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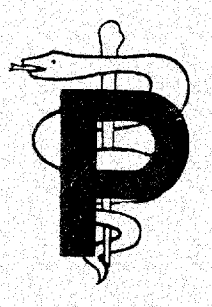

American Association of Veterinary Parasitologists

30th Annual Meeting
July 22-24, 1985
Las Vegas, Nevada

AMERICAN ASSOCIATION OF VETERINARY PARASITOLOGISTS

Founded 1956
Affiliated with the American Veterinary Medical Association

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PROGRAM
AMERICAN ASSOCIATION OF VETERINARY PARASITOLOGY
ANNUAL MEETING

Las Vegas Convention Center - Room 4
Monday, July 22

7:00 AM **REGISTRATION**

SESSION 1: EXPERIMENTAL AND CLINICAL STUDIES I
Moderators: J.F. Williams and P.H. Klesius

1. 8:00 KEYNOTE ADDRESS - In vitro detection of anthelmintic activity - a review of established methods and discussion of a novel approach.
J.L. Bennett - Professor of Pharmacology and Toxocology, Michigan State University

2. 8:30 A new test for detecting anthelmintic resistant nematodes.
D.J. Giordano, G.C. Coles, J.P. Trischler, and A.L. Schmidt

3. 8:45 Anthelmintic resistant strain of Haemonchus contortus in the Louisiana State University Research Sheep Flock.
J.E. Miller, F.G. Hembry, D. Sims, and L. Stagg

4. 9:00 Secretory/excretory chemotactic substances from L_3 of Ostertagia ostertagi account for eosinophil locomotion.
P. Klesius, T. Haynes, D. Cross, and H. Ciordia

5. 9:15 Discovery of Nematodirus battus in sheep in Oregon.
E.R. Hoberg, G.L. Zimmerman, and J.R. Lichtenfels

6. 9:30 Vacuuming horse pastures: a non-chemical approach to the control of horse parasites.
R.P. Herd

7. 9:45 Anthelmintic usage by New England sheep farmers.
J.P. Tritschler II, D.J. Giordano, and G.C. Coles

10:00 COFFEE BREAK

SESSION 2: DIROFILARIA
Moderators: R.B. Grieve and J.W. McCall

8. 10:30 Canine filariasis (Dirofilaria immitis, D. repens, and Dipetalonema spp.) in Italy - historical and epidemiological perspectives.
R.A. Roncalli and P. Tassi

9. 10:45 Development and survival of larval Dirofilaria immitis implanted in diffusion chambers in syngeneic normal and immunized mice.
D. Abraham and R.B. Grieve*

10. 11:00 Evaluation and use of commercially available systems in the serodiagnosis of occult heartworm disease in dogs.
T.W. Schillhorn Van Veen

11. 11:15 Confirmation of heartworm prophylaxis with single dose ivermectin at one month post inoculation by serology and late necropsy.
M.T. Dzimianski, J.W. McCall, L.S. Blair, R.L. Seward, and R.E. Plue

12. 11:30 Serological characterization of heartworm antibody response in ivermectin treated, laboratory raised beagles exposed under field conditions.
J.W. McCall, C. Bagshaw, J. Brown, and M.T. Dzimianski

13. 11:45 Dirofilaria surface antigen preparation for the enzyme linked immunosorbent assay diagnosis of heartworm infection.
B.S. Ebinne, B.J. Packer, R.M. Corwin, T.J. Green, and S.E. Pratt-Green

12:00 PM LUNCH

SESSION 3: EPIDEMIOLOGY
Moderators: C.H. Courtney and J.C. Williams

14. 1:00 Epidemiology and control of gastrointestinal nematodes of cattle in Virginia.
J.W. Hansen, B.D. Perry, and R. Freeman

15. 1:15 An update on the hypobiotic changes in Ostertagia ostertagi during environmental adaptation in Louisiana.
K.S. Marbury, J.C. Williams, and E.R. Willis

16. 1:30 Trichinellosis in an agricultural ecosystem: Transmission under natural and experimentally modified on-farm conditions.
G.A. Shad, C.D. Duffy, D.A. Leiby, K.D. Murrell, and E.W. Zirkle

17. 1:45 Epidemiological significance of intraspecific biological and biochemical variations in Trichinella spiralis.
K.D. Murrell, T.A. Dick, F. Stringfellow, J. Dame, and G. A. Schad

18. 2:00 Pattern of helminth egg counts in pastured horses over two grazing seasons.
V.C. Gutierres and T.J. Kennedy

19. 2:15 Helminth populations in naturally parasitized grazing foals in Wisconsin and Alabama.
R.M. McCormick and T.J. Kennedy

20. 2:30 Periparturient rise in 3 strains of Florida native sheep and its relation to parasite resistance in lambs.
C.H. Courtney, R. Gessner, S.R. Sholz, and P.E. Loggins

21. 2:45 Population dynamics of trichostrongylid nematodes in pregnant and non-pregnant Florida native and Dorset/Rambouillet ewes.
A.M. Zajac and R.P. Herd

3:00 POSTER SESSION (refreshments will be available)

22. Altered nematode prevalence following three consecutive years of Paratect bolus administration at the same pasture location.
T.A. Yazwinski, B.L. Presson, H. Featherstone, T.J. Newby, and T. Greenway

23. Drug resistance in flukes.
G.C. Coles

24. Dose-titration of fenbendazole in chickens.
L.M. Pote and T.A. Yazwinski

25. Parasitism in overwintering cattle in Missouri.
R.M. Corwin, C.K. Wise, S.E. Pratt-Green, and B. Lucas

26. Site specificity of avian Cryptosporidium sp.
D.S. Lindsay, B.L. Blagburn, and J.A. Ernest

27. Resistance to Ascaris suum infection in pigs induced by post-migration larvae.
T.B. Stewart and T.J. Rowell

28. Evaluation of ivermectin as a microfilaricide in Dirofilaria immitis infected dogs.
A.J. Paul, K.S. Todd, Jr., J.A. DiPietro, and J.J. Liu

29. Use of ELISA to detect serum antibodies against avian coccidia.
M.D. Ruff and M.B. Chute

30. Use of hybridoma antibodies in the study of host cell interaction with Eimeria sporozoites.
H.D. Danforth and P.C. Augustine

31. The inhibition of growth and development of Ascaris suum larvae in vitro by proline analogs.
R. Fetterer and J. Urban

32. Combined effects of feeding stimulants and inhibitors on in vitro ingestion by Trichostrogylus colubriformis.
L.W. Bone and K.P. Bottjer

33. Combined effect of feeding stimulants or inhibitors and anthelmintics on in vitro ingestion by Trichostrongylus colubriformis.
K.P. Bottjer and L.W. Bone

34. Comparison of helminth larval counts from adult and immature horses over two grazing seasons.
T.J. Kennedy and D.J. Bruer

35. Experimental Fascioloides magna infection in calves.
B.E. Stromberg, G.A. Conboy, D.W. Hayden and J.C. Schlotthauer

36. Influence of fenbendazole treatment on yearling steers with pre-type II Ostertagiasis.
G.L. Zimmerman, D.W. Weber, G.H. Myers, M.J. Nelson, C.R.B. Clark, and T. Brundage

37. Cuticular ridge patterns separate Haemonchus contortus of sheep from H. placei of cattle.
J.R. Lichtenfels, P.A. Pilitt, and L.F. LeJambre

38. Moniezia spp. in Cattle and Sheep in Wyoming.
R.C. Bergstrom

39. Dye-sensitized photo-oxidation of ovine gastrointestinal nematode larvae.
M.B. Smith and M.C. Healey

40. Equine Dermatitis Associated with Black Fly (Simuliidae) Infestation.
F.L. Anderson and M.G. Shupe

SESSION 4: TREMATODES
Moderator: G.L. Zimmerman

41. 4:00 The guinea pig as a model for Fascioloides magna infection in sheep.
G.A. Conboy, B.E. Stromberg, and D.W. Hayden

42. 4:15 Clorsulon efficacy against naturally occurring Fasciola hepatica in cattle as compared with albendazole.
R.L. Kilgore, M.L. Williams, G.W. Benz, and S.J. Gross

43. 4:30 Activity of SCH 32481 against gastrointestinal nematodes in yearling heifers and Fasciola hepatica in sheep.
L.S. Richards, G.L. Zimmerman, D.W. Weber, S.D. Dawley, M.J. Nelson, and C.R.B. Clark

PRESIDENTIAL ADDRESS

44. 4:45 Brainstorms on rainstorms and Louisiana snailforms - liver flukes in cattle.
J.B. Malone - President AAVP

5:05 BUSINESS MEETING

6:00 SOCIETY SOCIAL HOUR

Tuesday, July 23

SESSION 5: CHEMOTHERAPY
Moderators: S.D. Folz and G.H. Myers

45. 8:00 AM Efficacy of SCH 32481 (Schering Corp.) against inhibited larvae of Ostertagia ostertagi.
J.C. Williams, J.W. Knox, K.S. Marbury, M.D. Kimball, E.R. Willis, T.G. Snider, and J.E. Miller

46. 8:15 Efficacy of oxfendazole as administered to cattle by intraruminal injection.
B.L. Presson and T.A. Yazwinski

47. 8:30 Late season nematode aquisition by calves previously treated with the Paratect bolus.
T.A. Yazwinski, B.L. Presson, T.J. Newby, and H.E. Featherstone

48. 8:45 The antistrongyle activity of a propylene glycol-glycerol formal based formulation of ivermectin in horses.
J.A. DiPietro, K.S. Todd, Jr., and V. Reuter

49. 9:00 Comparative efficacies of VET 220 (Dienbendazole, prop. nom) and ivermectin against immature Parascaris equorum resulting from experimental infection of pony foals.
T.R. Bello

50. 9:15 Determination of rate and efficiency of gain of pigs following infection with Ascaris suum and anthelmintic treatment.
J.F. Urban and N.C. Steele

51. 9:30 Parasitism and production of once-daily suckling calves: effects of anthelmintic medication.
H. Ciordia and J.A. Stuedemann

52. 9:45 PRO-SPOT (fenthion) solution for control of fleas on dogs.
R.G. Arther and D.D. Cox

10:00 COFFEE BREAK

53. 10:30 Mitaban liquid concentrate: a tick and flea repellent and tick detachment drug.
S.D. Folz, K.A. Ash, G.A. Conder, and D.L. Rector

54. 10:45 Residual efficacy of a new class of pyrethrin flea and tick control products.
T.A. Miller

SESSION 6: VETERINARY ENTOMOLOGY SYMPOSIUM
Moderator: J.A. Hawkins

55. 11:00 The significance of ticks in cattle production in the United States.
J.A. Hair - Professor of Entomology, Oklahoma State University

56. 11:15 An update on horn fly pyrethroid resistence.
D.C. Sheppard - Associate Professor of Entomology, Coastal Plains Experiment Station, University of Georgia

57. 11:30 Tick-borne spotted fever in the United States.
B.R. Norment - Professor of Entomology, Mississippi State University

12:00 PM LUNCH

SESSION 7: PROTOZOA
Moderators: C.R. Sterling and M.D. Ruff

58. 1:00 KEYNOTE ADDRESS - Prevention of Toxoplasmosis by hygienic means and vaccination.
J.K. Frenkel - Professor of Pathology and Oncology, University of Kansas Medical Center

59. 1:30 Toxoplasma - induced abortions in sheep in Maryland.
J.P. Dubey, S. Miller, E.C. Powell, and W.R. Anderson

60. 1:45 Cryptosporidium infections detected by direct immunofluorescence using a monoclonal antibody recognizing an oocyst determinant.
M.J. Arrowood and C.R. Sterling

61. 2:00 Host specificity of avian Cryptosporidium sp.
B.L. Blagburn, D.S. Lindsay, and J.A. Ernest

62. 2:15 Measurement of antibody response to experimentally induced Eimeria bovis and E. zuernii infection in calves by enzyme linked immunosorbent assay.
H. Saatara Oz, B.E. Stromberg, W.J. Bemrick, and H.H. Oz

63. 2:30 A quantitative study of coccidia of beef calves from the coastal plains area of Georgia.
J.V. Ernst and T.B. Stewart

64. 2:45 Treatment of bovine trichomoniasis with Ipronidazole.
J.M. Cheney, L. Ball, R.G. Mortimer, and C.K. Kimberling

3:00 COFFEE BREAK

SESSION 8: EXPERIMENTAL AND CLINICAL STUDIES II
Moderators: T.A. Yazwinski and H. Ciordia

65. 3:15 Characterization of horn fly induced equine dermatitis and its potential relationship to onchocerchiasis.
L.D. Foil, T.R. Klei, R.F. Miller, C.S. Foil, D.D. French

66. 3:30 The antifecundity effect on Trichinella spiralis in immune pigs.
H.P. Marti and K.D. Murrell

67. 3:45 Immunization of swine against Trichinella spiralis using ES antigens.
H.R. Gamble and K.D. Murrell

68. 4:00 Local and systemic blastogenic responses of cattle to infection with Ostertagia ostertagi.
L.C. Gasbarre

69. 4:15 Potential antigens for serodiagnosis of bovine cysticercosis.
E. Sollo, M. Rhoads, K.D. Murrell, and K.J. Lindquist

70. 4:30 Detection and assessment of subclinical lungworm infection in calves by fecal analysis, hematological changes, biochemical profiling and scanning electron microscopy.
F.M. Seesee and D.E. Worley

71. 4:45 Strategic control of strongyles in ponies with ivermectin in Ontario.
J.O.D. Slocombe

