PROCEEDINGS

27th ANNUAL MEETING

THE AMERICAN ASSOCIATION OF VETERINARY PARASITOLOGISTS

JULY 18 - 19, 1982

SALT LAKE CITY, UTAH

PROGRAM
AMERICAN ASSOCIATION OF
VETERINARY PARASITOLOGISTS
ANNUAL MEETING

July 18-19, 1982
Ballroom A

Sunday, July 18

SESSION 1: TREMATODES, LITTLE AMERICA
Chairmen: D. A. Armstrong and W. J. Foryet

9:00 AM 1 A Feedlot Production Response Following the Removal of F. Hepatica
DA Armstrong, Fort Shaw, MT

9:15 2 Several Years with Experience Fasciola hepatica Treatment in Production-tested Beef Cattle
RE Bradley and RS Sand, Gainesville, FL

9:30 3 Fasciola hepatica in Texas Cattle
RR Bell, College Station, TX

9:45 4 Experimental Infections with Fasciola gigantica in Awasi Sheep
JK Kadhim, Baghdad Iraq

10:00 5 The Importance of Fascioloides magna in Wild and Domesticated Animals in Minnesota
BE Stromberg, JC Schlotthauer, PD Karns and GA Conboy, St. Paul, MN

10:15 6 A Serologic Survey of Fasciola hepatica in Washington Cattle
RB Wescott and CJ Farrell, Pullman, WA

10:30 Break

11:00 7 Control Strategy for Fascioliasis Based on Seasonal Transmission to Louisiana Cattle
JB Malone, A Loyacano, M Hugh-Jones and KC Corkum, Baton Rouge, LA

11:15 8 Immunology of Fasciola hepatica Infections in Ruminants
GL Zimmerman, Corvallis, OR

11:30 9 Prophylactic Treatment of Fasciola hepatica in Ruminants
R Rew and RH Fetterer, Beltsville, MD

11:45 10 Control of Liver FLukes in Small Ruminants
WJ Foryet, Pullman, WA

12:00 11 Chemotherapy of Dicrocoelium dendriticum
VJ Theodorides, West Chester, PA

12:15 Lunch

SESSION 2: IMMUNITY, Ballroom A
Chairmen: G. L. Zimmerman

1:30 PM 12 Influence of Cell-Mediated Immunity in the Development of Resistance to Clinical Coccidiosis in the Chicken
JJ Giambrone and PH Klesius, Auburn, AL

1:45 13 Studies on the Active and Passive Immunity of Pigs to Migrating Larvae of *Ascaris suum*
MB Rhodes and LA Staudinger, Lincoln, NE

2:00 14 *Fascioloides* Infections in Cattle in Michigan
TW Schillhorn Van Veen, East Lansing, MI

2:15 15 Demonstration of a Requirement for Mast Cells in the Rejection of *Nematospiroides dubius* from Mice
LW Jen and RB Wescott, Pullman, WA

2:30 16 Reaction of Arteries to *Strongylus vulgaris* Larvae Following Treatment with Ivermectin or Fenbendazole
O Slocombe and BM McCraw, Ontario, Canada

2:45 17 Isoelectric Focusing Patterns of Antigens from *In Vitro* Cultured *Cooperia punctata*
GL Zimmerman and JE Cerro, Corvallis, OR
SE Leland, Manhattan, KS

3:00 Break

SESSION 3: DIROFILARIA, Arizona Room
Chairmen: R. B. Grieve and B. E. Stromberg

1:30 PM PAPER WITHDRAWN

1:45 18 Current Status of *Dirofilaria immitis* in Minnesota
JC Schlotthauer and BE Stromberg, St. Paul, MN

2:00 19 Periodicity of *Dirofilaria immitis* Microfilariae in Dogs and Mice
RB Grieve and S Lauria, Philadelphia, PA

2:15 20 Serology and the Diagnosis of Occult Dirofilariasis
R Scholtens and S Patton, Knoxville, TN

2:30 21 Efficacy of Thiacetarsamide in Experimentally Infected Dogs at 2 Months, 4 Months, 6 Months or 12 Months Post-infection with *Dirofilaria immitis*
LS Blair, PF Malatesta, L Jacob and DV Ewanciw, Rahway, NJ

2:45 PAPER WITHDRAWN

3:00 Break

SESSION 4: EXPERIMENTAL STUDIES, Ballroom A
Chairmen: B. Hammerberg and J. J. Giambrone

3:30 PAPER WITHDRAWN

3:45 22 Factors Contributing to *In Vitro* Development of *Ascaris suum*, from Second-stage Larvae to Adults
FW Douvres and JF Urban, Beltsville, MD

4:00 23 *Sarcocystis* as a Cause of *Placentitis* and Abortion in Cattle
JP Dubey and JA Bergeron, Bozeman, MT

4:15 24 Hematologic, Serum Biochemical and Urinary Changes in Dogs with Experimental *Dipetalonema reconditum* Infections
BA Lindemann and JW McCall, Athens, GA

4:30 25 Stimulation of Hypersecretion in Stomach Mucosal Cells of Rats by *In Vitro* Products of *Ostertagia* Larvae
Y Rikihisa and B Hammerberg, Blacksburg, VA

4:45 26 Nutritional and Metabolic Effects of Concurrent Infections by Coccidia and Nematodes in the Rat
JC Frandsen, Auburn, AL

5:00 27 Life Cycle of *Isospora suis* in Baby Pigs
WL Current, JB Ernst and DL Lindsay, Auburn, AL

SESSION 5: CLINICAL AND PATHOLOGICAL STUDIES, Arizona Room
Chairmen: K. R. Kazacos and T. M. Craig

3:30 28 Massive Peritoneal Cestodiasis in a Dog
JF Williams, MC Lindsay and PG Engelkirk, East Lansing, MI

3:45 29 Histologic Findings in Dogs Naturally Infected with *Hepatozoon canis*
TM Craig, LP Jones and RM Nordgren, College Station, TX

4:00 30 *Capillaria putorii* in Domestic Cats
JH Greve, Ames, IA

4:15 31 Clinical Outbreak of *Dictyocaulus arnfieldi* in Horses in Illinois
NM Cole, JA DiPietro, GJ Baker, and KS Todd Urbana, IL

4:30 32 Comparison of Quantitative Fecal Techniques in Horses
JA DiPietro, KS Todd and NM Cole, Urbana, IL

4:45 The Population Dynamics of Helminths of the Gastrointestinal Tract of Horses at Slaughter
CR Reinemeyer, SA Smith, RP Herd and AA Gabel, Columbus, OH

5:00 34 Experimental Ocular Larva Migrans due to *Baylisascaris procyonis* in Subhuman Primates
KR Kazacos, WA Vestre and EA Kazacos, West Lafayette, IN

5:30 HOSPITALITY SESSION AND BUSINESS MEETING, Ballroom A

Monday, July 19
All Sessions, Ballroom A

SESSION 6: EPIDEMIOLOGY OF RUMINANTS,
Chairmen: R. C. Bergstrom and J. C. Williams

8:00 AM 35 Comparison of the Periparturient Rise (PPR) in Fecal Egg Counts of Exotic and Domestic Ewes
CH Courtney, CF Parker, KE McClure and RP Herd, Columbus, OH

8:15 36 An Experimental Model of Breed Resistance to Haemonchus contortus in sheep
CH Courtney, CF Parker, KE McClure and RP Herd, Columbus, OH

8:30 37 Epidemiology of Bovine Lungworm Infection in Western Range Cattle
DE Worley, JB Winters, RH Jacobson and JC Fox, Bozeman, MT

8:45 38 Helminths of Cattle in Wyoming: 1961 and 1977
RC Bergstrom and BA Werner, Laramie, WY

9:00 39 Observation of Ostertagia ostertagi Populations in Tracer Calves Grazed with Beef Yearlings
JC Williams, JW Knox, KS Marbury, BA Baumann and TG Snider, Bossier City, LA

9:15 Break

SESSION 7: MINISYMPOSIUM

9:35 Biology of Cryptosporidiosis
40 Cryptosporidiosis Update
BC Anderson, Caldwell, ID

41 Cryptosporidiosis in Humans and Calves
WL Current, Auburn, AL

10:55 Minor Use of Drugs
42 WA Knapp, Raleigh, NC

11:40 Lunch

SESSION 8: REPORTS ON SYMPOSIA AND WORKSHOPS
Chairman: T. R. Klei

1:00 PM 43 Cysticercosis: Present State of Knowledge and Perspectives
JF Williams, East Lansing, MI

1:10 44 Ostertagia Workshop
RP Herd, Columbus, OH

1:20 45 Immunoparasitology Symposium: Past Future
GL Zimmerman, Corvallis, OR

1:30 46 Behavioral Cues Which Influence Parasites
WS Bailey, Auburn, AL

1:40 47 Identification of Animal Parasites in Tissue Sections: A New Study Set Available at AFIP
CH Gardiner, Washington, DC

SESSION 9: CHEMOTHERAPY-IVERMECTIN
Chairmen: J. Yakstis and J. A. Hawkins

2:00 48 The Effect of Ivermectin on Transmission Patterns of Equine Intestinal Nematodes
KG Ludwig, TM Craig and JM Bowen, College Station, TX

2:15 49 Efficacy of Ivermectin against Cutaneous Onchocerciasis in Horses
RP Herd and JC Donham, Columbus, OH

2:30 50 Ivermectin in Injectable and Paste Formulations: Efficacy against Fourth Stage Strongylus vulgaris Larvae and Posttreatment Responses of Ponies
TR Klei, BJ Torbet, MR Chapman and BS Kramer Baton Rouge, LA

2:45 51 The Efficacy of IVOMEC against Dermatobia hominis in Cattle
RA Roncalli and C Benitez-Usher, Rahway, NJ

