PROCEEDINGS

AAVP

American Association of Veterinary Parasitologists

33rd Annual Meeting
July 17 & 18
Portland, Oregon

AMERICAN ASSOCIATION OF VETERINARY PARASITOLOGISTS

Founded 1956
Affiliated with the American Veterinary Medical Association

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Program and Abstracts

33rd Annual Meeting

American Association of Veterinary Parasitologists

Portland Hilton
Rose Ballroom

Sunday, July 17,1988

7:00 AM Registration

Session 1 Epidemiology

Moderators: Harold C. Gibbs and James E. Miller

1. 8:00 Epizootiology of *Nematodirus battus* in western Oregon.
L.G. Rickard, E.P. Hoberg, J.K. Bishop and G.L. Zimmerman.

2. 8:15 Alternative domestic hosts for *Nematodirus battus* in the Pacific Northwest and their role in transmission.
J.K. Bishop, L.G. Rickard, E.P. Hoberg and G.L. Zimmerman.

3. 8:30 Differential host responses of domestic sheep, goats and bighorn sheep to the ovine lungworm, *Dictyocaulus filaria*.
D.E. Worley and F.M. Sensee.

4. 8:45 The effect of stocking rate and parasite control on the performance of grazing replacement beef heifers.
J.W. Hansen, A. Zajac and D. Eversole.

5. 9:00 A harrowing experience with strongyles in ponies in Ontario.
O. Slocombe.

6. 9:15 Seasonal variations in strongyle larvae load on Southern California irrigated pasture.
G.E. Hackett, A.P. Fritts and R. McCormick.

7. 9:30 Epizootiology of endoparasitic infections in pet dogs and cats presented to the Veterinary Hospital of the University of Pennsylvania.
C.E. Kirkpatrick.

8. 9:45 The finding of *Eucoleus boehmi* (Supperer, 1953) Moravec, 1982 (Nematoda: Capillariidae) in the nasal mucosa of North American dogs.
B.G. Campbell and M.D. Little.

10:00 Coffee Break

Session 2 Chemotherapy I

Moderators: Robert G. Arther and Tjaart Schillhorn van Veen

9. 10:15 Efficacy of epsiprantel against *Taenia pisiformis* and *Dipylidium caninum* in dogs.
E.L. Roberson, D.L. Ambrose and T.J. Keefe.

10. 10:30 Paragonimiasis in dogs and cats: Treatment with praziquantel.
M.F. Hoover, D.D. Bowman, M.K. Frongillo, K.A. Beck, J.T. Blue, L. Cooper, W.E. Hornbuckle, O.D. McGinnis and R.C. Johnson.

11. 10:45 Effect of ivermectin treatment on performance of parasitized pigs.
T.B. Stewart, D. Leon and L.L. Southern.

12. 11:00 Extended treatment regimen for fenbendazole in pigs infected with *Ascaris suum* and *Trichuris suis*.
D.H. Bliss, S.A. Brantmeier, R.F. Taylor and R.K. Muser.

13. 11:15 The activity of levamisole against artificial nematode infections in goats.
G.C. Coles, D.J. Giordano and J.P Tritschler II.

14. 11:30 Controlling *Haemonchus contortus* in ewes in Louisiana using ivermectin.
J.E. Miller, S.L. Lemarie, F.G. Hembry, P.G. Hoyt, E.R. Willis and T. Gray.

15. 11:45 Sheep anthelmintics: Resistance and reversion.
R.P. Herd and K.E. McClure.

12:00 Lunch

Session 3 Experimental I

Moderators: H.Ray Gamble and Charles R. Sterling

16. 1:00 **Keynote Address**:
Eosinophil structure and function in parasitic infections.
C. Mackenzie

17. 1:30 Characterization of cuticular proteins from the free-living and parasitic stages of *Haemonchus contortus*.
R.H. Fetterer.

18. 1:40 Characterization of a specialized region of the second molt cuticle of *Haemonchus contortus*.
H.R. Gamble, R.H. Fetterer and J.P. Purcell.

19. 1:50 Purification of a parasite protease which regulates the ecdysis of infective larvae of *Haemonchus contortus*.
J.P. Purcell, H.R. Gamble and R.H. Fetterer.

20. 2:00 Some evidence that variation in parasite egg shedding rates is partially controlled by a host genetic component.
E.A. Leighton, K.D. Murrell and L.S. Gasbarre.

21. 2:15 Natural and experimental infection of cats with larvae of *Toxocara canis*.
J.C. Parsons, D.D. Bowman and R.B. Grieve.

22. 2:30 Bronchoalveolar eosinophilia in guinea pigs harboring inapparent infections of *Paraspidodera uncinata*.
G.A. Conder, I.M. Richards, L.W. Jen, K.S. Marbury and J.A. Oostveen.

23. 2:40 Calfhood immunization to *Ostertagia ostertagi* with high molecular weight soluble larval proteins.
D.A. Cross and P.H. Klesius.

24. 2:50 Fucose-affinity purification of eosinophil chemotaxin from *Ostertagia ostertagi*.
P.H. Klesius.

3:00 **Coffee Break**

Session 4 Canine Heartworm

Moderators: Robert M. Corwin and John C. Schlotthauer

25. 3:15 Serodiagnosis of prepatent dirofilariasis.
M.M. Wong, J. Thomford and G.Y. Lee.

26. 3:30 Relative prevalence of *Dirofilaria immitis* and a survey of gastrointestinal helminths of coyotes and foxes in Missouri.
M.J. Wixsom, S.P. Green, R.M. Corwin and E.K. Fritzell.

27. 3:45 Variation in the size and location of canine pulmonary arteries as determined by computerized digital subtracting radiography.
R.A. Holmes, G.H. Turnwald and S.P Schmidt.

28. 4:00 A new chemotherapeutic, canine model for dirofilariasis using IV transplanted adult worms.
M.T. Dzimanski, J.W. McCall and T.L. Mctier.

29. 4:10 Efficacy of a new adulticide (RM 340) against IV transplanted, one-year-old *Dirofilaria immitis* in dogs.
M.T. Dzimanski and J.W. McCall.

30. 4:20 Preliminary results on the efficacy of a new adulticide (RM 340) for *Dirofilaria immitis* in naturally infected dogs.
J.P. Raynaud, R.B. Atwell and B. Davoust.

4:30 **Awards** W.H.D. Leaning

Remarks by Distinguished Parasitologist Awardee

5:00 **Presidential Address** Thomas R. Klei

5:20 **Business Meeting**

7:30 **Society Social** - RiverPlace - Alexis Hotel
1501 SW Harbor Way
(about 5 blocks from the Hilton)

Monday, July 18, 1988

Session 5 Experimental II
Moderators: George A. Conder and Joseph F. Urban

31. 8:00 Helminth parasites of Northern spotted owls from Western Oregon.
E.P. Hoberg, G.S. Miller, E. Wallner-Pendleton and O.R. Hedstrom.

32. 8:15 Extracts of *Ambrosia maritima* as 'natural' molluscicides
A.A.I. Elmagdoub, M.F. El-Sawy, S.A. Baker and J.B. Malone.

33. 8:30 Use of a computerized geographic information system to model potential habitat of *Fossaria bulmoides* on coastal marsh pasture in Louisiana.
S.H. Zukowski, J.B. Malone and J.M. Hill.

34. 8:45 Studies on *Culicoides* hypersensitivity "sweet itch" in Louisiana horses.
L.D. Foil, C.S. Foil, R.E. Corstvet, C. Klimzcak, M. Klass and F. Enright.

35. 9:00 The tabanids of Eastern Mississippi. (Diptera: Tabanidae)
R.L. Combs and J. MacDonald

36. 9:15 Observation of parasites in foal meconium
J.Kivipelto and R.L. Asquith.

37. 9:30 Usefulness of ultrasonography in the diagnosis of liver fluke infection in ruminants.
A.R. Donoghue, C.D. Brown and T.W. Schillhorn van Veen.

38. 9:45 Evaluation of diagnostic tests for calves with *Fasciola hepatica* infections.
T.M. Craig, S.Q. Hasan, B.L. Doughty, C.G. Wade and D.K. Miller

10:00 **Coffee Break**

Session 6 Protozoology

Moderators: Byron L. Blagburn and Michael D. Ruff

39. 10:15 Newly recognized fatal protozoan disease of dogs distinct from toxoplasmosis.
J.P. Dubey, J.L. Carpenter, C.A. Speer, M.J. Topper and A. Uggla.

40. 10:30 Detection of *Sarcocystis* antibodies in polyclonal sera and hybridoma cell culture supernatants with IFAT, ELISA, and dot-ELISA.
A. Tenter and C. Pein.

41. 10:45 A survey of coccidiosis in pen raised wild turkeys.
M.D. Ruff, L. Schorr, W.R. Davidson and V.F. Nettles.

42. 11:00 Coccidiosis outbreaks attempting to use sanitary measures to prevent the disease in poultry flocks.
W.M. Reid.

43. 11:15 Characterization of cytoplasmic proteins in *Eimeria maxima* oocysts.
L.M. Pote, A.J. Ainsworth, J.E. Brown and J. Haney.

44. 11:30 Miniature pigs as bioresearch models for porcine neonatal coccidiosis.
B.L. Blagburn, T.R. Boosinger and T.A. Powe.

45. 11:45 Parasitic infections in immunodeficiency virus-infected rhesus monkeys.
J.L. Blanchard, G.B. Baskin, M. Murphey-Corb and L.N. Martin.

12:00 Lunch

Session 7 Chemotherapy II

Moderators: Dennis D. French and David E. Worley

46. 1:00 Control of GI nematodes in cattle by strategic ivermectin treatment.
J.C. Williams, J.W. Knox, R.A. Swalley, S.A. Barras and C.S. Eddi.

47. 1:15 Ivermectin in a sustained-release bolus: prophylactic efficacy against nematodes of cattle.
R.Alva-Valdes, D.H. Wallace, J.R. Egerton, G.W. Benz, S.J. Gross, J.W. Wooden and V.E. Reuter.

48. 1:25 Efficacy of ivermectin in a sustained-release or a topical formulation against natural infestation of biting and sucking lice of cattle.
J.E. Holste, D.H. Wallace, G.W. Benz, J.L. Cox and S.J. Gross.

49. 1:35 Safety and tolerance of two formulations of ivermectin in suckling foals.
R.L. Asquith and J. Kivipelto.

50. 1:45 Efficacy of ivermectin in the treatment of 28-day-old stages of *Parascaris equorum* in pony foals.
J.A. DiPietro, T.F. Lock and K.S. Todd.

51. 1:55 Comparison of two parasite control programs for horses in Brazil.
E.L. Bordin, L. Mifano, F. Heiderich and J. Guerrero.

52. 2:05 Comparative anthelmintic control of parasite infections in young horses on pasture in Western Canada.
C.A. Piche and M. Kennedy.

53. 2:15 Photodynamic action of erythrosin B on third-stage equine strongyle larvae.
C.E. Couvillion and C.R. Boyle.

Session 8 Poster Session

2:30 - 3:30
Refreshments will be served.

54. A comparison of equine anthelmintics by route of administration.
G.T. Hackett and J. Buonafide.

55. Comparative efficacy and safety of pyrantel tartrate fed daily to horses for a year.
G.E. Hackett, R. McCormick and P. Mendosa.

56. Paralysis of *Strongylus edentatus* after treatment with nematocides.
S.D. Folz, R.A. Pax, T.R. Klei, E.M. Thomas, K.A. Ash, G.A. Conder and J.L. Bennett.

57. Efficacy of ivermectin in oral drench and paste formulation against migrating stages of *Parascaris equorum*.
D.D. French, T.R. Klei, M.R. Chapman and H.W. Taylor.

58. Serological characterization of *Strongylus vulgaris* soluble somatic antigens recognized by equine IgG antibody.
V.A. Dennis, T.R. Klei and M.R. Chapman.

59. Hand-raising pony foals for controlled anthelmintic trials.
J.A. DiPietro, J.L. Davis, J.A. Boero and T.F. Lock.

60. A modification of the agar-gel technique to eliminate free-living nematodes from herbage samples.
D.E. Snyder.

61. Relationship between egg excretion and total worm burden in naturally infected calves.
K.D. Murrell, E.A. Leighton, B.A. Boswell and L.C. Gasbarre.

62. Induction of protective immunity in calves against *Ostertagia ostertagi* by strategic administration of an anthelmintic.
L.C. Gasbarre.

63. Antigen induced histamine release by intestinal mucosal mast cells (IMMC) in vitro as an indicator of local immunity to *Ascaris suum* in swine.
J.F. Urban, M. Ashraf and C.M. Lee.

64. Efficacy of morantel sustained release trilaminate matrix device against gastrointestinal nematodes in beef calves.
L.G. Rickard, G.L. Zimmerman, E.P. Hoberg, J.K. Bishoo P.W. Lockwood, D.W. Weber and R.J. Miller

65. Use of fenbendazole premix administered via loose mineral in a strategic parasite control program for stocker cattle in Virginia.
A.M. Zajac, J.W.Hansen and W.D. Whittier.

66. Efficacy of febantel against GI nematodes and lungworm in cattle.
J.C. Williams, K.S Marbury, C.S. Eddi, E.R Willis, R.A. Swalley and D.G. Luther.

67 Indications of nematode resistance to levamisole and fenbendazole among sheep and goats in Texas
D.K. Miller and T.M. Craig.

68. Extrapolation of a climate based fluke forecasting system for Louisiana to rainfall-dependent pasture zones of Florida, Texas and Oklahoma.
J.B. Malone and R.A Riggleman

69. Heartworm (*Dirofilaria immitis*) infection in Minnesota - An update.
J.C. Schlotthauer & B.E. Stromberg

70. Use of echocardiography for determining adult heartworm burden before and after treatment.
J.P Raynaud.

71. Pharmacokinetics and clinical pharmacology in dogs of a new heartworm adulticide.
P.L. Toutain and J.P Raynaud.

72. Comparison of five serologic techniques to detect antigen to *Dirofilaria immitis* in the dog.
G.H. Turnwald, R.A. Holmes, S.P Schmidt, P.H. Smith and J.B. Malone.

73. Confirmation of the optimal effective oral dose of milbemycin against adult hookworm infections in naturally infected dogs.
D.D. Bowman, R.C. Johnson and D.I. Hepler

74. Experimental infection of dogs with *Caryospora bigenetica* (Apicomplexa: Eimeriidae).
C.A. Sundermann, B.L. Blagburn, L.J. Swango and T.R. Boosinger.

75. Muscular sarcocystiasis in a dog.
B.L Blagburn, K.G. Braund, M. Toivio-Kinnucan and K.A. Amling.

76. *Caryospora bigenetica* (Apicomplexa: Eimeriidae): Complete development in vitro.
C.A. Sundermann and D.S. Lindsay.

77. Developmental stage and host species crossreactive hybridoma antibodies generated against *Eimeria bovis* sporozoites.
D.S. Lindsay, J.P. Duby, P.C. Augustine, L.F. Carson, H.D. Danforth and R. Fayer.

Session 9: Presidents Symposium

Paradigms Associated with the Diagnosis of Parasitic Infections

Moderator: Thomas R. Klei

78. 3:35 Diagnosis of Parasitic Diseases in Small Animal Practice.
R. B. Grieve

79. 3:50 Diagnosis of Parasitic Diseases in Large Animal Practice
T. Shillhorn van Veen

80. 4:05 Applications of Diagnostic Tests for Diagnosis of Zoonotic Parasites in Humans.
P. M. Shantz

81. 4:20 Improved Diagnostics for Parasites in the Future of Animal Health.
H.R. Gamble

4:35 Group Discussion

Session 10: Syntex Symposium

Moderator: R.A. Schiltz

82. 5:00 Use of Oxfendazole to Control Inhibited *Ostertagia ostertagi* in Beef Cattle.
I.G. Pearson

83. 5:30 Rumen Injection for Positive Administration of Bovine Anthelmintics.
J.F. Reid

6:00 Syntex Social - North Galleria Room
Portland Hilton

1

EPIZOOTIOLOGY OF NEMATODIRUS BATTUS IN WESTERN OREGON. L.G. RICKARD*, E.P. HOBERG, J.K. BISHOP AND G.L. ZIMMERMAN. OREGON STATE UNIVERSITY. CORVALLIS, OR 97331

Epizootiological studies of N. battus and other Nematodirus spp. in sheep were initiated in western Oregon in late 1985 to determine 1) periods of transmission and 2) to provide information for potential prophylactic control. Beginning in November 1985 and ending in March 1988 three Nematodirus-free tracer lambs were released, on a monthly basis, on pasture naturally contaminated with N. battus. Lambs were grazed for 28 days, isolated for 22 days and necropsied for recovery of Nematodirus (abundance estimated by counts of 5% aliquots). Counts of EPG were taken weekly starting on day 17 post turn out.

