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SCIENTIFIC PROGRAM / PROGRAMME SCIENTIFIQUE

WEDNESDAY, AUGUST 12TH / LE MERCREDI 12 AOÛT

8:00 REGISTRATION / INSCRIPTION
9:00 OPENING CEREMONY / CÉRÉMONIE D'OUVERTURE
10:00 **Veterinary Parasitology - Canadian Perspective**
10:30 BREAK / PAUSE CAFÉ
11:00 **Veterinary Parasitology - U.S.A. Perspective**
11:30 **Improvements in the Serodiagnosis of Helminthic Zoonoses**
12:00 LUNCH / DÉJEUNER

14:00 - 15:15

Room / Local Parc 1 **4a**
Schering Corporation Symposium:
Advances in the Control of Parasites in Cattle
Développements dans le contrôle des parasites chez les bovins
Chairman/président: J. Duncan

14:00 - 14:15 Efficacy of netobimin (Schering Corp.) against a mixed infection of *Dicrocoelium dendriticum* and *Fasciola hepatica* in cattle.
K. Pfister*, D. Ducommun, H. Kipfer, H. Kaufmann & W.B. Young 4a-1

14:15 - 14:30 Efficacité du netobimin (Sch. 32481) sur les principaux helminthes parasites internes des ruminants. Synthèse de l'expertise clinique.
A. Marchand* 4a-2

14:30 - 14:45 Effects of two years of strategic deworming with fenbendazole on a beef cow/calf herd in Minnesota.
J.C. Schlotthauer*, B.E. Stromberg, D.L. Haggard, R.J. Vatthauer & H.E. Henke 4a-3

14:45 - 15:00 Netobimin (Hapadex) evaluation against gastrointestinal nematodes and cestodes in alpacas.
M. Jose Alva* 4a-4

15:00 - 15:15 Ivermectin: Productivity and control of nematode parasites in cattle.
J.C. Williams*, J.W. Knox, K.S. Marbury & M.D Kimball 4a-5

Room / Local Parc 2 **11a**
Pharmacokinetics
Pharmacocinétique
Chairman / président: D. Hennessy

Pharmacokinetics and tissue residues of luxabendazole in sheep.
J.W. Steel* & D. Duwel 11a-1

Influence of different physical forms of triclabendazole on its efficacy and pharmacokinetics in sheep.
R.J. Richards*, P. Mayer, G. Buscher, M. Strong & F.L. Bowen 11a-2

Experimental pharmacology of echinococcosis/hydatidosis in vitro: effect and kinetics of mebendazole, praziquantel and quinone derivatives.
R.N. Lorenzini*, P. Betto & G. Settimj 11a-3

Pharmacodynamic aspects of the anthelmintic efficacy of ivermectin.
J. Bogan*, Q.A. McKellar, I. McKinnon & E.W. Scott 11a-4

Some factors affecting isometamidium prophylaxis against bovine trypanosomiasis.
A. Peregrine, O. Ogunyemi, D.D. Whitelaw, P.H. Holmes, S.R. Moloo, H. Hirumi, G.M. Urquhart* & M. Murray 11a-5

15:15 BREAK / PAUSE CAFÉ — FOYER

16:00 - 17:30

Room / Local Parc 1 **4b**
Chemotherapy and Productivity in Cattle
Chimiothérapie et productivité chez les bovins
Chairman / président: H. Pfeiffer

16:00 - 16:15 Parasite control programs for preweaned calves in subtropical Argentina.
G.M. Bulman*, J.M. Bulman, C.A. Fiel & R.R. Ambrustolo 4b-1

16:15 - 16:30 Productivity evaluations of ivermectin parasite control programs in pre-weaned calves in Brazil.
O. Bastos*, M.E. Bavia, M. Malacco, F.V. Heiderich & E.L. Bordin 4b-2

16:30 - 16:45 Treatment strategies for parasite control in grazing steers in a temperate climate region of Argentina.
R.R. Ambrustolo*, C.M. Entrocasso, C.A. Fiel, G.M. Bulman & C.A. Biondani 4b-3

16:45 - 17:00 Comparisons of ivermectin with conventional treatments in growing cattle in tropical or subtropical areas of Brazil.
M. Farias & E.L. Bordin* 4b-4

17:00 - 17:15 Performance of fattening beef cattle treated with ivermectin or other treatments in sub-tropical areas of Brazil.
M. Malacco, M. Farias, E.L. Bordin*, F.V. Heiderich & O. Bastos 4b-5

17:15 - 17:30 Evaluations of productivity in replacement heifers in subtropical Argentina.
G.M. Bulman*, J.M. Bulman, R.R. Ambrustolo, C.A. Fiel & B. Beckwith 4b-6

Room / Local Parc 2 **12a**
Metabolism and Toxicology
Métabolisme et toxicologie
Chairman / président: R. Prichard

Toxicology of netobimin in laboratory animals.
D.G. Campbell* 12a-1

In vitro and *in vivo* mutagenicity testing of netobimin.
D.B. McGregor* & D.G. Campbell 12a-2

Elimination par le lait des résidus de netobimin (Sch 32481) administré à la vache laitière par la voie sous-cutanée.
L.P. Pinault* & C.F. Camus 12a-3

Safety of netobimin in ruminants.
D.G. Campbell* & R.M. Slepetys 12a-4

Metabolism of benzimidazole anthelmintics and their prodrugs: consequences in pharmacology and therapeutics.
P. Delatour* (30 minutes) **Keynote Paper** 12a-5

18:30 - 20:00 SCHERING WELCOME COCKTAIL RECEPTION - BALLROOM / BIENVENUE - RÉCEPTION COCKTAIL - SALLE DE BAL

.....Foyer
.....J. Eckert, R. Prichard & T. Klei...Parc 2.....Chairman / président: H. Smith
.....**O. Slocombe**.....Parc 2.....Chairman / président: H. Smith
.....Foyer
.....**J. Malone**.....Parc 2.....Chairman / président: T. Klei
.....**P. Schantz**.....Parc 2.....Chairman / président: J. Euzèby