3:00 52 Acaricidal activity of Ivermectin against an Experimental Infestation of Psoroptes ovis in Cattle
DL Ferguson and TC Swieczkowski, Lincoln, NE

3:15 Break

SESSION 10: CHEMOTHERAPY
Chairmen: V. J. Theodorides and T. B. Stewart

3:45 53 Cestocidal Activity of Fenbendazole in Calves
H Ciordia, JA Stuedemann and HC McCampbell, Experiment, GA

4:00 54 Clinical Trials with Combinations of Mebendazole and Piperazine in Horses
JA DiPietro, A Paul and KS Todd, Urbana, IL

4:15 55 Prophylaxis of Porcine Coccidiosis with Salinomycin
TJ Kennedy and JE Shively, Terre Haute, IN

4:30 56 Significance of Parasite Stage on Perceived Anthelmintic Efficacy against Hookworm Infection in Dogs
TA Miller, Kansas City, KS

4:45 57 The Effect of Xanthene Dyes on Bovine Gastrointestinal Nematodes
JA Hawkins, JR Heitz and MC Healey and MH Johnson Mississippi State, MS

5:00 58 Efficacy of Fenbendazole against Migrating Ascaris suum Larvae in Pigs
TB Stewart and TD Binder Baton Rouge, LA

1 A FEEDLOT PRODUCTION RESPONSE FOLLOWING THE REMOVAL OF FASCIOLA HEPATICA
D. A. ARMSTRONG, Fort Shaw, Montana.

Although liver flukes are a cause of serious economic loss in cattle, in the past many of these losses have been poorly defined. Such losses include reduced average daily gain, increased feed per gain, lowered fertility, reduced mature body weight, and lowered weaning weight. This paper will discuss some of the practical information that has been gathered on the economic impact of bovine fascioliasis.

Feedlot managers who deal with fluke-infected cattle report a common experience. Such cattle usually gain and convert as anticipated until the final stages of finishing. At this point, a dramatic reduction in growth and feed efficiency occurs, resulting in protracted, costly losses.

In one Oklahoma feedlot, we analyzed production records to compare fluke-infected cattle with cattle that were uninfected. The infected cattle demonstrated consistently lower average daily gain, higher feed conversion ratios, and higher cost of gain. Steers subsequently treated for fluke infection gained more weight and had fewer livers condemned at slaughter than untreated steers.

Additional research is needed to adequately characterize the economic significance of fascioliasis in cattle production.

2 SEVERAL YEARS' EXPERIENCE WITH FASCIOLA HEPATICA TREATMENT IN PRODUCTION TESTED BEEF CATTLE
R. E. Bradley and R. S. Sand, College of Veterinary Medicine, University of Florida, Gainesville, Florida.

This study was started in 1977 to determine if albendazole (ABZ) was as effective as hexachlorethane (HEX) in controlling liver fluke infection in a practical production situation in Florida. Approximately 100 Aberdeen-Angus heifer calves from the herd were divided into 2 groups: an ABZ-treated group and a HEX-treated group. Treatment was at 3 to 6 months of age and then at 6 to 8 month intervals until their first calves were weaned at 3 years of age. This was repeated in 1978 and 1979. From the 3 years of calf crops, the average fertility rate for the ABZ-treated group was 92.5% and for the HEX-treated group 87.5%. The calf weaning weight for the ABZ-treated group has been significantly higher ($p>.05$) than for the HEX-group. The difference was 6.9 kg (15 lbs.) when adjusted to the standard 205 day age. It was concluded that ABZ treatment of cows twice anually resulted in a significant improvement of calf weaning weights as compared with HEX treated cows.

3 FASCIOLA HEPATICA IN TEXAS CATTLE
R. R. BELL, Department of Microbiology and Parasitology, College of Veterinary Medicine, Texas A&M University, College Station, Texas.

Feeder steers free of F. hepatica were used to determine economic loss due to F. hepatica under full feed conditions. Ten steers were infected with metacercariae and ten used as controls. The animals were housed

individually and daily feed was weighed. There were no differences in weight gains or feed efficiency.

A large herd of purebred cattle is being used in a field trial. All animals have been treated with albendazole in the spring and fall for 5 treatments and all indicators show reduced numbers, and effects from flukes have been reduced.

4 EXPERIMENTAL INFECTIONS WITH FASCIOLA GIGANTICA IN AWASI SHEEP

J. K. KADHIM, Veterinary Laboratories and Research Institute, Abu Ghraib, Baghdad, Iraq.

Six lambs, 3-4 months of age, which had not previously been exposed to Fasciola gigantica infection, were each infected artificially with a single dose of 200 metacercariae of Fasciola gigantica. The experimental infections were studied over a period of 22 weeks. A group of 6 noninfected lambs served as controls.

All infected lambs showed signs which could be attributed to fascioliasis. The eggs were for the first time detected in the feces of all infected lambs from 99-108 days postinfection; the number of flukes recovered varied from 36-76, the mean fluke burden being 54.5.

There was an increase in the serum gamma globulin of 39% during the first 18 weeks after initial infection. Eosinophilia was observed at 2-4 weeks postinfection, and later, there was well-marked anemia. There appeared to be no direct relationship between the gamma concentration and eosinophilia.

5 THE IMPORTANCE OF FASCIOLOIDES MAGNA IN WILD AND DOMESTICATED ANIMALS IN MINNESOTA

B. E. STROMBERG, J. C. SCHLOTTHAUER, P. D. KARNS and G. A. CONBOY, Department of Veterinary Pathobiology, College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota, and Forest Wildlife and Populations Groups, Minnesota Department of Natural Resources, Grand Rapids, Minnesota.

White-tailed deer, Odocoileus virginianus, the definitive host for the liver fluke Fascioloides magna, are found throughout Minnesota. In the traditional range of the Northern half of Minnesota, deer population densities vary from 75 per square mile in a state park, to 1 per square mile in the more agricultural areas. The infection rate was estimated at 68.8% in 1952, 46% in 1960, and varies between 10 and 53%, in 1981, depending on the area. The deer population overlaps with the state's moose (Alces americana) population in the northeast and northwest corners of the state. The infection rate in moose, as determined by carcass examination during the moose hunting seasons, over the last eight years (1973, 1975, 1977, 1979) was 12.8% (118 of 920) in the northeast region. Here the ranges of the two species overlap only in the southern moose range near Lake Superior. Liver fluke infection in moose is not a definitive host for this trematode. In the northwest corner of the state where both populations overlap throughout the moose range, the infection rate is 64.5% (1120 of 1736) and infected animals are found throughout the area. The

most intensive sheep raising occurs in this northwest corner where much of the land is agricultural. Practitioners report that this area and most of the northern tier counties have endemic F. magna which causes major problems for the sheep producer. These findings indicate the need for good pasture management in the areas where sheep and deer populations overlap.

6 A SEROLOGIC SURVEY FOR FASCIOLA HEPATICA IN WASHINGTON CATTLE

R. B. WESCOTT and C. J. FARRELL, Department of Microbiology and Pathology, College of Veterinary Medicine, Washington State University, Pullman, Washington.

Sera from 100 herds of cattle were examined with an enzyme-linked immunosorbent assay (ELISA) for antibody to Fasciola hepatica in a preliminary screening involving 5 to 10 samples per herd. The results suggested that 28 herds contained infected cattle and that the parasite was most prevalent in three distinct geographic areas. Subsequent retesting of all sera available from 14 representative herds (mean of 109 samples for each) indicated that the screening test detected 7 of 7 operations in which approximately 50% of the cattle had positive or suspect titers and 3 of 4 operations in which approximately 10% of the cattle had positive or suspect titers. One of three herds considered negative on screening had a few (7%) samples with suspect titers. Accuracy of ELISA also was compared to diagnosis of F. hepatica by the fecal sedimentation technique in these same herds. A good correlation (5 of 5) was found where a high percentage (50%) of sera were positive or suspect. No Fasciola eggs were found in samples from two herds with 10% positive or suspect sera and two herds that were negative by ELISA.

7 CONTROL STRATEGY FOR FASCIOLIASIS BASED ON SEASONAL TRANSMISSION TO LOUISIANA CATTLE

J. B. MALONE, A. LOYACANO, M. HUGH-JONES and K. C. CORKUM, Louisiana State University, Baton Rouge, Louisiana.

The effectiveness of albendazole (ABZ) against Fasciola hepatica in cattle was studied in relation to a 3-year seasonal transmission study. Methods involved correlation of treatment time to data on sentinel calves, quarterly herd infection prevalence, and bi-weekly snail population studies. The number of flukes found in 4-6 sentinel calves was 13 in 1979 (mid-May to July grazing period), 456 in 1980 (late February to July), and 22 in 1981 (late February to July). Yearly variation was related to the suitability of snail habitat microclimate. Herd treatment in October with ABZ reduced herd prevalence and mean epg counts 3-4 months later from 42% (0.9 epg) to 31% (0.6 epg) in 1979-80 and from 96% (13.7 epg) to 38% (1.0 epg) in 1980-81. Treatment with ABZ in 4 other herds in the coastal marsh region resulted in a reduction in herd F. hepatica prevalence from 88-93% (4.2-16.2 epg) in August-November, 1980 to 16-57% (0.2-1.9 epg) in March-June, 1981. Herd prevalence and epg values remained relatively stable through the fall of 1981 whether herds received one, two or no additional ABZ treatments in the winter, spring and summer. Seasonal

transmission data indicated that 1981 was a "low-risk" year for fascioliasis.

