrocytes count and hemoglobin content which followed the same curve as packed cell volume values. The animals showed haemoglobinuria accompanied by jaundice and one animal died on day 12 with severe anaemia. On the other hand, the used strain of *B. bovis* didn't caused significant alteration in total erythrocyte counts hemoglobin content and packed cell volume values. Haemoglobinuria and jaundice didn't occurred and all infected hosts survived *B. bigemina* infections were much severe than *B. bovis* infections.
One of the hosts which survived without any treatment its experimental *B. bovis* infection was released in a tick infested pasture where 52 days later it developed a natural infection with *B. bigemina*. This observation shows that an eventual cross immunity between the two parasite species, if it occurred at all, was not complete.

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Isolation of *Babeisa bigemina*, *Babesia bovis* and *Anaplasma marginale* Through Ammonium Chloride Lysis of Infected Erythrocytes.

ROSANGELA Z. MACHADO*, A.A. PINTO and C.A.A. VALADÃO

Experimental infection of esplenectomized calves was done with *Babesia bigemina*, *Babesia bovis* and *Anaplasma marginale*. Blood sample were taken and promptly mixed with cold Alsever's

solution (pH 7.2). Blood cells were then submitted to three washings with cold saline (0.85%) and left to sediment after which they were suspended in saline at the 1:1 proportion. Then for each 10ml of this suspension a volume of 100ml was added of a buffered pH 7.4 ammonium chloride solution previously warmed to 37°C for 3-5 minutes. After this the suspension was centrifuged for 20 minutes at 500g in a low temperature (-10°C) centrifuge, followed by a double washing in cold sterile saline. Free parasites were observed in dry smears fixed in methanol and stained by Giemsa's method. Such parasites freed from erythrocytes constitute the regular antigen used for the indirect immunofluorescence technique. For special purposes this antigen can be previously freed also from leucocytes through differential separation in 9% ficoll gradient by means of the above mentioned centrifuge (250g x 30 minutes, laboratory temperature).

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A Morpho-Pathogenic Study of *Babesia bigemina* Infected Cattle.

F. LOZANO-ALARCON* and L.G. ADAMS

The morphologic alterations of bovine babesiosis were investigated in 10 Babesia bigemina infected calves. The gross, microscopic and ultrastructural lesions were studied in tissues collected sequentially from 36 hours to 10 days post-inoculation. The gross lesions consisted of yellow discoloration of the fasciae, aponeurosis and subcutaneous tissue. Subpleural petechial hemorrhages and slight excessive pericardial, pleural and peritoneal fluid also occurred in these calves. Parasitemia become evident on day 7 post-inoculation, and non-cell associated forms of B. bigemina were found in tissue impression smears, although ultrastructually, macrophages in the renal lymph nodes and splenic pulp contained similar organisms suggesting an exoerythrocytic schizogony. The microscopic lesions consisted of generalized vascular congestion and leukocyte margination, transmigration and infiltration in the parenchymatous tissues, as well as edema, hemorrhagic foci, lymphoid, and histiocytic and reticular cell hyperplasia of visceral and peripheral lymph nodes. Marked congestion and neutrophilic infiltration occurred in the spleen, heart and kidneys of the calves necropsied during acute babesiosis. Increased bone marrow erythro-and myelopoiesis was observed during acute babesiosis. At the ultrastructural level, the plasmalemmae of the parasitized erythrocytes had radiating strands which may have contributed to the adhesiveness of such erythrocytes to leukocytes and endothelial cells. The ultrastructural lesions of macrophages of the renal lymph nodes and splenic red pulp included decreased amounts of dilated smooth and rough endoplasmic reticulum, swollen mitochondria, and formation of single membrane limited large vacuoles. Reduction in the quantity of pinocytotic vacuoles in the endothelium of the hepatic arterioles and renal lymph node post-capillary venules was also observed.

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Cell Mediated Immune Response in Cattle Babesiosis.

ROSANGELA Z. MACHADO*, A.A. PINTO and C.A.A. VALADÃO

The "in vitro" Cell Mediated Immune Response (CMIR) test was applied to four calves, two of which had been previously splenectomized, employing the Leukocyte Migration Inhibition Test (LMIT). These tests were applied both before and after experimental infection with *Babesia bovis*. *B. bovis* particulate antigen was suspended at the rate of 1:10 in the complete TC-199 culture medium. For this blood samples of each animal were collected in three heparinized plastic test tubes and the white cells were separated after erythrocyte lysis in ammonium chloride buffered solution (pH 7.4). The leukocyte suspension so obtained in each of the tubes was sedimented by means of a centrifuge (250g 5 minutes) at the ambient temperature. The resulting sediment was resuspended in complete TC-199 at the rate of $5\text{-}10 \times 10^7$ cells/ml. The comparative results between splenectomized and normal calves showed significant differences which may be ascribed to protective mechanisms against *B. bovis* infection. LMIT in normal calves after 6, 9, 12, 15 and 26 days infection showed a much higher percentage of cell migration inhibition than in splenectomized ones.

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Control of Bovine Coccidiosis With Amprolium and Monensin Under Brazilian Husbandry Conditions.

JOSÉ D. LIMA*, ROMÁRIO C. LEITE and HELTON M. SATURNINO

Bovine coccidiosis is endemic under Brazilian husbandry conditions. Its morbidity, rather than mortality, has been incriminated as cause of high losses in calves less than 6 months old. An experiment has been conducted to evaluate the effectiveness of amprolium and monensin in controlling coccidia in calves kept under natural Brazilian conditions, during a period of 12 months. Three groups, each of 15 calves, were used. One group was given feed with added amprolium at the dosage level of 1 g/kg of feed; other group received feed with added monensin at the dosage level of 20 g/ton of feed; and, the other remained as nonmedicated control. Calves were given medicated feed for 70 days, beginning 15 days after birth. Calves of each group were housed together in pens during the first 45 days of the experiment and, later, all groups were mixed and kept together in common pasture; but, each group was separated once a day to give medicated feed as previously described. Fecal samples were collected at 28 days intervals and examined for the presence of coccidia. Calves were also weighed at the same intervals. Coccidia oocysts were found in fecal samples of all groups, but larger number of oocysts were found in calves of the control group. Several species of *Eimeria*, including *E. bovis* and *E. zuernii*, was identified. Differences in weight gains were found among the three groups but they did not differ significantly in the first 3 months of the experiment.

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On Two New Sarcocystis Species From The Chinese Yak (*Peophagus grunniens*).

T. WEI*, P.Z. CHANG, M.X. DUONG, X.Y. WANG and A.Q. XIA

Studies were made for the first time on Sarcocystis of the Chinese yak, a bovine food animal of Gansu and Qinhai province, China. Two Sarcocystis species from the yak were differentided by light microscopy, transmssion and scanning electron microscopy. Since they differ from other species of the genus and from each other in morphology described in this paper and biology, they have been considered as two new species, designated as Sarcocystis poephagi sp. nov. and Sarcocystis poephagicanis sp. nov., respectively. The differential morphopogical features are listed in following table.

	S.poephgi	S.poephagicanis
Cyst shape	rhabditiform, filariform, earthworm-like	spherical, silkworm chrysalis-shaped
Cyst size mm	average 4.295X0.211	average 0.286X0.120
Zoite size mum	average 10.63X4.09	average 10.78X3.08
Cyst wall	thick, with cross striations	very thin, a homogenous layer
Cyst wall, by transmission electron microscopy	primary wall(pw) composed of 7-8 layers of spindle-shaped cell. The membrane of which, crenated; secondary wall (sw), a transparent layer of cellular granules	pw, a layer of membrane with crenated ridges; sw, a layer of homogenous ground substance

Cyst wall, by scanning electron microscopy	pw, with surface loose, spongy and scholartree like; sw, with gauzelike surface	pw, its surface looks like a honeycomb with numerous meshes of various sizes; sw not clearly seen
Rhoptries	3 in no. the middle one is longer than other 2	2 in no., both short
Lysosome	numerous	less numerous
Vacuoles	less	more

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Identification of Serodemes of *Trypanosoma congolense* in Isolates From a Defined Locality in Kenya.

RACHAEL A. MASAKE*, V.M. NANTULYA, A.J. MUSOKE, P.O. MAJIWA and S.K. MOLOO

Previous studies on Trypanosoma congolense have shown that each serodeme has a limited number of metacyclic variable antigen types (VATs) which are serodeme-specific. It was subsequently suggested that serological typing of metacyclics may offer an important tool for identification of serodemes. Such an approach, if feasible, could be used to determine whether the number of T. congolense serodemes in a defined geographical locality is also limited. To investigate this, 20 tracer Boran cattle were introduced on a farm at the coastal belt of Kenya and exposed to tsetse-challenge for 8 months. Sixty-four isolates were prepared from the tracer cattle: 61 were T. congolense and 3 were T. theileri. Forty of the T. congolense isolates have been passaged and cloned in mice. Out of these, 6 clones and 11 stocks have been transmitted through tsetse (Glossina morsitans centralis). Cross testing of the metacyclics of the 6 clones by indirect immunofluorescence and neutralization assays using anti-metacyclic hyperimmune sera revealed that these clones belonged to 3 distinct serodemes. Immunization followed by cross-challenge confirmed that the 3 serodemes were completely different. The serological differences observed with the 3 serodemes were also demonstrable by molecular karyotyping. Analysis of metacyclics of the stocks by indirect immunofluorescence revealed that each stock had a mixture of the 3 serodemes. These results suggest that serological typing of metacyclics can be used for identification of serodemes and that the number of T. congolense serodemes in the locality investigated was limited. Furthermore, analysis of sera from the tracer cattle showed the presence of antibodies against metacyclics of the 3 serodemes as early as 3 months following introduction of the animals on the farm. This indicates that exposure of cattle to tsetse-challenge under field conditions may lead to the development of acquired immunity against the local serodemes.

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Babesia bigemina: Requirements for *in vitro* Cultivation.

CARLOS A. VEGA*, G.M. BUENING, T.J. GREEN and C.A. CARSON

The study of the biology of Babesia bigemina required an in vitro model in which the intraerythrocytic parasite would replicate continuously. Preliminary studies had indicated that this parasite could only be mantained for few days in the laboratory. An splenectomized calf was inoculated with a Mexican strain of B. bigemina. When clinically ill, blood containing infected erythrocytes (iRBC's) was drawn into heparinized tubes, and washed with a Phosphate - Saline-Dextrose solution supplemented with Adenine and Guanosine (VYM). Normal bovine erythrocytes (nRBC's) were obtained from intact donors, by defibrination with glass beads, similarly washed and stored in VYM. For the original isolation nRBC's and iRBC's were mixed and suspended at a 5% concentration in six commercially available tissue culture media, supplemented with 50% Fresh Normal Bovine Serum (FNBS). Suspensions were alloted in 805 μl volume in 24-well plates in duplicate. Plates were incubated at 37°C in six different chambers possesing atmospheres with increasing O_2 concentrations. Culture medium was exchanged daily. Giemsa stained smears were prepared to monitor parasite development. The culture system was considered established after 11 days of in vitro replication, which was better observed in low oxygen atmospheres, emphasizing the microaerophilic nature of B. bigemina. Similarly, it was found that a minimum of 20% concentration of FNBS in culture medium was required to mantain growth. Multiplication cycles were continuosly sustained through subcultures by dilution with nRBC's in fresh medium. Afther 36 days $1.5x10^8$ in vitro-derived B. bigemina iRBC's were inoculated in another splenectomized calf, and the disease reproduced. The organism was reisolated by in vitro culture, fulfilling Koch's postulates. The strain has been mantained continuously under in vitro laboratory conditions for over one year. The procedure is now deemed satisfactory to study the biology of the parasite.