Wednesday, July 24

Las Vegas Convention Center, East Meeting Rooms, Room N2

SESSION 9: VETERINARY PROTOZOOLOGY - UPDATE*
Moderator: B.E. Stromberg

72. 8:30 Treatment and control of coccidiosis in food profucing animals.
John V. Ernst

73. 9:00 Coccidiosis in companion animals: a clinical impression.
William D. Schall and Janet A. Grace

9:30 Discussion and break

74. 10:00 The importance of Sarcocystis to animals and humans.
Ronald Fayer

75. 10:30 Cryptosporidium: is the veterinarian at risk?
William L. Current

76. 11:00 Toxoplasma: update on public health significance.
Jacob K. Frenkel

*Cosponsored by the American Association of Veterinary Parasitologists and the American Veterinary Medical Association

2. A NEW TEST FOR DETECTING ANTHELMINTIC RESISTANT NEMATODES. D.J. GIORDANO*, G.C. COLES, J.P. TRITSCHLER II and A.L. SCHMIDT. Dept. of Veterinary and Animal Sciences and of Zoology, University of Massachusetts, Amherst, MA. 01003

Two strains of Haemonchus contortus, a cambendazole (CBZ) susceptible strain (BPL) and a CBZ resistant strain (CR - Kates, Colglazier and Enzie), were compared using both benzimedazole and nonbenzimedazole anthelmintics. The eggs were separated from sheep feces using standard saturated sucrose centrifugation and collected onto a 38 or 45 micron sieve. The collection was diluted with water and Escherichia coli to about 100 eggs/ml. The E. Coli was prepared from the centrifuged pellet of E. coli inoculated EC broth or from lyophilized cells. One ml of this solution was added per well to multiple well culture plates and incubated at room temperature. The anthelmintics were prepared so that 5 ul aliquots were added to the one ml eggs and E. coli solution to obtain the desired concentrations. The anthelmintics were added 24 hrs after the original solution. Larval growth and development were evaluated 4-6 days later. A benzimedazole egg hatch test was conducted for comparison. In general, the larval test is not as sensitive to time of egg collection and storage as the egg hatch test. Unlike the egg hatch test, the larval test appears to work with nonbenzimedazole anthelmintics. The preliminary results show that the ratio of lethal concentrations for 50% mortality for the resistant strain to the susceptible strain was greater for the larval test, suggesting that it is a more sensitive measure of benzimedazole resistance.

3. ANTHELMINTIC RESISTANT STRAIN OF Haemonchus contortus IN THE LSU RESEARCH SHEEP FLOCK. J.E. MILLER,*, F.G. HEMBRY, D SIMS, L STAGG. Department of Epidemiology and Community Health, School of Veterinary Medicine and Department of Animal Science, Louisiana State University, Baton Rouge, LA.

Anthelmintic resistant strains of Haemonchus contortus have been reported from various regions of the world. Resistance to thiabendazole is well known and has been reported in the U.S. Thiabendazole has not been very effective in the LSU research sheep flock for a number of years; therefore, levamisole has been used for nematode control. The efficacy of levamisole has been in doubt recently. A study was initiated to evaluate the effectiveness of 4 anthelmintics administered to mature ewes in each of 4 groups (20 animals each) throughout the summer season. Levamisole, fenbendazole, and morantel tartrate initially reduced egg counts, but by summer's end egg counts were as high after treatment as they were when the study began. Ivermectin treated animals had essentially 0 egg counts throughout the summer, except after the last treatment when 18 of the 20 animals had positive counts. A follow-up critical study was conducted to evaluate the efficacy of levamisole in naturally infected lambs. Five lambs were treated with levamisole and 5 were left as controls. Egg counts and total worm counts were not reduced with treatment.

These studies show that levamisole, and probably fenbendazole and morantel tartrate, have limited effectiveness in controlling H. contortus in the LSU research sheep flock. The marked increase in the number of positive egg counts after the last ivermectin treatment may be an indication of limited future potential of this anthelmintic in the LSU flock.

4. SECRETORY/EXCRETORY CHEMOTACTIC SUBSTANCE FROM L_3 OF OSTERTAGIA OSTERTAGI ACCOUNTS FOR EOSINOPHIL LOCOMOTION P. H. KLESIUS*, T. B. HAYNES, D. A. CROSS AND H. CIORDIA. USDA, ARS, REGIONAL PARASITE RESEARCH LABORATORY, AUBURN, AL 36830

The infective larval (L_3) stage of Ostertagi ostertagia produced an excretory-secretory (E-S) substance that is chemotactic for bovine eosinophils. The eosinophil chemotactic substance was present in supernatants of L_3 cultures within 6 h of incubation in Eagle's Minimal Essential Medium containing 25 mM HEPES. Bovine eosinophils appeared to have a receptor for the chemotactic E-S substance which appeared identical or structurally similar to the previously described eosinophil chemotactic substance present in soluble L_3 extracts. The E-S substance of L_3 may cause eosinophil accumulation in the abomasal tissue of cattle with ostertagiasis.

5. Discovery of Nematodirus battus in Sheep in Oregon

E. P. Hoberg,[1] G. L. Zimmerman,[1] and J. R. Lichtenfels[2] [1]College of Veterinary Medicine, Oregon State University, Corvallis, Oregon. [2]Animal Parasitology Institute, Agricultural Research Service, USDA, Beltsville, Maryland

Nematodirus battus Crofton and Thomas, 1951 from sheep is reported for the first time in North America. Nematodes referrable to this species were recovered from the small intestine of sheep born and raised in the Willamette Valley of western Oregon. N. battus previously was thought to have a geographic distribution limited to the British Isles and smaller foci in Europe where it is recognized as a significant pathogen in lambs. The presence of this nematode, exotic to North America, is consequently of great importance. Specimens of N. battus can be distinguished from those of related species found in North America by a combination of characters. Diagnostic attributes include the structure of the synlophe in both sexes, the form of the copulatory bursa and terminal portion of the spicules in males, and the form of the tail in females. It is likely that N. battus in sheep will most often occur in mixed infections with N. filicollis and N. spathiger.

6. VACUUMING HORSE PASTURES: A NON-CHEMICAL APPROACH TO THE CONTROL OF HORSE PARASITES. R.P. HERD, DEPARTMENT OF VETERINARY PATHOBIOLOGY, THE OHIO STATE UNIVERSITY, COLUMBUS, OH 43210.

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

This approach provided highly effective parasite control, superior to that achieved by anthelmintic treatments. Concentrations of infective L3 on cleaned pasture reached a maximum of 1000 L3/kg, compared to 18,486 L3/kg for control pasture and 4850-10,210 L3/kg for anthelmintic treatment groups. The low pasture L3 counts on the cleaned pasture occurred even though the ponies in this group received no anthelmintic treatments and they had the highest mean fecal egg counts of all groups (peak 1722 epg).

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

7. ANTHELMINTIC USAGE BY NEW ENGLAND SHEEP FARMERS. J. P. TRITSCHLER II*, D. J. GIORDANO and G. C. COLES. Dept. of Veterinary and Animal Sciences and of Zoology, University of Massachusetts, Amherst, MA. 01003.

A postal survey of anthelmintic usage and farmers' drenching programs was conducted. Of about 2,000 surveys mailed, 665 valid responses were received from throughout New England and eastern New York. The farms averaged 35 lambs and 30 stock sheep. Only 46% of total lambs were grazed on summer pasture. While most producers (84%) indicated that they followed a predetermined drenching program, only 27.5% of the farmers had different programs for lambs and mature sheep. The most typical program was to worm sheep 2-4 times per yr. These times were usually around spring lambing, beginning of grazing season, middle to late grazing season and fall breeding season (end of grazing). Less than 4% of the producers used modern epidemiological drenching for lambs. The majority of producers (65%) alternated anthelmintics (78% of this alternation was within a calender year). Levamisole (82%) and thiabendazole (62%) were the anthelmintics most used. Anthelmintic resistance was indicated as a major problem with 35% of the producers ceasing to use at least one compound due to ineffectiveness. In general, those producers who stopped using an anthelmintic were larger and had distinct programs for lambs including more modern epidemiological drenching. In addition, they used more anthelmintics and were more likely to alternate compounds.

8. Canine Filariasis (Dirofilaria immitis, Dirofilaria repens, Dipetalonema spp.) in Italy - Historical and Epidemiological Perspectives. R. A. RONCALLI MERCK SHARP & DOHME RESEARCH LABORATORIES, RAHWAY, NJ 07065. P. TASSI University of Bari, Bari, Italy, 70126.

For more than a century Italian veterinarians, parasitologists (especially malariologists) and physicians have studied the etiology, epidemiology and clinical picture of dog filariasis. Dirofilaria immitis and D. repens have been identified in dogs from northern to southern Italy as well as in the islands of Sardinia and Sicily. The prevalence of these filarial worms in dogs raised in areas with rice paddocks, water canals, irrigated meadows and marshes is as high as 50%. The two Dirofilaria species are transmitted to dogs by a number of Culicidae. While the adults of D. immitis are generally found in the right atrium, right ventricle and the upper pulmonary arterial tree, the adults of D. repens occur in the subcutaneous tissue of dogs. Occasionally, some dogs can host both Dirofilaria spp. Dipetalonema spp have also been identified in dogs in Italy. Human subcutaneous and pulmonary filariasis attributed to D. repens and D. immitis, respectively, have also been reported in Italy, especially in areas where the prevalence of these two filarial worms in dogs is high.

9. Development and survival of larval Dirofilaria immitis implanted in diffusion chambers in syngeneic normal and immunized mice. D. ABRAHAM and R. B. GRIEVE.* School of Veterinary Medicine, University of Wisconsin-Madison, Madison, WI 53706.

Development of a rodent host for larval stages of Dirofilaria immitis would permit experimentation on the early stages of infection in a syngeneic host. Infective larvae were inoculated into diffusion chambers and implanted subcutaneously into C57Bl/6, DBA/2 and BALB/c mice. Chambers were recovered after two weeks and larval survival and development was assessed. Equivalent larval development and survival was observed among strains; BALB/c males were used thereafter. Larvae molted to the fourth stage and increased in length during a 3-week implantation period, though at a rate slower than that reported for infections in dogs. Mice were immunized with live larvae using a variety of infection regimens. The mice were then challenged with larvae implanted in diffusion chambers. Larvae recovered from immunized mice were of lengths equivalent to larvae recovered from normal mice. There was, however, a statistically significant decrease in larval survival in immunized animals.

10. EVALUATION AND USE OF COMMERCIALLY AVAILABLE SYSTEMS IN THE SERODIAGNOSIS OF OCCULT HEARTWORM DISEASE IN DOGS. T.W. SCHILLHORN VAN VEEN AND A.J. MURPHY. College of Veterinary Medicine, Michigan State University, East Lansing, MI 38824.

Serum samples were collected from dogs which were euthanized for other reasons at Michigan State University. The presence or absence of Dirofilaria immitis in the heart of pulmonary arteries, and of microfilariae in the peripheral blood, was determined.

These sera were used to test the accuracy of four commercially available systems for the detection of Dirofilaria antibody or antigen. The Dirocult™ system detected only 30% of the known occult cases, the Dirotect™ 65%, the Track XI™ 87% and the Filarochek™ 97%. All systems showed false positive results; the Filarochek™ very few, the Dirocult™ a substantial number.

The test results were influenced by laboratory procedure; hemolysed samples for instance showed lower titers.

It is recommended that diagnostic tests such as these heartworm antibody detection systems should be evaluated by independent laboratories before being marketed.

11. CONFIRMATION OF HEARTWORM PROPHYLAXIS WITH SINGLE DOSE IVERMECTIN AT ONE MONTH POSTINOCULATION BY SEROLOGY AND LATE NECROPSY. M.T. DZIMIANSKI*, J.W. McCall, L.S. BLAIR, R.L. SEWARD AND R.E. PLUE. COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF GEORGIA, ATHENS, GA AND MERCK AND COMPANY, INC., RAHWAY, NJ.

Fourteen Beagles from a commercial source were each given 30 infective larvae of Dirofilaria immitis and allocated to 2 groups containing 7 dogs each. One group served as a non-treated control and the other group was given ivermectin as a single oral dose of 3 mcg/kg at one month postinoculation (PI) of larvae. Serum samples were taken prior to infection and periodically throughout the experiment for characterization of the indirect fluorescent antibody (IFA) response using a commercially available test kit (Track XI, Daryl Laboratories, Santa Clara, CA). Approximately 5 months PI, 2 control and 2 treated dogs were euthanatized; and the remaining 10 dogs were held until 13.5 months PI. At necropsy, the 2 control dogs terminated early in the experiment had an average of 22.5 heartworms and those held for 13.5 months had an average of 18.6 heartworms per dog. No heartworms were recovered from any of the treated dogs. Thus, ivermectin was 100% effective in preventing infection even when at least a year was allowed for their development. At 5 months PI, all of the treated dogs were serologically negative for heartworms ($\bar{X}$ titer, 3; range, 0-6) while all of the control dogs were serologically positive and had relative high titers ($\bar{X}$, 233; range, 80-789).

12. SEROLOGICAL CHARACTERIZATION OF HEARTWORM ANTIBODY RESPONSE IN IVERMECTIN TREATED, LABORATORY-RAISED BEAGLES EXPOSED UNDER FIELD CONDITIONS. J.W. McCALL*, C. BAGSHAW, J. BROWN AND M.T. DZIMIANSKI. COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF GEORGIA, ATHENS, GA.