Herd performance testing in one of the 4 herds in 1979 through 1980 revealed a 10.1 kg advantage in 205-day adjusted weaning weight and a higher grade (11 vs 9) for calves from 41 cows treated with ABZ in June 1979 and February 1980 as compared to calves from 41 cows treated with levamisole on the same dates. Group infection prevalence was reduced from 70% (5.8 epg) to 67% (2.0 epg) 3 months after ABZ treatment in July 1979, and from 95% (15.4 epg) to 44% (1.3 epg) 2 months after ABZ treatment in February 1980. In the levamisole treated group, prevalence was 36% (4.2 epg), 80% (12.1 epg), 95% (19.3 epg) and 75% (8.6 epg) in July and September, 1979 and February and April, 1980, respectively. Seasonal transmission data indicated 1980 was a "high-risk" year.

Results suggest that ABZ is most effective in the fall when most flukes are mature and less effective in the spring-early summer when a mixed mature-immature population is present. A control strategy will be proposed based on F. hepatica seasonal transmission patterns, available flukecides, management factors, and cost-effectiveness.

8 IMMUNOLOGY OF FASCIOLA HEPATICA INFECTIONS IN RUMINANTS

G. L. ZIMMERMAN, School of Veterinary Medicine, Oregon State University, Corvallis, Oregon.

This presentation will be a review and update of the knowledge about the ruminant-liver fluke immune interface. Topics to be addressed will include the following: 1) comparisons and contrasts of the immune interactions between liver flukes and either sheep or cattle; 2) stimulation of the ruminant immune system by F. hepatica; 3) avoidance, modulation, and suppression of host immune systems by F. hepatica; and 4) research leading to the immunoprotection of ruminants against F. hepatica.

9 PROPHYLACTIC TREATMENT OF FASCIOLA HEPATICA IN RUMINANTS

R. S. REW and R. H. FETTERER, Animal Parasitology Institute, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland.

Controlled-release administration of anthelmintics through implanted capsules or intraruminal boluses seems to offer an effective alternative to conventional treatment regimens. These delivery systems should provide several advantages to present day regimens by: 1) Acting prophylactically against helminth parasites immediately upon entry to the host to prevent pathology of larval stages and interrupt the life cycle of the parasite; 2) decrease handling costs by reducing number of treatments; and, 3) increase safety by decreasing potential toxicity to large, single doses. With these goals in mind, we selected a series of compounds reported to be effective against Fasciola hepatica, the common liver fluke, as a single oral dose to determine their prophylactic efficacy and pharmacokinetic properties under simulated controlled-release conditions in sheep and calves. The four compounds chosen were: 1) Diamfenetide, 2) albendazole, 3) MK-401, and 4) closantel. Diamfenetide given orally at 7.5 mg/kg/day for 21 or 28 days proved to be 93-97% effective in preventing F. hepatica infections in

sheep, but required 30 mg/kg/day for 28 days to be 88% effective in cattle. Albendazole given at 3 mg/kg/day for 28 days was 98% effective in sheep, but was without efficacy in calves even at 5 mg/kg/day. MK-401 at 3.5 mg/kg/day for 28 days was 62% effective in sheep and is presently being tested in calves. Closantel at 10 mg/kg given subcutaneously was 44% effective 2 wks after and 52% effective 4 wks after a single injection in sheep. Trials are presently underway with two injections of 10 mg/kg spaced 4 wks apart in sheep. The daily dosage provided an advantage by increasing time of protection from 1 day to 1 month with little increase in amount of total drug or provided a new type of activity.

Pharmacokinetic data for serum levels of these anthelmintics gave additional information about the efficacy properties of these anthelmintics. Diamfenetide reached a peak of 9.1 nmoles/ml 4 hrs after treatment and returned to 2.5 nmoles/mg by 24 hrs in sheep serum. Albendazole was not recoverable in the serum, but two major metabolites a sulfoxide and a sulfone were present for 48 hrs. Marriner and Bogan reported that the sulfoxide was the active metabolite. We found that the sulfoxide metabolite was found in 2X higher concentration in sheep serum than calf serum, while the sulfone metabolite amounts were reversed, 2X more in calf serum at 24 hrs. Closantel turned over very slowly with half-time turnover of 5-6 wks for a single subcutaneous injection.

10 CONTROL OF LIVER FLUKES IN SMALL RUMINANTS

W. J. FOREYT, Department of Veterinary Microbiology and Pathology, Washington State University, Pullman, Washington.

Fasciola hepatica and Fascioloides magna are two liver flukes that occur commonly in small ruminants in North America. Fasciola hepatica is found frequently in sheep and goats and is generally restricted to the liver. Fascioloides magna is also found in sheep and goats in areas where wild cervid hosts are infected. Infection in sheep and goats usually results in 100% mortality within 6 months of infection. Migration of immature F. magna in these hosts is often unrestricted, and flukes can be recovered from organs other than liver. Albendazole at 15-30mg/kg of body weight was effective against either fluke in small ruminants. Early treatment of small ruminants infected with F. magna is essential.

11 CHEMOTHERAPY OF DICROCOELIUM DENDRITICUM

V. J. THEODORIDES, SmithKline Animal Health Products, 1600 Paoli Pike, West Chester, Pennsylvania.

Dicrocoelium dendriticum, a three-host fluke, is a common parasite of ruminants in overseas' countries and in a few states in the U.S. and Canada. The chemotherapy of this fluke began back in 1936 with fuadin. In 1947, hexachloroethane and, in 1948, carbon tetrachloride were given to infected sheep. All of these drugs showed very little activity against D. dendriticum. Hetol and hitolin were used with low to moderate success. A single dose of 150 - 300 mg/kg of thiabendazole eliminated 99.5% of the flukes. Cambendazole at 240 - 300 mg/kg afforded better than 90% worm

reduction. Diamphenethide at a dose level of 240 mg/kg showed 98% efficacy. Fenbendazole at 20 mg/kg per day for 5 days or a single dose of 100 - 150 mg/kg was found to be highly efficacious. Praziquantel 50 mg/kg removed 92% of the flukes. Several studies demonstrated that albendazole as a single dose of 10 - 20 mg/kg afforded extremely high efficacy. It was also reported that albendazole, two doses of 7.5 mg/kg given seven days apart, eliminated 92% of the fluke burden.

12 INFLUENCE OF CELL-MEDIATED IMMUNITY IN THE DEVELOPMENT OF RESISTANCE TO CLINICAL COCCIDIOSIS IN THE CHICKEN

J. J. GIAMBRONE, Poultry Science Department, Auburn University, and P. H. KLESIUS, USDA, ARS, Regional Parasite Research Laboratory, Auburn, Alabama.

Four compounds, previously shown to stimulate immunity, were examined for their ability to modulate the chickens' immune response to coccidiosis vaccination. The following four compounds levamisole, CP20,960' Bordetella bronchiseptica bacterin, and a dialyzable leukocyte extract containing transfer factor were given to 1-week-old broilers at the time of coccidiosis immunization. Three weeks later the birds were challenged and various performance parameters determined. All four compounds were found to potentiate the immune response to coccidiosis vaccination as measured by percent livability, percent weight gain, and fecal score during a 7-day challenge period. In addition, three of the compounds were found to alleviate the adverse depression in weight gain which initially followed coccidiosis vaccination. The results suggest that immunopotentiation of coccidia vaccination is possible and may be helpful in the prophylactic control of coccidiosis.

13 STUDIES ON THE ACTIVE AND PASSIVE IMMUNITY OF PIGS TO MIGRATING LARVAE OF ASCARIS SUUM

M. B. RHODES and L. A. STAUDINGER, Department of Veterinary Science, University of Nebraska, Lincoln, Nebraska.

Four separate procedures were used to determine their respective effectiveness in increasing the resistance of pigs to migrating larvae of Ascaris suum. Active immunity stimulated by perienteric fluid of A. suum, non-specific immunity by prior infection of pigs with transmissible gastroenteritis virus (TGE), passive transfer of immune sera, or passive transfer of lymphocyte lysates (transfer factor) all failed to increase the resistance of pigs to migrating larvae of A. suum. Perienteric fluid stimulated an antibody and cell mediated immune response. Passive transfer of sera resulted in a greater number of superficial liver lesions and an increased resistance of the livers to a puncture probe compared to those from control animal. Skin tests for delayed hypersensitivity for pigs receiving lymphocyte lysate [prepared from immune or control pigs] were negative for all pigs. The eosinophil counts in the blood of the animals immunized with perienteric fluid, pre-infected with TGE virus or controls were similar at necropsy which was 8 days after oral challenge with embryonated eggs.

14 FASCIOLOIDES INFECTIONS IN CATTLE IN MICHIGAN

T. W. SCHILLHORN VAN VEEN, Department of Large Animal Surgery and Medicine, Michigan State University, East Lansing, Michigan.

Fascioloides magna is the only liver fluke indigenous to the Great Lakes region. The main reservoir hosts are White-Tailed Deer, of which up to 32% were found infected in the northern parts of Michigan. A survey on the prevalence of detectable liver fluke infection in slaughtered cattle revealed that during 1978-1980, 0.65% of the livers of 1.4 million slaughtered cattle were condemned. The condemnation rate was 0.4, 3.7, and 13.9% in cattle from Michigan's Lower, northern Lower and Upper Penisula, repectively. Many slaughtered cattle in southern Michigan were imported from other states, however. The highest condemnation rate was recorded from Chippewa county. There was little evidence of a seasonal variation in the condemnation rate; outbreaks of clinical disease were most commonly seen in winter. A serological survey indicated a low prevalence rate among dairy cattle. The economic importance of the condition in dairy cows will be evaluated.

15 DEMONSTRATION OF A REQUIREMENT FOR MAST CELLS IN THE REJECTION OF NEMATOSPIROIDES DUBIUS FROM MICE

L. W. JEN and R. B. WESCOTT, Department of Microbiology and Pathology, College of Veterinary Medicine, Washington State University, Pullman, Washington.