The most significant finding was continual transmission of N. battus throughout the year. Major peaks in transmission appeared to be confined to periods in the late fall and winter with minor increases in abundance in early and late summer. Annual continuity in the cycle of N. battus, possibly with attenuation of spring peaks of parasite abundance, has not previously been observed. The epizootiology of N. battus in western Oregon is substantially different from that seen in Scotland, Ireland and Norway.

2

ALTERNATIVE DOMESTIC HOSTS FOR NEMATODIRUS BATTUS IN THE PACIFIC NORTHWEST AND THEIR ROLE IN TRANSMISSION. J.K. BISHOP*, L.G. RICKARD, E.P. HOBERG, AND G.L. ZIMMERMAN. OREGON STATE UNIVERSITY. CORVALLIS, OR 97331.

Alternate grazing of cattle and sheep on pastures has long been recommended as a means of parasite control, especially with regard to Nematodirus battus. However, studies in the United Kingdom and Norway have shown young beef cattle can acquire infections of N. battus. Subsequently, cattle are capable of maintaining levels of contamination on pastures such that substantial infections may later become established in sheep. In light of this, a study was initiated on naturally contaminated pastures to ascertain whether N. battus could be transmitted to cattle in Oregon. Beginning in March 1987, four groups of three N. battus naive tracer calves were placed onto pastures. Calves were grazed for 28 days, isolated for 22 days and necropsied for the recovery of N. battus. Mean abundance was estimated by counts of 5% aliquots. Counts of EPG were taken weekly, begining on day 17 post turnout. N. battus, as well as other Nematodirus spp. were found in the tracer calves. Additionally, N. battus has been recovered from cattle grazing the Southern coast of Oregon, as well as from llamas in the Willamette Valley of Western Oregon. These data indicate that cattle and possibly other species may play a role in the transmission of N. battus to sheep.

3

DIFFERENTIAL HOST RESPONSES OF DOMESTIC SHEEP, GOATS AND BIG-HORN SHEEP TO THE OVINE LUNGWORM, DICTYOCAULUS FILARIA. D.E. WORLEY*, AND F.M. SEESEE. MONTANA STATE UNIVERSITY, BOZEMAN, MT 59717.

An isolate of the ovine lungworm Dictyocaulus filaria obtained from range sheep in western Montana was evaluated for cultural and storage characteristics, infectivity, and host responses in lambs, goats, and bighorn sheep. Although all levels of exposure ranging from 300 to 5000 L3 induced patent infections in 3-6 month-old lambs, a single dose of 3000 larvae was the most productive inoculum in terms of longevity of infection and total larval output. Larger doses (5000 L3) induced erratic infections with delayed patency (44-45 days) and negligible larval output or nonpatent infections. Most lambs given 3000 or more larvae exhibited signs of acute verminous pneumonia, including moist rales, shallow labored breathing and elevated temperatures late in the prepatent period.

Infectivity and fecundity of the isolate in goats was two- to three-fold higher than in sheep. Larval doses in the 1500-3000 range resulted in severe verminous pneumonia late in the prepatent period. Solid immunity to reinfection developed following spontaneous loss of the primary infection. Bighorn sheep, on the other hand, manifested an immune tolerance to the parasite which permitted reinfection with little or no clinical response to larval doses 10 to 20 times higher than the estimated LD70 in domestic sheep or goats. Passage through wild sheep did not appear to reduce the infectivity of the isolate for goats.

4

THE EFFECT OF STOCKING RATE AND PARASITE CONTROL ON THE PERFORMANCE OF GRAZING REPLACEMENT BEEF HEIFERS. J.W. HANSEN, A. ZAJAC, D. EVERSOLE. VIRGINIA TECH, BLACKSBURG, VA 24061

This study was designed to compare the animal production per area unit and per animal at 3 different stocking rates in combination with 2 deworming programs. Thirty-six beef replacement heifers were subdivided into 6 comparable groups grazing 6 paddocks of variable size equivalent to a grazing pressure of normal, medium and high stocking rates. All groups were treated with ivermectin at the beginning of the experiment. Five weeks later, 3 groups representing each of the 3 stocking rates were treated a second time. Fecal egg output, serum pepsinogen levels, herbage larval counts and weight gain were determined every three weeks. Due to drought conditions, fecal egg output, serum pepsinogen levels and herbage larval counts were low throughout the grazing season. The beneficial effects of the strategic deworming program were, however, indicated as the fecal egg counts and serum pepsinogen levels remained lower for the treated groups during most of the grazing season. Differences in weight gain favoring the treated groups were also observed. A clear effect of stocking rate was demonstrated. Low stocking rate groups continuously had the lowest egg output and serum pepsinogen levels and the highest average weight gain per animal. The experiment also clearly showed that the production per area unit increased with an increase in stocking rate. The medium and high stocking rate groups had a production per area unit exceeding that of the low stocking rate group by 45 and 15 percent respectively.

5

A HARROWING EXPERIENCE WITH STRONGYLES IN PONIES IN ONTARIO. OWEN SLOCOMBE, DEPT. OF PATHOLOGY, ONTARIO VETERINARY COLLEGE, UNIVERSITY OF GUELPH, GUELPH, ONTARIO. N1G 2W1.

Twenty-three mares were divided into 2 groups and each group was placed on a pasture in 1987 from May 25 to November 10. A stallion was added to each group from June 2 to September 15. One pasture was chain-harrowed weekly from June 24 to August 30 and once in the third week of September. Prior to turnout to pasture and fortnightly, thereafter, fecal samples were taken from each pony and pasture herbage samples were taken from each pasture. On each pasture there were three mares each with a foal. From each pasture, a foal was removed on September 14, October 14 and November 10 and when the foals were 5 months of age. Foals were kept in isolation for 6-8 weeks before necropsy.

Herbage larval counts on the pastures were similar. In foals from the harrowed pasture, the number of nematodes in the abdominal arteries and in the wall of the cecum, ventral colon and dorsal colon and the number of strongyle eggs per gram of feces (epg) were greater than those from the control pasture. However, the epg for the mature ponies from the harrowed pasture were significantly less than those for the control pasture.

To harrow or not to harrow for parasite control - that's the question?

6

SEASONAL VARIATIONS IN STRONGYLE LARVAE LOAD ON SOUTHERN CALIFORNIA IRRIGATED PASTURE. G.E. HACKETT, A.P. FRITTS AND R. MCCORMICK. EQUINE RESEARCH CENTER, CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA, POMONA, CA. 91768

A pilot study was initiated to examine three irrigated pastures in Southern California to determine the seasonal variation in the strongyle larvae load. The number of larvae per kilogram of dry matter of herbage was determined once a month for each pasture. These pastures were grazed by varying numbers of weanling, yearling and 2 yr old Arabian horses. Each pasture was irrigated at the rate of 7" of water a week, then three weeks with no water. Average larvae counts ranged from a low of 36/kg of dry matter in September to a high of 6700 larvae/kg of dry matter in February. The counts appeared to remain low during the summer and be high all winter. The study was set up as a randomized complete block design, with the pastures as blocks and individual months as treatments. A correlation coefficient and regression analysis was done for average monthly larvae per kg dry matter and each of : average monthly temperature, humidity, rainfall and the number of horse days of grazing. Larvae counts for September were lower than February ($P<.05$). Larval counts from May were lower ($P<.05$) than December, January, and March, and also ($P<.01$) February. Counts were found to significantly correlate to rainfall ($P<.05$), temperature ($.01<P<.025$) and grazing days ($.01<P<.025$), but the correlation to humidity was insignificant.

7

EPIZOOTIOLOGY OF ENDOPARASITIC INFECTIONS IN PET DOGS AND CATS PRESENTED TO THE VETERINARY HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA. C.E. KIRKPATRICK*, UNIVERSITY OF ILLINOIS, URBANA, IL 61801.

Prevalences of and risk factors associated with protozoan and helminthic parasite infections were determined for pet dogs and cats presented to the teaching hospital of the University of Pennsylvania School of Veterinary Medicine over a 2.5 yr. period. Of 2294 canine fecal specimens, analyzed by zinc-sulfate centrifugal flotation, 34.8% were found to contain one or more kinds of parasite, including: hookworms (14.4%); Trichuris vulpis (12.3%); Giardia (7.2%); ascarids (predominantly Toxocara) (5.5%); coccidia (2.7%); and cyclophyllidean cestodes (1.6%). The following risk factors were identified with intestinal parasitism in dogs: age of < 2 yr.; urban (Philadelphia, PA) locality; and male sex. Gonadectomy was associated with decreased parasite prevalences in both male and female dogs. Significant seasonal variations in prevalences of hookworm, ascarid, and Giardia infections were found in dogs. Of 452 feline fecal specimens tested, 24.6% were positive for parasites, including: ascarids (predominantly Toxocara) (16.4%); Giardia (3.5%); coccidia (2.9%); cyclophyllidean cestodes (2.4%); and Ancylostoma (1.1%). Host age of < 2 yr. was a significant risk factor associated with parasitism in cats. Of 1571 dogs tested for Dirofilaria immitis microfilaremia, 3.7% were positive. Non-urban locality was a significant risk factor for D. immitis infection in dogs.

8

THE FINDING OF Eucoleus boehmi (SUPPERER, 1953) MORAVEC, 1982 (NEMATODA: CAPILLARIIDAE) IN THE NASAL MUCOSA OF NORTH AMERICAN DOGS. B.G. CAMPBELL* AND M.D. LITTLE. TULANE UNIVERSITY. NEW ORLEANS, LA, 70112.

In September 1987, small numbers of trichinelloid eggs were observed in fecal specimens from two dogs housed in the Tulane University School of Medicine Vivarium. The delicately-pitted, barrel-shaped eggs, measuring 54 to 58 um by 30 to 35 um, possessed distinct polar plugs and multicellular embryos. At necropsy, capillariids, identified as Eucoleus boehmi (dog #1, 88 worms; #2, 16 worms), were found in the mucosa of the nasal turbinates, the walls of the nasal cavity, and the walls of the paranasal sinuses of both dogs. E. boehmi has been occasionally reported from several wild and domestic canids in Europe since its description in 1953. Reports of Capillaria aerophila (=Eucoleus aerophilus) in the nasal cavity of European and North American canids are probably due to confusion of that species with E. boehmi. Detection and identification of E. boehmi eggs is difficult, due to low numbers of eggs in feces and similarity to eggs of other capillariids and Trichuris spp.

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EFFICACY OF EPSIPRANTEL AGAINST TAENIA PISIFORMIS AND DIPYLIDIUM CANINUM IN DOGS. E.L. ROBERSON,[1]* D.L. AMBROSE,[1] AND T.J. KEEFE.[2] COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF GEORGIA, ATHENS, GA 30602[1] AND BEECHAM LABORATORIES, BRISTOL, TN 37620.[2]

The activity of a singly administered oral tablet formulation of epsiprantel was evaluated at 3 dosage levels (1.25, 2.5, and 3.75 mg/lb, i.e. 2.75, 5.5, and 8.25 mg/kg) in 40 dogs harboring induced infections of Taenia pisiformis and 40 dogs harboring naturally occurring infections of Dipylidium caninum. The 1.25 mg/kg dosage cleared 90% of dogs infected with T. pisiformis and 70% of dogs infected with D. caninum. Dosages of 2.5 and 3.75 mg/lb were 100% effective against both tapeworms. Confirmation of the 100% efficacy of the drug at the 2.5 mg/lb dosage was made in an additional 40 dogs.

The drug was also evaluated against induced T. pisiformis in 16 large dogs to compare the efficacy of the optimum dosage (2.5 mg/lb) with efficacy obtained when a 60-lb dose (150 mg) was used as the maximum regardless of the weight of the animal. In dogs weighing 63.5 to 95.5 lbs, a total dose of 150 mg was as effective in expelling T. pisiformis (100%) as was treatment of similar weight dogs at 2.5 mg/lb.

10

PARAGONIMIASIS IN DOGS AND CATS: TREATMENT WITH PRAZIQUANTEL. M.F. HOOVER*, D.D. BOWMAN, M.K. FRONGILLO, K.A. BECK, J.T. BLUE, L. COOPER, W.E. HORNBUCKLE, O.D. MCGINNIS, AND R.C. JOHNSON. CORNELL UNIVERSITY, ITHACA, NY 14853.

Praziquantel has only rarely been used in the successful treatment of dogs infected with Paragonimus kellicotti, and at the dosages used, it has not been reported as successful in treating cats infected with this parasite. To further evaluate the usefulness of this drug in treating these infections, 7 cats and 7 dogs were each given metacercariae from crayfish, 12 and 20-22 respectively, and treated after the infections became patent; 2 cats and 2 dogs served as uninfected controls. Beginning 1 week preinfection, physical exams, hematology, and coprology were performed weekly on each animal; thoracic radiographs were taken every other week. All dogs given metacercariae had patent fecal exams by 6 weeks postinfection (PI). Infected cats were patent by 7 weeks PI, but 2 cats given metacercariae never became patent or showed signs of infection. Symptoms were minor and included an increase in respiratory noise, a slight inducible cough, or mild dypsnea. A transient eosinophilia was seen around 3 weeks PI. Pretreatment radiographs showed cavitated lesions, pleural lines, patchy infiltrates, or pneumothorax. The treatment regimen was 23 mg/kg of praziquantel 3 times a day for 3 days; 1 infected cat and dog were not treated. By 2 weeks post-treatment, eggs had disappeared from the feces of the infected animals, and radiographically, the lungs showed marked resolution of the lesions. The 2 untreated animals and 1 treated dog were killed and necropsied to verify the presence of lesions and their resolution. All treated animals were considered cured of their infections by this treatment regimen.

11

EFFECT OF IVERMECTIN TREATMENT ON PERFORMANCE OF PARASITIZED PIGS. T.B. STEWART*, D. LEON AND L.L. SOUTHERN, LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA 70803.

Forty-five weanling pigs weighing an average of 38 kg were assigned to one of three groups on the basis of weight, sex and ancestry. Each pig in Groups I and II was given 2,000 Ascaris suum eggs on day 1 and 10,000 Oesophagostomum spp. larvae on day 3 per os; and 10,000 Strongyloides ransomi larvae on day 28 subcutaneously. On day 35, each pig in Group II was injected with a 1% solution of ivermectin at a dose rate of 249.2 ±27.72 um/kg of body weight. Pigs in Group III served as uninfected, untreated controls. Pigs were killed when they attained an average weight of 106.5 kg.

Infected pigs of Group I and II consumed less feed and gained less weight ($P<.05$) than controls for the first 35 days. From day 35 (treatment day of Group II) to slaughter, Group I pigs gained less weight ($P<.05$) than treated or control pigs and consumed less feed ($P<.05$) than control pigs. There was no significant difference in feed conversion efficiency overall among the groups, however, Group II pigs were 7% more efficient than Groups I and III pigs during the post-treatment feeding period of 40 days.

The 9% increase in average daily gain and 7% increase in feed conversion efficiency of ivermectin treated pigs over the infected untreated pigs should be of economic importance to pig producers.