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Room / Local Prince Arthur **16a**
Trypanosomiasis
Trypanosomiose
Chairman / président: P. Gardiner

African trypanosomiasis in cattle: improved performance by chemoprophylaxis.
M. Murray*, J.C. Trail & S.H. Moloo 16a-1

A rational approach to the development of new drugs against trypanosomiasis.
F.R. Opperdoes (30 minutes) **Keynote Paper** 16a-2

Chromosome profiles of *Trypanosoma congolense* isolates from the coastal area of Kenya. **R.A. Masake*, V. Nyambati, V.M. Nantulya & S.K. Moloo** 16a-3

Experimental infections of dogs with North American isolates of *Trypanosoma cruzi.*
S.C. Barr, R.A. Holmes, C. Brown, V.A. Dennis & T.R. Klei 16a-4

BREAK / PAUSE CAFÉ

Room / Local des Pins **1a**
Immunity and Vaccination
Immunité et vaccination
Chairman / président: A. Aeschlimann

Resistance to *Dermacentor variabilis* in mast cell deficient mice.
E.B. Steeves* & J.R. Allen 1a-1

Babesia divergens: Epidemiology and vaccination.
K.T. Friedhoff* & D. Ganse-Dumrath 1a-2

Eimeria maxima: sporozoite transport in naive and immune chickens.
D.P. Riley* & M.A. Fernando 1a-3

Chronic and atypical theileriosis.
T.T. Dolan* 1a-4

Immunity of yearling ivermectin treated cattle to lungworm challenge.
W.G. Ryan*, J. Armour, K. Bairden, M.T. Fox & D.E. Jacobs 1a-5

FOYER

Room / Local Prince Arthur **21a**
Epidemiology and Population Dynamics
Epidémiologie et dynamique des populations
Chairman/président: J. Boray

Epidemiology of bovine dictyocauliasis in Louisiana (USA).
C.S. Eddi* & J.C. Williams 21a-1

A study of the epidemiology of anaplasmosis in Nigeria.
S.A. Ajayi* 21a-2

Pasture sweeping for control of equine parasites and colic.
R.P. Herd* 21a-3

Bovine ostertagiasis: infective larval recoveries from herbage from grazed and ungrazed cattle pastures in Western U.K.
K. Bairden*, J.Armour & P.N. McWilliam 21a-4

Impact of *Arthrobotrys oligospora* on kinetics of Trichostrongylid L_3 on pasture.
H.A. Hashmi* & R.M. Connan 21a-5

Use of a geographical information system to model potential habitat of *Fossaria bulimoides* based on a soil map.
S.H. Zukowski*, J.B. Malone* & J.M. Hill 21a-6

Room / Local des Pins **1B**
Immunity and Vaccination
Immunité et vaccination
Chairman/président: H.J. Bürger

Immunity of yearling ivermectin treated cattle to challenge with gastrointestinal helminths.
W.G. Ryan*, J. Armour, K. Bairden, M.T. Fox & D.E. Jacobs 1b-1

Relationship between eosinophils in cutaneous basophil hypersensitivities and susceptibility to *Trichostrongylus colubriformis* infection.
T.L.W. Rothwell* & L.R. Abeydeera 1b-2

An increase in intestinal mucosal mast cells and their acquired responsiveness to larval antigens in vitro is characteristic of intestinal immunity to *Ascaris suum* in pigs.
J. Urban, Jr.*, M. Ashraf & C.M. Lee 1b-3

Further evaluation of the intestinal mast cell response and associated cell reactions in *F. hepatica* infections.
K. Pfister* & M. Spaehni 1b-4

Protection of yearling ponies against *Strongylus vulgaris* by foalhood vaccination.
T.R. Klei*, D.D. French, M.R. Chapman, J.R. McClure, V.A. Dennis, H.W. Taylor & G.W. Hutchinson 1b-5

Study on the resistance of sheep to *Fasciola gigantica* challenge infection.
S.A. Ali, J.K. Kadhim* & N.A. AL-Zahery 1b-6

THURSDAY, AUGUST 13TH / LE JEUDI 13 AOÛT

8:30 - 10:00

Room - Local Parc 1 **5A**
Control of Ectoparasites in Cattle
Contrôle des ectoparasites chez les bovins
Chairman/président: A. Malczewski

Room / Local Parc 2 **2A**
Application of Molecular Biology to Diagnosis
Application de la biologie moléculaire dans le diagnostic
Chairman / président: R. Gamble

08:30 - 08:45

Avermectin B_1 against the tick *Boophilus microplus* in cattle: results of a titration trial.
A.A. Bridi, L.A. Carvalho, L.G. Cramer, N.K. Amaral* & S.J. Gross 5a-1

DNA probes for diagnosis of filarial parasites.
S.A. Williams* & L.A. McReynolds 2a-1

08:45 - 09:00

Persistent activity of injectable ivermectin in the control of the cattle tick *Boophilus microplus.*
L.G. Cramer, A.A. Bridi, N.K. Amaral* & S.J. Gross 5a-2

Non-radioactive DNA probes as diagnostic tools for hydatidosis / echinococcosis.
K.W. Yap* & R.C.A. Thompson 2a-2

09:00 - 09:15

Cattle productivity trial using ivomec in a tick infested area of Argentina.
C. Eddi*, R. Niec, C. Benitez Usher, R. Dughetti & S. Gross 5a-3

Expression of *Echinococcus granulosus* antigens in *Escherichia coli.*
M.W. Lightowlers & M.D. Rickard* 2a-3

09:15 - 09:30

Influence of adequate parasite control on cattle productivity.
L.F. Uribe* & S.G. Gross 5a-4