Rejection of Nematospiroides dubius was examined and compared in mast cell deficient mice (W/W^V), normal mice of the same strain (+/+), C_{57} inbreds which were the foundation stock for both W/W^V and +/+, and random bred Swiss-Webster mice (SW). In initial experiments 250 N. dubius larvae, administered orally 3 times at 1 or 2 week intervals, were shown to elicit a pronounced "self cure" in SW but not in W/W^V mice. Subsequent experiments revealed that rejection also did not occur in +/+ or C_{57} hosts. Hence our preliminary conclusion that lack of mast cells in the W/W^V hosts was responsible for failure to reject was incorrect. Presently it appears that the C_{57} host lacks some factor or factors, as yet unidentified, needed for rejection of N. dubius and that this same unresponsiveness is characteristic for W/W^V and +/+ mice.

16 REACTION OF ARTERIES TO STRONGYLUS VULGARIS LARVAE FOLLOWING TREATMENT WITH IVERMECTIN OR FENBENDAZOLE

O. SLOCOMBE and B. M. MCCRAW, Department of Pathology, University of Guelph, Guelph, Ontario, Canada, N1G, 2W1.

Shetland-cross pony foals, 6-10 weeks of age and reared worm free from birth, were infected with infective Strongylus vulgaris larvae and 56 days after infection were given either ivermectin intramuscularly at 200 ug/kg body weight or fenbendazole via stomach tube at 50 mg/kg for 3 days or 10 mg/kg for 5 days. The two anthelmintics were used in separate studies and in each of these there were infected and untreated foals. Examination of the treated foals at necropsy 35 days after treatment revealed a resolving arteritis and minimal thrombosis. Ivermectin and fenbendazole were highly effective in eliminating later 4th-stage larvae from the lumen of the cranial mesenteric artery and its branches.

The ileocolic artery of these foals was examined histologically and larvae were found relatively deep in the wall of the artery in the ivermectin-treated foals and close to the intima and in thrombi in the fenbendazole-treated foals. Many larvae were found in the former and these appeared intact, but viability was difficult to determine. In the latter, only severely disrupted larvae were observed. The intima in both groups was discontinuous and the tunica media several times normal thickness. There was infiltration of eosinophils and mononuclear cells and deposits of hemosiderin and this was more extensive in the fenbendazole-treated foals.

17 ISOELECTIC FOCUSING PATTERNS OF ANTIGENS FROM IN VITRO CULTURED COOPERIA PUNCTATA

G. L. ZIMMERMAN and J. E. CERRO, School of Veterinary Medicine, Oregon State University, Corvallis, Oregon and S. E. LELAND, JR., Department of Laboratory Medicine, College of Veterinary Medicine, Kansas State University, Manhattan, Kansas

Cooperia punctata were cultured in vitro for 21 days with resulting worm populations consisting mainly of adults, some fourth-stage, and a few third-stage larvae. Excretory-secretory products (ESP) greater than 10,000 daltons were recovered by Amicon ultrafiltration from balanced salt solutions-antibiotics (BSSA) in which these worms had been incubated for 48 hours. Prior to lyophilization, BSSA was exchanged with either distilled water (Kansas) or phosphate buffered saline (Oregon). Protein concentration of ESP prepared by the Oregon procedure averaged 4.06 x 10^{-9} g/worm whereas by the Kansas method, the average protein content per worm was 2.97 x 10^{-9} g. ESP were separated by analytical flat-bed isoelectric focusing using pre-prepared polyacrylamide-ampholyte gels (LKB) of a 3-9 pH range. More than 42 bands were resolved in each preparation. Separation patterns of both preparations were similar except that a particular band at pH 7.2 was more intense in the Kansas ESP than in the Oregan ESP.

18 CURRENT STATUS OF DIROFILARIA IMMITIS IN MINNESOTA

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Endemic canine heartworm, Dirofilaria immitis, infection was observed in east central Minnesota as early as 1937. Epizootic canine dirofilariasis was first encountered in Hennepin County, which contains the city of Minneapolis, in 1956. Since that time, the parasite has continued to spread among dogs and by 1980 had become endemic in 30 of Minnesota's 87 counties (5 counties in 1960, 25 counties in 1977). Although the parasite continues to expand its range within the state, the number of new animal infections has been shown to fluctuate and probably reflects; 1) rainfall and subsequent mosquito density, and 2) the prevalence of diethylcarbamazine preventive therapy in dogs.

Recent mail surveys among Minnesota veterinarians revealed 2180 (4.1%) D. immitis infections among 53,770 dogs tested in 1976, 1383 (2.1%) infections among 64,671 dogs tested in 1977, and 899 (1.1%) infections among 81,075 dogs tested in 1980. Heartworm is primarily an infection of dogs, but is also seen in cats, red foxes and coyotes. The 10 counties with the largest number of new canine heartworm infections in 1980 were, in order of occurrence, Hennepin, Anoka, Ramsey, Dakota, Blue Earth, Carver, Chisago, Washington, Isanti and Crow Wing.

19 PERIODICITY OF DIROFILARIA IMMITIS IN DOGS AND MICE
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Cell-free microfilariae of Dirofilaria immitis were recovered from an experimentally infected dog and inoculated intravenously into adult female BALB/c mice. Each mouse received 1 x 10^5 microfilariae. In one experiment mice were bled and microfilariae were counted 7, 14 and 21 days after inoculation at both 1100 and 2300 h. A similar experiment was conducted with mice that had received 550 R gamma radiation 24 h prior to inoculation; microfilariae were counted at 1100 and 2300 h 7, 14, 21, 28, 35 and 42 days after inoculation and bled at 4-h intervals for 48 h; microfilaria numbers at each bleeding were compared to numbers of microfilariae present at the same time in the donor dog. In a fourth experiment 2 groups of mice were irradiated, inoculated and bled as before; one group was acclimated to light from 0700 to 1900 h whereas the other group was acclimated to light from 1900 to 0700 h. The microfilaremia was subperiodic, varying regularly with time in both the dog and mice. Microfilariae in the dog reached maximum numbers during light hours. In each experiment, regardless of actual time, microfilariae in mice reached maximum numbers during dark hours. These data suggest that the extent of microfilaremia may be directly related to the level of activity of the host. (NIH Research Grant AI-18249).

20 SEROLOGY AND THE DIAGNOSIS OF OCCULT DIROFILARIASIS
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An ELISA test for dog heartworms was evaluated in a population of normally exposed dogs. After categorization based on medical histories, clinical examinations, Knott's tests and thoracic radiographs, antibody was found to be present at relatively low titers in non-infected dogs (mean = 30), dogs with patent heartworm infections (mean = 122), and dogs with previous heartworms infections (mean = 64), while high levels of antibody (mean = 2896) were found in dogs with occult dirofilariasis. There is good evidence that true occult dirofilariasis is an immune-mediated condition characterized by very high levels of humoral antibody, and that it is sometimes confused with long-standing semi-patent or previous heartworm infections because of similar clinical signs and radiographic evidence.

21 EFFICACY OF THIACETARSAMIDE IN EXPERIMENTALLY INFECTED DOGS AT 2 MONTHS, 4 MONTHS, 6 MONTHS, OR 12 MONTHS POSTINFECTION WITH DIROFILARIA IMMITIS.
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The activity of thiacetarsamide against experimental infections of Dirofilaria immitis in male beagles was studied in a time dependent fashion. The standard thiacetarsamide regimen (2 consecutive days of morning and afternoon dosing of commercial thiacetarsamide sodium solution [10 mg thiacetarsamide sodium/ml] given intravenously at 0.1 ml per pound

of body weight) was given 2 months, 4 months, 6 months, or 12 months postinoculation to groups of 5 dogs. Two groups of controls received no treatment. One control group was necropsied 8 weeks after the 6-months treatment time, together with the first three treatment groups. The other control group was necropsied with the group treated 12 months postinoculation approximately 8 weeks after that treatment. Worm burdens for the two sets of controls were similar ($\bar{x}$ = 59 + 3.2 standard error; $\bar{x}$ = 51 + 7.2). The drug was most effective when given 2 months postinfection believed to be before the time at which worms migrate to the heart ($\bar{x}$ = 0.2 + 0.2). Treatment was least effective when given 4 months postinfection, a time thought to correspond to early arrival in the heart ($\bar{x}$ = 41 + 8.0). No differences in worm burdens were seen between dogs treated at 6 months (presumed to have young adult worms) ($\bar{x}$ = 20 + 3.3) and those treated at 12 months (presumed to have mature heartworm) ($\bar{x}$ = 19 + 5.1). Only 1 of the 10 dogs treated at 6 or 12 months postinfection was negative for adult heartworm at necropsy but 8 of the 10 had only female worms.

22 FACTORS CONTRIBUTING TO IN VITRO DEVELOPMENT OF ASCARIS SUUM, FROM SECOND-STAGE LARVAE TO ADULTS

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Second-stage larvae of Ascaris suum, artifically hatched from eggs, have been grown in vitro to young adult males and to mature females which laid unfertilized eggs. These developmental stages were obtained in a three-step roller culture system which consists of (1) medium KW-2 supplemented with 10 mM L-cysteine for the first 4 days and 5 mM for the following 7 days; (2) followed by medium API-18 for 7 days; and (3) thereafter, by medium API-1 supplemented with a bovine hemin compound at a concentration of 24 mcg/ml. Cultures were gassed with 95% nitrogen/5% carbon dioxide for the first 4 days and 85% nitrogen/5% oxygen/10% carbon dioxide, thereafter; and incubated at 39 C. Beginning with inocula of 300,000 to 600,000 larvae, this system producted maximal yields of 90% early to late third stage by day 11, 1 to 50% fourth stage by 18 to 25 days, and less than 1% that advanced through fourth molt to mature adults by 30 to 166 days. A. suum larvae developed to young adult males and females, with body lengths of 14 to 28 mm, as early as 34 to 38 days; and to egg-laying mature females, with body lengths of 80 to 85 mm, as early as 67 to 73 days. Thus far, the largest young adult male measured 47 mm long and the largest mature female measured 95 mm long. In one trial, between days 73 to 166, a mature female oviposited about 97,000 unfertilized eggs that were encased by the shell and a refractive, mammilated albuminous coat.