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Babesia bigemina: in vitro Culture Conditions for Cloning.

CARLOS A. VEGA*, G.M. BUENING, S.D. RODRIGUEZ and C.A. CARSON

There isolates of in vitro propagated Babesia bigemina were used. Original culture conditions were modified regarding concentration of cell suspension, and atmospheric environment. The parasite ability to initiate cultures with variation in seed density was tested. Culture were adjusted so that most infected erythrocytes contained only one parasite. Calculated dilutions in complete culture medium were carried out in 96- well plates, to approach 1 infected erythrocyte in 200 ul volume. This volume was dispensed in four 50 ul/well aliquots, and filled with 110 ul of a 5% normal bovine erythrocyte suspension. Parasite growth was detected as early as 16 days and all clones were harvested and expanded between 20 and 28 days afer initiation of cloning. Three primary clones were selected for recloning. The probability that detected parasites were the progeny of a single infected erythrocyte approached 0.99 for tertiary clones. Growth rates of sequentially derived clones did not prove to be uniform, as has been the case with B.bovis. Potential applications of the cloning procedure include the separation and differentiation of B. bigemina subpopulations.

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Ehrlichia bovis: Transmission Evaluation by Three Species of Ticks in Brazil.

CLAUDETE DE A. MASSARD and C.L. MASSARD*

Ingurgitated females of *Boophilus microplus (Canestrini), Anocentor nitens (Neumann)* and *Amblyomma cajennense (Frabicius)* were obtained from cattle and equines in differents regions of Rio de Janeiro State - Brazil. Monoxenes and thrioxenes ticks were rearing the methodology based in NEITZ, BOUGHTON and WALTERS (1971) modified, envolving the use of disposable serynges. During all non parasitic phases the ticks were maintened in climatized chambers with contrled temperature (27°C) and a relative umidity higher than 80%.

Twelve calves were used for evaluation of the trnsmission capacity of *E. bovis*. These animals were mantained in healthy conditions free from insects and comprovated free of haemoparasites.

Groups of animals were infested with *B. microplus*, *A. nitens* or *A. cajennense*. The exposure of *A. cajennense* nymphae, originated from larvae mantained on calves infected with *E. bovis* allowed to probe the transestadial transmission of *E. bovis*.

The temptatives of transmission *E. bovis* using *B. microplus*, *A. nitens* and *A. cajennense* larval stages failed to transmit *E. bovis*.

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Ehrlichia bovis (Donatien & Lestoquard, 1936): Geographical Distribution and Considerations on Susceptible Animals Species.

CLAUDETE DE A. MASSARD, C.L. MASSARD*, R.B. FREIRE and C.M. ANDRADE

Ehrlichia bovis was at first time described by Donatien & Lestoquard (1936) in Argelia, in samples proceeded from bovines experimentally inoculated with adults ticks of *Hyalomma* (Koch), from Iran. Following that, several researcher from France and Africa, repported its incidence associated to others haemoparasitios diseases in cattle from north Africa. This parasite has been frequentelly associated to a clinical debilitation of infected animals, designated as "Nofel" or as "Nopi" in Africa, and is commonly spreaded in central Africa, Senegal (Cape Verde), Sri Lanka and Brazil. In the Pale region, west Africa, this parasite was repported in zebuins with natural infections, associated with *Babesia bigemina* and *Anaplasma marginale*.

Althought *E. bovis* has been frequently associated to infections in bovines species, there are isolated publications where sheep, monkeys *(Macaca sylvana)* and Canadian bizon presented positive infection.

The Brazilian strain of *E. bovis* was only transmissible from cattle to cattle. All the experimental temptatives to transmit infection to dogs, goat, sheep and rabits were unsuccessfull.

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Acetylcholine and Acetylcholine-Receptors in Helminths.

N.C. SANGSTER*, S.C. SUKHDEO and D.F. METTRICK

Muscle physiology and neuromuscular transmission in helminths is poorly understood. The cholinergic responses, which are excitatory in Moniliformis moniliformis and inhibitory in Fasciola hepatica, were compared by measuring muscle contractions of whole worms or worm segments. Test compounds were added to the external medium for F. hepatica and M. moniliformis worms or injected through M. moniliformis segments. In whole M. moniliformis a range of cholingeric agonists had no effect on contraction except for nicotine (10^{-3} M) and levamisole (10^{-4} M). The sustained increases in baseline tension caused by these compounds were inhibited by pentolinium tartrate and hexamethonium. In M. moniliformis segments, the agonists acetylcholine, carbachol, nicotine, levamisole and morantel tartrate caused reversible contractions at concentrations as low as 2 µM for acetylcholine. In F. hepatica, the same compounds inhibited spontaneous muscle activity and caused flaccid paralysis. Antagonists, such as gallamine and atropine, caused increases in rate and amplitude of spontaneous contractions in worm segments. These data, and the presence of acetylcholine at 9.3 pmol.mg wet weight^{-1} in M. moniliformis and 20.9 pmol.mg wet weight^{-1} in F. hepatica, suggest that acetylcholine acts as an excitatory transmitter in M. moniliformis and as an inhibitory transmitter in F. hepatica. Drug studies in M. moniliformis may provide a useful comparison with drug actions in nematodes.

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Potentiation of the Anthelmintic Activity of Oxfendazole by Parbendazole.

D.R. HENNESSY, E. LACEY, R.K. PRICHARD and J.W. STEEL*

An in vivo effect of inhibitors of cellular microtubule assembly (spindle poisons) is a reduction in the activity of secretory cells, e.g. milk, saliva, hormones. Parbendazole (PBZ), which is a potent microtubule inhibitor, reduced the secretion of bile by sheep. The degree of depression was dose dependant. Since oxfendazole (OFZ) is largely metabolised by the liver and a substantial portion of the OFZ dose is secreted in bile, it was postulated that a PBZ-induced reduction in biliary secretion might temporarily slow the rate of metabolism of co-administered OFZ.

OFZ (4.53 mg/kg) was orally co-administered with a range of PBZ doses (1.35-36.0 mg PBZ/kg) and the area under the plasma OFZ concentration-time curve (AUC) determined. The presence of PBZ resulted in a progressive increase in OFZ maximum concentration in plasma and AUC with 4.5 mg PBZ/kg approximately doubling the AUC obtained from OFZ alone.

When tested against benzimidazole (BZ)-resistant Trichostrongylus colubriformis and Haemonchus contortus, the 4.5 mg PBZ + 4.53 mg OFZ/kg mixture was significantly more efficaceous than OFZ alone. For the two respective parasite species the PBZ/OFZ mixture removed 93.3% and 54.7% compared to 38.2% and 3.5% for OFZ. PBZ alone had no effect on either species. Moreover, field testing against BZ-resistant T.colubriformis resulted in the PBZ/OFZ mixture having an efficacy equivalent to, or slightly greater than than obtained from an OFZ double dose.

The potentiation of OFZ with a microtubule inhibitor has indicated a means by which more effective use can be made of currently available anthelmintic drugs.

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Pharmacokinetic Behaviour of Oxfendazole When Co-Administered With Parbendazole.

D.R. HENNESSY, E. LACEY, J.W. STEEL* and R.K. PRICHARD

Co-administration of 4.5 mg parbendazole (PBZ)/kg with 4.35 mg oxfendazole (OFZ)/kg has been previously shown to cause a two fold increase in the area under the plasma OFZ concentration-time curve (AUC). Consequently, the anthelmintic efficacy of OFZ against benzimidazole resistant worms was significantly increased. To examine the pharmacokinetics of OFZ when given as a PBZ/OFZ combination, sheep fitted with a permanent bile duct cannula were sequentially administered with OFZ, OFZ/PBZ then OFZ again. The treatments were 14 days apart with PBZ given at 4.5 mg/kg and the 5.0 mg OFZ/kg dose containing a trace of ^{14}C-OFZ.

Compared to administration of OFZ alone, PBZ did not affect the total plasma ^{14}C-OFZ AUC but increased the relative proportions of OFZ and fenbendazole (FBZ). There was no change in urinary ^{14}C-OFZ excretion. Most notably PBZ caused both a 22% reduction in biliary secretion of ^{14}C-OFZ and a shift in OFZ metabolism. With OFZ alone hydroxylated OFZ was the major and hydroxylated FBZ the minor biliary metabolites whereas both hydroxylated OFZ and FBZ were in equal proportions in bile of the PBZ/OFZ treated sheep. PBZ did not alter the faecal excretion of ^{14}C-OFZ.

In each compartment studied, the pharmacokinetic behaviour of OFZ was identical in the before and after PBZ/OFZ treatment demonstrating the PBZ influence to be indeed temporary. As there was no change in plasma ^{14}C-OFZ AUC, nor any change in urinary or faecal ^{14}C-OFZ excretion, the PBZ-reduced biliary ^{14}C-OFZ secretion provided indirect evidence for an increased non-biliary secretion of plasma metabolites across the gut wall. This increased flux of the higher relative proportions of plasma OFZ and FBZ was considered to provide a more prolonged anthelmintic insult against gastrointestinal worms in sheep co-administered with OFZ and PBZ.

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Filaricidal Effects of Benzothiazoles and Benzooxazoles in Experimental Filariasis.

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Benzothiazole and benzooxazole derivates, mainly isothiocyanates (I),dithiocarbamic acid esters (II), sulfoalcyl-dithiocarbamates (III), methylpiperazins (IV) and methyl-amino-piperidyls (V), were tested for their filaricidal activity in L. carinii, D. viteae, B. malayi and B. pahangi infected M. natalensis.

In principle all these compound were active against all filariae species but based on a 5 days treatment schedule a 2-8 times higher

efficacy was found for benzothiazoles. Further studies therefore included mainly benzothiazoles: (I) and (II) were more effective than the other derivates. In general, D. viteae showed less sensitivity than the other species. Best efficacy was found in Brugia infections, especially in the case of (I) and (II). Curative doses (5x6.25 mg/kg p.o.) were half and one fourth of those necessary in L. carinii and D. viteae infections respectively. Although the compounds were active against micro- and macrofilariae (I) had showed a better microfilaricidal efficacy than the other derivates. In contrast (II) and (IV) lacked an early effect against microfilariae. Especially in D. viteae infections data suggest that (II) in subcurative doses did not affect microfilariae at all but rather sterilized adult worms.