Subspecies of *Trichinella spiralis* characterized by DNA structure and correlated with infectivity for rodents and swine.
J.B. Dame*, K.D. Murrell & D.S. Zarlenga 2a-4

09:30 - 09:45

Efficacy of topically-applied ivermectin against *Dermatobia hominis* larvae in cattle.
L.F. Uribe*, P.F. McMullin, L.G. Cramer & R.A. Barrick 5a-5

Strain variation in *Echinococcus.*
R.C.A. Thompson* (30 minutes) **Keynote Paper** 2a-5

09:45 - 10:00

Control of lice on cattle with synthetic pyrethroids.
R.N. Titchener* 5a-6

10:00 - 10:45 BREAK / PAUSE CAFÉ — FOYER

10:45 - 12:00

Room / Local Parc 1 **6A**
Hoechst-Roussel Agri-Vet Symposium:
Advances in the Control of Parasites in Sheep
Développements dans le contrôle des parasites du mouton
Chairman / président: P. Nansen

Room / Local Parc 2 **2B**
The Application of Molecular Biology to Vaccine Development and Diagnosis
Application de la biologie moléculaire au développement des vaccins et au diagnostic
Chairman / président: J. Dane

10:45 - 11:00

Luxabendazole (LBZ) a new broadspectrum anthelmintic — review on pharmacological and toxicological investigations.
B. Tiefenbach* 6a-1

Cloning and characterization of *Dirofilaria immitis* antigens.
L.A. McReynolds*, A.G. Grandea III & C. Maina
(30 minutes) **Keynote Paper** 2b-1

11:00 - 11:15

The efficacy of luxabendazole (LBZ), a new broad spectrum anthelmintic, against nematodes of sheep.
E.M. Abbott* 6a-2

11:15 - 11:30

The efficacy of luxabendazole (LBZ) on flukes and tapeworms in sheep under laboratory and field conditions.
D. Düwel* 6a-3

The cloning and expression of diagnostic antigens from *Trichinella spiralis* muscle larvae.
D.S. Zarlenga & H.R. Gamble* 2b-2

11:30 - 11:45

Field treatment of *Protostrongylus* spp. and gastrointestinal parasites with fenbendazole in Rocky mountain bighorn sheep.
W. Foreyt* 6a-4

Immunodiagnosis of echinococcosis and cysticercosis: identification of specific antigens, in vitro translation of parasite mRNA and gene expression in bacteria.
B. Gottstein* (30 minutes) **Keynote Paper** 2b-3

11:45 - 12:00

The efficacy of netobimin at a dose rate of 15 mg/kg against *Dicrocoelium dendriticum* in sheep.
F.A. Rojo-Vazquez*, A. Meana, J.M. Tarazona & J.L. Duncan 6a-5

12:00 - 14:00 LUNCH — DÉJEUNER

Room / Local Prince Arthur **18A**
MSD-Agvet Symposium:
Advances in the Control of Parasites in Equines
Développements dans le contrôle des parasites chez les chevaux
Chairman/président: R. Herd

Seasonal incidence and impact of gastrointestinal parasites on developing pony foals in Louisiana.
D.D. French*, T.R. Klei, M.R. Chapman & H.W. Taylor 18a-1

Evaluation of the activity of ivermectin against *Parascaris equorum.*
J.A. DiPietro*, T.F. Lock & K.S. Todd, Jr. 18a-2

Controlled trial of dienbendazole (Vet 220) and analog Vet 220-S against pre-patent and patent *Parascaris equorum* resulting from experimental infection.
T.R. Bello* 18a-3

Control of benzimidazole-resistant equine cyathostomes and other nematodes with a combination paste containing oxfendazole and piperazine.
J.B. Bentley, I.G. Pearson* & B.J. Freckelton 18a-4

Comparative anthelmintic control of equine strongylosis.
G.G. Lumsden & W.G. Ryan* 18a-5

Oral liquid ivermectin for horses: efficacy and duration of effect.
R.J. Bell* 18a-6

BREAK / PAUSE CAFÉ

Room / Local des Pins **13A**
Pathophysiology
Pathophysiologie
Chairman / président: P.H. Holmes

Blood pathology in spontaneous gastrointestinal helminthiasis of poultry.
P.C. Sekhar* 13a-1

Strongyloides stercoralis migration in dogs.
G.A. Schad, L.M. Aikens*, & G. Smith 13a-2

Pathogenicity of *Nematodirus spathiger* in lambs.
R.M. Connan 13a-3

The occurrence and vitality of *Cysticercus tenuicollis* in the omentum majus of sheep.
M.-A. Hasslinger & R. Weber-Werringhen 13a-4

Examination of wool for detection of *Damalinia ovis* infested flocks.
F.C. Wilkinson* & G.A. Wise 13a-5

Plasma pepsinogen characteristics in cattle during three different infection regimens of *Ostertagia ostertagi.*
Q.A. McKellar* & P.D. Eckersall 13a-6

FOYER

Room / Local Prince Arthur **20A**
Janssen Symposium:
Advances in the Control of Poultry Parasites
Développements dans le contrôle des parasites de la volaille
Chairman / président: J.L. Fréchette

Diclazuril (Pinn), a new anticoccidial for broiler chickens.
O. Vanparijs, L. Desplenter & G. Braem* 20A-1

Control of coccidiosis by vaccination in two years of commercial roaster chickens with a new vaccine.
E.-H. Lee* & A. Kennedy 20a-2

Effect of halofuginone on experimental cryptosporidiosis in the bobwhite quail *(Colinus virginianus).*
M.G. Levy* & D.H. Ley 20a-3

Treatment of nematodiasis in laying hens with fenbendazole (FBZ) and its influence on egg production.
A. Ramisz* 20a-4

Battery studies on the anticoccidial efficacy of maduramicin ammonium in chickens.
I. Varga* 20a-5