12

EXTENDED TREATMENT REGIMEN FOR FENBENDAZOLE IN PIGS INFECTED WITH *ASCARIS SUUM* AND *TRICHURIS SUIS*. D. H. BLISS*, S. A. BRANTMEIER, R. F TAYLOR, AND R. K. MUSER. MIDAMERICA AG RESEARCH INC. MADISON, WI. AND HOECHST-ROUSSEL AGRI-VET CO. SOMERVILLE, NJ.

The efficacy of fenbendazole in pigs fed at the rate of 9 mg/kg body weight for 0, 3, 6, or 12 days against both larval and adult stages of *Ascaris suum* and *Trichuris suis* was examined in two studies. In study 1, 40 pigs harboring a natural infection of *Trichuris suis* were used. Necropsies were performed 6 and 7 days after the last treatment. Results demonstrated excellent efficacy with a 100% reduction in the 3 and 6 day treated groups against both both larval and adult stages while the efficacy in the 12 day treated group was slightly reduced. In study 2, 120 feeder pigs were inoculated with 20,000 *Ascaris suum* eggs and were fed fenbendazole. Pigs were necropsied 5 or 14 days post inoculation. Although, the efficacy against larval stages prior to lung involvement ranged from 49% to 85% in the reduction of liver spots, the efficacy was excellent against larval stages in the lung; 100% for the 3 and 6 day treated groups and 96.6% for the 12 day treated groups 5 days following infection. The efficacy against larval stages found in the gastrointestinal tract and lungs 14 days post-infection was 100% for all treatments compared with controls. These data support that fenbendazole is highly effective against both larval and adult stages of *Trichuris suis* and *Ascaris suum* using either a 3, 6 or 12 day treatment schedule.

13

THE ACTIVITY OF LEVAMISOLE AGAINST ARTIFICIAL NEMATODE INFECTIONS IN GOATS. G.C.COLES*, D.J.GIORDANO AND J.P.TRITSCHLER II. UNIVERSITY OF MASSACHUSETTS, AMHERST, MA 01003.

The activity of a single oral treatment of levamisole was determined at 3 dose levels in groups of goats (8 per dose level) against artificial infections with immature (7 day old) and adult (21 day old) Haemonchus contortus, Ostertagia circumcincta, Trichostrongylus axei and T.colubriformis.

The mean efficacy against adult worms in the abomasum and small intestine at 3.96 mg/kg was 65 and 69%, at 7.92 mg/kg was 83% and 99% and at 11.88 mg/kg was 98% and 100%. Activity against immature worms at 3.96 mg/kg was 45% and 51%, at 7.92 mg/kg was 88% and 97% and at 11.88% was 97% and 99.9 %. The activity of levamisole was thus lower in goats than in sheep. Reduced efficacy in goats at the normally used dose would increase the chances of selecting for anthelmintic resistant nematodes, and could in part explain why resistant nematodes have been reported to be more prevalent in goats than in sheep.

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CONTROLLING HAEMONCHUS CONTORTUS IN EWES IN LOUISIANA USING IVERMECTIN. J.E. MILLER*, S.L. LEMARIE, F.G. HEMBRY, P.G. HOYT, E.R. WILLIS, AND T. GRAY. Louisiana State University, Baton Rouge, Louisiana, LA 70803.

Results of a study during the summer of 1984 indicated that Haemonchus contortus in the ewe flock of Louisiana State University was not effectively controlled with repeated doses of levamisole, morantel, or fenbendazole. Ivermectin, however, was very effective in controlling H. contortus. Based on this study, ivermectin was selected for use in the ewe flock. To evaluate appropriate treatment intervals and the long term efficiency of ivermectin 20 Suffolk ewes were used as sentinal animals for a period of 3 years. Fecal samples were collected weekly and flock treatment was based on the pattern of egg counts observed in these 20 animals. During the second and third year of this study another 20 Suffolk ewes were maintained without routine anthelmintic treatment to evaluate normal seasonal patterns of nematode burdens based on fecal egg counts conducted every 2 weeks. For salvage purposes only, individual ewes were treated when egg count, PCV, and/or clinical signs dictated.

The periparturient rise in fecal egg count was observed in late winter/early spring followed by a decrease to low levels in late spring. Egg counts increased during the summer and peaked in late summer followed by a decrease to moderate levels in the fall/early winter. Treatments were deemed necessary once late in the periparturient rise and 3 times during the summer. A late fall/early winter treatment was questionable. Additional treatments would be necessary if suppression of pasture contamination was of primary concern. Efficacy, based on egg counts, of ivermectin for all treatments during the 3 year period was greater than 97.8%.

15

SHEEP ANTHELMINTICS: RESISTANCE AND REVERSION. R.P. HERD AND K.E. McCLURE. THE OHIO STATE UNIVERSITY. COLUMBUS, OHIO 43210.

Benzimidazole resistance was first detected at The Ohio Agricultural Research and Development Center, Wooster, Ohio in 1968, and by 1978 a triple dosage of fenbendazole (15mg/kg) had no effect on the predominant parasite, O. circumcincta, even though benzimidazole drugs had not been used for 9 years. In 1978, levamisole (8mg/kg) was 99% effective against all species, including hypobiotic stages, whereas benzimidazole drugs had reduced efficacy against O. circumcinta, H. contortus and Trichostrongylus spp. Studies in 1982 indicated that there was still no reversion to benzimidazole susceptibility and deaths from nematodiasis occurred in a group of thiabendazole treated lambs.

In the 10 years from 1977 to 1987, levamisole was used 3-4 times a year as the sole broad spectrum anthelmintic. In 1987, a comparative anthelmintic study was done to evaluate the state of resistance and reversion. The results showed a decline in levamisole (8mg/kg) efficacy from 99% (1978) to 64% (1987), and an increase in fenbendazole (5mg/kg) efficacy from 20-47% (1977/78) to 95% (1987). Ivermectin (0.2mg/kg) reduced worm burdens by 99%. Resistance to fenbendazole is likely to be re-asserted if this drug is used again, and resistance to ivermectin is likely to develop if it is used as the sole anthelmintic.

17

CHARACTERIZATION OF CUTICULAR PROTEINS FROM THE FREE-LIVING AND PARASITIC STAGES OF HAEMONCHUS CONTORTUS. R.H. FETTERER*. HELMINTHIC DISEASES LABORATORY, LIVESTOCK AND POULTRY SCIENCE INSTITUTE, USDA, ARS, BELTSVILLE, MD 20705.

Cuticles from H. contortus third stage larvae (L3) and adult male (AD) were isolated by a combination of detergent treatment and mechanical disruption. The cuticles or sheaths from the second molt larvae (2M) were isolated from exsheathed 2M larvae by flotation on a 30% Percoll solution. Proteins from isolated cuticles were solubilized by treatment with reducing agents. Soluble cuticular proteins from the stages examined were similar when analyzed by polyacrylamide gel electrophoresis and reverse phase chromatography. However, the amount of protein solubilized was greater in the AD (80%) than the L3 (60%) or 2M (25%). Amino acid analysis of the soluble cuticle proteins suggest that they are collagen-like although the proteins were not readily digested by collagenase.

The 2M cuticular proteins that were not soluble in reducing agents had a distinct brown appearance. A yellow, low molecular weight material with characteristics of phenols was released from these proteins following mild acid hydrolysis. These observations suggest the presence of a quinone tanning mechanism in H. contortus cuticle that may be similar to that described for insects.

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CHARACTERIZATION OF A SPECIALIZED REGION OF THE SECOND MOLT CUTICLE OF HAEMONCHUS CONTORTUS. H.R. GAMBLE, R.H. FETTERER AND J.P. PURCELL, USDA, AGRICULTURAL RESEARCH SERVICE, HELMINTHIC DISEASES LABORATORY, BELTSVILLE, MD 20705

The infective larvae of Haemonchus contortus is the third stage larvae retaining the second molt (2M) cuticle. This cuticle provides the larvae with an environmentally resistant sheath which allows survival on pasture for extended periods of time. Upon ingestion by the host, the 2M cuticle is rapidly cast, a process which is facilitated by the digestion of a protease sensitive region of the cuticle, termed the refractile ring region. A parasite produced protease is responsible for the digestion of this region of the 2M cuticle.

We have identified and partially characterized the proteolytic substrate (refractile ring) region of the 2M cuticle of H. contortus. This region appears to be composed of three proteins of M_r 105k, 120k and 160k in the intact 2M cuticle. Following digestion by the parasite protease, these proteins are degraded to a dominant 98k protein and a series of related proteins of lower molecular weight. Amino acid analysis of chromatographically purified 98k protein demonstrated that it contains considerably less glycine, proline and hydroxyproline and more serine and threonine as compared to the rest of the 2M cuticle. These results suggest that the refractile ring region is chemically distinct from other areas of the cuticle which are comprised primarily of collagen-like proteins.

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PURIFICATION OF A PARASITE PROTEASE WHICH REGULATES THE ECDYSIS OF INFECTIVE LARVAE OF HAEMONCHUS CONTORTUS. J.P. PURCELL, H.R. GAMBLE AND R.H. FETTERER, USDA, AGRICULTURAL RESEARCH SERVICE, HELMINTHIC DISEASES LABORATORY, BELTSVILLE, MD 20705.

The ecdysis of infective third stage larvae (L_3) of ruminant trichostrongyles is mediated by a protease which is produced by the parasite in response to environmental cues including an elevation of CO_2. The protease acts on a specialized region of the second molt cuticle termed the refractile ring region. Digestion of this area of the cuticle provides an opening for rapid escape of the L_3 in its transition to a parasitic phase of development.

We have purified the protease mediating ecdysis from Haemonchus contortus L_3 by a combination of ion exchange and molecular sizing high performance liquid chromatography; purification was monitored by the hydrolysis of an azocoll substrate. This purification scheme resulted in a 325-fold increase in specific activity and a 52% recovery of total enzyme activity. The purified protease initiated the formation of refractile rings on isolated second molt cuticles. The purified enzyme exists as two protein bands on SDS-polyacrylamide gels with apparent molecular weights of 18kDa and 15kDa.

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SOME EVIDENCE THAT VARIATION IN PARASITE EGG SHEDDING RATES IS PARTIALLY CONTROLLED BY A HOST GENETIC COMPONENT. E.A. LEIGHTON*, K.D. MURRELL AND L.C. GASBARRE. WYE RESEARCH AND EDUCATION CENTER, UNIVERSITY OF MARYLAND, QUEENSTOWN, MD 21658 AND HDL, LPSI, ARS, USDA, BELTSVILLE, MD 20705.

Parasite egg shedding rate was measured as eggs per gram of feces (EPG) for each of 300 purebred Angus calves sampled at or near weaning in the falls of 1986 and 1987. From birth in February-April until EPG determinations were made in September of 1986 or October 1987, calves nursed their dams and grazed on pastures located on the Eastern Shore of Maryland. Calves were sired by 26 different bulls, seven of which were used in both 1986 and 1987. To obtain a more normally distributed variable for analysis, 10 was added to each observed EPG and the common logarithm transformation was applied. For this log transformed variable (LOG_EPG), heritability was estimated at 39.8 percent. This suggests that an important part of the variation observed among calves in their egg shedding rates is under some form of additive genetic control which could be passed from one generation to the next. If selection pressure was applied, genetic change in egg shedding rate could be expected.

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NATURAL AND EXPERIMENTAL INFECTION OF CATS WITH LARVAE OF TOXOCARA CANIS. J.C. PARSONS*, D.D. BOWMAN AND R.B. GRIEVE. COLORADO STATE UNIVERSITY. FORT COLLINS, CO 80523

Multiple nodules were observed at necropsy within the viscera of a random-source cat. Histopathological examination revealed eosinophil-rich granulomas some of which contained sections of larvae indistinguishable from those of Toxocara canis. To more fully examine the pathological and serological response associated with this infection, eight conventional or specific pathogen free cats were given 5,000 embryonated eggs of T. canis. Two weeks later, four cats were given an additional 5,000 eggs. Singly and dually infected cats were paired and pairs of cats were necropsied at 18, 25, 32, and 39 days after initial infection. Blood samples were collected for leukocyte counts and serology at times of infection and necropsy. The major necropsy finding was firm, white, nodular foci in the liver, lungs and kidneys. Histopathology confirmed the eosinophilic and granulomatous nature of the lesions. Larvae in section were observed mainly within liver granulomas. Medial hypertrophy of the pulmonary arteries (MHPA) was observed as early as 18 days after initial infection. No inflammatory eye lesions were detected. The bone marrow of all cats exhibited eosinophilic hyperplasia. Levels of circulating eosinophils and larval antigen-specific antibody increased in all cats over the course of infection. Larvae of T. canis, therefore, appear to cause disseminated eosinophilic granulomatous disease and MHPA in the cat.

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BRONCHOALVEOLAR EOSINOPHILIA IN GUINEA PIGS HARBORING INAPPARENT INFECTIONS OF *PARASPIDODERA UNCINATA*. G.A. CONDER, I.M. RICHARDS, L.-W. JEN, K.S. MARBURY, AND J.A. OOSTVEEN. THE UPJOHN COMPANY, KALAMAZOO, MI 49001.

During the course of experiments examining the changes in cell populations in bronchoalveolar lavage (BAL) fluid in 3- to 11-week-old guinea pigs, a marked increase in the numbers of eosinophils was observed in BAL fluid in untreated control animals from historical levels of 8.8 ± 1.5% to levels >16% and up to 44%. The repeated occurrence of this phenomenon in several different groups of guinea pigs which appeared clinically normal and the impact on our experimental studies led us to attempt to identify the cause of increased inflammatory cell numbers in these guinea pigs. Examination in two groups of animals of whole blood and lung tissue for the presence of bacteria or fungi revealed minor bacterial infections in one of the groups but not the other, while both exhibited elevated eosinophil numbers. At necropsy, 41.7 and 60% of the animals in the two groups harbored the nematode *Paraspidodera uncinata*. It is known that at least some worms in their migration through the lungs alter inflammatory cell populations in BAL fluid. Since no other potential explanation for the increase in eosinophil cell numbers in the guinea pigs studied is evident and *P. uncinata* is known to migrate through the lungs during its development, it seems reasonable to suggest that the increase in eosinophils we observed was in response to the high incidence of *P. uncinata* in these animals.

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CALFHOOD IMMUNIZATION TO OSTERTAGIA OSTERTAGI WITH HIGH MOLECULAR WEIGHT SOLUBLE LARVAL PROTEINS. D.A. CROSS* AND P.H. KLESIUS. ANIMAL PARASITE RESEARCH LABORATORY, AGRICULTURAL RESEARCH SERVICE, U.S. DEPARTMENT OF AGRICULTURE, P.O. BOX 952, AUBURN, AL 36831-0952.

Past attempts to immunize against Ostertagia ostertagi with infectious third stage larvae (L3) have been unsuccessful. Little work has been done with antigens and, for this reason, five calves were immunized with L3-derived polypeptides of molecular weights greater than 36 kD. Serum antibody levels and peripheral blood lymphocyte blastogenic responses were measured and compared to five unimmunized, control calves.

All calves received an oral inoculum of 10,000 viable O. ostertagi L3 and were monitored for clinical signs, weight gain, and fecal egg output. A second, similar inoculum was administered and three calves from each group were necropsied to evaluate worm burden, abomasal lesions and histopathology, and lymph node-derived lymphocyte blastogenic responses.

Immunized calves had significantly higher immune responses when compared to the control calves. Parasitologic and weight gain data showed no significant differences between the two groups. The results suggest that immune responses produced by this immunization scheme were not protective against O. ostertagi.

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FUCOSE-AFFINITY PURIFICATION OF EOSINOPHIL CHEMOTAXIN FROM OSTERTAGIA OSTERTAGI. P.H. KLESIUS. ANIMAL PARASITE RESEARCH LABORATORY, AGRICULTURAL RESEARCH SERVICE, U.S. DEPARTMENT OF AGRICULTURE, P.O. BOX 952, AUBURN, AL 36831-0952.