The compounds were also active after single dose treatment. Usually doses had to be doubled in comparison to a 5 days treatment.

Microfilaricidal effects of benzothiazoles occured delayed when compaired with DEC. Neither in vivo nor in vitro the drugs induced cell attachment to microfilariae which otherwise occured using DEC. The embryogenesis in adult L. carinii was affected within 7 days after a single dose treatment.

In chemoprophylactic trials against 3rd stage larvae and preadult worms of the various filariae curative doses almost corresponded with those observed in chemotherapeutic studies.

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The Pharmacokinetics of Oxyclozanide, Rafoxanide and Closantel: Do Salicylanilides Really Kill Immature Flukes?

N.A.K. MOHAMMED-ALI and J.A. BOGAN*

The pharmacokinetics of the salicylanilide flukicides, oxyclozanide, rafoxanide and closantel, were examined in groups of 5 sheep at the normal therapeutic dose rates of 15, 7.5 and 7.5 mg/kg respectively. Plasma concentrations were determined by high performance liquid chromatography. Parent drug was detectable in plasma for, on average, 17, 112 and 90 days for oxyclozanide, rafoxanide and closantel at a detection limit of 0.1 µg/ml. All three drugs were extremely strongly bound to plasma protein (>99%).

Because of the long plasma half-life of rafoxanide, the possibility exists that the putative efficacy of rafoxanide against 4 and 6 week old fluke may be due to persisting plasma concentrations when these flukes reach maturity at 10-12 weeks. Three groups of 3 sheep were each given 450 metacercariae of Fasciola hepatica. At 6 weeks after administration of metacercariae group I was treated orally with 7.5 mg/kg rafoxanide. By analysis of blood samples taken from these sheep at intervals (for rafoxanide concentration) a dose of rafoxanide was chosen to reproduce the rafoxanide concentrations at 10 weeks. Group II was therefore treated with this dose (2.5 mg/kg) at 10 weeks after metacercariae administration. At 14 weeks, all 9 sheep were killed and the flukes counted. The efficacy of rafoxanide was 86.4% in Group I (7.5 mg/kg at 6 weeks) and 87.9% in Group II (2.5 mg/kg at 10 weeks) with the control group having a mean fluke burden of 66. This result demonstrates that the normal method of assessment of drug efficacy against immature fluke - by allowing fluke to develop post treatment to maturity - may give a misleading result for drugs as long-lasting as rafoxanide.

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Pharmacokinetic Studies With The Triclabendazole/Fenbendazole Combination in Sheep and Cattle.

JAMES A. BOGAN*, N.A.L. MOHAMMED-ALI, G. FORMICA and P. HAJDU

Triclabendazole (TCZ) has excellent activity against both immature and mature liver fluke (Fasciola hepatica) in sheep and cattle. Fenbendazole (FBZ) has excellent activity against immature (including L_4 stages) and mature gastrointestinal nematodes of sheep and cattle, and against lungworm, Dictyocaulus viviparus and D. filaria in cattle and sheep respectively. A combination of these two compounds, therefore, gives excellent activity against all the major endoparasites of sheep and cattle. Since, however, both of these compounds belong to the same chemical family (benzimidazoles) there is the possibility that drug interaction may occur and this paper describes the previously unreported pharmacokinetics of TCZ in sheep and cattle and compares the kinetics of FBZ and TCZ given alone with those in the combination product.

Six sheep were given per os TCZ alone at a dose rate of 10 mg/kg, FBZ alone at 10 mg/kg, or the combination product in a total dose of 20 mg/kg. Three groups of four adult cattle were administered with an oral dose of 5, 10 or 15 mg/kg of the combination product (20% w/v of a 1:1 mixture). Blood samples were collected at appropriate intervals and analysed by HPLC techniques for FBZ and TCZ and their metabolites.

TCZ was found to have a similar pattern of metabolism to FBZ via the sulfoxide and sulfone metabolites. In both sheep and cattle parent TCZ could be detected only in a few early samples (<0.06 µg/ml). Mean maximum concentrations of the sulfoxide and sulfone metabolites of TCZ in sheep were 11.0 and 10.9 µg/ml at a mean time after administration of 24-36 h and 36-48 h respectively at a dose rate of 10 mg TCZ/kg, and in cattle were 12.5 and 10.1 at 24-30 h and 96-110 h at a dose rate of 5 mg TCZ/kg. The pharmacokinetics of TCZ and FBZ were not affected by administration in the combination products. In cattle, dose rates of 5, 10 and 15 mg/kg gave parallel increases in the plasma concentrations of FBZ and of TCZ and their metabolites. TCZ and its metabolites were found to be extensively bound to plasma proteins (>99%).

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Netobimin (Totabin-Sch) Metabolism and Pharmacokinetics in Sheep.

J.W. STEEL*, D.R. HENNESSY and E. LACEY

Preliminary investigation of urinary metabolite excretion indicated that Netobimin, an orthonitroguanidinocarbamate possessing a solubilising taurine moiety, was cyclised to albendazole (ABZ) in the gastrointestinal tract after oral administration and then metabolised by a similar rout to that following administration of ABZ itself.The objective of the present study was to determine the major site and rate of cyclisation of Netobimin, the concentration profiles of putative metabolites in the principal compartments of the gastrointestinal tract, and their absorption and subsequent metabolism.

[^{14}C] Netobimin was given intraruminally at 7.5 mg/Kg to two Sheep which had been prepared with cannulae in the rumen, abomasum and terminal ileum and a catheter in the portal vein. Levels of total [^{14}C], Netobimin,ABZ,albendazole sulphoxide (ABZ.SO) and sulphone ($ABZ.SO_2$) were determined in digesta fluid, portal and jugular plasma, urine and faeces over 96h after dosing.

Table:Area under metabolite concn - time profile (nmoles.h/ml)

Site	Total [^{14}C]	Netobimin	ABZ	ABZ.SO	$ABZ.SO_2$
Rumen	161	61	37	34	0
Abomasum	538	0	53	430	49
Ileum	364	0	0	81	20
Portal Vein	189	0	5	105	23
Jugular Vein	184	0	0	107	22

Netobimin was rapidly metabolised to ABZ and ABZ.SO in the rumen and parent compound was absorbed from the gut. Rapid increases in ABZ and ABZ.SO levels in portal plasma suggested that the rumen was a major site of absorption of these two metabolites.High levels of ABZ.SO in abomasal fluid indicated substantial re-secretion of this metabolite from the plasma pool into the abomasum. Conversely, there was a net absorption of ABZ and ABZ.SO from the small intestine. Cumulative recovery of the [^{14}C] dose was 52.3% in faeces and 29.1% in urine 96h after administration.

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Effects of Parasitism on The Pharmacokinetics of Fenbendazole.
S.E. MARRINER*, E.S. EVANS and J.A. BOGAN

Plasma and abomasal fluid concentrations of fenbendazole and its two major metabolites, oxfendazole and oxfendazole sulphone, were measured in 4 sheep experimentally infected with the abomasal parasite Ostertagia circumcincta and compared with the concentrations found in the same sheep when non parasitised. Abomasal pH and plasma pepsinogen concentrations were monitored during the experiment as indicators of the presence of parasitic damage to the abomasum. The bioavailability of fenbendazole was reduced by the parasite infection and the proportion of drug present in the form of metabolites (oxfendazole and oxfendazole sulfone) was also reduced. The effects of parasitism on metabolism of drugs was further investigated in vitro by the use of hapatic microsomal enzyme preparations.

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Comparative Effects of Ivermectin and Benzimidazole Derivatives on Enzymatic Patterns in Naturally Parasitised Horses.
RODOLFO LORENZINI

Many reports exist about correlation between naturally parasitised animals and changes in serum enzymes. Furthermore data are beginning to be available on toxicity investigations conducted with various anthelminthic treatments. Some of these studies have been carried out monitoring enzymatic changes in blood serum. We report results of various trials to value correlation between Strongyle infection, administration of benzimidazole derivates or ivermectin and variation in enzymatic patterns in chronically infected sporting horses. Each experiment was carried out in 35 days and therapeutic and toxic effects of drugs were valued periodically testing cellular, mithocondrial and microsomal profiles. Benzimidazole have been chosen considering that they have been largely emploied as anthelminthics in past years; ivermectin considering the new perspectives which the drug offers in anthelminthic treatment. Moreover infection and toxicological aspects of these drugs were never been studied with these criteria in the horse. Data were statistically elaborated and showed that any change un enzymes release is significantly related to the removal of adult worms from the intestine and that benzimidazole derivates and invermectin haven't any subclinic toxic effects at normal level of administration in equines. However, the trial allowed to focus some realities that may have a primary role also with regard to public health. Considering that sporting horse up to now is the only model of large animal on which is possible to carry out a subclinical toxicological study, the data obtained must then be considered as standards of cellular, mithocondrial and microsomal safety.

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Persistent Anthelmintic Activity of Ivermectin in Cattle.
J. ARMOUR*, K. BAIRDEN and D.B. ROSS

Ivermectin, injected subcutaneously into cattle at 200 ug/kg successfully prevented (99%) the establishment of Ostertagia ostertagi, Cooperia oncophora and Dictyocaulus viviparus for at least 7 days in one trial and 14 days in establishment of D.viviparus was prevented for 21 days.
The benefits of such a persistent activity are that the interval between prophylactic anthelmintic treatments can be extended and where animals are moved to safe pastures the carry over of infection is minimised.

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Ectoparasites of Cattle and Horses in the Pantanal in the of State Mato Grosso do Sul, Brazil.
M.E.A. BERNE*, R.H. KESSLER, C.R. MADRUGA, A.M.S. SACCO, L.O.H.B. CARNEIRO and G. GRATÃO

A survey of cattle and horse ectoparasites was made in the pantanal region in the state of Mato Grosso do Sul, Brazil. One hundred fifty one cattle and aproximately 20 horses from four were examined. In the cattle, infestations of Boophilus microplus and Amblyomma cajennense were observed, with the former predominating. Haematopinus quadripertusis was found in a high percentage of cases. The horses showed high infestation of A. cajennense and Anocentor nitens. Larvae of Dermatobia hominis were not found in any of the animals examined. It is therefore concluded that, in this region, ticks and lice are widely distributed and the D. hominis is absent.

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Correlation Between the Prolificity of Engorged *Boophilus microplus* and Its Volume and Weight: Cubation of Engorged Ticks by Means of Water Displacement in the Outside Cylinder of a Plastic Hypodermic Spyringe.
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The volumes of engorged female *Boophilus microplus* ticks were determined through water displacement in the outside cylinder of a plastic hypodermic syringe and such volumes correlated almost perfectly with their weights as determined in two different scales. This result justifies the use of this simple equipment for the indirect weighing of engorged ticks in field research. Larger and heavier engorged females began egg-laying earlier, produced more eggs and died sooner than the smaller and lighter ones, being all these comparisons statistically significant. The tick's larvae showed positive hydrotropism and negative phototropism.