LUNCH

Room / Local des Pins **14A**
Zoonotic Infections
Infections zoonotiques
Chairman / président: T. Kassai

Human toxocariasis: role of IgE in diagnosis.
C. Genchi*, P. Falagiani, G. Mistrello, G. Riva & I. Masi 14a-1

Control of endemic neurocysticercosis by a large-scale treatment of human taeniasis: Ecuadorian experience.
Z. Pawlowski*, A. Davis, H. Dixon & M. Cruz 14a-2

Echinococcus granulosus strains and possibility of their usage for prevention of echinococcosis.
A.S. Bessonov* & V.B. Yastreb 14a-3

Hydatidosis in buffaloes *(Bubalus bubalis.)*
H.S. Gill* 14a-4

Domestic and wild animals infected with *Giardia* of the *duodenalis* type.
G.M. Faubert* 14a-5

DÉJEUNER

THURSDAY, AUGUST 13TH / LE JEUDI 13 AOÛT

14:00 - 15:15 Room / Local Parc 1 **11B**
Pharmacokinetics
Pharmacocinétique
Chairman / président: J. Bogan

Room / Local Parc 2 **2C**
Serodiagnosis
Serodiagnostic
Chairman / président: J. Vercruysse

14:00 - 14:15 Methods of enhancing the activity of a benzimidazole anthelmintic.
B.F. Chick*, R. Runkel & I.G. Pearson 11b-1

Uses and abuses of tests for immunodiagnosis of canine dirofilariasis.
C.H. Courtney* 2c-1

14:15 - 14:30 Dose response pharmacokinetics and metabolism of parenterally administered netobimin in cattle.
J.W. Steel* D.R. Hennessy 11b-2

Standardisation de l'expression des résultats dans le diagnostic sérologique de la leishmaniose canine: proposition d'un sérum de référence.
P. Haas*, M. Calamel, M. Lambert & M. Bayada 2c-2

14:30 - 14:45 Pharmacokinetics and metabolism of netobimin in swine following oral administration.
B.D. Cameron*, N. Milner, C. Young & D.M. Lichtenwalner 11b-3

Application of ELISA for *Babesia bovis* in experimental infections and for mass screening of exported *Bos indicus* cross bred cattle.
G.W. Hutchinson*, I.P. Sukanto & R. Hedleff 2c-3

14:45 - 15:00 The kinetics of albendazole disposition in sheep.
D.R. Hennessy* & J.W. Steel 11b-4

Specific *Toxoplasma gondli* antibody synthesis by congenitally infected sheep.
J.P. Dubey* 2c-4

15:00 - 15:15 Albendazole and albendazole sulfoxide: a comparison of biovailabilities in cattle and sheep.
M-P. Tiberghien* & J.A. Bogan 11b-5

Development of immunodiagnostic tests for *Tritrichomonas foetus* infection.
A. Yule*, S. Skirrow, J. Staats & R.H. BonDurant 2c-5

15:15 - 16:00 BREAK / PAUSE CAFÉ — FOYER

15:15 - 16:15 VIEWING OF POSTERS / SESSION AFFICHES

Room / Local Parc 1 **8A**
Control of Parasites: Posters
Contrôle des parasites: Affiches

Room / Local Parc 2 **2D**
Immunity and Immunodiagnosis: Posters
Immunité et immunodiagnostic: Affiches

Field evaluation of anthelmintic programmes for the control of bovine parasitic bronchitis.
D.E. Jacobs* & M.T. Fox 8a-1

Control of parasites of yearling cattle in Uruguay.
C.A. Fiel*, D. Saladas, J. Berdie, R. Fostel, G.M. Bulman & R.R. Ambrustolo 8a-2

Gastrointestinal parasitism of yearling cattle in the humid pampas of Argentina.
C.A. Fiel*, P.E. Steffan, R.R. Ambrustolo, H.M. Vercesi & G.M. Bulman 8a-3

The effect of antiparasitic treatment on mating weights of yearling beef heifers.
P.R. Holmes* 8a-4

Selection of ivermectin resistant *Trichostrongylus colubriformis* in lambs.
D.J. Giordano*, J.P. Tritschler II & G.C. Coles 8a-5

Control of zoonotic lymphatic filariasis of monkeys and cats.
V. Kumar*, J. Brandt & O. Vanparijs 8a-6

Treatment of psoroptic mange of rabbit with ivermectin.
V.S. Pandey* 8a-7

Survival of adult *Stomoxys calcitrans* and *Haematobia irritans* led blood from ivermectin-treated mice.
D.A. Ostlind*, D.V. Ewanciw & W.G. Mickle 8a-8

A larval development test for detection of anthelmintic resistant nematodes.
J.P. Tritschler II*, D.J. Giordano & G.C. Coles 8a-9

Bacillus thuringiensis israelensis: lethal synergism with benzimidazoles for *Trichostrongylus colubriformis* eggs.
L.W. Bone* & G.C. Coles 8a-10

Entrapment of trichostrongylid larvae by the predacious fungus *Arthrobotrys oligospora.*
P. Nansen*, J. Gronvold & J. Wolstrup 8a-11

Control of parasites in grazing steers in the humid pampas of Argentina.
P.E. Steffan, R.R. Ambrustolo*, C.A. Fiel, C.M. Entrocasso & G.M. Bulman 8a-12

Internal parasites of milking goats in France: epidemiology and control.
J. Cabaret & J.P. Raynaud 8a-13

Intradermal reactions in cattle of three antigens derived from *Rhipicephalus appendiculatus:* antigen titration, specificity of reaction, selection and use to determine tick exposure in the field.
P.B. Capstick*, J.J. de Castro & M. Nyindo 2d-1

Immunodiagnosis in *Bunostomum phlebotomum* infections in calves.
M.P. Guimaraes*, E. Nascimento, A.C.R. Leite & W.S. Lima 2d-2