A commercially available ELISA test kit (Dirotect™, Mallinckrodt, Inc., Bohemia, NY) was used in subjective (visual scoring) and objective (Titertek® Multiskan spectrophotometer) monitoring of heartworm antibody response in dogs on a field trial where the efficacy of ivermectin was determined. Forty Beagles from a commercial source were allocated to 5 groups of 8 dogs each. Three groups were treated (per os) monthly at 0.3, 1.0 or 3.3 mcg/kg and 1 group was treated every other month at 1.0 mcg/kg. One group served as the non-treated control. Monthly treatment

at 1.0 mcg/kg or higher was 100% effective in preventing heartworm infection, but monthly treatment at 0.3 mcg/kg and treatment every other month at 1.0 mcg/kg were only partially effective. Serum samples were taken monthly beginning at 2 months after initial exposure and continuing until necropsy at 10 months. Antibody was detected in all groups of treated dogs and in non-treated dogs soon after exposure and by the fifth month, at least 5 of the 8 dogs in each of the treated and control groups were seropositive. No obvious differences in the incidence of seropositives were found between treated and control groups at any time during the course of the study. However, the magnitude of the antibody response was less in treated Beagles than in controls and decreased with increasing ivermectin dose levels.

13. Dirofilaria Surface Antigen Prep for the Enzyme-Linked Immunosorbent Assay Detection of Heartworm Infection. B. Ebinne , B. Packer*, R. Corwin, S. Pratt-Green, T. Green. Univ. of Missouri Columbia, *Temple University-Philadelphia.

Surface or cuticular antigens (exoantigens) obtained from Dirofilaria immitis microfilariae cultured in vitro in a protein-free medium were used for coating microtiter polystyrene wells for the enzyme-linked immunosorbent assay (ELISA) detection of circulating anti-D. immitis reactive IgG in dogs undergoing heartworm infection. With optimal serum dilutions set at 1:300, assays of serum samples from known microfilaremic and uninfected, healthy dogs showed good sensitivity and reactivity. There was a clear distinction between negative and positive samples tested, using the horseradish peroxidase conjugate (enzyme-immunoglobulin) system.

Exoantigens are less complex than the somatic antigens obtained from extracts of adult D. immitis currently used for coating microtiter ELISA plates. These complex somatic antigens may be responsible for the cross reactivity so prevalent with such methods. With the exoantigens more species-specific diagnosis of Dirofilariasis could be enhanced.

14. EPIDEMIOLOGY AND CONTROL OF GASTROINTESTINAL NEMATODES OF CATTLE IN VIRGINIA. J.W. HANSEN, BRIAN D. PERRY, AND ROB FREEMAN VIRGINIA-MARYLAND REGIONAL COLLEGE OF VETERINARY MEDICINE, VIRGINIA TECH, BLACKBURG, VA 24061

Eighteen dairy replacement heifers divided into two comparable groups were grazing on two comparable permanent pastures. Both groups received an anthelmintic treatment at the time of turning out (late April). One group also received anthelmintic treatment 3, 6, and 9 weeks after turning out.

Fecal egg output, serum pepsinogen levels and weight gain were determined every two weeks. Larval development, survival and availability of

infective larvae on herbage were monitored every week. Reproductive records were kept on all animals.

A significant difference was found in the seasonal parasite egg output, larval development, survival and availability of infective larvae on herbage between the two types of management. The non-treated group had a peak of fecal egg output early to mid-June followed by a peak of infective larvae on herbage one to two weeks later. Both parameters remained low for the treated group. A significant difference in weight gain was noticed in favor of the treated group. Breeding age was reached 58 days earlier in the treated group.

15. AN UPDATE ON THE HYPOBIOTIC CHANGES IN OSTERTAGIA OSTERTAGI DURING ENVIRONMENTAL ADAPTATION IN LOUISIANA. K.S. MARBURY*, J.C. WILLIAMS AND E.R. WILLIS. LOUISIANA STATE UNIVERSITY. BATON ROUGE, LA 70816.

The frequency and pattern of arrested development (hypobiosis) of Ostertagia ostertagi in cattle was studied over a two and one half year period to determine whether different inhibition patterns in the north and south are due to genetic differences in inhibition-proneness between parasite isolates or to a non-genetic mechanism of environmental adaptation.

To determine the degree of inhibition, separate one-acre pasture plots in a warm tropical climate region were contaminated by animals carrying an Ohio isolate or a Louisiana isolate of gastrointestinal nematodes. During the Fall of 1982, 1983, and 1984 and Spring of 1983 and 1984 three successive groups of parasite free calves were grazed on plots 14 days at three-week intervals. The tracer calves were killed for worm counts and identification 10 to 12 days after removal from pasture. Both groups showed little or no inhibition during the Fall studies. During the Spring of 1983 and 1984, 72% and 65% respectively, of the O. ostergati population aquired by tracer calves grazed on the Louisiana plots were inhibited during development; only 6% during 1983 and 3% during 1984 of the O. ostertagi population was inhibited in calves grazed on the Ohio plot.

16. TRICHINELLA SPIRALIS: ON-FARM TRANSMISSION. G. SCHAD, C. DUFFY, D. LEIBY, UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA: K. MURRELL, ANIMAL PARASITOLOGY INSTITUTE, USDA: AND E. ZIRKLE, NJ DEPARTMENT OF AGRICULTURE, TRENTON

An investigation conducted on a farm with high prevalences of trichinellosis in swine and rats, found that garbage was not a source of infection. Poor management resulted in death and the availability of swine carcasses for cannibalization, and samples from the carcasses contained Trichinella larvae, implicating cannibalism as the major route of transmission. However, rats also fed on these carcasses, and their infection rate increased dramatically during the first 5 months. To assess the relative importance of swine and rats in maintaining a high prevalence of infection on this farm, it was depopulated and restocked with uninfected, sentinel pigs. In the absence of cannibalism, sentinel pigs exposed to rats acquired infections rapidly, whereas sentinels with limited rat-exposure remained uninfected, suggesting that when rats are abundant and the prevalence of murine trichinellosis is high, predation

on rats can be as effective as cannibalization in maintaining a high prevalence of porcine trichinellosis.

17. EPIDEMIOLOGICAL SIGNIFICANCE OF INTRASPECIFIC BIOLOGICAL AND BIOCHEMICAL VARIATIONS IN TRICHINELLA SPIRALIS. K.D. MURRELL[1], T.A. DICK[2], F. STRINGFELLOW[1], J. DAME[1], AND G.A. SCHAD[3]. ANIMAL PARASITOLOGY INSTITUTE, ARS, USDA, BARC-E, BELTSVILLE, MD 20705[1]; DEPARTMENT OF ZOOLOGY, UNIVERSITY OF MANITOBA, WINNIPEG, R3TN2[2]; SCHOOL OF VETERINARY MEDICINE, UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA 19104[3].

The importance of sylvatic strains or isolates of Trichinella spiralis as a reservoir for swine trichinosis is not clearly understood. Some, but not all, isolates of T. spiralis from wild animals have been experimentally shown to have poor infectivity for swine. Laboratory investigations have revealed that there are important genetic differences among various sylvatic isolates and that the systematics of Trichinella is far from settled. In an attempt to clarify this with regard to the epidemiological importance of sylvatic T. spiralis, isolates from a number of infected bears, foxes, raccoons, an opossum, a skunk, an isolate of T. pseudospiralis, and isolates from domestic pigs from the United States and Thailand were evaluated for their infectivity to pigs and for their genetic diversity by isoenzyme analysis and DNA hydridization technics. The isolates varied markedly in their infectivity for swine. Only two of nine isolates from black bears, two isolates from raccoons, and isolates from the skunk and opossum had infectivity indices comparable to that of domestic pig isolates. In a cross-infection experiment, it was found that an isolate from a pig was poorly infective for foxes. Isoenzyme and DNA hybridization studies are in progress, but results suggest that those isolates with high infectivity for pigs share similar enzyme profiles.

18. PATTERN OF HELMINTH EGG COUNTS IN PASTURED HORSES OVER TWO GRAZING SEASONS. Viviani C. Gutierres, D.V.M., Ph.D., and T.J. Kennedy, Ph.D., AEF Research Inc., Waunakee, WI.

The pattern of helminth egg counts in pastured horses was observed over two grazing seasons (1983-1984) in two different geographic areas, Wisconsin and Alabama. Forty naturally infected horses in each area were allocated randomly into two treatment groups according to infection degree and weight and placed in similar pastures grazed previously by parasitized horses. One group received pyrantel tartrate at the rate of 2.64 mg/kg body weight daily during the duration of the two grazing seasons. In Wisconsin the treated and control groups exchanged pastures for the second grazing season. To assess the helminth egg output, fecal worm egg counts were performed at 4-weeks intervals during the study. Supplemental grain and/or forage was given to the animals to compensate for low herbage availability. Increase in helminth egg production was observed in Wisconsin horses in both years 3-4 months after being turned out to pasture, although the peak egg counts occurred in April. Alabama horses showed a different pattern in helminth egg counts. The highest egg production was observed in the fall of the second grazing season. During the rest of the study the fecal worm egg counts showed less

monthly fluctuation. Both treated groups showed very low or negative worm egg counts during the entire study, with a noticeable rise in December of the first grazing season. The influence of climatic factors (temperature and humidity), time of foaling, animal management and treatment will be presented.

19. HELMINTH POPULATIONS IN NATURALLY PARASITIZED GRAZING FOALS IN WISCONSIN AND ALABAMA R.M. McCORMICK, PFIZER, INC., LEE'S SUMMIT, MO AND T.J. KENNEDY, AEF RESEARCH INC., WAUNAKEE, WI

Two studies were conducted with foals over two foaling seasons to investigate the effect of a daily prophylactic anthelmintic treatment on helminth populations in naturally parasitized grazing foals. Treatment one received no anthelmintic during the grazing season and treatment two received pyrantel tartrate at 2.64 mg/kg body weight on a daily basis, either as a top-dress or in a complete feed. Six foals from each treatment group were sacrificed each year for determining their worm burdens and species. Seventeen species of cyathostominae were recovered. Other internal parasites including large strongyles, Oxyuris equi and Parascaris equorum were recovered. The daily administration of pyrantel tartrate reduced the overall helminth populations by more than 98%.

20. The periparturient rise in fecal egg counts in three strains of Florida native ewes and its value in predicting subsequent resistance of their lambs to Haemonchus contortus. C. H. Courtney, R. Gessner, S. R. Sholz, and P. E. Loggins.

Significant ($P < 0.05$) differences in the magnitude of the periparturient rise in fecal egg counts (PPR) occurred in ewes of 3 strains of Florida Native sheep during the period 4 to 10 weeks after lambing. Nonlambing ewes (n=12) and lactating University strain ewes (n=31), a strain selected over a 26 year period for parasite resistance by survival at pasture without anthelmintic treatment, had lower fecal egg counts than either Maxcy strain ewes (n=17), a commercial strain treated regularly with anthelmintics, or Backlinie strain ewes (n=16), a strain of Florida Native sheep that had some crossbreeding to Hampshire and Suffolk in their genotype and were regularly treated with anthelmintics. Whereas both Maxcy and Backlinie ewes showed a pronounced PPR, none occurred in nonlambing ewes (n=12) and the slight rise in fecal egg counts observed in University ewes was not significantly different from that of the nonlambing ewes. Backlinie ewes having twin lambs (n=5) had a higher PPR than Backlinie ewes with single lambs (n=11) or Maxcy ewes with single lambs (n=15), but all 3 groups had higher PPRs than University ewes with single lambs (n=27). No differences occurred in fecal egg counts of nonlambing ewes regardless of strain, and 6 weeks after weaning fecal egg counts of all ewes were uniformly low, regardless of whether they had lambed or not and regardless of strain.

Ram lambs born to these ewes showed no significant strain differences in Haemonchus contortus burdens after experimental infection, deworming with levamisole and reinfection, although University lambs (n=13) had lowest mean worm burdens at necropsy (2437) followed by Maxcy lambs (n=12, mean = 3106) and Backlinie lambs (n=13, mean = 3670). There was

no significant correlation between worm burdens in these lambs and the magnitude of the PPR in their dams. Ten to 16 weeks after turn out to pasture, ewe lambs (n = 13) born to University ewes and grazing contaminated pastures after weaning had significantly lower ($P < 0.01$) fecal egg counts than similar ewe lambs (n=8) born to Backlinie ewes. Prior to this time differences were not significant and egg counts were uniformly low. The magnitude of the PPR in their dams was not significantly correlated with fecal egg counts of individual ewe lambs.

The PPR is reduced by selection of sheep for parasite resistance, and strain differences in parasite resistance are expressed primarily during lactation in ewes. Although slight strain differences in parasite resistance was present in lambs, it could not be correlated with the magnitude of the PPR in their dams.

21. POPULATION DYNAMICS OF TRICHOSTONGYLID NEMATODES IN PREGNANT AND NON-PREGNANT FLORIDA NATIVE AND DORSET/RAMBOUILLET EWES. A.M. ZAJAC AND R.P. HERD. DEPARTMENT OF VETERINARY PATHOBIOLOGY, THE OHIO STATE UNIVERSITY, COLUMBUS, OHIO 43210.

The absence of a periparturient egg rise has been observed in several exotic sheep breeds, including the Florida Native. To determine if this variation in the periparturient rise can be related to differences in the behavior of worm populations during pregnancy, trichostrongylid parasite populations were measured in both parasite resistant ewes and susceptible domestic breed sheep through gestation. Forty-six Dorset/Rambouillet cross (25 pregnant, 21 open) and 20 Florida Native (8 pregnant, 12 open) ewes were grazed on naturally-infected pasture in the fall. Animals were housed in December and maintained under conditions preventing further infection until the completion of the experiment in June. Pregnant and open ewes of both breeds were killed at approximately 60 and 120 days of gestation and approximately 6 weeks following lambing. Total worm counts performed on ewes showed that Dorset/Rambouillet sheep had consistently higher mean parasite burdens than Florida Natives at all intervals. Differences within the two breeds between pregnant and open ewes were less marked. Mean fecal egg counts throughout the experiment were also lower in both pregnant and non-pregnant Florida Natives than in Dorset/Rambouillet ewes.