Previous work has established that excretory/secretory substances (ES) and soluble extracts (SE) from infective larvae of Ostertagia ostertagi contain eosinophil chemotaxin (EC). Monosaccharides were examined for their capacity to inhibit EC-mediated eosinophil chemotaxin to facilitate purification of EC. Fucose had the greatest inhibitory activity than other sugars tested. Fucose elution of SE on an immobilized fucose column yielded purified EC. Collectively, the results indicate that EC consists of 16 and 24-kilodalton polypeptides that have binding sites for fucose.

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SERODIAGNOSIS OF PREPATENT DIROFILARIASIS. M.M. WONG*, J. THOMFORD, AND G.Y. LEE. UNIVERSITY OF CALIFORNIA, DAVIS, CA 95616.

Sera from 106 dogs with prepatent infections of Dirofilaria immitis (between 97 and 209 days) were assayed by 3 commercially available antigen-detecting kits and one ELISA for specific antibody. Sensitivities of the 3 antigen test kits were 12.3%, 13.2%, and 66%. When the "negative" sera were re-tested, sensitivities improved to 17%, 17%, and 75%, respectively. Two of the antigen tests failed to detect infections younger than 157 days of age, whereas the third, a more sensitive test, was able to detect those from 134 days onward with some positive correlation with the worm burden. On the other hand, all prepatent sera tested positive for antibody.

The problems created by the high percentage of false negative tests (even when the best kit is used) should caution diagnosticians against relying totally on antigen test kits. This is especially of concern since those infected dogs would most likely be put on prophylactic drugs, none of which are effective against the juvenille worms, but would kill the microfilariae when they are produced, possibly causing pathologic amicrofilaremic dirofilariasis.

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RELATIVE PREVALENCE OF DIROFILARIA IMMITIS AND A SURVEY OF GASTROINTESTINAL HELMINTHS OF COYOTES AND FOXES IN MISSOURI. M.J. WIXSOM*, S.P. GREEN, R.M. CORWIN, AND E.K. FRITZELL. UNIVERSITY OF MISSOURI. COLUMBIA, MO 65211.

In order to compare the prevalence of Dirofilaria immitis in foxes with a wild "control" population of coyotes and to survey the gastrointestinal helminth populations of Missouri wild canids, we obtained 271 wild canid carcasses during the 1986-1987 and 1987-1988 trapping seasons. Eight helminth genera were recovered from 169 coyotes (Canis latrans), 51 gray foxes (Urocyon cinereoargenteus and 51 red foxes (Vulpes vulpes). Lower canine teeth were used for radiographic and precise histological aging. Thirteen coyotes had Dirofilaria in populations from one to 100. Four red foxes had Dirofilaria in populations from one to seven. No heartworms were found in any gray foxes. Gastrointestinal tracts were checked for helminths in 48 coyotes, 18 red foxes and 17 gray foxes in 1986-1987. Coyotes, gray foxes and red foxes had 35.4%, 52.9% and 16.6% Physaloptera rara; 18.8%, 0% and 0% Ancylostoma caninum; 0%, 0% and 5.5% Uncinaria sp.; 0%, 11.8% and 27.8% Toxocara canis sp.; 12.5%, 0% and 0% Toxascaris leonina; 18.8%, 0% and 0% Trichuris sp.; and 68%, 23.5% and 0% Taenia sp., respectively. No correlation between infection by helminth genus was found. This study shows that heartworm prevalence does vary by canid species even in the same area and during the same time. This provides the first Missouri survey of gastrointestinal parasites in wild canids.

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VARIATION IN THE SIZE AND LOCATION OF CANINE PULMONARY ARTERIES AS DETERMINED BY COMPUTERIZED DIGITAL SUBTRACTION RADIOGRAPHY. R.A. HOLMES*, G.H. TURNWALD, S.P. SCHMIDT. LOUISIANA STATE UNIVERSITY. BATON ROUGE, LA 70803.

The size and location of the pulmonary arteries are some of the main diagnostic criteria in the radiographic diagnosis of Dirofilaria immitis in dogs. Numerous studies have been published stating the range in size and location of the main and peripheral pulmonary arteries. These studies did not take into account the stage of the cardiac cycle or phase of respiration.

In this study, it was found that there was a significant change in the size and location of pulmonary arteries dependent on the stage of the cardiac cycle. During systole, the pulmonary arteries were larger and in a different location than when the blood pressure was decreased during diastole. Changes due to respiratory phase were not readily perceived. As variations in artery size and location could have a significant impact on the radiogrpahic diagnosis of heartworms in dogs, methods to determine the stage of cardiac cycle will be discussed.

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A NEW CHEMOTHERAPEUTIC, CANINE MODEL FOR DIROFILARIASIS USING IV TRANSPLANTED ADULT WORMS. M.T. DZIMIANSKI,* J.W. MCCALL, AND T.L MCTIER, COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF GEORGIA, ATHENS, GA 30602.

In vivo evaluation of heartworm adulticides and microfilaricides has been limited primarily to the use of naturally infected dogs. Unfortunately, such infections are not standardized with regard to age of the parasites, number of parasites, or general health of the animal. In view of this, uniform infections established by IV transplantation of adult heartworms in dogs (Rawlings and McCall, Am. J. Vet. Res. 46(1): 221-224, 1985) were evaluated as a potential chemotherapeutic model for screening potential heartworm drugs. Twenty-seven Beagles were given five to 15 pairs of adult heartworms (186-421 days old) by jugular venotomy. Of the 212 pairs of male and female heartworms given, 188 (88.7%) of the males and 196 (92.4%) of the females were recoverd at necropsy 77 to 181 days post-transplantation (PT). Seven of eight dogs given older worms (i.e., 421 days old) had developed patent infections within two weeks PT and the remaining dog had circulating microfilariae one week later. All dogs with infections established with younger worms had developed patent infections by four weeks PT. In a preliminary experiment, three of six dogs each harboring eight pairs of 275-day-old heartworms were given the standard IV thiacetarsamide treatment of 2.2 mg/kg BID for two consecutive days and killed at 8 weeks PT. The drug was 100% effective against male worms and 50% effective against female worms, with an overall efficacy of 75%. Control dogs had an average of 13.3 live worms (i.e., 83.3% recovery) at necropsy.

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EFFICACY OF A NEW ADULTICIDE (RM 340) AGAINST IV TRANSPLANTED, ONE-YEAR-OLD DIROFILARIA IMMITIS IN DOGS. M.D. DZIMIANSKI* AND J.W. MCCALL, COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF GEORGIA, ATHENS, GA 30602; J.-P. RAYNAUD, RHONE MERIEUX, TOULOUSE, FRANCE.

RM 340, a new trivalent arsenical patented in 1985, has potent adulticidal activity against Dirofilaria immitis. Chemically, the drug is similar to trimelarsan but it shares little structural similarity with thiacetarsamide. Pharmacokinetically, it is quite different from both of these arsenicals. It is formulated as a soluble powder for IM injection and has a chemotherapeutic index of about 3. It is being developed as a full treatment in a single day. RM 340 was evaluated for efficacy against one-year-old heartworms in 22 dogs with 6 to 10 pairs of IV transplanted worms. In the first trial, a single dose of 5.0 mg/kg and two doses of 2.5 mg/kg 24 hours apart were 100% effective, but treatment at 1.25 mg/kg/day for four consecutive days was ineffective. The average percent recovery of worms in the controls was 88.9. In the second trial, treatment with two doses of 2.5 mg/kg six hours apart was 100% effective, whereas, a single dose of 2.5 mg/kg reduced the male and female worm burden by only 35.0 and 5.3%, respectively, with an overall reduction of 20.5%. Treatment at 2.0 mg/kg twice, 6 hours apart, killed 96.7% of the male worms and 47.4% of the female worms with an overall reduction of 72.6%. Thus, male worms were more sensitive to the drug than were female worms. The average percent recovery of worms in the controls was 97.5.

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HELMINTH PARASITES OF NORTHERN SPOTTED OWLS FROM WESTERN OREGON. E.P. HOBERG*, G.S. MILLER, E. WALLNER-PENDLETON, AND O.R. HEDSTROM. OREGON STATE UNIVERSITY CORVALLIS, OR 97331.

Spotted owls, Strix occidentalis, are characteristic but rare birds of forested habitats extending from British Columbia to northern Mexico. The status of this species (whether threatened or endangered) has been poorly understood and until recently, relatively little information had been available concerning the biology of S. occidentalis.

During the present study, 12 northern spotted owls, S. o. caurina from southwestern Oregon State were necropsied and examined for helminth parasites. Results reported here constitute the first records for the occurrence of helminth parasites in this species of owl. Overall, 67% of this sample was parasitized. Multiple infections (greater than one species/ host) occurred in 4 birds (Range 1-3 helminth species/ host). Nematodes were the most prevalent parasites (Porrocaecum depressum, Capillaria falconis, and Synhimantus hamatus) although cestodes (Paruterina rauschi) and acanthocephalans (Centrorhynchus conspectus) were also represented. There was an evident association between components of this helminth fauna and the diet of spotted owls which is dominated by small rodents. The occurrence of P. rauschi rather than P. candelabraria in this geographic region and host-species may provide additional support for recognition of a latitudinal partition in the ranges of Paruterina spp. among strigiforms in the Nearctic.

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EXTRACTS OF AMBROSIA MARITIMA AS 'NATURAL' MOLLUSCICIDES

Ali A. I. Elmagdoub*, M. F. El-Sawy, S. A. Barker and J. E. Malone. College of Agriculture, High Institute of Public Health, Alexandria University, Egypt and the School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA., U.S.A.

Several compounds have been utilized as molluscicides in combating snail intermediate hosts of Fasciola and Schistosoma. However, many chemical molluscicides also affect non-target organisms, while some are carcinogenic. Studies in our laboratories on several plant extracts have yielded variable results in regard to their ability to act as molluscicides. However, in both field and laboratory studies of crude extracts from Abrosia maritima, a high degree of molluscicidal activity has been consistently observed. Activity may be observed by direct immersion of the plant in water containing snails. The active component(s) is extractable with water or ethanol. Acid/neutral and base extraction of the aqueous extract showed that the compound is a weak acid with high water solubility. Dialysis of the aqueous fraction showed that the compound was a small molecule with a molecular weight of less than 1000 amu. Further fractionation of the active component(s) is presently being conducted and is directed toward the eventual identification of the most potent constituents and the examination of their toxicological effect on aquatic species. The results obtained to date indicate a potential for the use of Ambrosia maritima as a safe and effective molluscicide. A patent for the use of this material for these purposes has been applied for.

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USE OF A COMUTERIZED GEOGRAPHIC INFORMATION SYSTEM TO MODEL POTENTIAL HABITAT OF FOSSARIA BULIMOIDES ON COASTAL MARSH PASTURE IN LOUISIANA. S.H. Zukowski*, J.B. Malone and J.M. Hill, School of Veterinary Medicine and Remote Sensing and Image Processing Laboratory, Louisiana State University, Baton Rouge, LA.

Spatial relationships between habitats of F. bulimoides and soils were examined on a 760 hectare cow-calf operation in an area of coastal marsh in southwest Louisiana. Fossaria habitat was surveyed, mapped, input to a geographic information system and compared with a soil map. Habitats occupied 3.5% of the farm, concentrated around interfaces of landlocked former beaches with a marsh clay; this was more constant along the wavefaces (former beachfronts) than on the backslopes. A computer simulation for mapping potential habitat based on these findings generated 2 zones along these interfaces. The 1st zone, 70m wide along the waveface, included 51% of the habitat on the farm within 5% of total farm area. The 2nd zone, 40-90m wide along backslopes, included an additional 27% of the habitat within an area equal to 20% of the farm. Together, the simulation zones included 78% of the habitat, with an area equal to 25% of the farm. After an area of high salinity unsuitable to the snail was excluded, the zones occupied 11% of the farm while including 77% of actual habitat. The simulation has been extrapolated to a 25,000 ha study area for future validation of the model. Results suggest that the methodology of computer mapping, analysis and modeling of snail habitat is a promising epidemiologic approach to fascioliasis. Supported by Louisiana Sea Grant Development R/PMO-8 and USDA 84-CSRS-2-2444.

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STUDIES ON CULICOIDES HYPERSENSITIVITY "SWEET ITCH" IN LOUISIANA HORSES. L. D. Foil*, C. S. Foil, R. E. Corstvet, C. Klimzcak, M. Klass, and F. Enright. Department of Entomology and School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70803.

Hypersensitivity to the feeding of various species of Culicoides is an important cause of seasonal pruritic dermatitis in adult horses. Aspects of the etiology of "sweet itch" or "Queensland itch" have been identified in Australia, England, Ireland, British Columbia, and Israel. Although this problem is considered important in the U.S., there have been no studies that identify the species of Culicoides that are feeding on symptomatic horses and demonstrate a response to skin testing using antigens prepared from these species. We will report the results of a 2 year study. The Culicoides populations on 4 farms were followed using CDC light traps with dry ice as a synergist. The feeding sites on horses for different species was determined by aspirating feeding Culicoides off the horses. We were fortunate in our study to collect 2 species of Culicoides that were feeding on horses and causing the behavior that contributes to the self-induced dermatitis of "sweet itch". We will also report the findings of skin tests with antigens prepared from wild-caught and colonized Culicoides in normal and allergic horses.

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THE TABANIDS OF EASTERN MISSISSIPPI, (DIPTERA: TABANIDAE). R.L. COMBS* AND J. MACDONALD, DEPARTMENT OF ENTOMOLOGY, MISSISSIPPI STATE UNIVERSITY, MISSISSIPPI STATE, MS 39762.

A seven year study of the tabanids from Mississippi has resulted in a collection of 44 species in eight genera. Tabanids were collected from tethered steers, canopy traps and box traps. Daily and seasonal activity, preferred feeding site on host, cattle movement as a factor in tabanid dispersal, and speciation was studied. Six species account for 90% of the tabanids collected. The data will be shown in a poster presentation.

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OBSERVATION OF PARASITES IN FOAL MECONIUM. J. Kivipelto* and R. L. Asquith. University of Florida. Gainesville, FL 32611.

Ninety-five meconium samples were collected from foals born at the Horse Research Center in Ocala, FL during 1981, 1982, 1984 and 1986. Meconium samples were collected from the newborn foals within an hour after birth using a water enema. Third stage larvae of Strongyloides westeri and small strongyle were recovered from 29 of the 95 meconium samples after the samples were incubated for 7 days at 26 degrees C. A Baermann apparatus was used to recover larvae from the meconium samples after incubation. Of the 95 meconium samples tested, 29 contained S. westeri and/or small strongyle larvae. S. westeri larvae were recovered from 12 of the 95 meconium samples (1 to 6 larvae). Small strongyle larvae were recovered from 21 of the 95 meconium samples (1 to 29 larvae). Both S. westeri and small strongyle larvae were found in 4 of the 95 samples.

A double centrifugation method was used to determine egg per gram counts on 2 gram aliquots of each meconium sample. This method failed to demonstrate positive egg per gram counts for any of the 95 samples tested.

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USEFULNESS OF ULTRASONOGRAPHY IN THE DIAGNOSIS OF LIVER FLUKE INFECTION IN RUMINANTS. A.R. DONOGHUE* AND T.W. SCHILLHORN VAN VEEN. COLLEGE OF VETERINARY MEDICINE, MICHIGAN STATE UNIVERSITY, EAST LANSING, MI 48824.

Ultrasonography is increasingly used as a diagnostic tool in human and animal medicine. As more veterinarians will have access to this equipment we evaluated the use of ultrasound technology in the detection of liver fluke infection.

Two FH calves were orally inoculated with 5 metacercariae/kg of Fasciola hepatica, two with the same dose of Fascioloides magna, and two with 2.5 metacercariae/kg of both F. magna and F. hepatica. One calf was kept as a control. Each week the animals were weighed, fecal and blood samples taken, and the livers scanned by ultrasound for 21 weeks post-infection. The first eggs appeared between week 12 and week 15. The SDH and gamma-GT rose sharply after week 8. The liver was scanned from the right paralumbar fossa and the right intercostal spaces. Three weeks post-inoculation, slightly dilated vessels and an increased echogenicity of the liver parenchyma could be imaged by ultrasound. From week 4-8 mottling of the liver parenchyma was seen as well as an increase in echogenicity of the bile duct walls. From weeks 8-12 a progressive dilation of bile ducts was seen along with shadowing and/or enhancement. The liver parenchyma also appeared more echogenic than that in the control. These changes became increasingly prominent over time. The changes seen corresponded with the pathological changes in the liver seen at necropsy of selected animals.