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The Efficacy of Flumethrin as a "Pour-On" for the Control of *Boophilus microplus* Infestation on Hereford Cattle.
ARMANDO NARI*, C.A. PETRACCIA and H. CARDOZO

Two field trials were carried out to determine the efficacy of flumethrin "pour-on" against B. microplus in an enzootic area of Uruguay (lat. 31°50'S).
Trial 1: Twenty yearling Hereford breed were artificially infested with 8 x 2000 larvae of the B. microplus "Mozo" strain Three treatments (0.5-1-1.5 mg/kg) were randonly assigned to 4 groups of animals (n=5) and one group being left as control group. From day 0 to day 39 artificial infestation was done twice a week and weekly from then to day 60. Ticks were counted in the field and laboratory studies of females collected from treated and untreated animals were done to determine egg production and hatchability. For each treatment the percentage of surviving ticks and the index of reproduction were calculated, the latter expressed as percentage of control. Paramount drug activity regarding of survival ticks was observed between 25-40 days post-treatment. There was no significant difference (P=0.05) between the treatments although a better response was observed for the 1 and 1.5 mg/kg. dosage. The effect (IR) was 100% during the first 35 days and over 90% after 50 days post-treatment.
Trial 2: Nine tick free animals were used to measure the effect of flumethrin "pour-on" on succesive challenges of B. microplus larvae. One group of cattle (n=4) was treated with 1 mg/kg. of the acaricide one week before the begining of the infestation (x 2000) and another one (n=5) was maintained as con

trol. The same level of infestation was applied every 3 days up to day 56. When drug was applied in advance a strong inhibitory effect of parasitic development was observed in the first 35 days. Furthermore a sterilising effect of 100% was confirmed for flumethrin in females detached within the 54 days following treatments.

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Recent Developments in The Use of Synthetic Pyrethroids as Tickicides in Australia.
JAMES NOLAN* and HERBERT J. SCHNITZERLING

DDT-resistance which is still prevalent in tick populations in Australia caused some early problems in the development and use of synthetic pyrethroids for tick control. One strategy for overcoming this problem has been through the addition of organophosphorus (OP) compounds as synergists in pyrethroid formulations. This concept of synergism is however not applicable to all pyrethroids being useful for example with cypermethrin but not effective with flumethrin. The toxicology and biochemistry of metabolism of these two pyrethroids, in resistant and susceptible strains of ticks, will be compared. Levels of tick control resulting from single and multiple treatments with cypermethrin/chlorfenvinphos and with flumethrin, when used conventionally and as a pour-on, will be presented.

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Control of Horn Fly, *Haematobia irritans* on Cattle by Treatment With Cypermethrin and Decamethrin in Humid Tropical Areas of Brazil.
GONZALO EFRAIN MOYA BORJA*

A field test was conducted on Nelore cattle located at the Agropecuaria Rio Branco Farm state a Amazonas, to determine the effect of cypermethrin-impregnated (8.5%) ear tags and cypermethrin and decamethrin sprays on horn fly control. Herds and treatments used in Test A were as follows: 1) cypermethrin 8.5% ear tags were applied at the rate of one per head; 2) cypermethrin 8.5% ear tags were applied, at the rate of two per animal to 28 cows and 32 bulls;3)cypermethrin 0.05% was sprayed to the dorsal part of 250 bulls (one liter per animal); and, 4) an untreated herd of 20 bulls. Fly counts were made on 20 randomly selected animals in each herd at monthly intervals from April to July, 1984. In test B, 220 bulls were sprayed with decamethrin 0.0025% (one liter per animal). Fly counts were made on 15 animals before applying the insecticide and at predetermined schedule of times until the effective fly control has ended. In both testes the flies were counted on one side of the animal and double to determine the individual infestation.

The use cypermethrin ear tags (one or two per animal) resulted in effective fly control during three months. Animals sprayed with cypermethrin and decamethrin were protected against horn fly for five and seven weeks, respectively.

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Ocurrence of *Raillietia auris* (Leidy) (Acari: Gamasida) in Beef Cattle in Brazil.
J.L.H. FACCINI and A.H. DA FONSECA*

Surveys carried out on adult beef cattle routinely processed at commercial abattoirs in five states have shown that the prevalence of Raillietia auris is very high, ranging from 94 to 100%. Mean intensity of about 45 mites/animal and intensity of infestation ranging from 1 to 283 mites/ear/animal have been reported. Infestation was bilateral. Mites congregate at the base of external ear canal and surface of the tympanic membrane. Diagnosis was best accomplished by examining the washings of ear canals since mites are easily seen by naked eyes. Mixed infestations with Rabditiform nematodes have been found in two instances. The effects of R. auris on the health of the hosts have not been assessed clearly. In most cases infestations were assymptomatic. The most frequent necropsy findings included exudate, increase of cerumen and reddish aspect of tympanic membrane. Otitis was rarely seen.

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***In vitro* Development of *Raillietia auris* (Leidy) (Acari: Gamasida)**
A.H. DA FONSECA* and J.L.H. FACCINI

Specimens of Raillietia auris were obtained by washing the ear canals of recently slaughtered cattle with physiological saline. Field collected larvae and females were placed in individual test tubes in a controlled environment (30±1°C and 80 90% R.H.). The development series of egg, larva, protonymph, deutonymph and adult (male and female) were completed without food. The progression from oviposition to adult required about 5 days.All imature stages were short lived with none over 2 days. Survival of adult from field-collected larvae were longer ($\bar{X}$=14 days) in contrast with those from laboratory ecloded larvae ($\bar{X}$=10 days).Teneral adults were more active than any other stages. This is the first successful in vitro rearing of a Raillietia sp.

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Influence of *Oestrus ovis* Infestation on the Reproductive Performance of Merino Sheep.
M.T. DE J. GARCIA LARA

A study was carried out of the lambing characteristics of sheep attacked by Oestrus ovis on 6 extensively-farmed holdings in the Alcudia Valley (Ciudad Real province). The number of animals investigated was 223.

By means of lambing graphs it was possible to identify the effects of cavitary myiasis on the stock concerned.

The presence of stress factors, especially the sheep nostril fly, results in a momentaneous slowing down of lambs production, as well as in a number of behavioural changes among infested stock (loss of appetite, weight reduction, etc.) which are inevitably reflected in deficient reproduction.

The effects of the Oestrus ovis are extremely insignificant within the tupping period. Ewes are most often affected and display stress symtoms. Effects in rams, on the other hand, are more concentrated in nature, occurring more often in acute periods. This parasitosis is of more significance in rams than ewes, since it is the former who initiate tupping through their olfactory perception in the flocks farmes during lambing ("hatajos").

Contrasting results were obtained by the use of different antiparasitic products on the various holdings studied.

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Population Variance of *Chrysomya* Species in The County of Capão do Leão, RS.

M.M. WIEGAND*, P.B. RIBEIRO, J.G.W. BRUM and P.R.P. COSTA

Mensal population variance of C. megacephala, C. chloropyga, and C. albiceps species was estimated in the period from february 1983 to january 1985 using two wind oriented traps. The traps were suspended to trees 300 m apart at a height of 1.0 to 1.2 m. The bait was a piece of deteriorated bovine liver 50% of which was replaced every 10 days to ensure renewal of the attraction principle. Identification and count of the diptera were made 2 to 3 times a week, according to the captured amount. From a total of 317.458 diptera, 27.990 belonged to the species C. megacephala, 10.009 to the species C. chloropyga and 111.233 to the species C. albiceps. The greatest population occurred in the months of march, abril and may, with a predominance of the species C. albiceps. It was observed that in the months of july, august, september and october the population of the three species was virtually nonexistent which indicates that in mean temperature inferior to 18º it decreases substantially. The conclusion was that mean mensal temperature has a considerable influence on the population of Chrysomya albiceps, C. megacephala and C. chloropyga.

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Influence of Temperature Upon Pupal Period of *Dermatobia hominis* (L. Jr., 1781).

P.B. RIBEIRO, P.R.P. COSTA, J.G.W. BRUM* and M.M. WIEGAND

After leaving their host, Dermatobia hominis larvae lie on the ground to pupate. The pupal period varies with the time of the year. To verify the influence of temperature upon the pupal period of Dermatobia hominis, 25 pupae extracted from larvae obtained from naturally infested bovine were kept individually in jars half-filled with moist sawdust. During the experimental period, temperatures provided by the Agroclimatological Station of the Federal University of Pelotas were used to determine pupal temperatures (máx., méd. and mín.) for correlation analysis. Pupal period ranged from 26 to 132 days in the 25 pupae observed, and the correlation coefficients to maximum, medium and minimum temperatures were, respectively, -0,96, -0,93 and -0,89. It was concluded that temperature influences the pupal period of D. hominis in an inverse proportion

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Cattle Parasitosis in The Zona da Mata Region of Minas Gerais State, Brazil: I. Seasonal Behavior of Gastro-Intestinal Nematodes.

JOHN FURLONG*, H.L. DE ABREU and R. DA S. VERNEQUE

Two tracer calves were necropsied monthly between October 1980 and September 1982 at Coronel Pacheco, Zona da Mata, State of Minas Gerais, Brazil. Cooperia spp. (80%) and Haemonchus spp. (17%) were the most prevalent genera. The climate of the region proved suitable to the development and surviving of these genera during the year, but occurring a significant diminuition ($P < 0.05$) of Haemonchus spp. during the dry season (April to September). The rainfall proved best correlating climatic parameter and monthly nematode index, when compared with hydric balance and bioclimatograph, and was considered the best indicator of the larval availability in the pasture of this region. The dry season is the critical period for calves due to the available larval number and low forage availability.

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Cattle Parasitosis in The Zona da Mata Region of Minas Gerais State, Brazil: II. Seasonal Behavior of Lung Worms.

JOHN FURLONG*, J.C. VILAS NOVAS and J.B. CARDOSO FILHO

In order to study the availability of Dictyocaulus viviparus in the pasture, during the period of October 1980 until September 1982, a total of 46 tracer calves were necropsied, being two monthly. The climate variations of the region allow the development and surviving of larvae during all the year, although the greatest availability of larvae occurred in the winter (July to September). Low temperatures was the factor best correlated. The ingested larvae in Autumn was incriminated to cause and outbreak of infective larvae in the pasture in the winter.

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Seasonal Variation of Nematodes in Beef Production on Grazing Systems in The Pampean Semiarid Region of Argentina.