22. Altered Nematode Prevalence Following Three Consecutive Years of Paratect Bolus Administrations at the Same Pasture Location T.A. YAZWINSKI*, B.L. Presson, H. Featherstone, T.J. Newby, T. Greenway and H. Holtzen, Department of Animal Sciences, University of Arkansas, Fayetteville, Arkansas 72701

For three consecutive grazing seasons, pastures grazed by Paratect-treated and control calves have been maintained at the University of Arkansas. Despite dramatic bolus-dependent reductions in fecal nematode ova counts and overall worm burden acquisitions by tracer and principal animals, certain nematode infections have endured the environmental and anthelmintic attrition. Trichostrongylus and Cooperia spp. infections have proven readily controlled by strategic Paratect use, with both principal and tracer calf burdens reduced by 90%. Conversely, in the

terminal group of tracer calves used, the animals allowed to graze the Paratect pasture had higher Nematodirus ($P < .01$) and Haemonchus ($P < 0.1$) spp. burdens than did their control pasture counterparts. Although consistently lower in the Paratect than control animals, reductions of Ostertagia spp. principal animal burdens have gone from 70.1% for the first year to 51.2% for the third year. In addition, tracer calf burdens have reflected this trend. Nematode ability to at least temporarily circumvent the effects of slow-release morantel therapy is seen to embrace the histotropic nature of larvae (Ostertagia), the late summer optimal transmission (Haemonchus) and the long-term survival of extra-host stages (Nematodirus).

23. DRUG RESISTANCE IN FLUKES, G.C. COLES, ZOOLOGY DEPT., UNIV. OF MASSACHUSETTS, AMHERST, MA. 01003-0027

A novel in vitro method for selecting for drug resistance in trematodes of veterinary importance has been used with the human fluke, Schistosoma mansoni, a species in which occasional cases of resistance has been reported in the field (Brazil). A Puerto Rican strain that has been in the laboratory for many years was examined. Large numbers of schistosomules were prepared, cultured in vitro in Schistosomicides for 3 days and then innoculated into mice. Drug levels were selected that permitted only a few adult schistosomes to develop from the 20,000 - 40,000 schistosomules that were injected into each mouse (normal lethal dose is 100-150 schistosomules). Eggs from worms that developed were used to infect snails and resulting cercariae to infect mice. The response of the selected strain was then compared with the original strain in chemotherapeutic trials. Changes in response were detected to 3 out of 5 unrelated drugs examined indicating genes conferring some resistance to these different drugs were present in the laboratory strain of flukes. This method avoids repeated passage of parasites in drug treated animals, and could be adapted for selection of resistant Fasciola or nematodes.

24. Dose-Titration of Fenbendazole in Chickens, L.M. POTE* and T.A. Yazwinski, Department of Animal Sciences, University of Arkansas, Fayetteville, Arkansas 72701

Sixty birds, experimentally infected with Ascaridia galli, Heterakis gallinarum and Capillaria obsignata, were divided into 4 groups of 15 birds per group, and given fenbendazole in the diet at the levels of 180 ppm (1 day), 60 ppm (3 days), 30 ppm (6 days) and 0 ppm (continuous). Treatments were initiated at patency. Birds were necropsied 4-5 days after medication withdrawal. For all medicated birds, A. galli levels were reduced by 100%. For the 180, 60 and 30 ppm groups, H. gallinarum levels were reduced by 98.4, 100 and 100%, respectively. In the same order, C. obsignata counts were reduced by 74.6, 90.8 and 99.2%. No adverse reactions were noted in any of the birds receiving fenbendazole. All diets were readily consumed. Rates of fenbendazole actually consumed per bird during the treatment periods were 16.35, 14.66 and 11.61 mg/kg for the 180, 60 and 30 ppm diets, respectively.

25. Parasitism in Overwintering Cattle in Missouri (R. Corwin, C. Wise, S. Pratt-Green, B. Lucas

In 1984-85, emphasis in our studies in Missouri shifted from beef cow-calf gastrointestinal nematode parasitism to that of stocker calves (weanlings - yearlings). Three study sites were selected with 26 and 30 yearling calves in 2 summer studies and 30 weanling calves in the overwintered group. The purpose for the overwintering study was to ascertain the possibility of an arrested state of Ostertagia in the winter (northern type) in addition to that which occurs in summer (April-July) as has been previously described. Worm burdens, egg counts, weights of calves, and weather data will be presented.

26. Site Specificity of Avian Cryptosporidium sp DAVID S. LINDSAY, BYRON L. BLAGBURN AND JAMES A. ERNEST. DEPARTMENT OF PATHOLOGY AND PARASITOLOGY SCHOOL OF VETERINARY MEDICINE, AUBURN UNIVERSITY

Nine, 2-day-old chicks were inoculated orally with 4×10^5 oocysts of avian Cryptosporidium sp., and seven, 2-day-old chicks were inoculated intra-tracheally with 8×10^5 oocysts. Beginning 4 days post-inoculation (PI), birds were killed at daily intervals by cervical dislocation. The following tissues were removed from each bird, processed by routine histological procedures, and examined for developing stages of Cryptosporidium sp.: lung, trachea, air sacs, liver, pancreas, duodenum, jejunum in the region of the yolk sac diverticulum, cecae, bursa of Fabricius, and cloaca.

Two of the 9 birds inoculated orally had developing stages of Cryptosporidium in their tracheae, whereas the 7 chicks inoculated intra-tracheally harbored developing stages in the air sacs, bronchi, bronchioles and tracheae. The mode of inoculation did not influence the distribution of Cryptosporidium within the digestive tract. Developing stages were found in the bursa of Fabricius and cloaca of all chicks and occasionally in the terminal colon regardless of the route of inoculation. Parasites were not found in any of the other organs that were examined.

27. Resistance to Ascaris suum infection in pigs induced by post-migratory larvae. T.B. Stewart and T.J. Rowell. Department of Veterinary Microbiology and Parasitology, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA.

Two groups of pigs were given 3 vaccinating doses of Ascaris suum post-migratory larvae by mouth 11 days apart. Pigs in one of the latter groups were given fenbendazole on days 8, 9, and 10 after each infection. A third group of pigs was the uninfected-nontreated controls. All pigs were challenged with 100 A. suum eggs on the 40th day of the experiment and necropsied 32 days later. Control pigs had a total of 169 worms, all except one derived from the challenge infection. Infected-fenbendazole treated pigs had a total of 61 worms, all derived from the challenge infection. Infected-nontreated pigs had a total of 103 worms, all except four derived from the vaccinating infections.

Termination of A. suum infections with fenbendazole after the molt of L_3 to L_4 reduced the number of worms developing in pigs from challenge infections by 64% compared to the number of worms in challenge-only pigs. Allowing post-migratory larvae to develop and/or the presence of adult A. suum in the intestine prevented development of 98% of worms from challenge infections compared to the number of worms from challenge-only pigs.

28. EVALUATION OF IVERMECTIN AS A MICROFILARIACIDE IN DIROFILARIA IMMITIS -INFECTED DOGS A.J. PAUL*, K.S. TODD, J. DIPIETRO, AND F. LIU DEPARTMENT OF VETERINARY PATHOBIOLOGY, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, ILLINOIS

The study was conducted to assess the efficacy, safety and acceptability of ivermectin when administered to dogs naturally infected with Dirofilaria immitis. Thirty-two mature dogs with patent heartworm infections were grouped by sex and placed into eight replicates of four dogs each. Within each replicate, the dogs were randomly allocated into different treatment groups. Group 1 served as unmedicated controls, Groups 2-4 received ivermectin orally at 2 mcg/kg, 10 mcg/kg and 400 mcg/kg respectively. Three treatments were administered at monthly intervals. Blood samples were drawn and microfilaria counts performed 5 days before treatment and 1, 3, 7, and 14 days after treatment. No adverse reactions were noted. Microfilaria counts were markedly or completely suppressed in dogs receiving the 400 mcg/kg dosage while no effect and some suppression were observed in microfilaria counts in the dogs receiving the 2 mcg/kg and 20 mcg/kg levels respectively.

29. USE OF ELISA TO DETECT SERUM ANTIBODIES AGAINST AVIAN COCCIDIA. M.D. Ruff* AND M.B. CHUTE. U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, ANIMAL PARASITOLOGY INSTITUTE, BELTSVILLE, MARYLAND 20705.

A technique was developed to measure serum antibodies produced by chickens in response to coccidiosis. The test used soluable antigen recovered from sporulated oocysts. Serum antibody levels were highest in chickens immunized by oral inoculation with oocysts of the same species as the antigen source. There was some cross-reaction with serum fro chickens immunized with a different species. The level of antibody increased with time after inoculation and number of inoculations.

30. USE OF HYBRIDOMA ANTIBODIES IN THE STUDY OF HOST CELL INTERACTION WITH EIMERIA SPOROZOITES. H. D. DANFORTH AND P. C. AUGUSTINE. U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, ANIMAL PARASITOLOGY INSTITUTE, BELTSVILLE, MARYLAND 20705.

Two hybridoma antibodies (HAb) that labeled the surface of Eimeria sporozoites were used to study cultured host cell-parasite interaction. Both HAb produced a surface immunofluorescent antibody (IFA) pattern on glutaraldehyde-fixed sporozoites, but one HAb (E5) demonstrated a

uniform surface IFA pattern while the other HAb (A6) gave an IFA pattern of scattered points of fluorescence. Similar types of labeling patterns were seen ultrastructually with glutaraldehyde-fixed sporozoites treated with HAb and ferritin (Fe) conjugate: Following host cell inoculation, extracellular sporozoites fixed before treatment with HAb, A6, and Fe conjugate, were heavily labeled, but no label was seen on intracellular parasites or on the intracellular pellicle of those sporozoites penetrating the host cells. The same type of Fe labeling was seen on extracellular parasites pretreated with the HAb and Fe conjugate at 4C, but the Fe label of those sporozoites penetrating cells appeared to be scraped off at the point of entry. No Fe label was seen on the intracellular sporozoites. The extra- and intracellular sporozoites exposed to HAb E5 and Fe conjugate before fixation had no label on the pellicle. These results indicate that the parasites either shed or lost the label during penetration and movement through the host cell.

31. THE INHIBITION OF GROWTH AND DEVELOPMENT OF ASCARIS SUUM LARVAE IN VITRO BY PROLINE ANALOGS. R. FETTERER AND J. URBAN. ANIMAL PARASITOLOGY INSTITUTE, ARS, USDA, BARC-E, BELTSVILLE, MD 20705

The cuticle of parasitic nematodes have collagen-like proteins as major biochemical constituents. These proteins are rich in proline and hydroxyproline and poor in aromatic amino acids. Structural analogs of proline, such as azetidine-2-carboxylic acid (AZ) and dehydro-L-proline (DHP), prevent collagen synthesis in a variety of vertebrate tissues. Because proline is an important component of nematode collagen the effects of proline analogs on growth and development of A. summ larvae were examined. The proline analogs AZ and DHP inhibited the in vitro growth and development of 3rd stage Ascaris suum larvae at concentrations as low as 0.5 mM. The effects of AZ on nematode growth were antagonized by addition of proline to culture media. The incorporation of ^{3}H-proline but not ^{3}H-tryptophan into A. suum cuticle was prevented by AZ. These results suggest that the proline analogs (AZ and DHP) exert their inhibitory effects on growth and development of A. suum larvae by a specific antagonism of proline which results in a disruption of normal cuticle synthesis.

32. COMBINED EFFECTS OF FEEDING STIMULANTS AND INHIBITORS ON IN VITRO INGESTION BY TRICHOSTRONGYLUS COLUBRIFORMIS. L. W. BONE* AND K. P. BOTTJER. USDA, ARS, REGIONAL PARASITE RESEARCH LABORATORY, AUBURN, AL 36830.

Feeding in vitro by the sexes of Trichostrongylus colubriformis was stimulated similarly by millimolar ratios of histamine and serotonin or histamine and dopamine, but not dopamine and serotonin. Concentrations of the feeding inhibitor octopamine reduced the stimulatory effect of histamine, serotonin and dopamine on feeding stimulants decreased the inhibitory action of octopamine. Serum from an immune host reduced the stimulation of nematode feeding by histamine, dopamine or serotonin, but not the inhibition of feeding that was caused by octopamine. Elevated concentrations of histamine, dopamine and serotonin decreased the feeding inhibition of immune serum. The results indicate that feeding by nematodes may reflect the chemical ecology of their microenvironment.

33. COMBINED EFFECT OF FEEDING STIMULANTS OR INHIBITORS AND ANTHELMINTICS ON IN VITRO INGESTION BY TRICHOSTRONGYLUS COLUBRIFORMIS. K. P. BOTTJER* AND L. W. BONE. USDA, ARS, REGIONAL PARASITE RESEARCH LABORATORY, AUBURN, AL 36830

In vitro and in vivo feeding by the sexes of Trichostrongylus colubriformis is altered by exposure of the nematodes to selected anthelmintics, or stimuli, such as biogenic amines and serum. Treatment of the nematodes with piperazine (1 mg/ml), ivermectin (1 ug/ml), oxfendazole (10 ug/ml) or tetramisole (0.5 ug/ml) reduced the stimulatory effect of dopamine on in vitro feeding by the nematode. Dopamine stimulated worm feeding after treatment with levamisole (10 ug/ml) or thiabendazole (5 ug/ml). Histamine induced feeding by nematodes was inhibited by tetramisole, piperazine, oxfendazole and thiabendazole but not ivermectin. The inhibition of nematode feeding associated with exposure to the biogenic amine octopamine was absent after anthelmintic treatment of the worms. Serum from immune hosts further reduced the nematodes' feeding after treatment with anthelmintics.