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Evaluation of diagnostic tests for calves with Fasciola hepatica infections

T.M. Craig, S.Q. Hasan, B.L. Doughty, C.G. Wade, D.K. Miller. Department of Veterinary Microbiology and Parasitology, Texas A&M University, College Station, Texas 77843. H.J. Wells, Keystone Medical Corp., Columbia, MD 21045.

Twenty six Holstien Fresien steer calves were each infected with 400 metacercaria of Fasciola hepatica. Eight, 10 and 12 weeks post-infection 3 groups of 6 or 7 calves were administered clorsulon (7mg/kg) and were slaughtered 120-140 days post-infection, 1 group of 6 calves remained untreated.

Throughout the trial the calves were evaluated for serological activity, lymphocyte blastogenesis, serum gamma glutamyl transferase (ggt), fecal sedimentation and body weight. At slaughter the number of flukes, degree of bile duct proliferation and number of nodules present was evaluated.

There was a high degree of correlation of various blood tests within each group of calves with the rise and subsequent fall of levels consistent to time of treatment. A rapid, chute side, ggt test was found to be useful in evaluating the status of infection in the various groups of calves.

Partial funding was provided by Agrimont S.p.A. Gestione Veterinari.

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NEWLY RECOGNIZED FATAL PROTOZOAN DISEASE OF DOGS DISTINCT FROM TOXOPLASMOSIS. J. P. DUBEY*, J. L. CARPENTER, C. A. SPEER, M. J. TOPPER AND A. UGGLA. ANIMAL PARASITOLOGY INSTITUTE, USDA-ARS, BELTSVILLE, MD 20705.

Histologic sections and case histories from 23 dogs with proven fatal toxoplasmosis-like illness at the Angell Memorial Animal Hospital, Boston were reviewed retrospectively. Toxoplasma gondii was identified in 13 dogs: currently with canine distemper virus infection in 8, lymphosarcoma in 1, ehrlichiosis in another and alone in 3. A new parasite structurally distinct from T. gondii was found in 9 dogs. The newly discovered organism formed meronts in many tissues of dogs, especially the brain and spinal cord. It was located directly in the host cell cytoplasm without a parasitophorous vacuole; it divided by endodyogeny; it contained more than 11 rhoptries; and it did not react with the anti-T. gondii serum in the immunoperoxidase test. Meningoencephalomyelitis and myositis were the main lesions associated with the new organism. Ulcerative dermatitis was the main lesion in 1 dog.

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DETECTION OF SARCOCYSTIS ANTIBODIES IN POLYCLONAL SERA AND HYBRIDOMA CELL CULTURE SUPERNATANTS WITH IFAT, ELISA, AND DOT-ELISA. A.M. TENTER* AND C. PEIN. INSTITUTE OF PARASITOLOGY, SCHOOL OF VETERINARY MEDICINE, BÜNTEWEG 17, 3000 HANNOVER 71, WEST GERMANY.

The quality of the serodiagnosis of protozoan infections has been markedly improved by the introduction of new serotests during the last decade. We used the dot enzyme-linked immunosorbent assay (Dot-ELISA) for the detection of antibodies to Sarcocystis arieticanis and S. tenella in sheep, S. capracanis in goats, and S. muris in mice and compared the results given by this test with those given by the indirect fluorescent antibody test (IFAT) and the enzyme-linked immunosorbent assay (ELISA). The Dot-ELISA detected antibodies almost as early as the IFAT (from 11 days after infection onwards) and up to 28 days earlier than the ELISA.

All of eight monoclonal antibodies directed against S. muris cystozoites gave positive reactions in the IFAT; six reacted also positively in the Dot-ELISA and two in the ELISA, an indication that antigens important for the Dot-ELISA may be similar to those important for the IFAT. The Dot-ELISA combined the sensitivity of the IFAT with the convenience of the ELISA.

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A SURVEY OF COCCIDIOSIS IN PEN RAISED WILD TURKEYS. M.D. RUFF*, ARS, API, BARC-EAST, BELTSVILLE, MD, 20715, L. SCHORR, W.R. DAVIDSON, AND V.F. NETTLES, SCWDS, DEPT. PARASIT, COLL. VET. MED., UNIV. GEORGIA, ATHENS GA.

ABSTRACT: One hundred nineteen pen-raised wild turkeys (Meleagris gallopavo) from 12 locations were examined for coccidiosis by sugar flotation of intestinal contents and mucosa or by inoculating uninfected domestic turkeys. Seventy eight (65.5%) of the turkeys were positive for coccidia. There were no differences in the frequency of coccidia between adult, subadult, or juvenile turkeys. More females (75%) were infected than males (48%) and more turkeys from the midwest (95%) were infected than from the north (38%) or southeast (48%). The species of coccidia from 30 of the turkeys were identified based on microscopic examination of oocysts, fresh scrapings, stained sections, and inoculations of bobwhites (Colinus virginianus). The frequency of each species was Eimeria meleagrimitis (97%), E. gallopavonis (47%), E. meleagridis (27%), E. dispersa (17%), E. innocua - E. subrotunda (13%), E. adenoeides (7%), and an unnamed species (3%). Of the 30 turkeys in which the species of coccidia were determined, 30% had a single species infection, 40% two species, 20% three species, and 10% four species.

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COCCIDIOSIS OUTBREAKS ATTEMPTING TO USE SANITARY MEASURES TO PREVENT THE DISEASE IN POULTRY FLOCKS. W. MALCOLM REID*, POULTRY DEPARTMENT, UNIVERSITY OF GEORGIA. ATHENS, GA 30602

Many outbreaks have occurred when a poultry producer has attempted to control coccidiosis using suggested sanitary measures. Problems have arisen due to: 1) misunderstanding of the ubiquitous nature and longevity of coccidial oocysts, 2) difficulties in eliminating them by clean-out and disinfecting procedures, 3) inability to serologically detect carriers as employed in eradication of bacterial and viral infections, 4) and lack of understanding of the frequency with which mild subclinical infections, sometimes know as coccidiasis, commonly produce flock immunity. Infection may be initiated by a few surviving oocysts and is reinforced by new crops of oocysts shed in subsequent life cycles by the phenomenon known as trickle infection. Poultry producers have been surprised when severe coccidiosis outbreaks occured in new, oocyst-sterile houses. Prevention of this so called "new house coccidiosis syndrome" requires an early subclinical coccidiasis exposure reinforced by trickle infections. Many of older recommendations for sanitation-control of coccidiosis need modification.

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CHARACTERIZATION OF CYTOPLASMIC PROTEINS IN EIMERIA MAXIMA OOCYSTS. L. M. POTE*, A. J. AINSWORTH, J. E. BROWN AND J. HANEY. COLLEGE OF VETERINARY MEDICINE, MISSISSIPPI STATE UNIVERSITY, MISSISSIPPI STATE, MS 39762.

Cytoplasmic protein fractions (CPF) from sporulated and unsporulated oocysts were analyzed by gel chromatography, SDS-PAGE, ELISA and Western blot. Using gel chromatography unsporulated oocysts were characterized as having three major cytoplasmic proteins, while the sporulated oocysts had five major cytoplasmic proteins. Molecular weights of these proteins ranged from 5.0×10^3 to 1.4×10^6. Comparison of the CPF from sporulated and unsporulated oocysts on SDS-PAGE showed differences in proteins in 150,000 and 14,000 molecular weight range. Presently peak protein fractions from gel chromatography run on SDS-PAGE are shown to consist of a few detectable sub-units.

Monoclonal antibodies (MoAb) to CPF were produced using hybridoma techniques. The CPF from sporulated and unsporulated oocysts reacted differently to MoAb in ELISA reactions. Thus far results of Western Blots of SDS-PAGE gels to the same MoAb are ambiguous.

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MINIATURE PIGS AS BIORESEARCH MODELS FOR PORCINE NEONATAL COCCIDIOSIS. B. L. BLAGBURN*, T. R. BOOSINGER AND T. A. POWE. COLLEGE OF VETERINARY MEDICINE. AUBURN UNIVERSITY, AL 36849.

Six, 7-day-old Sinclair miniature pigs, and four, 5-day-old cross-bred conventional pigs were each given 1×10^5 sporulated Isospora suis oocysts. Infected pigs were maintained in metal cages equipped with heat lamps and fed approximately 6 ounces of milk replacer twice daily. Three noninfected miniature pigs were nursed by the sow and served as controls. Representative miniature and conventional piglets were euthanatized and necropsied 3,6,8,10,12 and 15 days postinoculation (PI) and their tissues evaluated histopathologically and morphometrically. Surviving piglets were weighed daily 3 through 8 days PI. Daily fecal specimens were scored 1 through 3 with the higher number indicating fluid feces. Numbers of oocysts recovered from feces were graded 0, low, moderate, and high. Control pigs were evaluated similarly, but were not necropsied. Prepatent periods, oocyst excretion dynamics, trends in surviving piglet weights, and lesions were similar in miniature and conventional pigs. Control pigs remained noninfected. Results indicate that miniature pig susceptibility to I. suis is similar to conventional counterparts. The small size of miniature pigs facilitates husbandry and allows for longer periods of maintenance of piglets in isolators. These advantages should encourage their use as models for the study of neonatal coccidiosis.

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PARASITIC INFECTIONS IN SIMIAN IMMUNODEFICIENCY VIRUS-INFECTED RHESUS MONKEYS. J.L.BLANCHARD*,G.B.BASKIN,M.MURPHEY-CORB,AND L.N.MARTIN. TULANE UNIVERSITY, DELTA REGIONAL PRIMATE RESEARCH CENTER, COVINGTON,LA. 70433

Simian immunodeficiency virus (SIV) is closely related to human immunodeficiency virus, the cause of acquired immunodeficiency syndrome (AIDS), and causes a similar disease in rhesus monkeys. SIV-infected monkeys have many of the same immune defects and secondary infections seen in AIDS patients. Examination of feces and tissues obtained at necropsy from SIV-infected monkeys revealed the presence of a variety of parasites including Strongyloides, Trichuris, Pneumocystis, Cryptosporidium, Trichomonas, Balantidium, Entamoeba, Giardia, Endolimax, Chilomastix, and Iodamoeba. Many of these are seen in non-SIV-infected rhesus monkeys, but only occasionally cause clinical disease. In SIV-infected animals, Giardia, Cryptosporidium, and Trichomonas were associated with clinical illness during life or with significant lesions at necropsy. Cryptosporidium was found in the trachea, bronchioles, peribronchiolar gland epithelium, intrahepatic bile ducts, gallbladder, pancreatic ducts, and small intestine. Trichomonads were found with increased frequency and numbers in the large intestine, and in one monkey caused severe gastritis. Giardia was identified in fecal examinations and was believed to contribute to the chronic diarrhea often seen in these monkeys. Pneumocystis was only rarely seen in direct contrast to the situation in AIDS patients. A description of the clinical signs, gross necropsy findings and histologic changes of these parasitic infections in SIV-infected monkeys will be presented.

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CONTROL OF GI NEMATODES IN CATTLE BY STRATEGIC IVERMECTIN TREATMENT. J.C. WILLIAMS*, J.W. KNOX, R.A. SWALLEY, S.A. BARRAS, AND C.S. EDDI. LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER, BATON ROUGE, LA 70803

Seventy-two crossbred beef calves were used in a year-long grazing trial (Nov. 6, 1986-Oct. 6, 1987). Group treatments (n=18) were: 1-ivermectin every 6 weeks; 2-ivermectin X3 in Nov., Mar., July; 3-fenbendazole X3 in Nov., Mar., July; 4-untreated controls. With continuous moderate to cold and wet weather and a high level of infection risk, all cattle lost weight from weaning through February. Parasitism in Gp 1 was suppressed. Salvage treatment for clinical parasitism in Gp 3 (FBZ) and Gp 4 (IVM) was required during winter and spring. Fecal egg counts were generally low in Gp 2 after Mar., but consistently higher for Gp 3 to July and for Gp 4 to October. Herbage larval counts decreased on all pastures after April. Worm counts in spring tracers were high in Gps 2-4 (highest in Gp 3) and O. ostertagi larval inhibition was >80%. Similar results were observed in spring- killed yearlings; larval inhibition was >90%. T. axei numbers were large in Gps 3 and 4. Greatest and deciding levels of gain were made during Mar. 2-July 3 by Gps 1, 2, and 4; Gp 3 gains were lowest in the period. Final group average weights and (total gains) were: Gp 1-803 lb. (373); Gp 2-721 lb. (282); Gp 3-618 lb. (188); Gp 4-694 lb. (262). Type II ostertagaisis was observed in Gps 3 and 4, particularly the latter, from Aug. to Oct. Supported in part by USDA Special Research Grant No. 59-2221-0-2-076-0 and MSD AGVET, Division of Merck & Co., Rahway, NJ.

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IVERMECTIN IN A SUSTAINED-RELEASE BOLUS: PROPHYLACTIC EFFICACY AGAINST NEMATODES OF CATTLE. R. ALVA-VALDES*, D.H. WALLACE, J.R. EGERTON, G.W. BENZ, S.J. GROSS, J.W. WOODEN, V.E. REUTER. ANIMAL SCIENCE RESEARCH, MERCK SHARP & DOHME RESEARCH LABORATORIES, P.O. BOX 2000, RAHWAY, NJ 07065.

Twelve Holstein calves were utilized to determine the prophylactic efficacy of ivermectin against induced challenge infections of gastrointestinal and pulmonary nematodes. Two groups of 6 calves were formed (205 kg average body weight). Each calf in group 2 received one prototype sustained-release bolus designed to deliver ivermectin at a continuous daily dosage of 8 mg. Group 1 served as non-medicated controls. Third-stage nematode infective larvae were given to the calves on post-treatment days 28 and 42. The calves were euthanatized 77 days or 78 days following bolus administration.

Ivermectin was 100% effective ($P<0.05$) in preventing the establishment of infections by Haemonchus placei, Ostertagia ostertagi, Cooperia spp (C punctata, C oncophora, C surnabada), Nematodirus helvetianus, Oesophagostomum radiatum, Dictyocaulus viviparus and 99% effective against Trichostrongylus axei. An incidental infection of Trichuris spp was reduced 94% ($P=0.08$).

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EFFICACY OF IVERMECTIN IN A SUSTAINED-RELEASE OR A TOPICAL FORMULATION AGAINST NATURAL INFESTATION OF BITING AND SUCKING LICE OF CATTLE. J.E. HOLSTE*, D.H. WALLACE, G.W. BENZ, J.L. COX, S.J. GROSS. ANIMAL SCIENCE RESEARCH, MERCK SHARP & DOHME LABORATORIES, P.O. BOX 2000, RAHWAY, NJ 07065.

Eighteen cattle weighing 200 to 340 kg were utilized to determine the efficacy of ivermectin in a sustained-release formulation or a topical formulation against a natural infestation of Damalinia bovis, Haematopinus eurysternus, and Linognathus vituli. Cattle were allocated by restricted randomization on total louse counts to three treatment groups: untreated control; prototype sustained-release bolus designed to deliver 12 mg ivermectin/day; ivermectin in a topical formulation given once at 500 mcg/kg. Damalinia bovis were reduced significantly ($P<0.05$) on bolus-treated cattle from Day 14 through Day 56 and on topically treated cattle from Day 7 through Day 56. One D. bovis was seen on one bolus-treated animal on Day 28, and none were observed thereafter through the end of the trial. No D. bovis were observed after Day 14 on topically treated animals. Neither bolus-treated nor topically treated cattle had any Linognathus vituli observed after Day 7. No Haematopinus eurysternus were observed on bolus-treated animals on or after Day 7, and topically treated cattle had none after Day 14. Reductions in numbers of L. vituli and H. eurysternus were significant ($P<0.05$) from Day 7 until Day 42 when numbers of lice on control animals declined due to natural causes.