23 SARCOCYSTIS AS A CAUSE OF PLACENTITIS AND ABORTION IN CATTLE

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An adult, multiparous Hereford cow from Frenchtown, Montana, aborted a near-term female calf. The aborting cow was clinically normal. Multiple

foci of necrosis were seen in the placenta, mainly involving lamina propria. There was a mild polymorphonuclear leukocyte and a mononuclear cell infiltrate in the lamina propria of cotyledonary villi and an increase in macrophages in the deeper villar portion of lamina propria. Focal mononuclear cell infiltrates and necrosis were present in glomeruli and in intertubular connective tissue in cortex and renal medulla. Lungs were edematous, congested, and there were focal interlobular hemorrhages and focal vasculitis. Meronts of Sarcocystis in all stages of development, were found in endothelial cells of capillaries, arterioles, and arteries of placenta, fetal lung, and kidney. The meronts were structually identical to those of coyote-derived Sarcocystis cruzi.

24 HEMATOLOGIC, SERUM BIOCHEMICAL, AND URINARY CHANGES IN DOGS WITH EXPERIMENTAL DIPETALONEMA RECONDITUM INFECTIONS

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Dipetalonema reconditum is known to parasitize dogs in the United States, but its role as a canine pathogen has been largely ignored. Therefore, the present study was initiated to characterize cellular, serum biochemical, and renal responses in dogs with experimental dipetalonemiasis and in dogs with existing chronic experimental infections. All dogs were microfilariae negative prior to inoculation and protected from mosquitoes and fleas. For experimental infections, three male and three female Beagles, six to seven months of age, were subcutaneously inoculated with 30 infective larvae per dog. A duplicate group of Beagles served as uninfected controls. Mean values for total RBC, HB, PCV, MCH, MCV, total and differential WBC, Knott's tests and weights were compared preinoculation and weekly thereafter. Total protein, albumin, BUN, ALT and CK were compared preinoculation and biweekly thereafter. Routine urinalyses and fecal exams were performed preinoculation and 28 weeks postinoculation. Mean total WBC were significantly ($P<0.05$) greater in infected dogs than in uninfected dogs 4, 5 and 7-12 weeks PI. Mean eosinphil counts were signficantly greater in infected dogs than in uninfected dogs 3-11, 13-15, 20, 23 and 24 weeks PI. Basophils were detected only in infected dogs 13, 15, 16 and 18-20 weeks PI. Microfilariae were detected 10 weeks PI and sporadically thereafter in three infected dogs. Mean values for remaining tests were not significantly different. One infected female developed a subacute purulent lymphadenitis of undetermined origin 17 weeks PI and was subsequently deleted from the study. Six worms were recovered at necropsy 18 weeks PI. All remaining infected dogs were necropsied 28 weeks PI and a total of one adult worm was recovered. Four of five dogs with chronic infections (70-89 weeks PI) has eosinophilia (1046-3690), one of five had lymphocytosis (5170) and three of four dogs examined had proteinuria (30+ to 100+ mg/dl).

25 STIMULATION OF HYPERSECRETION IN STOMACH MUCOSAL CELLS OF RATS BY IN VITRO PRODUCTS OF OSTERTAGIA LARVAE

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Infection of ruminant abomasa by Ostertagia results in mucous cell hyperplasia and decreased acid secretion. Small molecular weight peptides (G-25II) which inhibit respiration of isolated gastric glands have been isolated from in vitro products of Ostertagia. The in situ effects of G-25II on rat stomachs are reported here. Rats were intraperitoneally injected with 2 mg of G-25II twice a day for 3 days. As a control, the same preparation from the culture medium without Ostertagia was intraperitoneally injected into rats on the same schedule. The rats were starved 24 hours after the last administration, then sacrificed. The stomach was cut out and immersed in fixatives after intralumenal fixation in situ. Antrum and body portions of the glandular stomach were excised and prepared for electron microscopy. The thick sections of all specimens were stained with toluidine blue, periodic acid Schiff or alcian blue. Thin sections were observed by transmission electron microscopy. The stomachs from rats administered G-25II intraperitoneally or orally revealed large amounts of mucus in the glandular cells. Toluidine blue stain revealed a substance with high metachromasia in the pits of stomachs, representing secreted mucus. Periodic acid Schiff and alcian blue stain revealed increased amounts of both neutral and acidic mucus in the glandular cells. Transmission electron microscopy confirmed increased accumulation and secretion of mucus in the stomach with G-25II. Since both oral and intraperitoneal administration induces similar changes in stomachs, direct luminal contact of G-25II with mucus cells is not required. Three days after the last administration, stomachs revealed reduced mucus secretion, rather less than the control stomach. This result suggests that small peptides from Ostertagia specifically enhance mucus production and secretion in rat stomachs and this action is reversible.

26 NUTRITIONAL AND METABOLIC EFFECTS OF CONCURRENT INFECTIONS BY COCCIDIA AND NEMATODES IN THE RAT

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Growing, male Sprague-Dawley rats were subclinically infected with nematodes (Nippostrongylus brasiliensis) and coccidia (Eimeria nieschulzi) to produce single and double infections. In the double infections, the coccidial infection was superimposed on the nematode infection after allowing sufficient time for all nematodes to arrive in the gut. In each experiment there were two control groups: (1) uninfected rats fed ad libitum, and (2) uninfected rats pair-fed with each infected animal. Specific (viz., distinct from the effects of anorexia) effects of infections included (1) a reduction in feed conversion efficiency in doubly-infected rats, but not in singly-infected ones; (2) reduction in liveweight gains in the doubly-infected rats, but not in singly-infected ones; (3) a depression in the apparent digestibility of dry matter following the anoretic period in rats infected with coccidia alone, but not

in those doubly-infected or infected only with nematodes: (4) a reduction in apparent organic matter digestibility in rats infected with nematodes for one day and for four consecutive days in those infected with coccidia, but no reudction in doubly-infected rats; (5) reduction in apparent nitrogen digestibility in doubly-infected rats and those infected with coccidia only, with the occurrence of the concurrent nematode infection being associated with an earlier onset of decreased digestibility and an increase in its duration from two days to five.

27 LIFE CYCLE OF ISOSPORA SUIS OF BABY PIGS

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Sporogonous development of Isospora suis of swine was determined using established guidelines. Uninucleate sporonts underwent nuclear division, became binucleate, and then divided to form two round uninucleate sporoblasts. Binucleate sporoblasts elongated to form binucleate sporocysts, each of which then gave rise to four sporozoites. Sporulation was completed with 56 hr at 20 C, 40 hr at 35 C, 16 hr at 30 C, and 12 hr at 37 C. When sporocysts were freed mechanically from the oocysts and exposed to excysting solution, movement of the sporozoites inside the sporocyst was seen within 5 minutes. Indentations in the sporocyst wall became apparent and total or partial collapse of the sporocyst wall followed. Immediately following collapse of the sporocyst wall, released sporozoites were sluggish but became more active after incubation in excysting solution. The early endogenous development of I. suis was also studied to supplement an earlier report (Lindsay et al., 1980). J. Parasitol. 66: 771-779) which described stages from 1.5 to 10 days postinoculation (PI). Sporozoites were seen inside epithelial cells at 10 hr PI. Stages seen at 20 hr PI were sporozoites, binucleate Type 1 meronts and Type 1 merozoites indicating that merogony takes place 24 hr earlier than previously described. This research was supported in part by USDA Grant No. SEA-592011120510 to WLC and by General Cooperative Agreement No. ARS-587B30-2-313 between the Alabama Agricultural Experiment Station and the U. S. Department of Agriculture, Agricultural Research.

28 MASSIVE PERITONEAL CESTODIASIS IN A DOG

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At a routine ovariohysterectomy on a clinically normal 18-month-old Italian Greyhound about 0.5 L of packed cestode larvae 1-10 mm in diameter were recovered from the peritoneal cavity. The dog remained normal for 2 years until rapid development of a painful and distended abdomen necessitated surgery, at which time overwhelming larval cestode infection was found. Massive abdominal enlargement was associated with parasitic infiltration of all viscera. Adults of Mesocestoides were present in the intestine. Although light and electron microscopic characteristics of the

peritoneal forms, many of which were cystic and acephalic, were not typical of those described previously for Mesocestoides, the occurrence of peritoneal larval cestodes and patent intestinal adult infection with this genus suggests that the two were related. Comparisons made with other reported instances of aberrant infections with Mesocestoides and taeniid metacestodes will be discussed.

29 HISTOLOGICAL FINDINGS IN DOGS NATURALLY INFECTED WITH HEPATOZOON CANIS

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The diagnosis of infections with Hepatozoon canis in dogs from the Texas Gulf Coast has been enhanced by identification of various stages of the life cycle in skeletal muscle. Pyogranulomas, merozoites, schizonts and a previously undescribed cyst have been identified.

Myositis was not apparent in most of the biopsies submitted. The diagnosis was based on finding thin-walled cysts averaging 250 um in diameter. The nucleus (15-60 x 30-90 um) was surrounded by a bluish, mucinous, often granular material and fine laminar membranes which gave the cyst an onionskin appearance. In some cases the cyst nucleus appeared to be undergoing division.

Some cases were characterized as a myositis and/or myocarditis with well-defined pyogranulomas composed almost equally of macrophages and neutrophils with occasional eosinophils. Very few plasma cells or lymphocytes were found and no giant cells recognized. In one case there was notable sarcolemminal cell proliferation along the edge of the lesion. The lesions in the heart appeared to be more diffuse than the skeletal muscle. There was no evidence of encapsulation of any of the granulomas observed. The lesions, especially in the myocardium must be differentiated from those of Chaga's disease.