V.H. SUAREZ

Since March 1981 to February 1985 gastrointestinal worms counts from 60 spring born cattles slaughtered periodically from the weaning al 6 month till their second winter at 24 months of age, were described. The animals were taken from 3 grazing periods: 1981/1982, 1982/1983 and 1983/1984. The forage offer was different, seasonal crops prevailed in the first and perennial pastures in the last grazing period. The predominant nematodes were Ostertagia ostertagi, Cooperia spp, Haemonchus placei and Trichostrongylus axei. Larger burdens of adult Ostertagia were observed in wearnes in late autumn and early winter and later in 18 month-old animals in the following late summer and early fall. A high porcentage of inhibited fourth stage larvae (EL_4) were found since early spring towards middle summer. Adult Cooperia oncophora and C.punctata burdens became increased in weaners in late autumn and early winter, but variation in leves of older cattle than a year were found. Adult population of Haemonchus placei were highest during early fall in weaners as well as in older animals. Lows burdens of Adult and EL_4 T.axei showed a similar trend to Ostertagia spp, with greater counts on the second fall of the cattle. Oesophagostomum radiatum and Trichuris spp.ocurred occasionally in low numbers, and the former commonly occurred in late summer-early fall. Dictyocaulus viviparus was sporadically seen in two cattles.

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Seasonal Availability of Gastrointestinal Nematodes for Tracer Cattle in The Pampean Semiarid Region of Argentine.

V.H. SUAREZ

Since 1981 to 1985 the seasonal infestation of paddocks contaminated by growing cattle with gastrointestinal worms, was studied. Each month parasite-free tracer calf, was grazed on that paddocks for 25 days at one month interval and then slaughter for worm count 14 days after their removal from paddocks. The numbers of worms found in the tracer calves estimated the seasonal occurrence of nematode larvae on grasses. Tracer indicated the predominance of Ostertagia (92.8%), Cooperia (82%), Haemonchus (67%) & Trichostrongylus (43%). The greater infestation of grasses occurred in autumn-early winter and in the end of spring. Perennial pastures showed the greatest infection and the other hand winter crops

showed the lowest. Ostertagia spp.prevailed from the middle of fall till the end of spring. The higher records took place in theautumn-winter period and about the middle of spring, during this last period higher percentages of inhibited early fourth stage larvae (EL_4) were observed. Trichostrongylus axei showed a similar tendency to Ostertagia spp. but the counts values were very low and were not found in summer. The greater values of Cooperia spp.took place in spring-summer and early winter, while Haemonchus placei showed the highest levels in summer and not being found during the cold dry month of winter. The possibles factors of the differences found between years are discussed.

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Epidemiology and Control of Gastrointestinal Nematodes of Cattle in Louisiana (USA).

J.C. WILLIAMS*, J.W. KNOX, K.S. MARBURY, M.D. KIMBALL and T.G. SNIDER

Epidemiological studies of nematode parasitism of cattle were conducted over a 2-year period (1980-81 and 1981-82). During the 24 month period, pairs of yearling cattle and tracer calves were killed at monthly intervals for analysis of worm population characteristics in relation to seasonal weather factors and management conditions. Results supported previous observations in Louisiana, i.e., occurrence of type I ostertagiasis from winter into spring, increasing availability of inhibition-prone larvae (EL_4) on pasture in spring, and the late summer-autumn occurrence of type II ostertagiasis. Rainfall was generally adequate through 1980-81 and only small numbers of EL_4 were acquired. Very large numbers of EL_4 were acquired in spring prior to the dry 1982 summer. Clinical disease was not evident in 1980-81, but type II ostertagiasis did occur during August-October 1982 as indicated by large numbers of adult worms, decreased numbers of EL_4, severe clinical parasitism and abomasal pathology, and elevated plasma pepsinogen. Epidemiological data were applied in design of integrated control experiments. Similar experiments in which safe pasture and appropriately timed anthelmintic treatments were employed, were conducted during 1982-83 and 1983-84 with beef calves grazed on pasture from autumn weaning through the following summer. Particular emphasis was placed on prevention and control of O. ostertagi. In 1982-83, 3 groups of cattle (n=15/gp) were observed. Group 1 was treated at weaning, on February 1 and May 1 and grazed on safe pasture; group 2 was similarly treated but grazed on contaminated pasture; group 3 was given minimal treatment at weaning only and grazed on contaminated pasture. In 1983-84, 2 groups of cattle (n=17/gp) were used for studying comparative efficiency of 2 anthelmintics on contaminated pastures; a 3rd group was treated with one of the anthelmintics and grazed on safe pasture. Timing of treatment was similar to 1982-83. During both years, productivity of the cattle was significantly greater and effects of parasitism less in groups treated and grazed on safe pasture.

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Epidemiology of Fascioliasis hepatica in The Paraíba River Valley, São Paulo, Brasil.

SUZANA B. AMATO*, H.E.B. DE REZENDE, D.C. GOMES and N.M. DA SERRA FREIRE

The present study provides extended epidemiological data obtained in a dairy farm, in Piquete County, SP, during a period of 60 months, from June 1980 to May 1985. The snail population dynamics was studied in six quadrats of 1 m^2 established along the length of a small and shallow creek which crosses the property. The seasonal fluctuation of metacercari a on pasture was evaluated using tracer sheep.

It revealed that although Lymnaea columella Say, 1817 and Stenophysa marmorata (Guilding, 1828) were found in the same habitat, only L. columella harbored intramolluscan stages of Fasciola hepatica L., 1758. Monthly data about the snail population showed it partially affected by high temperatures, decreasing slightly during the warmer months, but that its limiting factor is the rainfall and the number of rainy days. The drought that occurred between June and November 1981 dramatically reduced the number of snails collected. Larger snails were collected in March-July and November-December, while the smaller snails were collected in January-February and August-October, suggesting that there may be two generations of L. columella per year. The higher prevalence levels of infection in L. columella were: first year, June = 8.82%, September = 9.09%, October = 10.52%; second year, March = 6.25% and March = 6.06%; third year, August = 9.52%, April = 20.83% and May = 12.38%; fourth year, July = 19.14%, August = 12.32%, September = 10.84%, November = 10.52%, December = 9.09%, January = 8.16% and April = 8.33%; and fifth year, September = 11.66%, October = 8.77% and March = 15.38%. The results obtained with the tracer sheep showed larger numbers of metacercariae on pasture between June and October, and between March and April, even though infection was present during most of the year.

Work supported by a grant from the National Council of Research (CNPq)

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Survival of Cattle Gastrointestinal nematode Infective Larvae in The Pantanal Regions, Mato Grosso do Sul, Brazil.

JOÃO BATISTA CATTO

The survival of the infective larvae of cattle parasites in the Pantanal region was studied during two years through monthly deposition of faecal pats on the pasture and periodic examinations of them and of the foliage around them. It was observed that the faecal pats set down during the dry season (May to September) and the pasture around them remained positive to infective larvae for an average of 4.6 and 4.3 months, respectively; during the wet season (October to April) remained positive for an average of 2.4 and 1.9 months, respectively. The liberation of the larvae from the pats to the pasture showed a positive correlation with the frequency and intensity of the rains. During the dry season the faecal pats formed a crust which inibited the larvae migration but also provided survival conditions for the larvae within the pats. During the wet season due to more frequent and intense rains and due to dung bettle action (Coleoptera), the faecal pats did not form crust, leading to a prompt liberation of larvae. Once in enviroment, the larvae had their survival shortened by the action of the sun, extremely sandy soil, poor vegetal cover of the soil and high temperatures. Larval identification in the coprocultures, faecal pats, and pasture showed that: *Cooperia* spp. represented, respectively, 74.1, 92.4 and 90.2%; *Haemonchus* spp. 17.1, 3.2 and 3.3%; and *Oesophagostomum radiatum* 8.5, 4.4 and 6,5%. This demonstrated the better conditions of the larvae of the genus *Cooperia* to survive in the open enviroment. It is concluded that a pasture resting period of two months, from November to February, may drasticaly reduce infective larval population.

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Prevalence of Abomasal Nematoda of Domestic Cattle From Chiapas State, Mexico, With Special Reference to *Mecistocirrus digitatus*.

JOSE CAMARGO-AZPEITIA and R. ANGEL MEJIA-GARCIA*

Previous reports on the helminthiasis in cattle from Mexico have been made mostly using faecal examinations or coprocultures. However, very few workers have studied the adult forms of helminths. This report shown the type of helminth's species of the abomasum of cattle from the northern region of Chiapas State, México. 122 abomasums collected from slaughtered cattle were searched for worms using the seaving technique. From 6137 specimens found only 5 species of nematoda were identified, 488 of which were measured.

The percentages found were: Haemonchus similis (61.47%), H. "placei" (4.09%), Mecistocirrus digitatus (27.04%), Cooperia pectinata (3,27%) and C. punctata (4.09%). This is the first report on H. similis, H. "placei", C. pectinata and C. punctata of cattle in Mexico.

According to Gibbons's works (1979) on the revision of the

genus Haemonchus, H. placei would be synonyme with H. contortus, but Dunn's opinion (1969, 1978) is also accepted because he considered H. placei like the bovine strain of H. contortus. We propose to use the term H. "placei" to indicate that the vulval morphology of the identified Haemonchus is a knob-like process, to diferentiate it from the lingual-like vulval aspect typically shown by strains of H. contortus. Therefore we agree with Gibbons' proposition.

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The Epidemiology of Gastrointestinal and Pulmonary Helminths in Beef Cattle on The Santa Catarina Plateau.

RAMOS, C.I.* and PALOSCHI, C.G.

Weaned male beef calves, 7 to 20 months old were kept on native pasture for 4 years (June 1977 - May 1981). Three c calves were sacrificed each month on each of three properties in different geographical regions of the Plateau. Additionally, from September 1979 to August 1982, tracer animals were used on one property, which remaned on pasture for onmonth before being sacrificed. The main genera of helminths found were: Trichostrongylus, Ostertagia, Cooperia, Haemonchus, Oesophagostomum and Dictyocaulus. Seasonal fluctuation in the populations were analysed by stepwise regression of the climatic variables for each period. It was seen that Trichostrongylus and Ostertagia gradually increased in burdens from the start of the spring through summer and autumm, with increasing temperature. Cooperia and Haemonchus showed highest burdens in spring and summer, acompanying increases in rainfall, while Oesophagostomum and Dictyocaulus burdens accompanied increases in the relative humidity and mean minimum temperatures. The trace animals showed that the most probable period for the occurence of infection with Trichostrongylus spp and Ostertagia spp is in winter and spring, for Cooperia spp and Haemonchus spp, at the and of spring and the beginning of summer, while Oesophagostomum spp and Dictyocaulus are most probable in the middle of winter and begining of autumm.

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A Study Under Natural Conditions, Upon the Development and Survival of Eggs and Larvae of Cattle Gastrointestinal Nematodes at The Savannah Pastures in Selviria County, Mato Grosso do Sul State, Brazil.