Synthesis of neoglycoproteins from *Fasciola hepatica* glyco lipid oligosaccharides.
L.H. Semprevivo* & G.C. Coles 2d-3

Exoantigen-mediated protection and immunosuppression in naive animals immunised with serum from irradiated rats in fected with *Trypanosoma lewisi.*
C.M. Ndarathi*, C. Proulx & C.E. Tanner 2d-4

Importance of lymphokines in the control of the multiplication and dispersion of *Leishmania donovani* within liver macrophages of resistant and susceptible mice.
M. Olivier*, C. Proulx & C.E. Tanner 2d-5

Detection of surface specific antigens on the nematode, *Nematospiroides dubius.*
G.C. Coles* & L.H. Semprevivo 2d-6

Blastogenic responses of lamb lymphocytes and their effects on the lymphocyte responses of adult ewes to *H. contortus* antigen.
A.M. Zajac*, C.J. Burger & J.W. Hansen 2d-7

Immune resistance to the tick *Ambylomma americanum* in the sheep and protection-associated antigens.
O.O. Barriga*, F. Andujar & W.J. Andrzejewski 2d-8

Mediation of cellular immunity to *Eimeria tenella* in avian and bovine somatic cells.
M.H. Kogut & C. Lange* 2d-9

The diagnosis of ostertagiasis in first season grazing calves with special references to biochemical and serological changes.
P. Berghen, J. Vercruysse*, P. Dorny & H.M. Hiderson 2d-10

Enzyme linked immunosorbent assay (ELISA) for diagnosis of cysticercosis in rabbits.
S. Yang*, Z. Wang & B. Shi 2d-11

16:15 - 17:00 Discussion - Posters/Affiches
Room / Local Parc I
Control of Parasites **8A**
Contrôle des parasites
Chairmen / présidents: D. Düwel & P. Waller

Discussion - Posters / Affiches
Room / Local Parc 2
Immunity and Immunodiagnosis **2D**
Immunité et immunodiagnostic
Chairmen / présidents: E. Ruitenberg & B. Gottstein

EVENING FREE

POSTERS WILL REMAIN ON DISPLAY

19:30 - 21:00 ECHINOCOCCOSIS RESEARCH NEEDS

W.A.A.V.P. MEETING IN COLLABORATION WITH W.H.O.

Room / Local Prince Arthur **21B**
Epidemiology and Production
Epidémiologie et production
Chairman / président: M. Jones

Evaluation of some risk factors for bovine parasitoses in Italy.
G. Battelli, M. Martini*, G. Poglayen & R. Restani 21b-1

Establishment of baseline data for the prevalence of *Fasciola hepatica* in Oklahoma cattle.
H.E. Jordan*, J.C. Fox, B.J. Johnson, C.E. Barnett & K.J. Melcher 21b-2

Seroepidemiology of nematode infections in cattle: its possible role in the economic appraisal of field infections and treatment.
H.W. Ploeger, A. Kloosterman & G.J.W. Schoenmaker 21b-3

Influence of an alternate grazing system of animal husbandry on *Nematodirus battus* infection in lambs.
R.L. Coop*, F. Jackson & E. Jackson 21b-4

Relation of farm management factors to nematode infection levels in calves yearlings and milking cows measured on 100 commerical farms by means of serology and faecal examination.
A. Kloosterman* 21b-5

BREAK / PAUSE CAFÉ

VIEWING OF POSTERS / SESSION AFFICHES

Room / Local des Pins **7A**
Control of Parasites Ruminants
Contrôle des parasites chez les ruminants
Chairman / président: G. Coles

Anthelmintic F28249-α. I. Discovery of anthelmintic activity.
I.B. Wood*, J.A. Pankavich & M.E. Doscher 7a-1

Anthelmintic F28249-α. II. Efficacy against experimental and naturally acquired nematode parasitisms in ruminants.
J.A. Pankavich*, I.B. Wood & M.E. Doscher 7a-2

Prevention of the springrise in housed ewes by anthelmintic treatment during winter.
T.W. Schillhorn van Veen & A.J. Murphy 7a-3

New data on the chemotherapy of fasciolosis in sheep.
J.C. Boray* 7a-4

Effect of monensin on naturally acquired coccidiosis in lambs at pasture.
J. Hendriks, W.A. de Leeuw*, D. Oostendorp & J. Wensvoort 7a-5

FOYER

Room / Local Parc 1 **8A** (Con't)
Control of Parasites: Posters
Contrôle des parasites: Affiches

Productivity responses with ivermectin or other treatment programs for parasite control in cattle in sub-tropical Brazil.
O. Bastos, F. Helderich, L.G. Cramer, E.L. Bordin* & S.J. Gross 8a-14
Efficacité de l'ivermectine dans le traitement des protostrongylidoses ovines.
A. Dakkak*, B. Robin & M. Kachani 8a-15
Gale généralisée de la chèvre: valeur thérapeutique de l'ivermectine.
A. Dakkak* & H. Ouhelli 8a-16

Room / Local Parc 2 **2D** (Con't)
Immunity and Immunodiagnosis: Posters
Immunité et immunodiagnostic: Affiches

Acquired immunity to *Necator americanus* in mice.
J.M. Behnke & C.A. Wells 2d-12
Isolation of messenger RNA from *Nippostrongylus brasiliensis* and its translation *in vitro*.
T.D.G. Lee* & A.D. Befus 2d-13
Anti-idiotypic antibody induced *in vitro* proliferative responses of *Eimeria tenella* specific cloned T cells.
B. Bhogal*, E. Jacobson & D. Schmatz 2d-14

Room / Local Prince Arthur **15A**
Pathophysiology and Biochemistry: Posters
Pathophysiologie et biochimie: Affiches