30 CAPILLARIA PUTORII IN DOMESTIC CATS

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Adult Capillaria putorii were found in the gastric mucus of 11 of 60 (18.3%) pound cats or pet cats. Female parasites measured 3.46-7.40 mm, and males measured 2.53-5.29 mm. The eggs measured 57-66 x 21-28 m and could be differentiated from those of Capillaria aerophila. No lesions or clinical signs were attributed to infection with C. putorii. It was suspected, but not proven, that the nematodes had been carried into the stomachs via intestinal reflux. This is the first record of C. putorii in domestic cats in North America.

31 CLINICAL OUTBREAK OF DICTYOCAULUS ARNFIELDI IN HORSES IN ILLINOIS

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In November of 1981, 2 weanling miniature horses were presented to the University of Illinois VMTH with a 2-month history of cyclic fevers and

respiratory infections unresponsive to 5 different antibiotic therapies. Clinical signs of intermittent coughing, bilateral mucopurulent nasal discharge, polypnea, and prominent bronchovesicular sounds throughout the lung fields were observed in both weanlings. Baermann technique on feces from 1 of the weanlings was positive for D. arnfieldi larvae.

Clinical workup on the weanlings included complete blood counts, cytology and microbiology culture of tracheal aspirates, endoscopy, thoracic radiographs, and pulmonary perfusion scintigraphy. Results revealed secondary bacterial infection and increased radiographic lung densities. Scintigraphy revealed large perfusion defects consistent with abcesses, granulomatous processes, or large infarcts. Verminous bronchitis with secondary bronchopneumonia was diagnosed. Mebendazole (20 mg/kg) and trimethoprim-sulfadiazine mixture (6.8 mg/kg) was used to treat both weanlings for 5 consecutive days. Two weeks after treatment, clinical signs of coughing and nasal discharge subsided. One month after treatment both weanlings were negative for D. arnfieldi.

The weanlings orginated from a herd of 11 miniature horses and 7 donkeys pastured together in central Illinois. In the spring of 1978, 2 donkeys died acutely. A necropsy of 1 of these donkeys revealed subacute, suppurative pneumonia with cross-sections of nematodes indicative of Dictyocaulus sp. In the fall of 1981, a third 3-month-old donkey had an acute respiratory episode and died within 24 hours. Necropsy revealed chronic pneumonia. A fecal profile of the remaining horses and donkeys on the farm revealed 3 lungworm positive donkeys. No other miniature horses or donkeys were showing clinical evidence of respiratory disease.

32 COMPARISON OF QUANTITATIVE FECAL TECHNIQUES IN HORSES

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Three quantitative and 1 qualitative fecal examination techniques for equine helminth ova were carried out 25 times each. A modified McMaster's technique (MMT) The Cornell McMaster's technique (CMT), a modified Stoll's technique (MST), and a sugar flotation technique (SFT) were used. The techniques were compared for variability, differences in mean values, and % positives. Feces used were obtained from the rectum of a 1-year-old horse over a single 2-hour period.

All four techniques were 100% positive for strongyles. Significantly ($p = .05$) different mean strongyle egg per gram counts (EPG) were found using the MMT (3584), CMT (2718), and the MST (650). The coefficient of variation of the strongyle EPG was greatest for the MST (40.2%), less for the MMT (30.9%), and least for the CMT (19.3%).

The SFT was 76% positive for Parascaris equorum. The MST was 52% positive for P. equorum, while the MMT was 32% and the CMT 16%. Significantly ($p = .05$) different mean P. equorum EPG were found using the MMT (112) than the CMT (8.0) or MST (8.8) which were similar. The coefficient of variation of the P. equorum EPG of the CMT (223.0%) was higher than that of the MMT (171.6%) and the MST (115.1%).

33 THE POPULATION DYNAMICS OF HELMINTHS OF THE GASTRONINTESTINAL TRACT OF HORSES AT SLAUGHTER

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Horses necropsied at the Ohio State University, College of Veterinary Medicine were examined for worms at the rate of 4 per month from May 1, 1981 to April 30, 1982. Aliquots of stomach, cecal and colonic contents, and pepsin/HCL digests of the stomach and cecal mucosa were examined, and worm burdens quantitated and identified to genus, species, sex and reproductive status.

The cyathostomes comprised the majority of the parasite population. Five species which have been shown to be resistant to benzimidazole anthelmintics (Cylicocyclus nassatus, Cyathostomum coronatum, Cth. catinatum, Cylicostephanus goldi, and Cph. longibursatus) made up 66% and 84% of the cecal and colon worm burdens, respectively. Reproductive activity of the small strongyles decreased in September and October, as indicated by a decrease in gravid females and an increase in spent females. An increase in tissue larvae stages in January and February suggested that arrested development is at a peak during these months.

The prevalences of large strongyles (33%) and mesenteric arterial lesions (35%) were lower than previously reported. Ascarids, pinworms and cestodes were also relatively uncommon in the adult horses examined.

34 EXPERIMENTAL OCULAR LARVA MIGRANS DUE TO BAYLISASCARIS PROCYONIS IN SUBHUMAN PRIMATES

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The purpose of these studies was to assess the ability of Baylisascaris procyonis to cause ocular larva migrans (OLM) in subhuman primates, as an indication of its possible zoonotic importance. Four squirrel monkeys (Saimiri sciureus) were inoculated per os with 5,000 or 10,000 larvated B. procyonis eggs, and four cynomolgus monkeys (Macaca fascicularis) received 20,000 eggs. The squirrel monkeys were clinically examined by direct and indirect ophthalmoscopy at 14 days, and the cynomolgus monkeys every 2-3 days postinoculation. All of the monkeys developed fulminating, severe CNS disease; the squirrel monkeys died at 12-19 days and the cynomolgus monkeys at 13-22 days. At 14 days a larval granuloma was seen in the retina of one squirrel monkey. Motile larvae, hemorrhages, degeneration and inflammation were seen in the retinas of one cynomolgus monkey at 7 days. By 11 days, this animal had near-total destruction of the retinas of both eyes, and was dead of CNS disease at 13 days. Two of the other three cynomolgus monkeys had significant ocular lesions by 14-16 days. Histologically, moderate to severe OLM was seen in all of the monkeys. Ocular lesions consisted of larvae and larval granulomas in the retina and choroid, with various degrees of retinal and choroidal disruption, degeneration, inflammation and hemorrhage. These results indicate that Baylisascaris procyonis has marked capabilities for the production of ocular larva migrans in subhuman primates. Based on these results, it is likely that the parasite could produce OLM in human beings in situations where infection took place.

35 COMPARISON OF THE PERIPARTURIENT RISE (PPR) IN FECAL EGG COUNTS OF EXOTIC AND DOMESTIC EWES

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Ewes of three exotic breeds (Florida Native, Barbados Blackbelly, and St. Croix) showed no PPR when housed from late fall through lambing and weaning. Domestic breed ewes (Finn Dorset X Rambouillet) showed a pronounced PPR, while St. Croix X domestic ewes showed an intermediate PPR. No PPR was seem in non-lambing ewes.

In a second experiment, differences in the PPR were not as pronounced when ewes were allowed to graze a contaminated pasture after lambing. Florida Native, St. Croix, and 3/4 St. Croix X 1/4 domestic ewes showed a reduced PPR. The remaining breeds (Barbados Blackbelly, F_1 hybrids of domestic and exotic breeds) showed a higher PPR. The reduced PPR in the exotic breeds implies less suppression of immunity during lactation compared to domestic breeds, as well as reduced contamination of pastures with worm eggs.

36 AN EXPERIMENTAL MODEL OF BREED RESISTANCE TO HAEMONCHUS CONTORTUS IN SHEEP

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An experimental model was developed to study breed resistance of domestic and exotic sheep to laboratory infections of H. contortus. Few differences were found between domestic and exotic breed lambs after primary infection with H. contortus. However, when lambs were dewormed after patency, and re-infected one week later, substantial breed differences were found. Domestic breeds (Dorset, Rambouillet, Suffolk, Finn crosses) showed little or no reduction in worm recovery after reinfection as compared to controls receiving a primary infection at he same time. St. Croix lambs showed a 99% reduction in worm burden, whereas Barbados Blackbelly, Florida Native, and 3/4 St. Croix X 1/4 domestic lambs had intermediate worm burdens. In these breeds there was a mixture of "responder" and "non-responder" individuals with worm burdens similar to the St. Croix and domestic lambs, respectively. Factors such as age, sex, and hemoglobin type are currently being evaluated with this system.

37 EPIDEMIOLOGY OF BOVINE LUNGWORM INFECTION IN WESTERN RANGE CATTLE

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The bovine lungworm (Dictyocaulus viviparus) as it occurs in Montana is a high prevalence/low intensity infection in beef herds moved to summer ranges in late May or early June. Initial exposure in spring-born calves occurs during their first summer on pasture. Onset of patent infections follows a distinct seasonal pattern beginning in July or August and persisting until November or December. Spontaneous reactivation of dormant infections appears to take place on a regular basis in some yearling animals 3 to 5 months after initial calfhood infections become nonpatent.

Overwinter survival of larvae on pasture was found to occur under certain conditions and may be the primary source of exposure to calves during their first grazing season. Wildlife reservoirs (elk, mule deer and moose) may contribute to contamination of summer ranges but are not believed to be an important factor in maintenance of bovine infections.

38 HELMINTHS OF CATTLE IN WYOMING: 1961 AND 1977

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Two surveys of trichostrongylid nematodes of cattle have been completed in Wyoming. The first survey (1957-61) included 375 calves, 228 yearlings and 275 mature beef cattle. After a sixteen year interim the second survey was made which included 676 calves, 431 yearlings and 383 mature cattle. Mean eggs per gram did not change significantly in calves (14 and 20 epg), in yearlings (29 and 19 epg) or in adult bovines (22 and 21 epg). No significant trends were discernible.