MARIA C.Z. SENO, R.Z. MACHADO* and W.A. STARKE

Free living stages of cattle gastro-intestinal nematodes in pastures were studied through the identification of two foecal-cakes every fortnight around one year. The eggs stayed undeveloped longer in foeces dropped during the dry season (April to September) and dry season foecal cakes kept longer as reservoirs of infective larvae than the ones dropped at the wet season, when such cakes were desmantled by coprophagic bettles during the first week. Infective larvae were found since the 7th day after the foeces were dropped along all the year. *Cooperia*, *Haemonchus*, *Oesophagostomum*, *Trichostrongylus* and *Bunostomum* were the genera of recovered 3rd stage larvae from foecal-cakes along, the whole year. The *Cooperia* larvae had the largest survival time averaging 11.2 weeks. Rainfall was the most conspicouous factor influencing migration of larvae to pasture gross.

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The Efficacy of Ivermectin Paste Formulation Against Cutaneous Habronemiasis in Tropical Area (Central Brazil, MS).

EDSON LUIZ BORDIN* and O.P. BASTOS

During the summers of 1984 and 1985, 24 horses with naturally occuring summer sores were given oral dose of 0.2 mgIvermectin (22, 23 - dihydroavermectin B_1)/kg. Biopsy samples (0.4-0.5 cm diameter) were taken on the day of treatment for histological evidence of the expected microscopic tissue reaction against larvae or its products, as well as, 7 to 18 days from treatment in order to prove evidence of microscopic healing as suggested by macroscopic features of lesion.
There was a marked and dramatic clinical improvement in 21 horses (87%) 7 to 18 days period following therapy, with progressive lesion reduction as suggested by the healthy pink granulation tissue observed.
Histopathologic examination of sections (H.E/Grocott) from lesions in the day of treatment showed granulation tissue with marked eosinophilic infiltration and extensive necrotic areas. Larvae were not always found probably because of the unproportion between the size of the original lesion (8 to 17 cm) and biopsy samples.
In sections examined after treatment there was a marked reduction in the number of eosinophiles and other inflamatory cells, as well as the granulation tissued was more mature or differentiated based on the evidence of dense fribrous cicatricial connective tissue. Among the animals in which no clinical improvement were observed, at microscopic studies, two of them showed phungus evidence (Hyphomyces destruens) and one of them was found dead during the experimental period. There were no control horses included in the study because it is well established that lesions of untreated horses do not improve until after the onset of cold weather.

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The Quantitative Portion of Different Species of Small Equine Strongyles and Their Reduced Sensitivity Against Benzimidazole.

M.A. HASSLINGER

Two decades ago 100 slaughter horses from southern Germany have been investigated about the localisation and portion of small strongyles. Cyathostomum catinatum (in 68 horses), Cylicocyclus nassatus (65), Cyathostomum coronatum (37), Cylicostephanus longibursatus (33), C.calicatus (22), Cyathostomum pateratum (16), Cylicostephanus minutus (15), Cylicocyclus insigne (13) and C.leptostomus (12) occured.
It was of interest to realize, whether the whole palette of newly developed anthelmintics used in praxis caused a change. Approximately 20 years later quantitative data in the same series (in %) of 64.7, 100, 32.4, 58.8, 76.5, 76.5, 14.7, 5.9 and 82.4 could be obtained in 44 horses. For some species no change could be observed due to their meanwhile developed benzimidazole resistance.
A field study was carried out on 100 naturally with small strongyles infected horses of the "Bavarian main and state studfarm Schwaiganger" with three different benzimidazoles compared to a newly developed drug containing active substance as control. The treatment carried out 3 times in a 4 weeks interval caused a reduction of EpG's, but not a reduction of the number of positive horses; with the control drug negative results could be attained. The final treatment of all horses with the control substance resulted in a 95.2 to 100 % efficacy. These results reveal the limitation of benzimidazole applications and that besides epizootiological matters the search for new active substances has to be continued.
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Vacuuming Horse Pastures: A Non-Chemical Approach to The Control of Horse Parasites.

R.P. HERD

A non-chemical approach to equine parasite control based on removal of faeces twice weekly was evaluated at the Animal Health Trust, Lanwades Park, England, from May - October, 1984. The rationale of this approach is that faeces are removed from paddocks before there is time for development of eggs to infective L3 and migration of L3 to pasture.

This approach provided highly effective parasite control, superior to that achieved by anthelmintic treatments. Concentrations of infective L3 on cleaned pasture reached a maximum of 1000 L3/kg, compared to 18,486 L3/kg for control pasture and 4850-10,210 L3/kg

for anthelmintic treatment groups. The low pasture L3 counts on the cleaned pasture occurred even though ponies in this group received no anthelmintic treatments and they had the highest mean faecal egg counts of all groups (peak 1722 epg).

The clean pasture approach has several important advantages that more than offset the cost of the labour involved: 1) It provided better parasite control than modern anthelmintic drugs, 2) It increased the grazing area by about 50% by eliminating the separation of paddocks into roughs and lawns, 3) It eliminated the cost of repeated anthelmintic treatments and selection for drug resistance, and 4) It appears to offer an ideal control programme for both ascarids and strongyles in susceptible weanlings and yearlings where drug therapy is sometimes inadequate.

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The Strategic Use of Anthelmintics in Working Donkeys in Mediterranean Europe.

D.H. BLISS*, I.E. GEORGOULAKIS, W.J. JORDAN and E.D. SVENDSEN

The efficacy of two separate anthelmintic treatment regimes was tested over a two year period in working donkeys located on four separate Greek islands physical exams and body condition scores were recorded, faecal worm egg counts and faecal worm counts were conducted to determine efficacy and clinical benefits of each program. Anthelmintic administration during the first year was given three times at six week intervals beginning in May while anthelmintic administration during the second year was given three times at four week intervals beginning in March. During the first year, differences in faecal worm egg excretion between treated and control donkeys were not observed although a slight improvement in body condition scores of treated donkeys were observed. When treatment intervals were decreased to four week intervals between treatment during the second year, an overall mean reduction of 73% in faecal worm egg output and an overall improvement of 14.4% in body condition scores was observed in the treated donkeys compared with the control donkeys by the end of the trial period early autumn. Worm counts recovered from the feces of selected principal trial (treated and control) donkeys given a therapeutic anthelmintic treatment at the end of the trial period during the second year demonstrated a 91.9% reduction in worm burdens of the treated animals. These results demonstrated that an extended period of protection from parasitic infections could be acheived in donkeys and mules raised under Mediterranean peasant farming conditions using a monthly anthelmintic treatment program beginning in early spring at a time when extended forage growth first begins.

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Prevalence and Control of Benzimidazole Resistant Small Strongyles on German Thoroughbred Studs.

C. BAUER*, J.C. MERKT, R. GANDRAS and H.J. BURGER

To determine the prevalence of benzimidazole resistance in small strongyles a survey was conducted on 17 thoroughbred studs selected by chance in the Federal Republic of Germany using the faecal egg count reduction test improved by larval differentiations from faecal cultures. On these farms foals and yearlings had been routinely dewormed at monthly or bimonthly intervals. Two (pro)benzimidazoles frequently used in Germany and suspective of eliciting benzimidazole resistance in cyathostomes were compared to pyrantel pamoate, oxibendazole and ivermectin known to be effective against benzimidazole resistant strongyles. A significant 90 % reduction in cyathostome egg counts was not achieved by any of the former two (pro)benzimidazoles on any of the farms two weeks after treatment. However, pyrantel pamoate, oxibendazole and ivermectin reduced the strongyle egg counts on these studs by 97 to 100 % two weeks post-treatment. Six weeks after dosing with pyrantel pamoate or oxibendazole the egg output of small strongyles had increased again, whereas ivermectin still suppressed the egg counts by 95 to 100 % at this time. The fact that the former two (pro)benzimidazole compounds were insufficiently effective on all properties examined indicates the likelihood of resistant horse strongyles being prevalent on almost all thoroughbred studs in Germany.

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Efficacy of Ivermectin Against *Onchocerca cervicalis* (Railliet y Henry, 1910), in Horses, in The Subtropical area of Argentina.

J.P. ROUX, O.A. MANCEBO, B.I. D'AGOSTINO, F. PAMPILLO* and G.M. BULMAN.

A first report of equine oncocercosis in Argentina, made in 1984, in 139 horses from 6 northeastern provinces, has originated new studies to confirm regional prevalence and determine frequency of symptoms, the importance of lesions and treatment.

The objective of this trial was to ratify the efficacy of ivermectin against Onchocerca cervicalis, published to date only in other countries. For this reason, between October 1984 and February 1985, skin biopsies were made from the ventral midline of 196 Border Police and cattle farm horses, from 7 different locations in the Province of Formosa. These were analyzed by the technique described by Rabalais and Votara (1974), whereby 56 (28.5%) were positive, results being expressed by the number of microfilariae per miligram of skin.

From this last group, 29 horses and 1 mule, all of 4 years and more of age, were chosen and allocated at random to two equal groups, the first treated orally with ivermectin at 200 mcg/kg body weight, and the remaining 15 horses, left as controls with no treatment. On day +30 the treated group was divided into 2 subgroups, 7 horses remaining untreated and 8 being dosed again orally with ivermectin. Biopsies taken from the treated 15 horses on this opportunity revealed only a single microfilaria in one horse, the rest being free of the parasite. In the control group, biopsies evidenced the persistance of microfilariae, situation which remained unchanged on day +60, except for the small differences due to the diagnostic method employed. At this 2 month postreatment biopsy, the lack of microfilariae in both subgroups of the original ivermectin treated animals, confirmed the prolonged effective period of the drug and the absence of adverse effects.

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Pathogenesis of Equine Ventral Midline Dermatitis and Its Association With *Onchocerca cervicalis* and *Haematobia irritans*.

L.D. FOIL*, T.R. KLEI, R.I. MILLER, C.S. FOIL, and D.D. FRENCH

Equine ventral midline dermatitis (VMD) is a syndrome that has been associated with Onchocerca cervicalis infections, horn fly, Haematobia irritans, feeding and/or hypersensitivity to horn fly feeding. Ivermectin and fenvalerate (a synthetic pyrethroid) were used to clarify the interactive effects of horn flies and O. cervicalis in VMD. Sixteen horses (12 having patent O. cervicalis infections) were divided into four treatment groups: Ivermectin alone, fenvalerate alone, Ivermectin and fenvalerate, and untreated controls. Cattle maintained on pasture in a central area dividing the 4 groups provided a constant source of horn flies. Data obtained during the 3 month study included horn fly counts per horse (twice per week), clinical evaluation of skin lesions (biweekly), midventral lesion area quantitation by photography and image analysis (biweekly), histologic evaluation (monthly) and microfilarial enumeration (monthly). An exacerbation of active lesions (crust and ulcer) associated with VMD occurred following an increase in horn fly populations in horses not treated with fenvalerate. Rapid resolution of these lesions were observed in ivermectin and fenvalerate treated horses. Chronic lesions persisted in fenvalerate alone horses. These observations suggest an interactive effect of O. cervicalis and H. irritans in VMD under these conditions. Hypersensitivity reactions were not observed in either of the fenvalerate treated groups. However, low levels of horn fly feeding persisted in these groups. These observations suggest that hypersensitivity reactions to horn fly feeding do not occur, or occur only under conditions of very heavy feeding activity.