34. COMPARISON OF HELMINTH LARVAL COUNTS FROM ADULT AND IMMATURE HORSES OVER TWO GRAZING SEASONS. T. J. KENNEDY, Ph.D., Dixie J. Bruer, AEF Research Inc., Waunakee, WI.

Comparisons were made of fecal larvae counts from treated and nontreated horses over two grazing seasons, 1983-1984, in Wisconsin and Alabama. At each location, after allocation of forty mares to 2 groups based on body weights and degree of helminth infection, horses were allowed to graze equivalent pastures that had been used previously by parasitized horses. One group at each site received 2.64 mg/kg/day of pyrantel tartrate. In Wisconsin, the two groups exchanged pastures for the second grazing season. Rectal fecal samples, obtained every 28 days throughout the study were cultured to obtain infective larvae. Larvae collected by Baermannization were identified as small strongyles or to species from the genus Strongylus. Larval recovery as a percentage of fecal egg counts was rather constant throughout the year. Alabama larvae counts increased three to four months after the start of the grazing season, tapered off in summer (July) then peaked in late spring (MAR-APR). In Wisconsin, larvae counts peaked in MAR & APR and were practically zero in Aug-Oct. There were differences in the genera observed at various times throughout the year.

35. EXPERIMENTAL FASCIOLOIDES MAGNA INFECTION IN CALVES. B.E. STROMBERG, G.A. CONBOY, D.W. HAYDEN AND J.C. SCHLOTTHAUER. UNIVERSITY OF MINNESOTA, COLLEGE OF VET. MED., ST. PAUL, MN 55108.

Experimental infections with Fascioloides magna in four-week-old bull calves were monitored for 6 months post inoculation. There were no differences in weight gains between these and the uninoculated control calves. Complete blood counts showed a significant increase only in the number of eosinophils after the third week. Serum collected biweekly from the infected calves demonstrated significant but inconsistant increases in the levels of sorbitol dehydrogenase and glutamyl trans-

ferase activity. The infected calves demonstrated a significant increase in antibody levels to whole fluke extract in an ELISA, three weeks post infection. Peripheral blood lymphocytes were collected biweekly and were cultured to evaluate their ability to undergo blastogenesis in response to fluke antigen or mitogens. The responses (stimulation ratio) to the antigen were generally higher than for controls and there were no differences in the mitogen controls. On necropsy 1 to 32 flukes were recovered from the liver and peritoneal cavity. The flukes were generally encapsulated and in pairs. Fluke eggs were found in the contents of the capsules, but no fluke eggs were recovered from the feces.

36. The Influences of Fenbendazole Treatment on Yearling Steers with Pre-Type II Ostertagiasis. G. L. Zimmerman[1], D. W. Weber[2], G. H. Myers[3], M. J. Nelson[1], C. R. B. Clark[1], and T. W. Brundage[2]. [1]College of Veterinary Medicine and [2]Department of Animal Science, Oregon State University, Corvallis, Oregon and [3]American Hoechst Corporation, Somerville, New Jersey.

Yearling steers (20) from a herd shown to have hypobiotic Ostertagia ostertagi were divided into 3 groups of 7 animals each, and then treated orally with fenbendazole at 5 mg/kg (Group II), 10 mg/kg (Group III) or left as untreated controls (Group I). Blood and fecal samples and body weights were obtained every 28 days and daily feed consumptions of the groups were measured. At slaughter, carcass data were collected and abomasal O. ostertagi recovered. Serum protein differences were generally not significant. Mean serum pepsinogen values of treated groups decreased (more in Group II) continually throughout the study (significant by day 56). Although mean fecal egg per gram (EPG) counts of all groups decreased throughout the study, Groups II and III were reduced significantly ($P < 0.05$) compared to controls, beginning day 7 post-treatment. The mean average daily gains (ADG in pounds) were 2.76, 2.99, and 3.01 for Groups I, II, and III, respectively (not significantly different). Group II had the best feed efficiency resulting in a cost per pound gain of $0.05 less than controls. Carcass grades and qualities could not be adequately evaluated in such small groups. The overall efficacies ($p < 0.05$) of fenbendazole were 51.6% and 95.9% at 5 and 10 mg/kg for all worm stages combined, and 66.4% and 98.6% against fourth stage larvae.

37. CUTICULAR RIDGE PATTERNS SEPARATE HAEMONCHUS CONTORTUS OF SHEEP FROM H. PLACEI OF CATTLE. J. R. LICHTENFELS* P. A. PILITT AND L. F. LE JAMBRE. BIOSYSTEMATIC PARASITOLOGY LABORATORY, ANIMAL PARASITOLOGY INSTITUTE, AGRICULTURAL RESEARCH SERVICE, USDA, BELTSVILLE, MD 20705, AND PASTORAL RESEARCH LABORATORY, DIVISION OF ANIMAL HEALTH, CSIRO, ARMIDALE, NSW, 2350, AUSTRALIA

Biological differences have been reported between the large abomasal nematodes Haemonchus contortus of sheep and H. placei of cattle, but reliable morphological characteristics for identifying the species are unknown. The synlophes (pattern of surface cuticular ridges) of Haemonchus from natural and experimental infections of cattle and sheep were studied to determine whether this characteristic might be used to

differentiate the two species. Initially H. placei from its type locality (Australia) was compared with H. contortus from Australia; both species were raised in sheep. Additionally, both species from numerous other localities and hosts were studied. No differences were found in the pattern of ridges in the anterior half of the body. A difference was found between the species, however, in the percentage of the nematode body length covered by the synlophe. In both sexes of H. contortus the synlophe extended posteriad significantly beyond midbody, but in both sexes of H. placei the synlophe ended near midbody. This characteristic can be observed in whole living specimens or fixed cleared specimens with light microscopy. Passing the nematodes in unusual hosts did not affect the synlophe.

38. Moniezia spp. in Cattle and Sheep in Wyoming Robert C. Bergstrom, Div. Microbiol. and Vet Med., Univ. of Wyoming, Laramie, WY 82070

Clinical cases of Monieziasis in sheep are infrequent in Wyoming. In two trials with Rambouilliet and crossbred wether lambs respectively, no significant difference in weight gains of Moniezia-positive and Moniezia-negative (uninfected controls) could be found. However, the wet weight of Moniezia expansa in those trials was less than 400 g. In one flock of sheep north of Hulett, Wyo., a clinical case of Monieziasis was found in Columbia lambs averaging 19.5 kg in October when an average uninfected Wyoming lamb seven months of age should weigh, at least, 34 kg. More than 900 kg wet weight of M. expansa were taken from the small intestine of the lamb necropsied. No clinical cases of Monieziasis have been found in Wyoming cattle necropsied at the Wyoming State Veterinary Lab. from 1957-date. No bovine (calf, yearling or adult) was noted with more than 450 g wet weight of Moniezia at necropsy or more than 500 eggs/g of Moniezia ova in thousands of fecal samples.

39. DYE-SENSITIZED PHOTOOXIDATION OF OVINE GASTROINTESTINAL NEMATODE LARVAE by Marian B. Smith and Mark C. Healey*, Department of Animal, Dairy, and Veterinary Sciences *Departments of Biology and Animal, Dairy, and Veterinary Sciences

Preliminary experiments were conducted to evaluate the effectiveness of erythrosin B as a larvicide for ovine gastrointestinal nematodes. Feces were collected from 50 to 125 lb lambs harboring mixed nematode infections, pooled, and treated by adding varying amounts (125 to 3000 mg dye/kg feces) of erythrosin B. Fecal samples were incubated in the dark at room temperature for 3 weeks to allow for development of infective third-stage larvae. Larvae were then collected by Baermannization and exposed to light generated by 2 standard Westinghouse cool white 400 watt fluorescent bulbs. Maximum larval mortality was observed to be 78% after 6 hours of light exposure at the 3000 mg dye/kg feces level. Lambs were subsequently treated orally with erythrosin B at a dosage of 40 mg dye/kg body weight daily for 4 days. Fecal samples were collected, incubated, Baermannized, and the larvae exposed to light as before. Larval mortality reached 75% after 6 hours of light exposure by day 4 of treatment.

40. EQUINE DERMATITIS ASSOCIATED WITH BLACK FLY (SIMULIIDAE) INFESTATION. FERRON L. ANDERSEN* AND MERRILL G. SHUPE. DEPARTMENTS OF ZOOLOGY AND ANIMAL SCIENCE, BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH 84602.

In mid-April 1985 a severe case of generalized dermatitis (intense itching, some bleeding of scratched areas, loss of hair, and some encrustation) was observed in a 14-year old Tennessee Walker gelding. The animal had been in a general unthrifty condition during the winter months, had lost considerable weight, and had developed an unusually heavy coat of matted hair. The onset of dermatitis coincided with a marked increase in numbers of "black flies" (Family = Simuliidae) in the area, and numerous flies could be easily collected from the animal - especially from regions where matted hair existed. Throughout the winter months the owner of the horse had attempted to improve its physical condition through the use of numerous feed additives, vitamin supplements, and several broad-spectrum anthelmintics, including one purported to eliminate Neck Threadworms (microfilariae) alleged to cause dermatitis in horses. Although we did not complete any testing for the possible presence of filarial worms, we did determine that no eggs of any gastro-intestinal helminths were present. We then recommended that the animal be treated with a suitable insecticide to assist in the control of black flies. After 3 weeks of treatment, and coincidental with the time of the natural decline of the black fly population in the area, all symptoms abated.

41. THE GUINEA PIG AS A MODEL FOR FASCIOLOIDES MAGNA INFECTION IN SHEEP. G.A. CONBOY, B.E. STROMBERG, AND D.W. HAYDEN. UNIVERSITY OF MINNESOTA, COLLEGE OF VET. MED., ST. PAUL, MN., 55108.

The pathophysiologic responses of guinea pigs infected with 20 metacercaria of F. magna were monitored until their natural deaths and compared to uninfected control animals. Infected guinea pigs were also sacrificed throughout the experiment and tissue samples were taken for histopathology. Complete blood counts were done and serum levels of: asparate aminotransferase, alanine amino transferase, and gamma-glutamyl transferase were determined. The guinea pigs responded to infection with F. magna in a manner similar to sheep. There were no differences in weight gains or serum enzyme levels between the infected and control groups. Guinea pigs developed a pronounced eosinophilia and a basophilia both beginning 3 weeks post-infection (PI). Guinea pigs like sheep died suddenly due to fluke infection, lesions being present in all animals challenged and 0-13 flukes were recovered from each animal at necropsy. Flukes were found unencapsulated in the liver, kidney, peritoneal and thoracic cavities, skeletal muscle, and subcutaneous tissue. The livers contained necrotic tracts and the capsules were pitted. Microscopically principal liver lesions occurred in the portal areas and capsule and were characterized by both active and chronic inflammation. Abundant infiltrates of eosinophils and plasma cells often marked the portal areas.

42. CLORSULON EFFICACY AGAINST NATURALLY OCCURING FASCIOLA HEPATICA IN CATTLE AS COMPARED WITH ALBENDAZOLE. R. KILGORE*, M. WILLIAMS, G. BENZ, S. GROSS. MERCK SHARP AND DOHME RESEARCH LABORATORIES, RAHWAY, NJ 07065

Clorsulon anthelmintic activity against Fasciola hepatica was evaluated and compared to that of albendazole in a dose-confirmation trial. Twenty-eight cattle (8 to 12 months old) with natural F. hepatica infections were randomly allocated to 4 groups: Group 1, no treatment (controls); group 2, clorsulon suspension orally at 3.5 mg/kg; group 3, clorsulon suspension orally at 7 mg/kg; group 4, albendazole paste orally at 10 mg/kg. At necropsy, performed 7 and 8 days after treatment, control cattle harbored a geometric mean of 133.2 F. hepatica of which 16.0 were immatures. Clorsulon administered at either 3.5 mg/kg or 7 mg/kg resulted in 99% removal of the F. hepatica total populations, including immatures. Albendazole treatment resulted in an overall reduction of 76%, including 91% reduction of immatures. Fascioloides magna were also present in the cattle, but neither clorsulon nor albendazole caused significant reductions. No adverse reactions to either drug were observed.

43. Activity of SCH 32481 Against Gastrointestinal Nematodes in Yearling Heifers and Fasciola hepatica in Sheep. L. S. Richards[1], G. L. Zimmerman[1], D. W. Weber[2], S. W. Dawley[3], M. J. Nelson[1], and C. R. B. Clark[1]. [1]College of Veterinary Medicine and [2]Department of Animal Science, Oregon State University, Corvallis, Oregon and [3]Schering Corporation, Kenilworth, New Jersey.