39 OBSERVATIONS OF OSTERTAGIA OSTERTAGI POPULATIONS IN TRACER CALVES GRAZED WITH BEEF YEARLINGS

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Use of experimental tracer calves in epidemiological research on gastrointestinal nematodes of ruminants is expensive and demanding of resources. However, data furnished on worm population dynamics in relation to events in permanently grazed cattle can be obtained by no other means. Tracer calves, raised free of helminth infection to 5-7 months of age, were grazed at monthly intervals with yearling beef cattle during 1981 in northwest Louisiana. Some examples of these observations are given. Tracers grazed during November through February acquired few to no inhibited O. ostertagi; the expected increase in inhibited larvae was seen from February through April and numbers declined in May. Adult O. ostertagi predominated from November through February. Tracers grazed on a pasture in April, which had been free of animals for 2 months, had considerably lower worm burdens than tracers grazed on continuously contaminated pasture. Two additional April tracer calves, confined and treated repeatedly with thiabendazole or levamisole, had substantial O. ostertagi infections at 78 and 141 days after removal from pasture. In two tracers grazed during May and treated weekly while at pasture, O. ostertagi burdens were reduced slightly; all other genera were considerably reduced. Two tracers were grazed during August on a pasture which was freed of cattle on July 1. Numbers of Haemonchus and Cooperia spp. were substantially reduced.

40 CRYPTOSPORIDOSIS UPDATE

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Cryptosporidium appears to be gaining attention as a significant animal pathogen. This coccidian infects numerous species including avian, reptilian and mammalian (including domestic animals and man). The significance in animals is related to the probable high incidence in beef and dairy calves. The infection is often mixed with enteric viral infections and the combination appears to be severe to lethal. The effects of pure Cryptosporidium infection in calves may be minimal unless complicated by other enteric pathogens, poor management, undernutrition and/or inappropriate antibacterial therapy. The long term effect on production potential has not been evaluated.

The public health significance of cryptosporidiosis will have to be evaluated. Interspecies transmission of the infection has been demonstrated experimentally, including man to animal transmission. In addition, cases in people that have recently been in contact with Cryptosporidium-infected calves, have been documented. Furthermore, fatal cases in immunocompromised humans have been recognized. The veterinary profession needs to be fully informed on cryptosporidiosis.

41 SYMPOSIUM: THE BIOLOGY OF CRYPTOSPORIDIUM: CRYPTOSPORIDIOSIS IN HUMANS AND CALVES

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Cryptosporidiosis was diagnosed and monitored in 12 healthy individuals who had direct contact with animals from 3 separate, unrelated outbreaks of calf cryptosporidiosis. Clinical symptoms included diarrhea and abdominal cramping for 3 to 12 days. Two of the cases were asymptomatic. All of the human cases were diagnosed by the presence of Cryptosporidium sp. oocysts in the feces. The demonstration of oocysts in fecal flotations has proven to be a reliable technique for diagnosing and monitoring cryptosporidiosis. Therefore, histologic examination of intestinal biopsies from human subjects or of intestinal tissues obtained from animals during necropsy is not necessay for diagnosis of this disease. Fecal samples were obtained from 3 immunodeficient humans with persistent cryptosporidiosis who had undergone repeated intestinal biopsies in order to monitor their infections. Large numbers of oocysts were demonstrated in their fecal samples, and this technique is now being used to monitor these infections. Oocysts of human and of calf origin were morphologically indistinguishable, and produced similar infections in suckling mice, rats, and previously uninfected calves. These data support the view that cryptosporidiosis is a zoonosis and that calves with diarrhea are a potential source of infection.

Endogenous development of Cryptosporidium was investigated in three-day-old white mice inoculated orally with oocysts isolated from a calf. Two mice were necropsied at 4, 8, 12, and 16 hr postinoculation (PI) and then 2 mice were necropsied every 24 hr from day 1 through 9 PI. Sporozoites were observed in mucosal scrapings of the small intestine

obtained 4, 8, 12 and 16 hr PI. Trophozoites, immature schizonts, and mature schizonts with 8 merozoites were seen in small intestinal tissues by 16 hr PI. Mature schizonts observed in mucosal scrapings, 1-um-thick plastic sections, and in thin sections prepared for transmission electron microscopy (TEM) contained 8, 6, or 4 merozoites. Sexual stages were present in small intestinal tissues obtained days 4-9 PI. TEM revealed that all endogenous stages were in a parasitophorous vacuole within modified microvilli. Schizonts, macrogametocytes, and microgametocytes could be distinguished by TEM. Sporogony occurred within the host tissues which resulted in oocysts containing 4 sporozoites and a large residuum. Ultrastructure of endogenous stages of the calf isolate of Cryptosporidium will be compared with that of isolates from immunologically normal and immunodeficient humans. This research was supported in part by General Cooperative Agreement No. ARS-587B30-2313 between the Alabama Agricultural Experiment Station and the U. S. Department of Agriculture, Agricultural Research.

42 MINOR USE IN DRUGS

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The number of new drug entities approved by FDA for use in food animals during the last 15 years has been considered by many to be quite low. Since 1974, for instance, the average annual approval rate has approximated 1.5 new drug entities for the major species of livestock, i.e. cattle, swine, and poultry. The minor species of food animals (sheep, goats, rabbits, ducks, gamebirds, and foodfish), have recieved no new drug entity approvals since 1964. An overview, including an historic perspective as well as an assessment of current activities to increase the approval rate for both major and minor species of food animals will be presented.

3 REPORT OF MEETING - NO ABSTRACT

44 REPORT OF MEETING - NO ABSTRACT

45 REPORT OF MEETING - NO ABSTRACT

46 REPORT OF MEETING - NO ABSTRACT

47 IDENTIFICATION OF ANIMAL PARASITES IN TISSUE SECTIONS: A NEW STUDY SET AVAILABLE AT THE AFIP

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A new study set is available at the Armed Forces Institute of Pathology and stresses identification of metazoan animal parasites in tissue section. The set is composed of a syllabus, 83 microslides and 313 Kodachromes. The syllabus is composed of three sections. The first section details how to identify a parasite; the second describes the microslides; and the third describes each Kodachrome. Kodachromes have been prepared from each slide and illustrate the characteristic morphologic features of each parasite. The set may be used for teaching and/or for reference. Sets may be borrowed for a maximum of 2 weeks by writing: The Director, AFIP, Washington, D. C. 20306.

48 THE EFFECT OF IVERMECTIN ON TRANSMISSION PATTERNS OF EQUINE INTESTINAL NEMATODES

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This investigation was designed to provide information on the effectiveness of ivermectin as a means of control of equine intestinal nematodes and on aspects of the epidemiology of equine strongyles as it applies to central Texas. Six mares were treated with approximately 0.2 mg/kg ivermectin at parturition. The mares and their foals were placed on parasite-free pastures. Another six mares were administered a similar amount of vehicle on the day of parturition. These mares and their foals were placed in an adjoining pasture and served as controls.

Fecal egg counts from the mares indicated that ivermectin significantly reduced patent infections of equine stongyles for a period of four months. Pasture larval populations were also reduced.

Data from foal fecal egg counts and necropsies indicated that the treatment of mares with ivermectin at parturition reduced small strongyle burdens in the foals for at least the first five months of life.

The results confirmed that the mare is the most important source of infection for Strongyloides westeri and small strongyles to the foal.

The epidemiology of equine strongyles in Texas is different from that reported in Great Britain. The mare will pass strongyle eggs year round. No distinct late spring/early summer rise in mare fecal strongyle egg counts was noted, but a distinct mid-summer rise did occur. This high egg output coincided with the driest, hottest period of the year when pasture larval counts were low. A reservoir of infective strongyle larvae was created on pasture and with the first autumn rains, there was a dramatic increase in the number of larvae on forage. The small strongyle larvae burden in a foal necropsied after the increase in pasture larval counts was significantly higher than in those foals necropsied before the rise in pasture larval counts.

49 EFFICACY OF IVERMECTIN AGAINST CUTANEOUS ONCHOCERCIASIS IN HORSES

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Forty horses showing microfilariae of Onchocerca cervicalis in association with dermatitis, alopecia and pruritus of the ventral midline were given a single intramuscular injection of 0.2 mg/kg of ivermectin in June - August, 1981. Microfilarial counts in 40 horses ranged from 18 - 42,446 microfilariae per skin snip on the day of treatment and histopathologic examination of skin sections showed a chronic eosinophilic dermatitis. There were large numbers of microfilariae in the dermis, but there was no consistent relationship between the presence of microfilariae and the severity of the inflammatory reaction. In all 40 horses, a marked clinical improvement occurred 2-3 weeks posttreatment, when the lesion was replaced by healthy skin and new hair. Skin snips taken 4-33 days post-treatment were negative for microfilariae in all 40 horses. When further samples were taken from 15 horses 4-9 months later, 9 of them were still free of microfilariae and the other 6 had low counts (17-97). An additional 7 clinically affected horses, treated in November/December, 1981, when there was negligible chance of reinfection posttreatment were all free of microfilariae at both 6-10 days and 4-5 months posttreatment. This result suggests that ivermectin may be an adulticide as well as a microfilaricide.

An edematous reaction occurred on the lower abdomen of 4 (10%) horses and within the area of the lesion in 6 (15%) horses 24 hours post-treatment. The reactions disappeared after a further 24-72 hours. These 10 (25%) horses had significantly higher pretreatment umbilical microfilarial counts than the 30 horses with no posttreatment reaction. The reaction was attributed to liberation of toxic disintegration products following death of massive numbers of microfilariae. The marked clinical improvement in all 40 horses 2-3 weeks after killing microfilariae with ivermectin suggests that microfilariae are involved in the etiology and pathogenesis of the dermatitis.