Electron microscopical study on bovine onchocerciasis: damage to bovine skin associated with microfilariae of *Onchocerca gutturosa* (Neuman: 1910).
G.N. Isitor*, V.C. Ogbogu & Y.O. Ogunkoya 15a-1
The cellular reactions in the skin of rabbits in response to simultaneous feeding of *Rhipicephalus appendiculatus* and *Amblyomma variegatum*.
A.A. Latif 15a-2
Dermatitis in dogs associated with *Pelodera strongyloides*.
S. Nikander* 15a-3
The role of dehydrogenases and esterases in *Coenurus cerebralis (Multiceps multiceps)* -a parasite of sheep.
G.V. Rama Krishna* & Qamar Hasan 15a-4
Binding properties of diethylcarbamazine.
N.A. Pampori, N. Agarwal & V.M.L. Srivastava* 15a-5
Intervention des prostaglandines dans la relation hôte-parasite: cas des infestations helminthiques de l'abomasum du mouton.
A. Dakkak* 15a-6

Room / Local des Pins **21C**
Epidemiology and Population Dynamics: Posters
Epidemiologie et dynamiques des populations: Affiches

Survival on the ground of *Rhipicephalus appendiculatus* (Acarina: Ixodidae) at three sites in Kenya.
R.M. Newson* 21c-1
Gastrointestinal nematode incidence in western Canadian diary heifers.
W.R. Cox* & D.L. Lemiski 21c-2
Population dynamics of endohelminths of some fishes.
A.K. Sinha* 21c-3
Comparative susceptibility of Merinos and Romanov sheep to different helminth parasites.
L. Gruner*, J. Cabaret, J. Bouix & G. Molenat 21c-4
The helminth fauna of the cats in Bitola (SR Macedonia - Yugoslavia).
N.D. Hristovski* 21c-5
Situation actuelle, du cysticercosis porcine au Mexique.
A. Acevedo* & M.T. Quintero 21c-6
Les acariennes du gendre *Raillietia* au Mexique.
M.T. Quintero* & A. Acevedo 21c-7

17:00 - 17:30 Discussion - Posters / Affiches
Room / Local Prince Arthur
Pathophysiology and biochemistry **15A**
Pathophysiologie et biochimie
Chairman / président: R. Fayer

SOIRÉE LIBRE

19:30 - 21:00 ECHINOCOCCOSIS RESEARCH NEEDS

Discussion - Posters / Affiches
Room / Local des Pins
Epidemiology and Population Dynamics **21C**
Epidémiologie et dynamique des populations
Chairman / président: A. Kloosterman

AFFICHES DEMEURENT PRÉSENTES

Réunion de l'W.A.A.V.P. en coopération avec l'O.M.S.

FRIDAY, AUGUST 14TH / LE VENDREDI 14 AOÛT

8:30	**The African Trypanotolerant Livestock Network**.....17a-1
9:00	**Outstanding Problems in Chemotherapy**
9:30	**Prospects for Molecular Vaccines in Veterinary Parasitology**
10:00	BREAK / PAUSE CAFÉ
10:30	**Host Effector Mechanisms Against Parasites**
11:00	**Parasite Defence Mechanisms for Evasion of Host Attack: A Review**
11:30	**New Approaches in the Development and Management of Drugs Used in Ectoparasite Control**
12:00	AFTERNOON AND EVENING FREE / OPTIONAL TOUR / APRÈS-MIDI ET SOIRÉE LIBRES / TOUR OPTIONNEL

SATURDAY, AUGUST 15TH / LE SAMEDI 15 AOÛT

08:30 - 10:00

Room / Local Parc 1 **22A**
SmithKline Symposium:
Advances in the Delivery of Antiparasitic Drugs
Développements dans les modes d'administration des médicaments
Chairman / président: R. Rew

Room / Local Parc 2 **1C**
Immunity and Vaccination
Immunité et vaccination
Chairman / président: M. Rickard

08:30 - 08:45

Efficacy of an albendazole intraruminal device in lambs.
S.L. Bell* & R.J. Thomas 22a-1

Vaccination against cysticercosis with inner cells of *Taenia crassiceps* larvae and comparison of inner cells and tegument from antigen composition point of view.
J. Prokopic*, K. Kudrna & L. Vanova 1c-1

08:45 - 09:00

Efficacy of albendazole slow releasing device against gastrointestinal nematodes in sheep
D. Rapic, N. Dzakula, S. Blagovic, A. Marinculic & R. Rajkovic-Janje 22a-2

Vaccination of calves with somatic and excretory-secretory preparations of the nodular worm, *Oesphagostomum radiatum.*
L.C. Gasbarre* & A. Canals 1c-2

09:00 - 09:15

Control of parasites of cattle with ivermectin applied topically.
J.L. Cox*, R.A. Barrick, E.S. Brokken, R.A. Roncalli & I.H. Sutherland 22a-3

Effect of dietary threonine on the immune response in pigs against *Ascaris suum.*
D.A. Leon*, E. Koszalka, O. Barta, L.L. Southern & T.B. Stewart 1c-3

09:15 - 09:30

Prophylactic medication with netobimin in drinking water of grazing calves.
N.E. Downey* 22A-4

Identification of a *Strongylus vulgaris* induced eosinophil chemotactic factor from equine peripheral blood mononuclear cells.
V.A. Dennis, T.R. Klei* & M.R. Chapman 1c-4

09:30 - 09:45

Field efficacy of Safe-Guard Emproal molasses deworming supplement blocks in heifers nursing fall-born calves and fall weaned stocker calves.
J.E. Miller*, D.G. Morrison, F.J. Peterson, G.H. Myers, F.G. Hembry, C.P. Bagley, J.C. Williams, B.M. Olcott 22a-5

Two variable surface glycoproteins from different *Trypanosoma vivax* serodemes infective for rodents.
P.R. Gardiner* & M.W. Clarke 1c-5