The activity of SCH 32481 against gastrointestinal nematodes (natural infections) and F. hepatica (induced experimental infections) was evaluated in yearling heifers and sheep, respectively. The heifers (10 controls and 10 treated orally with SCH 32481 at 7.5 mg/kg) are necropsied 2 weeks after treatment and the gastrointestinal nematodes were recovered. The efficacy percentages for adult worms of the following genera were: Ostertagia, 67.2 ($p < 0.05$); Cooperia, 97.7 ($p < 0.05$); and Oesophagostomum, 100 ($p < 0.01$). Worm burdens of Nematodirus and Trichuris were not adequate for analysis. Late spring maturation of Ostertagia fourth stage larvae (not affected by the drug at 7.5 mg/kg) during the 14-day-treatment necropsy interval resulted in the lower than expected total worm efficacy (37.3%). Thirty sheep were each given 250 F. hepatica metacercariae. After infections were confirmed by DOT-ELISA [4 weeks post infection P.I.], ELISA (8 weeks P.I.) and fecal examinations (all positive 16 weeks P.I.), 10 sheep were selected as controls and 20 were treated orally with SCH 32481 (10 at 7.5 mg/kg and 10 at 20 mg/kg). One and 2 weeks post-treatment, 5 sheep of each group were necropsied and adult flukes were recovered. Efficacy of SCH 32481 against F. hepatica was 62% ($p < 0.01$) at 7.5 mg/kg and 90.7% ($p < 0.01$) at 20 mg/kg; differences between the 7.5 mg/kg and 20 mg/kg groups were significant at p 0.01.

44. BRAINSTORMS ON RAINSTORMS AND LOUISIANA SNAILFORMS-LIVER FLUKES IN CATTLE. J.B. MALONE, LOUISIANA STATE UNVERSITY, BATON ROUGE, LA 70803

For cost-effective control of Fasciola hepatica, several factors are of key importance: 1) seasonal transmission patterns, 2) annual climate variation, 3) individual farm risk, and 4) management-nutritional stress factors. Most transmission to cattle in Louisiana occurs during February - July of each year, but a greater than 20 fold variation can occur in the number of fluke transmitted in mild, wet years as compared to drier years with colder winters. A climate forecasting system based on the Thornthwaite water budget will be described that was developed for use in Louisiana and other gulf coast states to inform producers in April and September of the need for spring and fall treatment, respectively. Individual farms also vary widely in fluke risk according to the amount of pasture area occupied by snail habitat, and practical means of estimating the individual farm risk factor has limited development of effective control programs. Fecal egg counts, fluke recovery data, and/or ELISA prevalence were correlated with an aerial photographic method of estimating snail habitat on pastures. The latter may have important broad-scale application. By integration of these methods, development or regional control strategies that can be tailored to individual farms is possible.

45. EFFICACY OF SCH 32481 (SCHERING CORPORATION) AGAINST INHIBITED LARVAE OF OSTERTAGIA OSTERTAGI. J. C. WILLIAMS, J. W. KNOX, K. S. MARBURY*, M. D. KIMBALL, E. R. WILLIS, T. G. SNIDER, AND J. E. MILLER. DEPT. VETERINARY SCIENCE, LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

SCH 32481 is a new anthelmintic derived from a series of similar phenylthioureas and phenylguanidine compounds. As an ionic salt the compound is water soluble and this property has given rise to both a water soluble drench formulation and an injectable material. A high margin of safety as well as high levels of efficacy against a variety of internal parasites has been observed in all animal species tested. Evaluation against inhibited larvae of O. ostertagi in Louisiana was conducted with naturally infected, yearling beef cattle in spring. In late April, 4 uniform groups of 10 cattle per group were treated as follows: (1) untreated controls, (2) SCH 32481 at 7.5 mg/kg, oral drench; (3) SCH 32481 at 15.0 mg/kg, oral drench; (4) SCH 32481 at 20.0 mg/kg by oral drench. All cattle were killed at 13-15 days post treatment. Mean numbers of O. ostertagi adults, developing L4, and early L4 in untreated controls were: 8,279, 2,806, and 12,070, respectively. Means for numbers of other parasite genera (T. axei adults, immature, Haemonchus adults; and Cooperia spp.) were: 42,260, 1,118, 979, and 588, respectively. Percent reductions at the 7.5, 15.0 and 20.0 mg/kg dosages, respectively were: O. ostertagi, adults--94.9, 98.7, 99.2, developing L4-83.3, 86.8, 91.0, early L4-60.2, 74.7, 81.5; T. axei, adults--99.7, 99.9, 99.8, immature-- 100.0, 100.0, 100.0; Haemonchus adults-- 95.1, 100.0, 100.0; Cooperia spp--89.5, 98.3, 96.6.

46. Efficacy of Oxfendazole as Administered to Cattle by Intraruminal Injection, B. L. Presson* and T. A. Yazwinski Department of Animal Sciences University of Arkansas, Fayetteville, Arkansas 72701

Oxfendazole, formulated into a 22.5% suspension, was administered via intraruminal injection to cattle at the effective rates of 0, 1.125, 4.5 and 6.75 mg/kg BW. In total, 50 naturally infected calves were used with 10 animals being allocated to each of the 5 treatment groups on the basis of pre-treatment EPG counts. All animals were necropsied 7 days post-treatment. The trial was performed from December, 1983 to January, 1984 with the animals on concrete for a minimum of 35 days immediately prior to necropsy. For all nematodes and stages combined, % efficacies were 97.4, 98.8, 99.5 and 99.8 for oxfendazole at 1.125, 2.25, 4.5 and 6.75 mg/kg BW, respectively. Dose-limiting nematodes proved to be Ostertagia spp. EL_4's and N. helvetianus adults, with reductions 93% at the rates of 4.5 mg/kg BW and above. Anthelmintic administration was readily accomplished, with no local or systemic adverse reactions encountered.

47. Late Season Nematode Acquisition by Calves Previously Treated with the Paratect Bolus, T. A. Yazwinski*, B.L. Presson, T.J. Newby and H.E. Featherstone, Department of Animal Sciences, University of Arkansas, Fayetteville, AR 72701

Late Season, reinfection potential of calves treated at spring turn-out with the Paratect bolus was assessed in this trial. At the conclusion of a 150 day Paratect field trial, five calves were obtained from both the control and Paratect groups, placed on concrete and treated twice with fenbendazole at the rate of 10 mg/kg BW. Three days after the final treatment, the animals were allowed to graze a heavily contaminated pasture for 28 days. The animals were then returned to concrete for 4 days prior to necropsy. At initiation of the late season grazing, the Paratect group mean weight advantage was 39.5 kg. At necropsy, the mean advantage was 35.4 kg. No significant EPG trends were noted to develop. At necropsy, the Paratect animals harbored an average of 27.9% fewer nematodes than did the controls. Relative proportions of immature and mature nematode burdens were not seen to vary significantly between groups.

48. THE ANTI-STRONGYLE ACTIVITY OF A PROPYLENE GLYCOL-GLYCEROL FORMAL BASED FORMULATION OF IVERMECTIN IN HORSES. J. DIPIETRO*, K. TODD, AND V. REUTER. COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF ILLINOIS, URBANA, IL 61801.

Forty horses were assigned randomly to 1 of 4 treatments (n=10): 200 mcg of ivermectin (IVM)/kg as a 1% solution in a propylene glycol-glycerol formal base (PG-GFB) orally; 200 mcg of IVM/kg as a 1% solution in a PG-FGB via nasogastric tube; 200 mcg of IVM/kg as a 1.87% paste orally; and 10 mg of oxibendazole (OXB)/kg as a 22.7% paste orally. Fecal samples were obtained immediately prior to treatment (Day 0) and on days 14, 28, 42, 56, and 70. Quantitative and qualitative fecal examinations were done.

On day 0 all treatment groups had similar mean strongyle epg counts (464-1836; SEPG) and numbers of horses detected passing strongyle eggs All IVM treatment groups had (9-100) reductions in day 0 mean SEPG that were 100% on days 14 and 28, and ranged from 99.9-100% on day 42, 99.8-100% on day 56, and 93.4-99.4% on day 70. All IVM treatment groups had 0 horses detected as passing strongyle eggs on days 14 and 28, and ranged from 0-2 on day 42, 3-5 on day 56, and 8-9 on day 70. The OXB treatment group had a reduction in day 0 mean SEPG of 99.9, 99.7, 92.9, 78.6, and 54.5% and 5, 7, 8, 9, and 9 horses detected as passing strongyle eggs on days 14, 28, 56, and 70 respectively. Adverse reactions to treatment were not observed.

49. COMPARATIVE EFFICACIES OF VET 220) (DIENBENDAZOLE, PROP. NOM.) AND IVERMECTIN AGAINST IMMATURE PARASCARIS EQUORUM RESULTING FROM EXPERIMENTAL INFECTION OF PONY FOALS.

Thomas R. Bello, The Sandhill Equine Center, Southern Pines, NC 28387

To determine the efficacy of VET 220 against immature Parascaris equorum in the small intestine resulting from experimental infection, 24 mixed breed pony foals 5.5 - 13 weeks old were randomly allocated as 6 foals/group to these treatments: nontreated controls or VET 220 given at 2.5, 5.0 or 10.0 mg/kg of bodyweight. Foals were reared in an environment to prevent natural Parascaris infection. On day 28, foals were given 10,000 embryonated P. equorum eggs by nasogastric intubation. Foals were necropsied on day 14 and all P. equorum larvae were collected from the small intestines. In comparison with the 16,878 larvae recovered from the nontreated controls, the anthelmintic effect of VET 220 at 2.5, 5.0 and 10.0 mg/kg B.W. was 47.6%, 85.7% and 94.4%, respectively. Throughout treatment groups there were 2 or 3 distinctly different larval populations resulting from the single experimental infection, but there appeared to be no distinct differences in drug effect by VET 220 against the "larger" (ca. 26 mm.) vs. the "smaller" (13-19 mm.) larvae.

In a concurrent study the efficacy of ivermectin at 0.2 mg./kg. BW was determined in 18 foals 6-17.5 weeks old. There were 6 foals in each treatment group: nontreated control, ivermectin injectable micelle, or ivermectin oral paste. In comparison with the 17,944 larvae found in the non-treated controls, the anthelmintic effect of ivermectin injectable or ivermectin oral paste was 96.0% and 99.9%, respectively. There was a distinct difference in drug effect against the "larger" vs. the "smaller" larvae by the 2 formulations of ivermectin. There were no adverse signs related to treatment with either VET 220 or ivermectin in these young foals.

50. DETERMINATION OF RATE AND EFFICIENCY OF GAIN OF PIGS FOLLOWING INFECTION WITH ASCARIS SUUM AND ANTHELMINTIC TREATMENT. J.F. URBAN, JR. AND N.C. STEELE. ANIMAL PARASITOLOGY INSTITUTE AND ANIMAL SCIENCE INSTITUTE, USDA, ARS, BELTSVILLE, MD 20705

Nine groups of 12 barrows were treated for 7 weeks as follows: 3 groups were maintained helminth-free in confinement (treatment 1); 3 groups

were maintained in confinement and experimentally infected every other day with 1,000 A. suum eggs (treatment 2); 3 groups were naturally exposed to A. suum on a dirt lot (treatment 3). One group from treatments 1, 2, and 3, received either ivermectin, fenbendazole, or no anthelmintic during the first week of parasite exposure. Following the course of treatment, six pigs from each of the 9 groups were challenge-exposed to 10,000 A. suum eggs and killed 7 days later to assess the level of protective immunity. The remaining pigs were anthelmintic treated as described above and were placed in confinement to evaluate rate and efficiency of gain over 4-two week intervals. All groups that were parasite exposed had developed high levels of protective immunity to challenge exposure. Average daily gain (ADG) and rate of gain were lowest for those pigs that were naturally exposed to A. summ and received no anthelmintic treatment, but ADG was significantly greater for those pigs naturally exposed to A. suum and treated with anthelmintics. The performance of pigs that had been experimentally infected did not differ from controls.

51. PARASITISM AND PRODUCTION OF ONCE-DAILY SUCKLING CALVES: EFFECTS OF ANTHELMINTIC MEDICATION. H. CIORDIA AND J.A. STUEDEMANN. USDA, ARS, EXPERIMENT, GA 30212

Two studies over a 2-year period involving 192 young Angus cows were conducted to evaluate the effects of a once-daily suckling on cow reproduction and calf growth. Both studies compared two groups of 24 cows with calves restricted to a once-daily suckling (RS) during the first 45 days of the breeding season and two groups of 24 cows with calves suckling normally (NS). In both studies, half of the calves from each of the groups were medicated with thiabendazole on the first day of the RS period to determine the effect of medication on gastrointestinal parasitism and calf growth. In Experiment II, half of the calves from each of the 4 groups were medicated for a second time 40 days after the RS calves were returned to pasture with their dams. RS reduced postpartum interval and increased pregnancy rate of the cows, but it also decreased weight gains and increased nematode egg production from calves. Anthelmintic treatments lowered egg counts, but there were no differences at weaning. Medication also improved weight gains of calves, but not enough to counteract losses resulting from RS. In each year, necropsy of 16 calves for total worm recovery confirmed the therapeutic effect of the anthelmintic.