50 IVERMECTIN IN INJECTABLE AND PASTE FORMULATIONS: EFFICACY AGAINST FOURTH STAGE STRONGYLUS VULGARIS LARVAE AND POSTTREATMENT RESPONSES OF PONIES

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The efficacy of ivermectin at 0.2 mg/kg dose level in paste and injectable formulations was tested against eight-week-old Strongylus vulgaris fourth-stage larvae. Infections were introduced by per os inoculations of 500 third-stage larvae in parasite-free foals. Using comparisons of dead and viable S. vulgaris recovered 5 weeks post-treatment, in treated and nontreated controls, both formulations were shown to be >99% effective. Weight gains were greater in treated foals. Arterial lesions in treated ponies were markedly reduced or absent at necropsy. Total WBC counts, neutrophil numbers and eosinophil numbers were

significantly decreased in treated ponies, following treatment. Antibody titers as measured by an ELISA method did not change following treatment.

51 THE EFFICACY OF IVOMEC AGAINST DERMATOBIA HOMINIS IN CATTLE
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The combined results of four trials concluded in Paraguay and Brazil show that ivermectin* given subcutaneously as a single injection at a dose rate of 200 mcg/kg of body weight elicited — 7 to 11 days following treatment — an efficacy of 100, 93, and 99% respectively, against the first, second and third larval stage of Dermatobia hominis in cattle.

* IVOMEC

52 ACARICIDAL ACTIVITY OF IVERMECTIN AGAINST AN EXPERIMENTAL INFESTATION OF PSOROPTES OVIS IN CATTLE
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The avermectins are a new class of fermentation products which have exhibited excellent activity against a wide range of nematodes, insects, and arthropods. The purified components have shown even greater activity. This study was conducted to investigate the acaricidal activity of the B_{1a} component of the avermectins (ivermectin) against experimental infestations of Psoroptes ovis in cattle. Eighteen Hereford calves ranging from 350 to 450 lbs were experimentally infested with Psoroptes ovis and randomly allotted to three groups at 42 days postinfestation: (1) control (n = 6); (2) 200 mcg ivermectin/kg body weight once by subcutaneous injection (n = 6); and (3) 200 mcg ivermectin/kg body weight once orally in a paste formulation (n = 6). Severity of mite infestation for each calf was determined by skin scrapings 9, 4, and 2 days prior to treatment. Each calf was examined at 7 days posttreatment and 7-day intervals up to day 56 for the presence of Psoroptes ovis. Data have been assembled and will be presented.
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53 CESTOCIDAL ACTIVITY OF FENBENDAZOLE IN CALVES
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Forty-five commercial-grade Angus calves naturally infected with tapeworms (Moniezia sp) were used in 2 controlled experiments to evaluate the cestocidal efficacy of 3 dose levels of fenbendazole, methyl-5-(phenylthio)-2-benzimidazolecarbamate. In the first trial, 15 calves were divided into 3 groups of 5 each. One group served as nonmedicated

controls. Other groups were drenched with fenbendazole at dose rates of 10 and 15 mg/kg of body weight. Thirty calves used in the second experiment were divided into 3 equal groups. One group served as nonmedicated controls and the other 2 groups were drenched at dose rates of 7.5 and 10 mg/kg. Calves were necropsied 12 days after treatment. Doses of 10 and 15 mg/kg were 100% efficacious in reducing the number of tapeworm scolices, and a dose of 7.5 mg/kg was 91.7%. Medicated cattle did not show signs of intoxication.

54 CLINICAL TRIALS WITH COMBINATIONS OF MEBENDAZOLE AND PIPERAZINE IN HORSES
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Clinical trials were done on 40 horses of various sex, breed, and age with naturally-acquired parasitic infections. The horses were selected from a herd that had a history of routine deworming with benzimidazoles resulting in incomplete activity against strongyles. Prior to the onset of the trial, in vitro testing of the horses for benzimidazole-resistant strongyles was positive. The horses were randomly assigned 1 of 4 treatments (Tx): Tx1—8.8 mg/kg mebendazole (MBZ), Tx2—8.8 mg/kg MBZ and 55 mg/kg piperazine base (PZ), Tx3—8.8 mg/kg MBZ and 40 mg/kg PZ, and Tx4—8.8 mg/kg MBZ and 25 mg/kg PZ. A 3.33% suspension of MBZ and a 34% solution of piperazine monohydrochloride were utilized. The treatments were administered once via stomach tube. Fecal samples were obtained from the rectum immediately prior to treatment and 7 days posttreatment. Strongyle egg per gram counts (SEPG) using a modified McMaster's technique and fecal cultures for third-stage strongyle larvae were done on the samples. The horses were observed for adverse reactions throughout the trial.

Horses treated with MBZ alone had the smallest geometric mean % reduction in SEPG, 78.2%. A 99.9%, 99.7%, and 99.7% reduction in geometric mean SEPG occurred in the horses in Txs 2, 3, and 4, respectively. Results of fecal cultures prior to treatment indicated that the horses in all treatment groups were infected with large and small strongyles. Results of fecal cultures 7 days posttreatment indicated that small strongyles were present in horses treated with MBZ alone (Tx1) more frequently than horses treated with MBZ-PZ mixtures. Mixtures of MBZ and PZ appeared to be more effective in the control of strongyles than MBZ alone. Adverse reactions were not observed in any of the horses.

55 PROPHYLAXIS OF PORCINE COCCIDIOSIS WITH SALINOMYCIN
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Coccidiosis is emerging as a serious disease in the swine industry. National surveys have shown a 60% prevalence of coccidia in sows, while numerous investigators have described clinical disease in neonatal swine. Because treatments appear to be of little value in coccidiosis, numerous products have been tried as prophylactic routines in the sow. Pigs fed salinomycin at levels of 0.025, 0.05 and 0.1 mg/kg of the diet had fewer

days and lower peaks of oocyst production, improved fecal scores, greater weight gain and better feed conversion than infected nonmedicated pigs.

56 SIGNIFICANCE OF PARASITE STAGE ON PERCEIVED ANTHLMINTIC EFFICACY AGAINST HOOKWORM INFECTION IN DOGS

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The three hookworms that infect the dogs, Ancylostoma caninum, Ancylostoma braziliense and Uncinaria stenocephala, induce hypoproteinemia, and hypoalbuminemia through an increased exogenous catabolic rate of plasma albumin. Ancylostoma caninum also causes serious blood loss and is the major hookworm pathogen of dogs. The initiation of hypoalbuminemia, and, in A. caninum infection, anemia is related to the interval postinfection and worm stage(s) present.

When dogs are presented to a veterinarian for treatment for hookworm infection or disease, the presence of only adult worms can be detected; coexisting immature pathogenic stages cannot be clinically detected. Pups infected with large burdens of A. caninum can die of acute anemia in the prepatent period still with negative fecals. Clinical differential diagnosis to determine the species of hookworm(s) is difficult.

In hookworm-enzootic areas and under suitable climatic conditions, infection and accumulation of hookworm burdens are continuous processes. Hence burdens comprise spectra of age, stage, and in some areas also species of hookworm. It is essential, therefore, that treatment of the hookworm infected dog, particularly in acute anemic animals, be targeted at all stages and preferably also against all species. Of the available canine anthelmintics, few have FDA-approved claims of efficacy against immature worms and all three species.

57 THE EFFECT OF XANTHENE DYES ON BOVINE GASTROINTESTINAL NEMATODES

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A previous report indicated that erythrosin B was shown to be extremely toxic to third-stage larvae of various gastrointestinal nematodes of cattle. Experimental studies continue to confirm this report. Naturally-infected calves of approximately six months of age were treated per os with 20, 30, 40, and 60 mg/kg of erythrosin B daily for various periods of time. Untreated calves served as controls. Feces was collected daily prior to and during the treatment period. Fecal cultures were set up and third-stage larvae were collected and exposed to a controlled light source. The effect of days posttreatment and days in culture on the toxicity of erythrosin B to third-stage larvae were investigated. Additional studies were designed to determine the effect on adult nematodes. Preliminary evidence, however, indicates that neither adult nematode viability or fecundity seems to be significantly reduced when calves are treated per os with erythrosin B. There also seems to be little effect on egg hatchability. This is not surprising since the primary toxicity is a light dependent reaction. The comparative toxicity of a

number of different xanthene dyes other than erythrosin B was also determined.

Data collected to date continues to support the reported toxicity of erythrosin B to parasitic gastrointestinal nematodes of cattle. Additional studies are planned to further investigate the potential of this group of compounds for use in controlling parasites of domestic animals.

58 EFFICACY OF FENBENDAZOLE AGAINST MIGRATING ASCARIS SUUM LARVAE IN PIGS

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Twenty-four cross-bred, weanling pigs were each given 10,000 embryonated Ascaris suum eggs by mouth. The pigs were assigned to three equal groups by sex, weight and litter. Group I pigs were individually fed fenbendazole (3mg/kg) on days 2, 3, and 4 after infection; Group II pigs were individually fed fenbendazole (3mg/kg) on days 6, 7, and 8 after infection; and Group III pigs were not treated. All pigs were necropsied 24 days after infection and examined for lesions and parasites. Treatment of pigs at either time was effective in reducing the number of A. suum at necropsy by more than 99% when compared with controls (means: I, 0.5; II, 0.1; III, 120.9). Late treatment was more effective than early treatment in reducing number of liver lesions. Early-treated pigs, however, gained weight faster and were more efficient in conversion of feed into body weight than late-treated or control pigs (means: I, 0.99 and 3.51; II, 0.90 and 3.72; III, 0.73 and 4.06).

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