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SAFETY AND TOLERANCE OF TWO FORMULATIONS OF IVERMECTIN IN SUCKLING FOALS. R. L. ASQUITH* AND J. KIVIPELTO. UNIVERSITY OF FLORIDA, GAINESVILLE, FL 32611.

Eighteen Quarter Horse (n = 13) or Thoroughbred (n = 5) suckling foals were utilized to determine whether 3 times the use level of ivermectin liquid or 5 times the use level of ivermectin paste, administered 3 times will elicit signs of toxicity. Seven female and 11 male foals aged 26 - 59 days were allocated to receive water (placebo) at 0.06 ml/kg, ivermectin liquid at 600 mcg/kg or ivermectin paste at 1000 mcg/kg orally 3 times at 14 day intervals. Foals were examined at 6, 12 and 24 hours and at least once daily for 7 days following treatment for evaluation. Foals before and after all treatments were determined to be clinically normal and showed no treatment related adverse effects.

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EFFICACY OF IVERMECTIN IN THE TREATMENT OF 28-DAY-OLD STAGES OF PARASCARIS EQUORUM IN PONY FOALS. J.A. DIPIETRO*, T.F. LOCK, AND K.S. TODD, JR. COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF ILLINOIS, URBANA, IL 61801.

Eighteen mix-bred pony foals were weaned within 7 days of birth, housed in pressure-washed concrete stalls and fed milk replacer, pellets, rolled oats, and alfalfa hay in amounts necessary to assure growth and maintenance. Water was provided ad libitum. Extreme care was taken to minimize the chance of introducing Parascaris equorum eggs into the foal's housing during the study.

Once the foals were at least 7-days-old they were inoculated by nasogastic intubation with 1500 infective P equorum eggs on day -28. The foals were allocated to replicates of 3 and treatments were assigned to each replicate randomly. Treatments administered on day 0 included 0.02 ml ivermectin vehicle (liquid;n=6) /kg or 0.2 mg of ivermectin /kg as 1.87% paste (n=6) or 1.0% liquid (n=6) . The foals were euthanatized 14 days after treatment and examined for the presence of P equorum larvae in their small intestine. The geometric mean number of 4th-stage P equorum larvae recovered from foals treated with ivermectin vehicle was 1250.0 (846-1869). Significantly ($p < 0.01$) lower geometric mean numbers of 4th-stage P equorum were recovered from foals treated with ivermectin paste, 3.5 (0-79), and ivermectin liquid, 6.0 (0-27), than those treated with ivermectin vehicle. Treatment with ivermectin paste and ivermectin liquid was 99.72% and 99.52% effective respectively against 28-day-old P equorum when compared to ivermectin vehicle. Adverse reactions due to treatment were not observed.

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COMPARISON OF TWO PARASITE CONTROL PROGRAMS FOR HORSES IN BRAZIL. E.L. BORDIN, L. MIFANO, F. HEIDERICH, J. GUERRERO*. MERCK & CO. INC. RAHWAY, NJ, USA. G. SANTOS, F. de OLIVEIRA, L. de TOLEDO. POSTO de EQUIDAEOCULTURA de COLINA. COLINA, SAO PAULO, BRAZIL.

Optimal treatment intervals for different parasite control programs were determined in 20 horses, 18 to 24 months old, from a military stable in Brazil. Horses were paired by pretreatment fecal egg counts, and were randomly assigned to treatment with ivermectin (200 mcg/kg) or with other compounds routinely used on an alternation schedule at the facility. Horses grazed together on a 10-hectare pasture throughout the trial, which lasted one year. Treatments were given to all horses of a group when the mean egg count for the group reached or exceeded 300 EPG.

A total of 17 treatments were given to horses in the alternation program during the year. Many of the benzimidazole (BZD) and BZD/trichlorfon combination products that comprised this program failed to reduce fecal egg passage on every occasion they were used, and those that were effective intially began to wane during the latter months of the trial. These data suggest the presence of BZD-resistant small strongyles, and preclude estimation of an optimal treatment interval for these products. Horses in the ivermectin program required 6 treatments during the year to keep fecal egg counts below 300 EPG. In most cases, egg passage was completely (100%) suppressed for at least 5 weeks after treatment with ivermectin; the optimal treatment interval was determined to be every two calendar months.

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COMPARATIVE ANTHELMINTIC CONTROL OF PARASITE INFECTIONS IN YOUNG HORSES ON PASTURE IN WESTERN CANADA. C.A. PICHE*, MSD AGVET, CALGARY, ALBERTA, CANADA T1Y 5Y9. M. KENNEDY, ALBERTA AGRIC., EDMONTON, ALBERTA, CANADA.

To establish required frequency of use of equine anthelmintics in young horses, comparisons were made among 3 commercially-available paste preparations of ivermectin (IVM), pyrantel pamoate-trichlorfon (PP-TCF), and oxfendazole-trichlorfon (OFZ-TCF). A total of 44 recently-weaned horses from a breeding farm in western Canada were randomly allocated to 3 treatment groups, on the basis of pretreatment fecal egg counts and sex. Horses were treated on Day 0 with their assigned product and were turned out to graze on 3 separate, but comparable pastures.

Total fecal egg output (strongyle and ascarid eggs) in the IVM-treated group was reduced to 2 EPG for 8 weeks and reached 46 EPG by 10 weeks. In the group treated with PP-TCF, total egg counts were 6 EPG for 4 weeks and reached 209 EPG by 6 weeks. Although OFZ-TCF eliminated ascarid egg output, horses of this group continued to shed large numbers of strongyle eggs after treatment. Re-treatment with a second formulation, containing only OFZ, on Day 42 was also ineffective in reducing strongyle egg counts. This group was subsequently treated with IVM, which effectively reduced fecal egg output by 96%. On the basis of these results, adequate control of fecal egg output would be achieved by treating with IVM every 8 weeks. To achieve similar control with PP-TCF, treatment intervals should not exceed 4 to 6 weeks. Treatment intervals could not be estimated for OFZ or OFZ-TCF.

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PHOTODYNAMIC ACTION OF ERYTHROSIN B ON THIRD-STAGE EQUINE STRONGYLE LARVAE. C.E. COUVILLION* AND C.R. BOYLE. MISSISSIPPI STATE UNIVERSITY. MISSISSIPPI STATE, MS 39762.

The effect of erythrosin B and light exposure on survival of third-stage larvae of mixed populations of equine strongyle species was studied. Erythrosin B was administered to three horses at 10, 20, or 40 mg/kg body weight. A fourth horse served as an unmedicated control. The third day after dosing was begun, feces were collected at 24 hour intervals from each horse for 14 days. Feces were held at room temperature for 14 days pending development of larvae to the third stage. Third-stage larvae was concentrated from fecal cultures using a Baermann apparatus. Larvae were apportioned into tubes (300 larvae per tube) and exposed to a fluorescent light source. At 0, 2, 4, 6, and 24 hours after exposure to light, tubes were removed for enumeration of the number of motile and non-motile larvae. Mortality of erythrosin B/light treated larvae was dose dependent. After 24 hours of light exposure, an average mortality of 90% was observed in larvae from the horse that received 40 mg/kg of erythrosin B. Mortalities of 75% and 38% were observed in larvae from horses dosed with 20 mg/kg and 10 mg/kg, respectively. No larval mortality was noted in control larvae that were exposed to light but not erythrosin B. At all dosages of erythrosin B, there was a pronounced time effect with increasing larval mortality as time progressed.

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A COMPARISON OF EQUINE ANTHELMENTICS BY ROUTE OF ADMINISTRATION. G.E. HACKETT, AND J. BUONAFIDE. EQUINE RESEARCH CENTER, CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA, POMONA, CA. 91768

The 76 horses kept at the Kellogg Arabian Horse Center were divided by management system and then randomly assigned to one of three anthelmintic administration regimes. The horses were kept in these groups for a year. Regime 1 was tube worming every other month (6X). Regime 2 was 2 paste wormings followed by a tube worming. This pattern was repeated so each horse was wormed 6 times. Regime 3 was paste worming every other month (6X). Regardless of the method of administration each horse in the study was given the same dose of the same anthelmintic (2) at 2 month intervals. A fecal sample was collected from each horse 3 times between wormings, thus about 1600 fecal samples were examined. Fecal samples were periodically cultured as there was a persistance of strongyle type eggs, found to be cyathastomum species. There were no differences in fecal egg counts due to the administration regime. Thus, no advantage in parasite control can be attributed to the route of anthelmintic administration. No seasonal differences in egg production were found to be significant. When analyzed by management group, young pasture horses had significantly greater ($P < .05$) fecal egg counts than other management groups (older pasture horses, box stalls, or dry lots), regardless of the method of anthelmintic administration. Thus, younger horses are more severly parasitised or interval use of anthelmintics works less well in younger horses, and this decreased efficacy cannot be improved by altering the route of administration in an interval worming program.

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COMPARATIVE EFFICACY AND SAFETY OF PYRANTEL TARTRATE FED DAILY TO HORSES FOR A YEAR G.E. HACKETT, R. MCCORMICK AND P. MENDOZA. EQUINE RESEARCH CENTER, CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA, POMONA, CA. 91768

A year long experiment with 66 Arabian horses was conducted to look at the safety and efficacy of pyrantel tartrate as an equine anthelmintic. Alfalfa pellets containing pyrantel tartrate were fed daily as a top dress to deliver 2.64 mg/kg. All horses (19) in the test group readily consumed the pellets. Safety was evaluated by observing daily, for signs of toxicity, all horses receiving the test article. No evidence of toxicity was observed. Efficacy was evaluated by comparing pyrantel tartrate fed daily to accepted interval treatments with ivermectin (28 horses) and fenbendazole (29 horses). Comparisons were made by fecal examination for eggs every 30 days throughout a year. In the first 2 months, counts were highly variable and apparant differences were not significant (Aug. $P < .1635$), (Sep. $P < .5808$). There was a significant difference between ivermectin and fenbendazole in Oct. ($P < .0105$), Feb. ($P < .0062$), April ($P < .0137$), June ($P < .0027$) and July ($P < .0043$). In Nov. ($P < .0243$), Dec. ($P < .0012$), Jan. ($P < .0050$), March ($P < .0025$), June ($P < .0027$), and July ($P < .0043$) both ivermectin and the pyrantel tartrate treatment produced significantly lower fecal egg counts than did the fenbendazole treatment. A significant difference was also found between pyrantel tartrate and fendbendazole in May ($P < .0106$). There was no significant difference found between pyrantel tartrate and ivermectin throughout the study. This study was partially supported by a grant from Pfizer.

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PARALYSIS OF STRONGYLUS EDENTATUS AFTER TREATMENT WITH NEMATOCIDES. S.D. FOLZ*, R.A. PAX, T.R. KLEI, E.M. THOMAS, K.A. ASH, G.A. CONDER AND J.L. BENNETT. THE UPJOHN COMPANY, KALAMAZOO, MI, MICHIGAN STATE UNIVERSITY, EAST LANSING, MI AND LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA.

An in vitro assay involving Strongylus edentatus larvae has been developed to test for equine anthelmintic activity. Three commercially available equine anthelmintics (dichlorvos, ivermectin, and pyrantel pamoate) and an investigational drug (p-toluoyl chloride phenylhydrazone) were evaluated in this assay at four concentrations. After 24 hours incubation, ≥10 µg/ml of all four drug treatments significantly ($P \leq 0.05$) reduced the motility of L-3 S. edentatus, thereby indicating anthelmintic activity. Pyrantel pamoate also reduced motility at 1 µg/ml. At 0.1 µg/ml, none of the treatments significantly reduced motility. Incubation for 48 hours resulted in a significant reduction in motility at ≥ 1 µg/ml with two drugs (ivermectin, pyrantel pamoate); dichlorvos and the hydrazone reduced motility at ≥10 µg/ml. None of the treatments significantly reduced motility at the lowest concentration (0.1 µg/ml). The in vitro S. edentatus assay proved to be sensitive, accurate and rapid. This assay system should be a valuable addition to tests used to identify potential equine anthelmintics.

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EFFICACY OF IVERMECTIN IN ORAL DRENCH AND PASTE FORMULATION AGAINST MIGRATING STAGES OF PARASCARIS EQUORUM. D.D. FRENCH*, T.R. KLEI, M.R. CHAPMAN, H.W. TAYLOR. LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA 70803

Twenty-one mixed breed pony foals reared and maintained under parasite free conditions were used to test the efficacy of ivermectin in oral drench and paste formulations (200 mcg/kg) against 11 day old migrating larvae of Parascaris equorum. Three treatment groups of 6 foals each were infected with 3000 embryonated P. equorum eggs on day -11. On day 0, foals in group 1 received vehicle (1 ml/50kg) for the oral drench formulation, and served as untreated controls, foals in group 2 received ivermectin in the paste formulation and foals in group 3 were treated with ivermectin in the oral drench formulation. Three additional foals were similarly infected on day -11 and necropsied on day 0. These served as indicators of the infection condition at the time of treatment. Larval recoveries from the lungs, liver and small intestines of the indicator foals showed that the majority (99.9%) if not all of the larvae were in the lungs at the time of treatment. The recoveries of larvae from the lungs and small intestines of controls at 25 days post infection, indicate that all of the larvae had migrated to the small intestine by this time. Using small intestinal larval recoveries for calculations, ivermectin in both formulations was 100% efficacious against 11 day P. equorum. (Supported in part by a grant from Merck and Co.)

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SEROLOGICAL CHARACTERIZATION OF STRONGYLUS VULGARIS SOLUBLE SOMATIC ANTIGENS RECOGNIZED BY EQUINE IgG ANTIBODY. Vida A. Dennis, Thomas R. Klei* and Melanie R. Chapman. Louisiana State University, Baton Rouge, LA 70808.

Soluble somatic S. vulgaris antigens from L_4, L_5, female and male worms were characterized by ELISA and Western Blot techniques using pooled pony sera from fourteen different types of S. vulgaris experimental infections. Generally, higher ELISA antibody responses were observed with larval antigens. ELISA antibody responses to all antigens following challenge infections were greater in nonresistant than in resistant ponies. Sera from ponies with either monospecific infections of Strongylus edentatus or Parascaris equorum showed marginal antibody responses to S. vulgaris antigens. Western Blot analysis identified both stage specific antigens and crossreacting epitopes between larval and adult antigens. All sera from S. vulgaris infected ponies recognized two L_4 and L_5 antigens with molecular weights of 98 and 84 kd. Sera from S. edentatus and P. equorum infected ponies did not recognize these two larval antigens. Sera from all S. vulgaris challenged ponies recognized 2 species specific protein bands (22 and 23 kd) in adult antigen mixtures not seen in nonchallenged individuals. These initial observations have identified several antigens that are unique to specific parasitologic and/or immunologic conditions in parasitized ponies. Supported in part by the LSU Equine Veterinary Research Program.

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HAND-RAISING PONY FOALS FOR CONTROLLED ANTHELMINTIC TRIALS. J.A. DIPIETRO*, J.L. DAVIS, J.A. BOERO, AND T.F. LOCK. COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF ILLINOIS, URBANA, IL 61801.

During the period from 1985-1987 we have successfully reared more than 50 orphan foals for controlled anthelmintic trials utilizing a system which has resulted in excellent foal growth and health while maximizing labor efficiency.

Once adequate colostrum intake has occurred (24-48 hrs post partum) the foals were weaned and placed on a commercial milk replacer per label recommendations. From weaning until 1.5 months of age the foals were fed 4 times per day. Four time a day feeding facilitates their adaption to being hand-raised and decreases the labor costs of more frequent feeding which has been recommended in the past. Once greater than 1.5 months old the foals were fed three times per day. Milk replacer was offered in shallow pans and strict hygiene practiced in regard to all utensils used in mixing and feeding the foals. Alfalfa hay, trace mineralized salt, and water was fed to the foals ad libitum. A mixture of equal parts pelleted milk replacer and rolled oats (113.4-907.2 g/day) was offered at each feeding. Whenever possible foals were housed together in straw bedded concrete stalls which were cleaned daily and pressure washed weekly with 5 % lysol solution.