52. PRO-SPOT^{tm} (Fenthion) Solution for Control of Fleas on Dogs. R. G. Arther* and D. D. Cox. BAYVET Division of Miles Laboratories, Inc., Shawnee, KS. 66201

Fenthion is an organophosphorus compound which provides systemic insect control on animals following low volume dermal application. A new product containing either 5.6 or 13.8% fenthion (PRO-SPOT^{tm}) was recently approved for the control of fleas on dogs. A controlled double-blind study was conducted with 30 mixed-breed adult dogs of various sizes and hair types to evaluate the initial and residual flea control efficacy following a single PRO-SPOT^{tm} treatment. Ten dogs each re-

ceived either 4 or 8 mg/kg fenthion (the approved PRO-SPOT^{tm} dosage range) while 10 additional dogs served as controls and were treated with blank vehicle. Each dog was infested with 125 fleas prior to treatment and reinfested with the same number of fleas 7, 14, 21 and 28 days post-treatment. Fleas were combed out and counted at intervals for up to 31 days post-treatment. Flea control efficacy with 4 mg/kg on post-treatment days 1,3, 10, 17, 24 and 31 was 70.7, 99.6, 100, 98.0, 71.2, and 62.7% respectively. Efficacy with 8 mg/kg on the corresponding post-treatment days was 91.1, 100, 100, 99.9, 97.0, and 78.1%. Mean flea counts of the control dogs ranged between 45.7 and 85.3 fleas/dogs.

53. MITABAN^{R} LIQUID CONCENTRATE: A TICK AND FLEA REPELLENT AND TICK DETACHMENT DRUG S. FOLZ, K. ASH, G. CODNER, and D. RECTOR THE UPJOHN COMPANY, KALAMAZOO, MICHIGAN 49001

A topical formulation of amitraz (Mitaban^{R} Liquid Concentrate, The Upjohn Company, Kalamazoo, Michigan 49001) was evaluated for flea and tick repellent and tick detachment activities. Sixteen dogs were utilized for these studies and each received a single topical treatment with Mitaban at a concentration of 250 ppm, the rate recommended for demodicosis and scabies. The dogs were subsequently, experimentally challenged with ticks and fleas. Significant ($P < 0.05$) repellent activity (92-95%) was observed against the brown dog tick (Rhipicephalus sanguineus) for two weeks after treatment with the drug. The activity was significant (: 0.05) and moderate (63%) during the third week, and thereafter the drug was ineffective. Significant ($P < 0.05$) repellent activity (99%) was also noted for the American dog tick (Dermacentor variabilis); the activity against this pest was monitored for only 7 days. The drug had lesser (42%) but nevertheless significant ($P < 0.05$) flea (Ctenocephalides felis) repellent activity for four days following treatment. Established brown dog tick populations were also treated, and the drug indicated high (100%) tick detachment activity. Side effects were not observed in any of the dogs.

54. RESIDUAL EFFICACY OF A NEW CLASS OF PYRETHRIN FLEA AND TICK CONTROL PRODUCTS. T. A. MILLER, ADAMS VETERINARY RESEARCH LABORATORIES, INC. MELBOURNE, FL. 32935

Flea and tick control business constitutes a major source of income to the veterinary profession in most of the United States. In spite of some controversy about the life cycle of fleas, strategies for multiple component control programs are adequate. Control of these problems could be achieved if the client could afford, or would take the trouble, to follow instructions. Flea problems, however, have become progressively more severe and widespread over the past ten years. This is due at least in part to the progressive withdrawal of the chlorinated hydrocarbon insecticides and their replacement with less effective, less persistent insecticides that usually also have greater mammalian toxicity risks.

Pyrethrins, extracted from the chrysanthemum flower, have been used for centuries and are still recognized as the safest of all insecticides.

With synergists (and sometimes repellents) they provide the fastest insecticidal effect (knockdown of flying insects and flushing of crawling insects). However, they degrade very rapidly by oxidation and hydrolysis, catalyzed by ultraviolet light, so that duration of activity is measured in hours. There exists more than 50 years of published literature and patents describing attempts to stabilize pyrethrin, but only recently have residual pyrethrin products been introduced. Results of controlled studies to measure immediate and residual efficacy of pyrethrin products stabilized by a new technique will be reported.

56. An Update on Horn Fly Pyrethroid Resistance. D. C. Sheppard. Dept. Entomology, Univ. of Georgia Coastal Plain Experiment Station, Tifton, GA. 31793.

Significant insecticide resistance in horn flies was unknown before the widespread use of pyrethroid cattle ear tags. Pyrethroid resistance is now widespread in the SE. Cases have also been confirmed in TX, OK, KS, NE, CA, and HI. Resistance is usually evident after 2 seasons of ear tag use with resistance levels of 30-40X that which is commonly encountered. Resistance levels of 100X have been seen. Theoretical considerations in the resistance literature suggest that the steady release of low doses of pyrethroids from ear tags will rapidly select for resistant horn flies. A field study did show significantly greater resistance selection with pyrethroid tags than with pyrethroid sprays. Early indications are that the resistance is unstable and may be managed by alternate use of other insecticides.

57. Tick-Borne Spotted Fever in the USA. B.R. Norment. Department of Entomology, Mississippi State University, Mississippi State, MS 39762

Many species of wild and domestic animals are known to be susceptible to Rocky Mountain Spotted Fever (RMSF) and are recognized natural reservoirs in the maintenance of spotted fever-group rickettsiae, including Rickettsia rickettsiae, the causative agent of spotted fever. Recent rickettsial surveys have resulted in the discovery of additional spotted fever-group rickettsiae and of rickettsiae distinct from the spotted fever group. A nonvirulent rickettsia in the ovaries of Dermacentor andersoni has been isolated that apparently inhibits the development of virulent rickettsiae. The role of the dog in the epidemiology of RMSF has been the subject of several investigations. Recent evidence indicates, however, that the dog is not an efficient reservoir for infecting ticks. Studies of the lone star tick, Amblyomma americanum, have revealed that they are of little or no significance in the transmission of virulent spotted fever-group rickettsiae.

58. PREVENTION OF TOXOPLASMOSIS BY HYGIENIC MEANS AND VACCINATION. J. K. Frenkel, M.D., Ph.D., Kansas City, Kansas 66103

Toxoplasmosis is one of the most common anthropozoonosis. Although most cats and people and many other animals become infected, few develop illness. However, the possibility of serious illness in the human fetus

and newborn is becoming better known and veterinarians are often called upon for advice. What should a cat owner do when she becomes pregnant? Should the cat be tested? What risks exists for dogs and farm animals? What hygienic measures prevent infection? Can cats be immunized so that they do not shed oocysts? What opportunities would a vaccine offer for sheep and other animals and humans? These questions will be discussed.

59. TOXOPLASMA-INDUCED ABORTIONS IN SHEEP IN MARYLAND. J.P. DUBEY*, S. MILLER, E.C. POWELL, and W.R. ANDERSON. U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, ANIMAL PARASITOLOGY INSTITUTE, BELTSVILLE, MARYLAND 20705

During the lambing season of 1983 and 1984, 8 of 44 purebred Hampshire ewes on a farm in Knoxville, Maryland had reproductive problems. In at least 4 of these ewes the problem was due to toxoplasmosis. Necrosis and Toxoplasma gondii tachyzoites were found in histologic sections of the placenta of 3 ewes. Agglutinating antibody to T. gondii at a titer of 1:80 was found in pleural fluids of both lambs aborted from one ewe; this ewe had an antibody titer of 1:6400 at the time of abortion. In another ewe, the diagnosis was confirmed by the isolation of T. gondii from the placenta and from 1 of her lambs.

Of numerous free-roaming cats on the farm, 16 adults were trapped, euthanatized and examined for T gondii. In the modified agglutination (MA) tests, antibody to T gondii at titers of 1:4-1:64 was found in serum samples of all of the cats. Toxoplasma gondii was isolated from the tissues of 9 of the cats, and rectal contents, of 1 cat.

60. CRYPTOSPORIDIUM INFECTIONS DETECTED BY DIRECT IMMUNOFLUORESCENCE USING A MONOCLONAL ANTIBODY RECOGNIZING AN OOCYST DETERMINANT. M.J. ARROWOOD AND C.R. STERLING, DEPT. VETERINARY SCIENCE, UNIV. OF ARIZONA, TUCSON, AZ 85721.

A monoclonal antibody (MAb) to the oocyst wall of Cryptosporidium was made by immunizing BALB/c mice with isolated oocyst walls. Oocysts from calf feces were recovered by Sheather's sugar flotation and further purified by passage through Whatman CF-11 and DE-52 cellulose columns. Oocyst cells (OW) were isolated by sonicating intact oocysts, osmotically shocking the free sporozoites and washing in PBS to remove sporozoite debris. Spleen cells of mice immunized on days 0 (OW + FCA - im), 14 (OW + FIA - ip) and 28 (OW - iv) were fused on day 32 with P3/X63/Ag8.653 mouse myeloma cells. One hybridoma (C1B3) producing an IgG1 MAb was positive for oocysts by indirect immunofluorescence. The IgG1 MAb from ascites of the cloned hybridoma (C1B3-H5) was purified by ion exchange chromatography and directly labelled with fluorescene isothiocyanate (FITC) giving a titre of 512. The C1B3-H5-FITC conjugate at a 1:100 dilution in PBS detected Cryptosporidium oocysts in formalin-fixed air dried fecal smears. Although some cross reactivity with yeast was noted using this conjugate, they could easily be distinguished from oocysts by employing crystal violet as a counterstain.

61. HOST SPECIFICITY OF AVIAN CRYPTOSPORIDIUM SP. BYRON L. BLAGBURN, DAVID S. LINDSAY AND JAMES A ERNEST. DEPARTMENT OF PATHOLOGY AD PARASITOLOGY SCHOOL OF VETERINARY MEDICINE, AUBURN UNIVERISTY.

Cross transmission studies were conducted to determine if mammals were susceptible to an avian isolate of Cryptosporidum. The following mammals were inoculated orally with the numbers of Cryptosporidium oocysts indicated. Twelve gerbils - 2.4×10^5, 10 Sprague-Dawley rats - 2×10^5, 18 guinea pigs - 5×10^5, 16 laboratory mice - 1.5×10^5, 12 cotton rats - 2×10^5, and 6 adult nude mice - 3×10^5. All animals (except nude mice) were 5-10 days old when inoculated. In addition, oocysts isolated from chickens were inoculated orally into 8, 2-day-old turkey poults - 3×10^5, and into 6 adult quail - 3×10^5. Appropriate controls were maintained for each host. The following tissues were removed from experimental animals sacrificed on days 4-8 postinoculation (PI), fixed in 10% neutral buffered formalin, and examined for developing stages of Cryptosporidium: stomach, ileum, cecum, colon, liver, spleen, lung, kidney, pancreas, trachea, lungs, and bursa of Fabricius and cloaca (if applicable). Fecal examinations were performed on all animals on days 4-8 PI.

None of the mammals or quail inoculated with oocysts of Cryptosporidium passed oocysts in their feces, nor were developing stages recovered from any of their tissues. Several turkey poults inoculated with Cryptosporidium passed oocysts in their feces and harbored developing stages in their tissues. Results suggest that Cryptosporidium sp. isolated from chickens is transmissible to other avian species, but not to mammals.

62. MEASUREMENT OF ANTIBODY RESPONSE TO EXPERIMENTALLY INDUCED EIMERIA BOVIS AND E. ZUERNII IN CALVES BY ELISA. H. SAATARA OZ*, B.E. STROMBERG, W.J. BEMRICK. Department of Veterinary Pathobiology, College of Veterinary Medicine, University of Minnesota, St. Paul, MN.

An Enzyme-Linked Immunosorbent Assay technique was developed to detect antibodies against E. zuernii and E. bovis. Holsterin calves of 6 to 8 weeks of age were divided into 4 groups and inoculated orally with oocysts of E. bovis and/or E. zuernii. Sera were collected once weekly from day 0 up to 5 weeks post-inoculation. An E. tenella suitable antigen was used to detect the ELISA titers. There was cross reaction between E. tenella antigen and sera obtained from infected calves which were indicated by the ELISA titers. Infected calves had rising titers and produced oocysts. Those calves which received E. bovis or the mixed infection had higher titers than those which received only E. zuernii oocysts.

63. A QUANTITATIVE STUDY OF COCCIDIA OF BEEF CALVES FROM THE COASTAL PLAIN AREA OF GEORGIA. J. V. ERNST U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, ANIMAL PARASITOLOGY INSTITUTE, BELTSVILLE, MARYLAND 20705 AND T. BONNER STEWART, DEPARTMENT OF MICROBIOLOGY AND PARASITOLOGY, SCHOOL OF VETERINARY MEDICINE, LOUISIANA STATE UNIVERSITY, BATON ROUGE, LOUISIANA 70893
The prevalence and abundance of coccidian oocysts were determined in

fecal samples from crossbred beef calves raised on Bahia grass pastures during two consecutive spring and summer grazing seasons. Of the 534 fecal samples collected during the survey, 461 (86.3%) contained one or more species of coccidian oocysts. Thirteen species of Eimeria were found during both years of the survey. The total mean oocysts per gram of feces were significantly different ($P < 0.10$) between the two years. Eimeria bovis was the most prevalent species found in the survey; E. ellipsoidalis, however, had the greatest number of oocysts. Eimeria bukidnonesis, E. pellita, and E. brasiliensis were the least prevalent species and also had the lowest number of oocysts present in the fecal samples. One clinical case of occidiosis, due to E. zuernii, was seen in a nine-month old calf. This calf had excreted E. zuernii in several fecal samples before the clinical disease appeared.

64. Treatment of Bovine Trichomoniasis with Ipronidazole J.M. Cheney, DVM, L. Ball, DVM, R.G. Mortimer, DVM, C.V. Kimberling, DVM, College of Veterinary & Biomedical Science, Fort Collins, CO 80523

Ipronidazole is the latest of the substituted imidazole compound reported to be effective in the treatment of Trichomonas foetus in cattle. South African workers (1978) reported that 30gm of active ingredient given to bulls as a single intramuscular injection eliminated the infection. The first bull treated by our group was given a single injection of 30gm of ipronidazole. Subsequently, 6 preputial fluids collected in a 2 week period were cultured negative.