09:45 - 10:00

The use of an oxfendazole pulse release bolus in the control of gastrointestinal nematodiasis and parasitic bronchitis in first-season grazing calves.
J. Vercruysse*, P. Berghen, P. Dorny, H.M. Hilderson & K. Frankena 22a-6

The presence of antibodies in naive cattle and rabbits that react to whole tick homogenate of *Rhipicephalus appendiculatus.*
A.O. Mongi*, P.B. Capstick, C.A. Aganyo, J.J. de Castro & R.M. Newson 1c-6

J.C.M. Trail G. d'Ieteren	Parc 2	Chairman / Président: S.A. Ajayi
V. Theodorides, R.S. Rew	Parc 2	Chairman / Président: L. Grisi
P.K. Murray	Parc 2	Chairman / Président: G. Urquhart
	Foyer	
W. Morrison	Parc 2	Chairman / Président: M. Murray
R.W. Leid	Parc 2	Chairman / Président C. Dobson
J. Nolan	Parc 2	Chairman / Président: S. Gaafar

Room / Local Prince Arthur **9A**
Advances in the Control of Canine and Feline Parasites
Développements dans le contrôle des parasites du chien et du chat
Chairman / président: D. Jacobs

Room / Local des Pins **3A**
Drug Resistance
Résistance aux médicaments
Chairman / président: R. Lorenzini

SATURDAY, AUGUST 15TH / LE SAMEDI 15 AOÛT

10:00 - 10:45	BREAK / PAUSE CAFÉ	FOYER
10:30 - 10:45	The History of Scabies in Veterinary and Human Medicine from Biblical to Modern Times. **R.A. Roncalli**	Parc 2 Chairman / président: C. Himonas
10:45 - 12:00	Room / Local Parc 1 **12B** **Metabolism and Toxicology** **Métabolisme et toxicologie** Chairman / président: W. Mulligan	Room / Local Parc 2 **10A** **Developments in the Control of Parasites in Swine** **Développements dans le contrôle des parasites du cochon** Chairman / président: T. Bonner Stewart
10:45 - 11:00	Safety of ivermectin applied topically to cattle. **J.L. Cox, R.A. Barrick, E.S. Brokken, J.D. Pulliam, R. Roncalli* & I.H. Sutherland** 12b-1	Dose titration of netobimin administered in feed to pigs over 10 days. **R.K. Prichard*** 10a-1
11:00 - 11:15	Comparative effects and safety of ivermectin in pregnant mares. **R.L. Asquith, J. Kivipelto*, J.W. Harvey & J.E. Bauer** 12b-2	Use of netobimin in feed of swine from weaning to market weight. **L. Grisi*, C.S. Pimentel & E.A. Mendes** 10a-2
11:15 - 11:30	Toxicity of a closantel and albendazole combination anthelmintic in Angora goats and Merino type sheep. **T.D. Gunter*, P.C. van Schalkwyk & W.S. Botha** 12b-3	Efficacy of fenbendazole against *Trichinella spiralis.* **A.B. Childers*, J.M. Zaryske, D.B. Lawhorn & T.M. Craig** 10a-3
11:30 - 11:45	Teratogenicity studies in rats and sheep treated with luxabendazole. **F.S. Malan*** 12b-4	Effect of fenbendazole (FBZ), pyrantel tartarte (PT) and environment on immunity to *Ascaris suum.* **L.L. Southern*, T.B. Stewart, E. Koszalka & D. Leon** 10a-4
11:45 - 12:00	Alternative treatments for parasite control. **C.A. Hall*** 12b-5	Efficacy of ivermectin against scabies and natural gastrointestinal nematode infections in buffaloes, pigs and goats in India. **B.S. Gill*** 10a-5

12:00	LUNCH / DÉJEUNER
13:30	Report on WAAVP Terminology Committee Rapport du comité WAAVP sur la terminologie
14:00	WAAVP - Guidelines on Antiparasitic Drugs WAAVP - Informations sur l'évaluation des médicaments antiparasitiques
14:30	**Anthelmintic Resistance and the Future for Roundworm Control**
15:00	BREAK / PAUSE CAFÉ
15:30	WAAVP - General Meeting Réunion générale
16:30	Closing session / Session de fermeture
20:00	FAREWELL BANQUET / BANQUET DE CLÔTURE

BREAK / PAUSE CAFÉ — FOYER

Special presentation poster
Session affiche spéciale — FOYER

Room / Local Prince Arthur **19A**
Diagnosis
Diagnostic
Chairman / président: Th. Hiepe

Sensitivity of the coprological test for some helminthiases of red foxes.
G. Poglayen*, M. Martini, V. Guberti & G. Battelli 19a-1

Identification of strongylid eggs by multivariate analysis of morphometrics.
J.R. Georgi* 19a-2

Diagnosis of subclinical infection in horses on long-term anti-parasitic treatment.
T.R. Bello 19a-3.

Various projects to promote the health and longevity of donkeys by parasite control.
E.D. Svendsen*, W. Jordan, F. Taylor, A. Aluja, G. Evstathiou & D. Bliss 19a-4

Medication of cattle with the anthelmintic netobimin in drinking water.
R.K. Prichard* & C. Trudeau 19a-5

Room / Local des Pins **13B**
Pathophysiology
Pathophysiologie
Chairman / président: J. Steel

Blood enzymes and weight gain of *Sarcocystis miescheriana* infected pigs.
A. Daugschies 13b-1

Local responses in small intestine and abomasum of calves infected with *Cooperia oncophora* or *Ostertagia ostertagi.*
K. Frankena*, J. v/d Berg, J.M. Mouwen & J. van Dijk 13b-2

Parasitological, pathological and metabolism studies on *Cooperia oncophora* infections in calves.
P.N. McWilliam*, J.J. Parkins, J. Armour, P.H. Holmes & K. Bairden 13b-3