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A MODIFICATION OF THE AGAR-GEL TECHNIQUE TO ELIMINATE FREE-LIVING NEMATODES FROM HERBAGE SAMPLES. D.E. SNYDER, USDA-ARS, ANIMAL PARASITE RESEARCH LABORATORY, POB 952, AUBURN, ALABAMA 36831-0952.

Numerous techniques have been developed to estimate the number of trichostrongylid third stage larvae (L3) present on pasture herbage. The agar-gel technique is one of these techniques and has the major advantages of yielding only motile larvae in a minimum amount of debris. However, like the many techniques that have been tried, they yield in addition to trichostrongylid L3's, the free-living (FL) stages of nematodes that are indigenous to the particular locale. The numbers of FL nematodes obtained often far exceed the numbers of parasitic L3's and the subsequent use of Lugol's Iodine solution followed by decolorization to differentiate between them can be both time consuming and unreliable. The purpose of this report is to describe the ability of certain chemical solutions to selectively kill the FL nematodes while having little to no effect on the L3's of the cattle abomasal parasite, Ostertagia ostertagi. Subsequent treatment of this mixture of dead FL nematodes and live O. ostertagi L3's to the agar-gel technique eliminates the majority of these unwanted FL nematodes.

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RELATIONSHIP BETWEEN EGG EXCRETION AND TOTAL WORM BURDEN IN NATURALLY INFECTED CALVES. K.D. MURRELL,*, E.A. LEIGHTON, B. A. BOSWELL AND L.C. GASBARRE. HDL, LPSI, ARS, USDA, BELTSVILLE, MD 20705 AND WYE RESEARCH AND EDUCATION CENTER, UNIVERSITY OF MARYLAND, QUEENSTOWN, MD 21658.

Beginning February 1985 and continuing until the end of 1986, two Holstein tracer calves per month were allowed to graze for about 30 days on pastures located on the Eastern Shore of Maryland that were contaminated naturally with parasites. The calves were then housed on concrete for 3 weeks before slaughter. At necropsy the helminth egg excretion rates (EPG) and the total worm burdens from the abomasum and small intestine were determined. Blood samples were also obtained for serum pepsinogen (PEP) assays. A total of 44 calves were sampled over this period. Chi-square analysis indicated that worm burden data was more normally distributed after logarithmic transformation (LOGTOTAL), and that EPG and PEP were more normally distributed by square root transformation (SQRT_EPG; SQRT_PEP). Correlation between LOGTOTAL and either SQRT_EPG or SQRT_PEP were about 0.7. These correlations were higher than those obtained with non-transformed data. These results indicate that both EPG and PEP are easily measured indicator variables that explain a significant amount of the variation observed in total worm burdens. Polynomial regression models of a cubic order using the SQRT_EPG can account for nearly 80 percent of the variation observed in the LOGTOTAL, while SQRT_PEP accounts for only 55-60% of the variance. These results indicate that EPG are of value in predicting worm burdens in infected calves.

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INDUCTION OF PROTECTIVE IMMUNITY IN CALVES AGAINST OSTERTAGIA OSTERGAGI BY STRATEGIC ADMINISTRATION OF AN ANTHELMINTIC. L.C. GASBARRE*, HDL, LPSI, ARS, USDA, BELTSVILLE, MD 20705.

Protective immunity against Ostertagia ostertagi infection is generally slow arising and does not protect the host completely from reinfection. In order to test if either the immunogenicity of a primary infection could be enhanced or if a possible parasite-induced modulation of the host immune response might be lessened, calves were experimentally infected and then treated with fenbendazol at 5 mg/kg. Two protocols were followed: 1) Calves were orally inoculated with 1.25×10^5 or 2.5×10^5 infective larvae. Fecal egg counts were monitored 2 or 3 times per week until the egg counts began to noticeably decrease (approximately 6 weeks post-infection). At this time calves were treated with fenbendazol to remove worms, rested for 2 weeks, and challenged with infective larvae. Previously infected calves were found to consistently excrete fewer eggs in their feces than did previously uninfected controls following a challenge infection, however, both groups contained similar numbers of adult worms at necropsy. 2) Calves were treated with fenbendazol at 9 days after each of 3 priming infections; at 9 days O. ostertagi is just entering the molt from L_4 to adult. Calves that had been exposed to the parasite in this way not only excreted fewer eggs following a challenge infection, but also had significantly fewer adult worms at necropsy. These results indicate that previously infected calves may be able to regulate parasite fecundity, and death of larvae in the abomasal glands may induce a strong protective immune response.

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ANTIGEN INDUCED HISTAMINE RELEASE BY INTESTINAL MUCOSAL MAST CELLS (IMMC) IN VITRO AS AN INDICATOR OF LOCAL IMMUNITY TO ASCARIS SUUM IN SWINE. J.F. URBAN, JR.*, M. ASHRAF AND C.M. LEE. USDA, ARS, HDL, BELTSVILLE, MD 20705 AND HOWARD UNIVERSITY, DEPARTMENT OF ZOOLOGY, WASHINGTON, D.C. 20059.

Techniques were developed to isolate IMMC from intestinal tissues of helminth-free confinement-reared swine and from swine that had either been exposed naturally to parasites on dirt or inoculated experimentally in confinement. Only IMMC isolated from parasite exposed swine release histamine in vitro when mixed with parasite antigens. This release is parasite antigen specific and apparently requires an antibody receptor that is acid dissociable from the cell surface. The kinetics of development of the IMMC response indicated that pigs must be exposed orally to A. suum eggs for at least 18 days; this period is later than the appearance of serum antibody and peripheral blood cell blastogenic responsiveness to antigens. Late third stage larvae (L3) isolated from the lungs of donor pigs do not migrate parenterally in orally inoculated recipients. IMMC do not respond to antigen in vitro unless isolated 21 days after inoculation of recipients with L3; serum antibody levels do not increase until 25 days after inoculation. These results show that the responsiveness of IMMC to parasite antigens does not necessarily correlate with systemic expressions of immunity to A. suum.

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EFFICACY OF MORANTEL SUSTAINED RELEASE TRILAMINATE (MSRT') AGAINST GASTROINTESTINAL NEMATODES IN BEEF CALVES. L.G. RICKARD*, G.L. ZIMMERMAN, E.P.HOBERG, J.K. BISHOP, P.W. LOCKWOOD, D.W. WEBER, AND R.J. MILLER. OREGON STATE UNIVERSITY, CORVALLIS, OR 97331 AND PFIZER CENTRAL RESEARCH, TERRE HAUTE, IN 47808.

The effectiveness of the morantel sustained release trilaminate (MSRT) flex bolus in controlling gastrointestinal nematodes through a grazing season was evaluated using 60 yearling beef stocker calves randomly divided into two groups of 30 animals each. In April, 1985, the calves comprising the control group remained untreated whereas those of the treatment group each received an active bolus designed to release morantel tartrate for approximately 90 days. All animals were weighed and rectal fecal samples were taken at 14 day intervals, beginning on day 0, until trial termination (day 168). At trial termination, 10 control and 10 treated calves were necropsied for recovery of gastrointestinal nematodes. Three sets of parasite-naive tracer calves were utilized to evaluate the initial, interim, and final level of pasture larval contamination. Overall, the use of the MSRT resulted in a 75.5% reduction ($P<0.001$) of fecal worm egg output of the principals, an 81.8% reduction ($P<0.001$) of gastrointestinal nematodes in principals (at trial termination), and a 97% reduction ($P<0.05$) of pasture nematode contamination (as determined by parasite burdens in tracer calves). The mean weight advantage of treated calves was 16.6 kg per head ($P<0.001$).

'Paratect flex bolus is the Pfizer International trademark for the MSRT; Paratect diffuser is the Pfizer US trademark for the MSRT.

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USE OF FENBENDAZOLE PREMIX ADMINISTERED VIA LOOSE MINERAL IN A STRATEGIC PARASITE CONTROL PROGRAM FOR STOCKER CATTLE IN VIRGINIA. A.M. ZAJAC*, J.W. HANSEN, W.D. WHITTIER. VIRGINIA TECH. BLACKSBURG, VA 24061.

The feasibility of incorporating mineral mix containing anthelmintic into a strategic control program for beef cattle was tested on a commercial farm in southwestern Virginia. Sixty-one yearling steers were divided into 3 groups. All animals were treated with fenbendazole suspension at the time of pasture turnout in late April. Fenbendazole premix was added to standard mineral mix at a level to provide 5mg/kg/animal when consumed over a 3 or 6 day period. Group 1 received mineral containing anthelmintic for 3 days at 3 and 6 weeks after turnout, while Group 3 was treated for 6 days at 3 and 6 weeks. Group 2 (control) received no additional treatment. Animals were observed in daylight hours during the treatment periods. Fecal egg counts, serum pepsinogen levels, weights and pasture larvae counts were monitored at intervals throughout the experiment. Despite a severe summer drought, some changes in parasitologic parameters were seen. Following administration of the medicated mineral fecal egg counts of treated animals fell to 0 while remaining constant in control animals. Serum pepsinogen levels were also higher in control animals by the end of the grazing season. No significant differences in weight gains were seen amongst the 3 groups. Consumption of the medicated mineral was generally adequate, although rainy weather appeared to decrease ingestion. It would appear that medicated mineral may be an effective way to administer anthelmintic as part of a strategic deworming program in areas where handling animals during the grazing season is impractical.

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EFFICACY OF FEBANTEL AGAINST GI NEMATODES AND LUNGWORM IN CATTLE. J.C. WILLIAMS, K.S. MARBURY, C.S. EDDI*, E.R. WILLIS, R.A. SWALLEY AND D.G. LUTHER. LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER, BATON ROUGE, LA

Efficacy of febantel at a dosage of 5 mg/kg (45.5% paste formulation) against inhibited early 4th stage larvae (EL_4) of Ostertagia ostertagi, other nematodes of the abomasum and Dictyocaulus viviparus was investigated in 4-6 month old Holstein calves which grazed on heavily contaminated pasure from February 24 to April 1, 1986 (36 days). Twenty-five calves were randomly allotted by equal distribution of body weights to 2 groups and treated on April 4: placebo-treated controls; 13 calves and febantel treatment, 12 calves. Equal numbers of treated and control calves were killed over 2 days at 6 and 7 days, respectively, after treatment. Mean numbers of O. ostertagi in control cattle were: adults, 4,931; developing 4th stage larvae (DL_4), 1,119; and inhibited EL_4, 3,410. Ostertagia lyrata, Trichostrongylus axei, Haemonchus sp., and D. viviparus were well-distributed in nearly all control calves. Percentage reduction of O. ostertagi in treated calves when compared with controls was: adults, 83,6%; DL_4, 57.8%; and inhibited EL_4, 34.8%. Percentage reductions of other species were as follows: O. lyrata, 92.6%; T. axei adults, 99.3%, and 4th stage larvae (L_4), 100.0%; Haemonchus sp. adults, 66.7%, and L_4, 64.0%; D. viviparus adults 90.6%, and immature forms, 97.1%. It was considered that poor and moderate levels of efficacy against adult of Haemonchus sp. and O. ostertagia, respectively, may have been associated with numbers of DL_4 of both species. In the 6 to 7 day interval between treatment and slaughter, DL_4 at least, could have reached the adult stage and replaced adults lost through treatment.

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Indications of Nematode Resistance to Levamisole and Fenbendazole among Sheep and Goats in Texas. D.K. Miller and T.M. Craig, Texas A&M University, College Station, TX 77843.

Flocks of sheep or goats from different regions of Texas were tested for the presence of anthelmintic resistant nematodes. Groups of 10 or more animals in each flock were either treated with an anthelmintic or used as controls. The extent of susceptibility or resistance was estimated by the change in eggs per gram of feces at treatment and 7-10 days later. Evidence was found for resistance and cross-resistance with other anthelmintics, especially in flocks with a history of long-term, frequent treatments.

This work was funded by a grant from Hoechst-Roussel Agri-Vet Co.

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EXTRAPOLATION OF A CLIMATE BASED FLUKE FORECASTING SYSTEM FOR LOUISIANA TO RAINFALL-DEPENDENT PASTURE ZONES OF FLORIDA, TEXAS AND OKLAHOMA.
J.B. MALONE* AND R.A. RIGGLEMAN. LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA

A climate forecasting system has been used since 1984 to advise Louisiana cattlemen each spring and fall of the relative need for once or twice per year treatment for Fasciola hepatica. An annual index is calculated by accumulating the number of 'growing degree days' (base = 10°C) on days in which moisture is present in the top 2.5 cm of a 15 cm Thornthwaite water budget soil moisture model. For 10 Louisiana climate stations located in flukey areas, annual values are compared to 'normal' values calculated using 30-year average climate data, and low, moderate, high or very high risk designations are assigned. Annual index values (at least 2 years) and 30-year normals were calculated for 3 sites in Florida (Gainesville, Tampa, Okeechobee), 2 sites in Texas (Angleton, Victoria), and one site in Oklahoma (Poteau). Annual values varied widely at each site, suggesting the value of a forecast, and were generally consistent with available historical transmission data. Results also suggest 30-year normal values provide a measure of the severity of seasonal transmission patterns and the severity of the fluke problem in divergent climate zones. 'Normal' 30-year values varied from 1193 to 3098 between sites and indicated a lack of development in winter at Northern sites as compared to Louisiana, a nearly year-round transmission in Angleton, TX and the possibility of two transmission seasons in South Florida.

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HEARTWORM - (*DIROFILARIA IMMITIS*) INFECTION IN MINNESOTA - AN UPDATE. J.C. SCHLOTTHAUER* AND B.E. STROMBERG. DEPARTMENT OF VETERINARY PATHOBIOLOGY, UNIVERSITY OF MINNESOTA. ST.PAUL, MN 55108.

Endemic heartworm, *Dirofilaria immitis*, infection was first observed in Minnesota in dogs in 1939 in Hennepin County by the late Dr. F. W. Gehrman of Minnetonka, Minnesota. The infection smoldered but suddenly became epidemic in dogs in Hennepin County in 1955. By 1986 veterinarians reported that canine dirofilariasis had spread throughout much of Minnesota and had become endemic in 62 of the 87 counties.

The spread of canine dirofilariasis has been insideous since its first appearence nearly 50 years ago. In 1986 1.4 percent (2255) of 155,693 dogs tested were positive for the infection. Continued biannual surveillance has shown a decline yet persistance of infection in and around Hennepin County but a progressive movement of infection into most outstate regions of the state. Reductions in the prevalence of *D. immitis* in the metropolitan areas of the cities of Minneapolis and St. Paul and their suburbs can best be related to intensive mosquito control activity and widespread use of preventive medication by resident dog owners.

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PHARMACOKINETICS AND CLINICAL PHARMACOLOGY IN DOGS OF A NEW HEARTWORM ADULTICIDE (RM 340). P.L. TOUTAIN, NATIONAL VETERINARY COLLEGE, TOULOUSE, FRANCE; J.-P. RAYNAUD, RHONE MERIEUX, TOULOUSE, FRANCE.

The pharmacokinetics of arsenic (As) was studied in dogs given RM-340 by IM injection in the lumbar region. Absorption was rapid, with a mean absorption half-life of 2.6 min and a peak blood level at 8 min. The mean distribution half-time was 11.3 min and the mean elimination phase half-life was estimated to be 298 min. Computerized simulations of various effective dosages and intervals of administration were done, based on stationarity (time independent) and linearity of the As kinetics. Minimum Effective Concentrations and corresponding minimum exposition time were tentatively calculated, based on the kinetics and efficacy data obtained using a heartworm transplant model. The maximum tolerated dose was between 7.5 and 10 mg/kg, but there appeared to be no general toxicity with 7.5 mg/kg daily for 14 days. Acute toxicity appeared to be related to the peak arsenic concentration in the blood. Peaks of 0.96 to 1.06 mcg/ml were considered to give the best efficacy. Different dosage regimens were simulated with two injections given from 1 to 24 hr apart, and those with the most appropriate minimum effective consentration and arsenic peak were selected. For the reference dose of 2.5 mg/kg twice 24 hr apart, the Efficacy Index (E) was 1.01 and the Peak Arsenic Index (S) was 1.00. Efficacy experiments and tolerance tests are being conducted to select the most effective, practical dosage and treatment interval for adulticide therapy, e.g., (1) 2.2 mcg/kg twice, 3 hr apart (E=1.22, S=1.00) or (2) 2.5 mg/kg twice, 6 hr apart (E=1.35, S=1.09).