Nine infected bulls from 3 other herds were treated with a single injection of 30gm of ipronidazole. In 2 herds, all 4 treated bulls were negative 1 week following treatment but 2 were again positive at 7 weeks. In the other herd, all 5 treated bulls were negative at 1 and 2 weeks following treatment but 2 were positive at 6 weeks.

Six infected bulls from these 3 herds were brought to the university and were given LA200. Three days later 3 bulls were given 30gm of ipronidazole daily for 3 days. The other 3 bulls were given 15gm of ipronidazole daily for 3 days. Preputial fluids from all 6 bulls were cultured weekly for 21 weeks following treatment and remained negative.

65. Characterization of Horn Fly Induced Equine Dermatitis and Its Potential Relationship To Onchocerciasis. L.D. FOIL*, T.R. KLEI, C.S. FOIL, R. I. MILLER AND D. D. FRENCH, LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA 70803

Equine midventral dermatitis (EMD) is a syndrome that has been associated with Onchocerca cervicalis infections, horn fly Haematobia irritans feeding and/or hypersensitivity to horn fly feeding. Ivermectin and fenvalerate (a synthetic pyrethroid) were used to clarify the interactive effects of horn flies and O. cervicalis in EMD. Sixteen horses (12 having patent O. cervicalis infections) were divided into four treatment groups: Ivermectin alone, Fenvalerate alone, Ivermectin and Fenvalerate, and untreated controls. Cattle maintained on pasture in a central area dividing the 4 groups provided a constant source of

horn flies. Data obtained during the 3 month study included horn fly counts per horse (twice per week), clinical evaluation of skin lesions (biweekly), midventral lesion area quantitation by photography and image analysis (biweekly), histologic evaluation (Monthly) and microfilarial enumeration (monthly). An exacerbation of active lesions associated with EMD occurred following an increase in horn fly populations in horses not treated with fenvalerate. Rapid resolution of these lesions were observed in invermectin and fenvalerate treated horses. These observations suggest interactive effect of O. cervicalis and H. irritans in EMD under these conditions. Hypersensitivity reactions were not observed in either of the fenvalerate treated groups. However, low levels of horn fly feeding persisted in these groups. These observations suggest that hypersensitivity reaction to horn fly feeding do not occur, or occur only under conditions of very heavy feeding activity.

66. THE ANTI-FECUNDITY EFFECT OF TRICHINELLA SPIRALIS IN IMMUNE PIGS. H.P. MARTI AND K.D. MURRELL, ANIMAL PARASITOLOGY INSTITUTE, USDA, ARS, BELTSVILLE, MD 20705

An almost complete resistance against the establishment of muscle larvae in challenge infections with T. spiralis in previously infected pigs raised the question of whether anti-fecundity effects can account for this phenomenon. Outbred pigs were immunized by live infection and then they and uninfected controls were given a challenge infection. At intervals adult female worms were recovered and their fecundity assayed in vitro. The results from primary infections revealed a sharp drop in fecundity to less than 20% of the original values between week 3 and 4 after inoculation. In challenge infections, fecundity in immune pigs was depressed significantly compared to the controls. However, the resistance against the establishment of challenge 2nd generation muscle larvae in immune pigs cannot be attributed solely to anti-fecundity effects. Preliminary results from passive protection experiments suggest humoral antibody against the newborn larvae is also important.

67. IMMUNIZATION OF SWINE AGAINST TRICHINELLA SPIRALIS USING EXCRETORY-SECRETORY ANTIGENS. H. R. GAMBLE AND K. D. MURRELL. ANIMAL PARASITOLOGY INSTITUTE, ARS, USDA, BARC-E, BELTSVILLE, MD 20705

Immunity to reinfection with Trichinella spiralis develops following a single infection in rodents and swine. In rodents, significant immunity to challenge infection can be induced by immunization with excretory-secretory (ES) products derived from the muscle larvae stage or antigen extracts from other stages. In an effort to identify antigens with potential for vaccination of swine we tested the efficacy of larval ES products in pigs. Pigs were immunized by various routes with larval ES products derived from short-term culture. Intraperitoneal administration of antigens in complete Freund's adjuvant induced moderate levels of immunity to challenge infection; other routes of immunization were less effective. Immune pigs harbored fewer adult worms and the fecundity of female worms recovered from a challenge infection was significantly lower than the fecundity of female worms

from non-immunized pigs. Levels of immunity correlated directly with serum antibody titers against ES antigens. Attempts to boost the level of antigen-induced immunity by the co-administration of pertussigen were unsuccessful.

68. LOCAL AND SYSTEMIC BLASTOGENIC RESPONSES OF CATTLE TO INFECTION WITH OSTERTAGIA OSTERTAGI. LOUIS C. GASBARRE, ANIMAL PARASITOLOGY INSTITUTE, ARS, USDA, BARC-E, BELTSVILLE, MD 20705

Calves were primed by intramuscular injection of keyhold limpet hemocyanin (KLH) emulsified in CFA and at the same time orally inoculated with 10^5 infective larvae of Ostertagia ostertagi (Oo). The presence of antigenresponsive (KLH or Oo) lymphocytes was detected in peripheral blood lymphocytes (PBL), periaortic lymph nodes (PALN) and abomasal lymph nodes (ABLN) by conventional proliferation assays and the frequency of antigen-reactive precursors was determined by a sensitive limiting dilution analysis (LDA). KLH reactive cells at frequencies of 1:5000 are seen in the lymph nodes draining the site of KLH injection (PLAIN) within 3 days of infection and in some calves frequencies of 1:1600 are seen within 3 weeks of infection. Within 4 weeks of infection the regional antigen-reactive cells. In contrast to the kinetics observed with KLH, the frequency of Oo-specific lymphocytes was found to reach 1:4000 systemically (PBL) but was never less than 1:5000 (the highest concentration tested) locally (ABLN) or in non-involved lymph nodes (PALN). This lack of a detectable increase in antigen-reactive cells was seen in spite of an increase in ABLN size that continued throughout the first 4 weeks of infection. It appears the Ostertagia infection in cattle either initiates the non-specific proliferation of cells in lymph nodes draining the abomasum or involves potent local immunoregulatory phenomena.

69. POTENTIAL ANTIGENS FOR SERODIAGNOSIS OF BOVINE CYSTICERCOSIS. E.I.P. KAMANGA-SOLLO[1], K.D. MURRELL[1], and K.J. LINDQVIST[2]. ANIMAL PARASITOLOGY INSTITUTE, ARS, USDA, BARC-E, BELTSVILLE, MD 20705[1], DEPARTMENT OF PUBLIC HEALTH, PHARMACOLOGY AND TOXICOLOGY, FACULTY OF VETERINARY MEDICINE, UNIVERSITY OF NAIROBI[2].

Several antemortem diagnostic procedures have been developed for bovine cysticercosis, in the hope that they may be applied as an adjunct to current meat inspection procedures. However, the scarcity of homologous Taenia saginata antigens necessitates looking for cross reactive antigens in more abundant metacestode material. Comparative immunochemical study showed that fraction 10 antigen from T. saginata was similar to Antigen 4 from T. hydatigena. We found another antigen in T. saginata and T. solium metacestodes. More recently, we isolated a lipoprotein antigen from T. hydatigena metacestodes that also cross-reacted with T. crassiceps antigens. This antigen has at least two major components (Mr 77 and 9.5 KD). All of these antigens are now being compared for their sensitivity and specificity in an ELISA for bovine cysticercosis.

70. DETECTION AND ASSESSMENT OF SUBCLINICAL LUNGWORM INFECTION IN CALVES BY FECAL ANALYSIS, HEMATOLOGICAL CHANGES, BIOCHEMICAL PROFILING AND SCANNING ELECTRON MICROSCOPY. F.M. SEESEE AND D.E. WORLEY.* VETERINARY RESEARCH LABORATORY, MONTANA STATE UNIVERSITY, BOZEMAN, MONTANA 59717

Lungs of calves experimentally infected with 4500 infective larvae of a Montana isolate of Dictyocaulus viviparus appeared healthy at 15 days postinoculation (PI) except for a few scattered dark red plaques 2-3 mm. in diameter. The main lesion was an eosinophilia with some expansion of alveolar interstitial tissue. Masses of adult worms clogged the smaller air passages of calves killed 30 days PI. Histologically, the alveolar architecture was masked by cellular proliferation and infiltration of inflammatory cells. Bronchioles were clogged with eosinophils. Calves killed 45 days PI showed more severe consolidation. At 90 days, healing was underway with some minor consolidation persisting. Lymphocytic infiltration was the major feature. A significant rise in the level of circulating eosinophils was the principal change in the clinical hemogram. The increase occurred as early as day 14 PI and peaked at about 19% on day 21 PI. All other clinical hematology parameters were within the normal range for bovine species. Serum enzyme levels and other biochemical factors were also within the normal limits for cattle. The number of worms recovered from the lungs varied with the age of infection. Highest counts occurred between 30 and 45 days PI. The maximum number of larvae per gram of feces occurred 38 days PI. Changes in host tissue as revealed by scanning electron microscopy included shortened cilia, alveolar consolidation, proliferation of nonciliated cells of the bronchial epithelium, and asynchronous movement of cilia.

71. STRATEGIC CONTROL OF STRONGYLES IN PONIES WITH IVERMECTIN IN ONTARIO. J.O.D. SLOCOMBE, DEPARTMENT OF PATHOLOGY, ONTARIO VETERINARY COLLEGE, UNIVERSITY OF GUELPH, GUELPH, ONTARIO.

Twenty-five Shetland-cross pony mares were placed in 2 groups on separate pastures from June 1 to November 13, 1984. The pastures had been grazed for several years by the ponies which had minimal anthelmintic treatment. Prior to turnout, one group was treated with injectable ivermectin and retreated with ivermectin paste on July 10 and August 21. Feces from each pony and herbage from each pasture were examined prior to turnout and fortnightly thereafter. One foal from each group, approximately 3 to 4 months of age, was weaned and removed from pasture on August 2, September 4, October 14 and November 13 and housed for a period prior to necropsy.

Mean fecal strongyle epg for the control group ranged from 300 to 1185 with the highest epg in June. The treated group was mainly negative until October and rose to 200 epg by November 13. Larvae per kg of herbage in the control group was 6780 on May 12, decreasing to 0 on June 26 and then to peak at 40,972 on September 18. This pattern was similar for the treated group but the count on September 18 was 2333. Foals from the control group had a larger number of strongyles than those from the treated group.

72. PREVENTION AND TREATMENT OF INTESTINAL COCCIDIOSIS IN LIVESTOCK. John V. Ernst, U.S. Department of Agriculture, Agricultural Research Service, Protozoan Diseases Laboratory, Beltsville, Maryland 20705

Intestinal coccidiosis causes production losses in cattle, sheep, goats, swine and rabbits. This disease is usually a problem primarily in young animals, although older animals are often affected. Prevention of coccidiosis is based on preventing or controlling the intake of sporulated oocysts by the animals; proper animal care and good sanitation practices are important. Animals with clinical coccidiosis should be isolated to prevent contamination of other animals. Treatment should include therapeutic dosages of anticoccidial drugs to stop development of the parasite, antibiotics to control secondary bacterial infections, and electrolytes to control dehydration. Prophylactic use of anticoccidial drugs is recommended when outbreaks repeatedly occur.

73. Coccidiosis in Companion Animals: A Clinical Impression, William D. Schall, D.V.M., East Lansing, Michigan, Janet A. Grace, L.V.T., East Lansing, Michigan

When considered as a disease of companion animals, coccidiosis remains an enigma because pathogenicity is obscure and clear-cut association with clinical signs is lacking. Our impressions are based on companion animal practice in the states of Minnesota, Michigan, Indiana and Georgia (WDS) and based on experience in the clinical management of a colony of 150 to 175 adult research dogs intensively used for puppy production (JAG & WDS). Our impressions are that geographical differences are minimal, that the specie of coccidia documented cannot be correlated with disease, that the age of the host at which it is most tempting to attribute diarrhea due to coccidia is 8 to 10 weeks, and that therapy directed against the protozoa has no effect on the out-come of disease that may be attributed to coccidia.

74. The Importance of Sarcocystis to Animals and Humans. R. Fayer, Ph.D., Animal Parasitology Institute, USDA, ARS, Beltsville, Maryland 20705

Sarcocystis spp. transmitted via canid feces develop through a series of asexual stages in the blood vessels, blood, muscles and nerves of grazing livestock initiating clinical and subclinical changes that affect the health and economy of food animals. Pathophysiological effects on production parameters such as reproduction, growth and milk production and fiber production are discussed. The zoonotic nature of this genus is also discussed.

75. Cryptosporidium spp.: Is the Veterinarian At Risk? William L. Current, Ph.D., Animal Health Discovery Research, Eli Lilly Research Laboratories, P. O. Box 708, Greenfield, IN 46140

Protozoan parasites of the genus Cryptosporidium (Phylum Apicomplexa; Suborder Eimeriorina) are now recognized as a widespread and significant cause of diarrheal illness in many domesticated animals and man. In immunocompetent humans, Cryptosporidium infections may produce a short-term, cholera-like illness; however, in immune deficient persons this zoonotic agent often produces a prolonged, life-threatening

disease. Recent studies have shown that Cryptosporidium has little or no host specificity and that many different animals may transmit the infection to man. The role of Cryptosporidium as a cause of gastrointestinal and respiratory disease in animals and man will be discussed. Major features of the life cycle and epidemiology of this coccidian parasite, as well as risk factors for the veterinarian, will be discussed.

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