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Field Evaluations of Ivermectin Against Benzimidazole Resistant Strongyles in Louisiana Horses.

D.D. FRENCH*, T.R. KLEI, M.R. CHAPMAN and B.J. TORBERT

The occurence of benzimidazole-resistant small strongyle species in horses has been documented throughout the world. A survey conducted by fecal egg per gram count (EPG) methods identified thiabendazole-resistant populations on 17 of 22 southern Louisiana horse farms. Two large farms were found to have small strongyle populations showing cross resistance to cambendazole, fenbendazole, mebendazole and febantel, but not to oxibendazole or in some cases oxfendazole. Resistant populations to pyrantel pamoate, benzimidazole-piperazine combinations or ivermectin were not identified using this method. The use of ivermectin on farms with benzimidazole-resistant populations reduced EPG values to 0 by 2 weeks following treatment with counts remaining at or near 0 for 8 to 10 weeks following treatment. Prolonged treatment using ivermectin only versus a conventional program of anthelmintics (oxibendazole, pyrantel pamoate, benzimidazole-piperazine mixture) without ivermectin was tested on two broodmare farms. Anthelmintics were administered at 2 month intervals over an 18 month period. Horses were not restricted within their treatment groups when pastured. Seasonal EPG cycles were also monitored in a group of untreated control mares that were maintained in the same pastures. Although marked differences existed between conventionally treated, ivermectin-treated and untreated horses, all follow similar EPG seasonal patterns. Peak EPG values are seen in the early spring, with low levels observed during the summer months, followed by a rise in EPG during the fall. EPG of ivermectin- treated horses were consistantly lower than conventionally treated horses. Due to the mixing of horses of all treatment groups on pastures the total benefit of ivermectin treatment may have been overcome by repeated infection.

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Epidemiology of Strongyles in Ponies in Ontario, Canada.

J.O.D. SLOCOMBE

Forty-nine Shetland-cross pony mares were divided into 3 groups and each group with a stallion was placed on a separate pasture on May 31, 1984. For several years the pastures had been grazed by the ponies which had received minimal anthelmintic treatment. Feces from each pony and herbage from each pasture were examined fortnightly and blood from each pony was examined monthly from April through November. Strongyle egg counts in feces peaked in June and July and with a lesser peak in September and October. Infective strongyle larvae were found in low numbers in pasture herbage in May, in high numbers in late August to early September and then declined. As the pasture season progressed there were increasing numbers of eosinophils and levels of total protein and globulin (fractions, A_1, A_2, B_1, B_2, G) in blood samples.

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Pathologic and Immunologic Responses of Ponies to Repeated Infections of *Strongylus vulgaris* Followed by Sequential Ivermectin Treatments.

T.R. KLEI*, R.A. HOLMES, J.R. McCLURE, M.A.M. TURK, V. DENNIS and M.R. CHAPMAN

Ivermectin is highly efficacious against migrating larvae of S. vulgaris within the mesenteric vasculature of horses. Dead worms remain in the vasculature and are buried deep within the vessel walls during lesion resolution. It is possible that a continued deposition of these larvae may produce significant vascular lesions and/or alter the immune response to the parasite by the release of antigenic materials. This question was investigated using 10 pony foals reared parasite free. Foals were divided into 2 groups of 4 foals each and were infected weekly with 50 S. vulgaris L_3 per os for a period of 25 weeks. Foals in one of these groups received 3 treatments of ivermectin paste (0.2 mg/kg) at eight week intervals. The remaining 2 foals served as untreated, uninfected controls. Clinical signs were monitored daily. Serum antibody levels to crude S. vulgaris adult antigen, white blood cell counts, hemotocrits and body weights were measured weekly. Radiographic analysis of mesenteric arterial vasculature was conducted prior to infection and 2 to 3 weeks following each ivermectin treatment. Necropsies were performed 28 weeks post initial infection (WPI). Periodic high rectal temperatures were seen in untreated infected ponies throughout the study. Circulating eosinophil numbers increased in all infected ponies by 8 WPI. These numbers remained elevated in untreated infected foals, but were reduced significantly in ivermectin treated foals for 3 weeks following treatment. Circulating antibody titers appeared to be reduced in ivermectin treated foals by the termination of the experiment. Radiologic evidence indicated that arterial lesions resolved following the initial ivermectin treatment and did not reappear subsequently. Data analyzed to date suggests that repeated infection and ivermectin treatment does not produce a syndrome associated with chronic antigenic release.

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Anthelmintic Efficiency of Triclabendazole Against *Fasciola hepatica* in Naturally Infected Cattle.

GASTON VALENZUELA* and I. QUINTANA

The anthelmintic efficiency of Triclabendazole was assessed by faecal egg counts during an observation period of 105 days. 3 gr of faeces were examined by the sedimentation technique.
Twenty Holstein Freisian heifers belonging to a farm in Southern Chile, 39-40 S. (age 6 to 12 months, $\bar{x}$ weight: 180), were divided into two groups of ten heifers.
Group 1 was drenched with Triclabendazole (Soforen*) as an oral drench at dose level of 12 mg/kg of body weight and Group 2 was maintained as an undrenched control. All animals were maintained on fluke areas during the observation period. Egg counts were made twice before drenching and at 17, 35, 53 and 98 days after drenching.
All animals were excreting fluke eggs before treatment and all untreated animals remained positive during the observation period. After drench, the faecal egg counts from treated animals were negative except at the examination on day 98 when all animals from this group were positive again except one. None of the treated animals showed any side effects attributable to the drug. The results demostrate that Triclabendazole has a high activity against mature and early inmature Fasciola hepatica.

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*) Trademark.

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The Efficacy of The Triclabendazole/Fenbendazole Combination on Helminths in Cattle Under Laboratory Conditions.

DIETER DUWEL

The efficacy of the triclabendazole/fenbendazole-combination was tested in bulls after artificial infection with helminths. Each of the time and dosage groups included 11 animals.
The trial schedule was arranged according to the recommendations of the 'World Association for the Advancement of Veterinary Parasitology' (1982).
The oral administration of a combination at 15 mg/kg body weight (i.e. 7.5 mg of each active ingredient/kg) resulted in the following reduction (in %) of helminth burden:

Species and date (days p.i.)	1d p.i.	5d p.i.	26d p.i.
Haemonchus contortus	100	97.7	100
	2d p.i.		
Ostertagia circumcincta	99.4	97.3	100
Trichostrongylus axei	100	93.0	100
Trichostrongylus colubriformis	100	99.0	100
Cooperia oncophora	100	100	100
		16d p.i.	39d p.i.
Oesophagostomum radiatum	98.8	100	100
		14d p.i.	49d p.i.
Chabertia ovina	98.5	100	100
	2d p.i.	5d p.i.	26d p.i.
Dictyocaulus viviparus	98.8	100	100

Species and date (weeks p.i.)	4W p.i.	6W p.i.	8W p.i.	12W p.i.
Fasciola hepatica	100	100	94.5	99.9

Thus, the combination of fenbendazole and triclabendazole at this dosage is highly efficient for cattle.

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Comparison of Different Formulations of Fasinex (Triclabendazole) in Sheep and Cattle Artificially Infected With *Fasciola hepatica*.

F.L. BOWEN*, T. FRIEDEL and M.B. STRONG

The principal formulations of Fasinex, developed for the treatment of Fasciola hepatica, are liquid suspensions for oral administration. For sheep the product contains 50 g/L triclabendazole and for cattle 100 or 120 g/L triclabendazole.

In some countries of Europe and Africa there is a preference for treatment of animals with either a bolus (tablet) or with in-feed medicated granules. Thus two studies were initiated to demonstrate equivalence of efficacy for Fasinex at the recommended dose rate when administered by these alternate methods. Studies were undertaken in sheep and cattle.

In sheep, treatment was given when artificial infections of F. hepatica had reached 4 and 12 weeks old. Fasinex, formulated as either in-feed granules, boli, or liquid suspension, was given, at dose rates of either 5 or 10 mg/kg, to six groups of sheep. A control group remained untreated.

In cattle the treatments were given when artificial infections were 2 weeks old. Fasinex, formulated as either liquid suspension or boli, was given, at dose rates of 6 or 12 mg/kg, to 4 groups of yearling cattle. A control group remained untreated.

In both studies the behaviour of triclabendazole at each dose rate was the same irrespective of the formulation administered. This was demonstrated by monitoring faecal egg counts and/or total worm burdens at necropsy and also by correlating the efficacy with the pattern of metabolite levels in plasma.

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Clinical Evaluation of FASINEX (Triclabendazole) in Sheep and Cattle.

R.J. RICHARDS* and D.G. STANSFIELD

The efficacy of triclabendazole against Fasciola hepatica in sheep and cattle and F. gigantica in sheep has been established in controlled tests.

Clinical field trials have been conducted in sheep and cattle with acute, subacute and chronic fasciolíasis. 680 sheep and 101 cattle were included in the trials. In sheep triclabendazole was given at a dose rate of either 5 mg/kg or 10 mg/kg and in cattle the dose rates used were 6 mg/kg or 12 mg/kg. Efficacy was assessed by faecal fluke egg counts and in one trial plasma GLDH levels were determined. In sheep the percentage reduction in egg count after treatment ranged from 96.3 % to 100 %. Reduction in egg counts in cattle was 89.3 % at a dose of 6 mg/kg and between 94.7 % and 100 % at a dose of 12 mg/kg.

Triclabendazole was well tolerated in all treated animals.

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Characterization of Paddocks at Risk For Dairy Goats I/Digestive-Tract Strongyles

N. MANGEON and J. CABARET*

Thirteen paddocks, distributed in seven Touraine (France) dairy-goats farms, were studied. Herbage samples were collected monthly in June, July and August 1984 in order to assess pasture infectivity (L3/kg of herbage dry-matter) ; this period was considered at high risk from previous investigations. The farms were selected on their high rate of parasitic infection. Two levels of risk factors were considered, the farm general management and the paddocks own characteristics. At a farm level were considered the number and efficacy of anthelmintic treatments, stocking-rate and supplementary feeding. For each paddock the following groups of variable were measured : prevalence of Haemonchus contortus in herbage, area, fertilization, vegetation and soil. Ostertagia and/or Trichostrongylus were the most common genera ; Haemonchus contortus represented only 14 % of the larval population. The efficacy of treatment at turn out ($r = -0.78$; $P < 0.01$), the number of treatments from January to August ($r = -0.57$; $P < 0.05$), the percentage of Haemonchus in herbage ($r = +0.58$; $P < 0.05$), the percentage of area covered by Festuca spp. ($r = 0.60$; $P < 0.05$) were good indicators of infectivity of pastures. In conditions of intensive breeding, farm variables play a more important role than paddocks characteristics. Among the latter, botanical composition was of interest, whereas soil parameters or fertilization were not related to pasture infectivity.