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COMPARISON OF FIVE SEROLOGIC TECHNIQUES TO DETECT ANTIGEN TO DIROFILARIA IMMITIS IN THE DOG. GRANT H. TURNWALD, ROBERT A. HOLMES,* S. PETER SCHMIDT, PATRICIA H. SMITH, JOHN B. MALONE. SCHOOL OF VETERINARY MEDICINE, LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA 70803

Sera from 200 random source dogs were tested for D. immitis antigen using 5 commerical assay procedures according to directions provided by the manufacturers. There were two latex agglutination assays (Difil II®, Dirokit®), and three enzyme linked immunosorbent assays (Diro Chek®, Filarochek®, Cite®).

Feces from each dog were examined by direct smear and fecal flotation. The heart, pulmonary arteries and branches, as well as the cranial and caudal vena cava were examined for the presence, number and sex of mature and immature D. immitis. Results from serologic procedures were used to determine the sensitivity, specificity, predictive values and efficiency of each assay. McNemars test was used to assess possible significant differences with respect to agreement among the given serologic techniques.

Results and their statistical significance will be presented.

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CONFIRMATION OF THE OPTIMAL EFFECTIVE ORAL DOSE OF MILBEMYCIN AGAINST ADULT HOOKWORM INFECTIONS IN NATURALLY INFECTED DOGS. D.D. BOWMAN*, R.C. JOHNSON, AND D.I. HEPLER. CORNELL UNIVERSITY, ITHACA, NY 14853 AND CIBA-GEIGY CORP., GREENSBORO, NC 27419.

Previous work has shown that the adults of Ancylostoma caninum can be removed from experimentally infected dogs with a formulation of milbemycin at a dose of 0.5 mg/kg. To determine the efficacy of this treatment in dogs naturally infected with adult hookworms, 24 mixed-breed dogs with patent hookworm infections were purchased from an out-of-state vendor, and 6 male and 6 female dogs were assigned to either a control group or a group that would receive treatment. The dogs were treated 1 week after their arrival and euthanized 1 week post-treatment. Beginning 2 days before treatment, fecal samples were collected daily from all dogs, and the number of Ancylostoma eggs per gram dry weight of feces was determined for each sample. By 1 week post-treatment the number of eggs being passed by the treated dogs had dropped from 12,700 to 10 eggs per gram dry weight; there was no apparent change in the fecal egg counts of the control group. At necropsy, the mean number of adult A.caninum in the treated and control groups were 1.3 and 56, respectively; the efficacy of treatment was calculated in these naturally infected dogs to be 97.8%. Although, Uncinaria stenocephala, Toxocara canis, and Trichuris vulpis appeared also to be removed at this dose, there were too few animals to calculate meaningful efficacies. No adults of Anyclostoma braziliense were seen in any of the dogs, and the milbemycin formulation appeared to have no effect on the cestodes that were present in these animals.

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EXPERIMENTAL INFECTION OF DOGS WITH CARYOSPORA BIGENETICA (APICOMPLEXA: EIMERIIDAE). C.A. SUNDERMANN, B.L. BLAGBURN*, L.J. SWANGO & T.R. BOOSINGER. AUBURN UNIVERSITY. AUBURN, AL 36849.

Oocysts of Caryospora bigenetica were isolated from the feces of a canebrake rattlesnake, separated from fecal debris, sterilized, and ground with a tissue grinder to liberate some of the sporocysts. Four 6-week-old dogs were each inoculated orally with a mixture of 10^7 oocysts/sporocysts. Five and 3 days prior to inoculation, 3 of these dogs received injections of methlyprednisolone (MPN; 50mg). Two control dogs received placebo, and one also received MPN. All injections were ceased 7 days post-inoculation (DPI). Clinical signs of dermal coccidiosis were present 10 DPI in the 3 dogs that received oocysts and MPN. These animals had a thick mucous discharge from the eyes, periocular swelling, swollen muzzle, soft, spongy footpads, edematous nostrils, and inflammation of ears and abdominal skin. The dogs were recumbant and one was sacrificed 10 DPI. Numerous gamonts of C. bigenetica were observed microscopically in fresh smears of eyelid, muzzle, scrotum, and footpad. Coccidia were also present in histological sections of abdominal skin. A control dog (MPN + placebo) appeared healthy 10 DPI; no coccidia were present in the tissues examined. The other 2 control dogs were sacrificed 14 and 15 DPI; no coccidia were present in dermis or viscera. The 2 remaining experimental dogs recovered somewhat and were sacrificed 29 and 67 DPI. Numerous caryocysts were present in eyelid, muzzle, and footpad.

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MUSCULAR SARCOCYSTIASIS IN A DOG. B. L. BLAGBURN*, K. G. BRAUND, M. TOIVIOKINNUCAN AND K. A. AMLING. COLLEGE OF VETERINARY MEDICINE. AUBURN UNIVERSITY, AL 36849.

A four-year-old male dog was presented for physical and neurological examinations because of ataxia and limb stiffness. The dog had received prednisolone (7.5 mg/day for the previous two years; dosage was increased to 10 mg/day for several weeks prior to examination) to alleviate clinical signs. Biopsy of the biceps femoris muscle contained a single cyst resembling Sarcocystis sp. It was approximately 47 X 52 um inclusive of the cyst wall. The wall was palely eosinophilic and approximately 0.9 um X 2.3 um at its narrowest and widest margins, respectively. Outer cyst wall projections were barely visible in histologic sections. Septate projections of the cyst wall into the interior of the cyst were visible as clear or dark lines in PAS- and H&E-stained sections. Merozoites were moderately to intensely basophilic in H&E-stained sections and were irregularly arranged in groups bordered by septae. Results of stains using the PAS reaction revealed a cyst wall and interior septae that were PAS-negative. Inflammatory reactions were not associated with the cyst. Ultrastructurally, the primary cyst wall contained numerous irregularly spaced villous projections. A secondary cyst wall was not observed. An electron dense ground substance was present just beneath the primary wall and also was present in many of the villous projections. Clinical signs were thought to be the result of vacuolar degeneration of skeletal muscles associated with hypokalemia. The sarcocyst was considered an incidental finding.

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CARYOSPORA BIGENETICA (APICOMPLEXA: EIMERIIDAE): COMPLETE DEVELOPMENT IN VITRO. C.A. SUNDERMANN and D.S. LINDSAY*. AUBURN UNIVERSITY. AUBURN, AL 36849 and USDA ANIMAL PARASITOLOGY INSTITUTE. BELTSVILLE, MD 20705.

The development of Caryospora bigenetica in vitro is described at the light microscope level. Sporozoites from rattlesnake-derived oocysts were purified and inoculated onto cultures of primary cotton rat testicle cells, cotton rat kidney cells, and human fetal lung cells. Intracellular sporozoites were observed 1 and 2 days post-inoculation (DPI). Motile, extracellular first-generation merozoites were present 3 DPI, and second-generation merozoites were present 5 DPI. Mature gamonts were observed 9 DPI and developed into unsporulated oocysts by 10 DPI. Oocysts sporulated in vitro, and excystation was observed. Cells that were penetrated by in vitro-produced sporozoites formed caryocysts by 16 DPI. To test infectivity of in vitro-derived stages of coccidia, merozoites were removed from cultured cells 5 DPI and inoculated intraperitoneally into a mouse; infection resulted. Sporulated oocysts removed from cell cultures 12 DPI produced facial swelling in an orally inoculated cotton rat. Infection in both animals was confirmed by observation of stages of C. bigenetica in tissue smears. Supported by the Alabama Agricultural Experiment Station, project no. 13-0061.

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DEVELOPMENTAL STAGE AND HOST SPECIES CROSSREACTIVE HYBRIDOMA ANTIBODIES GENERATED AGAINST EIMERIA BOVIS SPOROZOITES. D.S. LINDSAY*, J.P. DUBEY, P.C. AUGUSTINE, L.F. CARSON, H.D. DANFORTH, AND R. FAYER. USDA, ANIMAL PARASITOLOGY INSTITUTE, PROTOZOAN DISEASES LABORATORY, BELTSVILLE, MD 20705

Mice were immunized with Eimeria bovis sporozoites (SZs) and their spleens were removed and the cells fused with mouse myeloma cells to produce hybridoma cell lines (HBs). The resulting HBs were examined for antibody (HAB) production against air-dried E. bovis SZs using an indirect immunofluorescent assay (IFA). Five HBs produced HABs that reacted by IFA with E. bovis SZs. These 5 HABs were further tested for reactivity with cell culture produced merozoites (MZs) of E. bovis, Sarcocystis cruzi, and Toxoplasma gondii; SZs of E. tenella and E. acervulina from chickens, SZs of E. meleagrimitis and E. adenoeides from turkeys, SZs of E. vermiformis and E. papillata from mice, and SZs of Cryptosporidium parvum from calves. Two of the 5 HABs reacted only with E. bovis SZs and were developmental stage and host species specific. The other 3 HABs reacted with SZs and MZs of all the other coccidian species tested except C. parvum and were developmental stage and host species crossreactive. The immunofluorescent pattern observed on test stages varied with the species being examined.

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Diagnosis of Parasitic Infections in Small Animal Practice. R.B. Grieve, Department of Pathology, Colorado State University.

Many of the most common parasitic infections of importance to the small animal practitioner are reliably diagnosed using established procedures, however, new methodologies have become available and, in some instances, are widely used. In addition, new insights into the importance of certain diseases has necessitated the development of different diagnostic capabilities. When faced with these considerations, the veterinary practitioner must decide how to properly use the new assays, when to use different assays, what the reasonable expectations are of an assay, and what they will do with the information provided with an assay result. Many of these concepts will be illustrated by a specific discussion of the appropriate uses of immunologic assays for diagnosis of canine heartworm (Dirofilaria immitis) infection.

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Diagnosis of parasitic disease in large animal practice. T.W. Schillhorn van Veen, Michigan State University, East Lansing, MI

The diagnosis of parasitic disease is, traditionally, based on the demonstration of the parasite or parasite material. In recent years, however, it is increasingly replaced by or complemented with, demonstration of antibody, circulating antigens or excreted antigens.

The presence of parasites in the host is not always related to disease, and occasionally disease may be manifest without detectable parasites. The diagnosis is then based on secondary changes such as increased enzyme activity, the presence of parasite induced mediators, or detectable morphological changes of the affected organs. In addition, there is an increasing interest in the evaluation of antiparasitic treatment, including the occurrence of drug resistance. The diagnosis of parasitic disease-risk in large animals is often made on a herd basis and includes epidemiological considerations. In addition, there is a trend to assess the severity of parasitic infection at slaughter, for reasons of herd health as well as for public health. The use of monoclonal antibodies and nucleid acid hybridization probes may considerably enhance this trend.

Finally, the advantage and disadvantage of in-house or on-site test systems will be discussed.

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Applications of Diagnostic Tests for Diagnosis of Zoonotic Parasites in Humans

Peter M. Schantz

Recent improvements in serologic technology have provided tests of great usefulness for diagnosis of several important parasites usually acquired from lower animal hosts. The use of Toxocara larval antigens in a highly sensitive and specific enzyme immunoassay has proved of great benefit to ophthalmologists and pediatricians who require an accurate laboratory test to confirm their presumptive diagnoses; the use of the same assay by epidemiologists has provided new information about the frequency and risk factors for this important zoonosis. Serologic tests for echinococcal hydatid disease have long been used for clinical diagnosis and, recently, have assisted in epidemiologic investigations of exposed populations. Serologic screening of endemic Eskimo populations in Alaska promises to reduce mortality due to alveolar hydatid disease by early detection and appropriate treatment. Neurocysticercosis due to the pork tapeworm, Taenia solium, can now be diagnosed with high sensitivity and specificity and improved diagnosis has revealed a very serious problem of imported disease in hispanic immigrants in the southwestern United States. Further development of tests for other potentially zoonotic agents such as animal hookworms, heartworm and roundworms may solve the etiologic puzzle of larva migrans syndromes in patients negative for Toxocara antibody.

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IMPROVED DIAGNOSTICS FOR PARASITES IN THE FUTURE OF ANIMAL HEALTH. H. R. GAMBLE, USDA, AGRICULTURAL RESEARCH SERVICE, HELMINTHIC DISEASES LABORATORY, BELTSVILLE, MARYLAND 20705.

Visualization of parasites in tissues, blood or feces, while still the most definitive diagnostic test, in many cases is not the most practical or cost effective. Alternative non-invasive diagnostic methods for animal parasites have become available with the advent of new technologies. A variety of serological tests have been developed for the detection of parasite specific antibodies in the host and these tests have proven useful for the antemortem detection of histotrophic parasites. However, serology tests do not necessarily indicate active infections for those diseases where the parasite has a finite life span in the host. In addition, positive serology seldom relates quantitatively to parasite burden. The detection of parasite secretory or excretory products in the circulation, particularly in the case of histotrophic parasites, can provide more accurate information on the active status of an infection and might suggest relative levels of infection. The direct detection of parasite DNA through hybridization probe technology has great promise in parasite diagnosis because of its characteristic high degree of specificity. The availability of improved diagnostic methods provides new tools to the veterinarian and should eventually have a positive impact on food quality and public health. Monitoring of food animals for disease-free status will allow the producer to offer a premium product. Integration of new or improved diagnostic programs at the slaughterhouse will aid in assuring the safety of products reaching the consumer.

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THE USE OF OXFENDAZOLE TO CONTROL INHIBITED OSTERTAGIA OSTERTAGI IN BEEF CATTLE. JAMES F. REID*. SYNTEX AGRIBUSINESS, BRUSSELS, BELGIUM

The study was conducted to determine the efficacy of oxfendazole against both adults and inhibited fourth stage larvae of Ostertagia ostertagi as well as other gastrointestinal nematodes. A normal recommended dose of oxfendazole 4.5 mg/kg resulted in efficacies of 98 percent against adult stages of Ostertagia and 97 percent against the inhibited larval stage. Oxfendazole was 100 percent effective against adult Cooperia oncophora and Trichostrongylus axei.

To establish the infection, calves were grazed for four weeks on pasture known to be contaminated with infective larvae of Ostertagia and other gastrointestinal parasites of cattle. At the end of the four week grazing period the calves were housed together for four weeks. Prior to treatment on Day 57, the calves were divided into two groups. One group was given the recommended dose of oxfendazole as a 22.5 percent suspension using a rumen injector. The other group was untreated. Calves were necropsied for parasitilogical evaluation fourteen days post treatment.

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RUMEN INJECTION - FOR POSITIVE ADMINISTRATION OF BOVINE ANTHELMINTICS. I. C. PEARSON*. SYNTEX AGRIBUSINESS, CASTLE HILL N.S.W. AUSTRALIA

The Rumen Injection system has proven to be an efficient and effective way to administer oxfendazole (suspension) anthelmintic to the cattle. In-field use of the rumen injector in Europe and Australia has demonstrated the safety and effectiveness of this system.

The rumen injector deposits the proper dose volume of oxfendazole for the bovine animal directly into the rumen, eliminating the possibility of rumen bypass via the esophageal groove. The dose is administered quickly with a minimum of restraint or confinement required. Treated animals show only minimal reaction to the injection. This method of application eliminates the waste or spillage often involved with oral administration of anthelmintics.

Dr. Ian Pearson will demonstrate the rumen injection system as well as outline its current applications in Australia, Europe and South America and its proposed applications in the United States and Canada.

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