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Characterization of Paddocks at Risk For Dairy Goats II/Protostrongylids

J. CABARET* and N. MANGEON

The study was carried out in Autumn, the period at risk for small lungworms. Eighteen paddocks from seven farms in Touraine (north-west of France) were investigated. Botanical composition of herbage and soil analysis were performed. The infectivity of pastures was assessed by the number of infective larvae recovered from the snails intermediate hosts collected during twenty minutes on each paddock on two occasions.

Few snails were recovered (Helix aspersa, Helicella spp. Cepaea spp.) and two slugs, Deroceras reticulatum and Arion spp. (mostly A. ater), represented more than 92 % of the mollusc population. D. reticulatum was 3 times more frequent than Arion and 3 to 9 times more infected. Muellerius capillaris was the only species of Protostrongylid.

From the wide range of plants covering the pastures (arranged in decreasing order of importance : Agrostis spp., Lolium perenne, Holcus lanatus, Trifolium repens, Festuca spp., Dactylis glomerata...), only Medicago lupulina was a good indicator of the infectivity of pasture. The presence of a forest joint to the border of paddocks did not seem to play a role. The amount of organic matter in soil as well as the concentration in calcium (either total or organic) exert an influence on the infectivity of pasture. The latter could be predicted by the use of four parameters ($P = 0.07$; $r^2 = 0.46$) i.e. % of area covered by Medicago lupulina, amount in soil (‰) of organic matter, exchangeable and total calcium.

This work was undertaken in Autumn when slugs are dominant ; it might be of interest to determine whether the infectivity of pasture in Spring (mostly due to snails) is related or not to the same parameters. It must also be kept in mind that only the potential risk for grazing goats was assessed.

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***In vitro* Hatching of *Toxocara vitulorum* Larvae.**

M.A. BARBOSA*, A.R. GONZALES and M.A. CORREA

Aiming obtention of Toxocara vitulorum larvae for use as antigen, eggs were obtained from dissected female worms or from naturally passed feces. The eggs were suspended in tap water, centrifuged seve-

ral times and distributed in Petri dishes containing tap water and a few drops of formol to avoid fungi. Incubation for 17 days at 28ºC with aeration each 3rd day was necessary to allow formation of infestant larvae. Eggs containing infestant larvae were transferred to essay tubes and centrifuged twice at 2.500 rpm. The sediment was suspended in 1.5 ml of tap water and Milton solution to completion of the volume and remained so for 15 hours. After centrifugation the sediment was washed twice in PBS, pH 7.2. The sediment was them resuspended in 1.0 ml PBS and 2 ml HCl. Through microscopic observation the HCl action on the egg shells was controlled and before their rupture PBS was added. After repeated centrifugation in PBS the eggs were submitted to CO_2 for 5 minutes and them the tubes were put in a waterbath at 37ºC for 10 minutes to allow hatching of the larvae.

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Morphological Study of The Infective Larvae of *Mecistocirrus digitatus* (Linstow, 1906).

M. ANGEL GARCIA-ORTIZ and R. ANGEL MEJIA-GARCIA*

The morphological characteristics of the infective larvae of M. digitatus are described. M. digitatus adults females were collected from bovine abomasum and they were ground to obtain the eggs. In order to obtain the infective stage of M. digitatus several kinds of culture were tested:
a) Unicell-physiological saline; b) Sterile sheep-faeces; c) Agar-physiological saline. The Unicell-physiological saline culture was the best.
The morphology of the infective larvae of M. digitatus have similar features to the third larvae stage of Trichostrongylids. The larvae showed two brownish kidney shape bodies in the front of the head, bigger than the two refractive and conspicuos spots showed by Cooperia larvae. The spots size were X= 2.0 x 2.5 u. It is proposed to call them "Cobra's spots" or "Kuppuswamy's spots". The larvae showed 16 intestinal pentagonal shape cells.
Being the unicell-physiological saline culture the best method, the measurements recorded here were made on 100 larvae obtained from this culture. Total length: $\bar{X}$=598.78±25.12µ. Width: X= 20.53 ± 1.28µ. Distance from the Cobra's spots to the anterior end: $\bar{X}$= 7.45 ± 0.35 µ. Oesophagical length: $\bar{X}$= 140.58 ± 11.70 µ. Tail of the sheath (from the anus to the sheath): $\bar{X}$= 75.5 ± 8.27 µ. Extension of the sheath (from the tip of the larvae to the tip of the sheath): $\bar{X}$ = 20.48 ± 6.05 µ.

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Immunization of Cattle Against *Theileria annulata* Infection Using Schizonts Propagated in Tissue Culture.

BAHA M.A. LATIF* and I.A. LHDIER

Six Holstein Friesian calves (3-7 month old) were inoculated subcutaneously (slc) with $5x10^6$ schizonts of 320 passage. Mild reactions were observed in vaccinated calves. Only macroschizonts were detected in lymph smear, while no erythrocytic form was observed in blood smear. With slight drop in RBCs count, Hb and PCV volume accompanied by rise in total WBCs. After challenge with infected ticks (Hyalomma a. anatolicum), four calves showed mild reactions and low parasitaemia (2.6-7.3%). Two calves (No.3127, 3259) exhibited severe clinical manifestation and one of them (No.3259) died on day 33 post-challenge (P.C.) .
Another six calves served as a control group, were also infected by ticks. They reacted severely and all of them died on day 12-28 post-infection (P.I)
The indirect fluorescent antibody test was used to detect antibody titre and it reached a maximum titre of 1:640 on day 40 post-vaccination (P.V.) and 1:10240 on day 35 P.C.

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Transmission of *Babesia Equi* by *Hyalomma a. anatolicum* and *Rhipicephalus turanicus.*

K.T. FRIEDHOFF*, G. KLINCKMANN and B. SIGRIST

Experimental infection of both tick species was identified and quantitated by microscopical demonstration of the parasites in the salivary glands using a modified Feulgen-reaction. The results obtained by this technique were confirmed by TEM, by inoculation of triturated salivary glands of activated ticks into ponies, and by infestation of ponies with ticks.
Infected acini were enlarged up to 160 µm (H. a. anatolicum, adults) or 210 µm (R. turanicus, adults) in diameter, noninfected acini measured only 19 to 24 µm. Sporozoite-stabilates derived from both tick species retained infectivity for at least 5 years. The prepatent period was 10 to 13 days. H. a. anatolicum acquired infection in the larval and nymphal stage, R.turanicus in the nymphal stage only. Adult H. a. anatolicum that were exposed in the nymphal stage (parasitaemia 0.1 to 0.005%) were infected at a rate of 83% (48/58); 13.9 acini (average) were infected per tick. Female ticks were infected at a rate of 84% (27/32), male ticks at a rate of 81% (21/26).
Infected nymphs that engorged on a rabbit became negative after having developed to adults.
R. turanicus nymphs that engorged in the larval stage on an infected pony (parasitaemia 2 to 7 %) were negative microscopically (0/20). Triturated salivary glands from 140 nymphs from the same pool did not cause infection in a pony.
Adult R. turanicus that were exposed in the nymphal stage (parasitaemia 0.1 to 0.05%) were infected at a rate of 92% (34/37); 10.4 acini (average) were infected per tick.
H. a. anatolicum and R. turanicus did not transmit B. equi ovarially to their offspring.
Nymphs from both species became infected while feeding on a horse that was negative in the CF-test and microscopically since 100 days.

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Ehrlichia bovis Donatien & Lestoquard, 1936): *In vitro* Cultivation by Primary Line of Bovine Leukocytes.

CLAUDETE DE A. MASSARD, C.M. ANDRADE, L.C. RODRIGUES, R.B. FREIRE* and C.L. MASSARD

A primary line of bovine leukocytes cultured "in vitro" was obtained by the adaptation of the methodology initially preconized by HESS (1960).

Bovine blood was withdrawed from animals either naturally or artificially infected with *Ehrlichia bovis*. The blood samples were mechanically defibrinated and mantained at 4ºC. Following that, it was separated from debris and centrifuged at 2000 X g/ 4ºC/ 30 min.. The leukocytes layer was blended and centrifuged again. The leukocytes layer was blended, mixed with a double volume of hypotonic solution and submited to a new centrifugation at 1000 X g/4ºC/ 20 min.. These preparations were free from erithrocytes.

Primary cultures were obtained by incubation of purified leukocytes were done by their incubation at 37ºC in Leighton tubes, during a lapse of time between 24-96 hours. Negatives cultures of leukocytes for *E. bovis* were experimentally infected after 24 hours incubation, showing multiplication of *E. bovis* in cytoplasm of leukocytes after, at list, 96 hours.

Infections of leukocytes were determined by microscopy examination using Giemsa's coloration method and immunofluorescent antibodies test

The obtained results had demonstrated that Giemsa's coloration is safelly used for acute infections, On the other hand, immunofluorescent antibodies should be more sensible for the diagnosis of long term infections either.

The viability of microorganisms from "in vitro" cultiva-

tion was established by reproducing the infection by experimental inoculation of cattle.

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Ehrlichia bovis (Donatien & Lestoquard, 1936): Identification by Immunofluorescence (DFA).

CLAUDETE DE A. MASSARD, C.L. MASSARD, R.B. FREIRE* and C.M. ANDRADE

Immunesera were experimentally obtained in our laboratorie (UFRRJ and UFRJ) by a midification of the methodology initially described by KWAPINSKI (1982). Sera obtained from animals naturally or experimentally infected were also used.

Samples of immunesera against *E. bovis* were precipitated with amoniun sulphate and purified trought a chromatography columm contaiming DEAE-Cellulose (A-50). The resultant purified IgG was conjugated with isothiocyanate of fluorescein and finally purified trought a Sephadex (G-50) chromatography column. Conjugated immunoglobulins were titred. Serial dilution (10^{0}, 10^{-1}, $2x10^{-1}$, $3x10^{-1}$, $4x10^{-1}$ and $5x10^{-2}$) of conjugated matherial was tested against targed infected bovine leucocytes containing *E. bovis*, obtained in primary line cultures. Laminulles containing infected cells, obtained by cultivation, and blood smears, were fixed with accetone and added of previally titred fluorescent antibodies and incubated at 37°C in a umid chamber. Following that, the preparations were washed and observed by fluorescence microscopy. Smears from organs of differents animals died with sintomathology related to ehrlichioses (anaemia, eosinopaenia and lymphoadenopathy) were also investigated.

Although, smears of samples knowled as positives by Giemsa's coloretion were positives when observed by immunofluorescence, some negatives results of Giemsa's observation should be positives for the labelled antibodies techinique. All samples negatives for the fluorescence antibodies methodology were confirmed negatives by Giemsa staining.