"Tric-F", an antigen binding protein that is formed in mice infected with the intestinal nematode *Trichinella spiralis.*
H.K. Parmentier, E.J. Ruitenberg*, P.W. Askenase & H. van Loveren 13b-4

Measurement of body composition: its relevance in parasitology.
W. Mulligan* 13b-5

T. Kassai ..... Parc 2 ..... Chairman / président: Th. Hiepe

I. Wood ..... Parc 1 ..... Chairman / président: J. Eckert

P. Waller ..... Parc 2 ..... Chairman / président: A. Donald

Foyer

Parc 1

Parc 2

Parc 1 & 2

Immunity and Vaccination / Immunité et vaccination

1A-1

RESISTANCE TO DERMACENTOR VARIABILIS IN MAST CELL DEFICIENT MICE. E.B. Steeves*, J.R. Allen. Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

Previous studies of tick-infested guinea pigs have revealed that these hosts acquire marked resistance to the blood-feeding of ticks, after a primary tick infestation. The tick-resistant state is associated with cutaneous hypersensitivity reactions to antigens in the ticks' saliva. Recently, Balb/c and C3H mice also have been shown to acquire tick resistance in association with increased numbers of mast cells in skin following 2 infestations with Dermacentor variabilis larvae. Mast cell-deficient mice (WBB6F1-W/Wv) also, unexpectedly, acquired resistance. In attempts to discover the mechanisms of tick resistance in W/Wv mice, the cutaneous reactions to tick challenge in normal and resistant animals have been studied by standard histological and immunocytochemical techniques and with the electron microscope. Concentrations of histamine and serotonin in extracts of skin biopsies have been assayed. Possibly the acquisition of resistance in W/Wv mice is associated with a cutaneous basophil hypersensitivity reaction.

1A-2

BABESIA DIVERGENS: EPIDEMIOLOGY AND VACCINATION. K.T. Friedhoff* & D. Ganse-Dumrath. School of Veterinary Medicine, Hanover, West Germany.

Epidemiologic studies in 3 cattle herds revealed high inoculation rates of 0.0054 to > 1.0 in 1984 and 1985. They represent average values, since prevalence and intensity of tick infestation fluctuated considerably during both grazing seasons. There was a high risk of disease in 2 herds since naive, adult cattle were exposed to ticks. Grazing periods were too short as to allow infection of all animals during one season. Although infection rates (= seropositivity) were identical in one herd during both seasons, i.e. 47 % (48/102 in 1984; 29/62 in 1985), 25 cattle developed disease in 1984 but only 4 in 1985. Infection rates did not reflect the real situation, since IFA titers declined within few months after infection. More realistic infection rates were obtained by multiple, short interval serotesting and microscopic examination (acridine orange-stained thick films). For vaccination, 10^8 B. divergens-infected jird (Meriones unguiculatus) erythrocytes suspended in RPMI 1640 medium were inoculated s.c. This dose caused disease in 24/39 cattle, particularly in cows (22/30). Most of the vaccinated animals developed high IFA titres and remained parasitaemic for months. A positive correlation existed between peak parasitaemias and antibody titres. Very low parasitaemias (< 3 babesia/10^5 red cells) induced by vaccination did not cause a rise in antibody titres, although parasitaemias persisted for months. S.c. inoculation of 10^7 infected jird red cells was well tolerated by animals aged 6 months to 2 years.

1A-3

EIMERIA MAXIMA: SPOROZOITE TRANSPORT IN NAIVE AND IMMUNE CHICKENS. D.P.Riley* & M.A.Fernando. Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada.

The early stages of sporozoite development in intestinal epithelium was compared in immune and naive chickens infected with Eimeria maxima using an immunoperoxidase stain specific for sporozoites. A significantly higher proportion of sporozoites was present in the crypts of naive chickens 48 hr post inoculation of oocysts compared to immune chickens. Sporozoites in immune birds tended to remain in the lamina propria rather than migrate to the crypts. Sporozoites were found within intraepithelial lymphocytes (IELs) in the epithelium, lamina propria and crypts of both naive and immune chickens. Parasites in IELs of immune birds could not be distinguished from those in IELs of naive birds at the ultrastructural level. Livers and spleens, of both immune and naive chickens that had been inoculated with Eimeria maxima, produced patent infections when fed to susceptible chickens. Infections could be transferred up to 72 hr post inoculation of the donor birds. Peak oocyst production in the recipient birds occurred 7 to 8 days after the transfers, similar to the prepatent period in a natural infection. This implies that the extra-intestinal stage was a sporozoite.
(Supported by the Natural Sciences and Engineering Research Council of Canada).

1A-4

CHRONIC AND ATYPICAL THEILERIOSIS. T.T. Dolan International Laboratory for Research on Animal Diseases, Nairobi, Kenya.

Theileriosis caused by the protozoan parasite Theileria parva is an acute and usually fatal disease in exotic cattle in Eastern Africa. Indigenous cattle in endemic areas are largely resistant. Recovered cattle remain carriers and with the recent development of effective chemotherapy and more widespread use of infection and treatment immunization the frequency of recovered carriers will increase. The majority of recovered cattle are healthy but a small number develop atypical or chronic forms of the disease. Controversy exists over whether the schizont or piroplasm stage maintains transmissible infection. Long term studies of treated recovered and immunized cattle have identified atypical disease forms and reduced productivity, related to the persistence of schizonts. Intravascular and perivascular aggregations of mononuclear cells and parasitised lymphocytes have been identified in the kidney, adrenal and pituitary glands, eye and testicle. The nature of these lesions and their similarity to those of cerebral theileriosis is described.

Immunity and Vaccination / Immunité et vaccination

1A-5

IMMUNITY OF YEARLING IVERMECTIN TREATED CATTLE TO LUNGWORM CHALLENGE. W.G. Ryan*, J. Armour, K. Bairden, M.T. Fox & D.E. Jacobs. MSD AGVET, Hoddesdon, Herts, EN11 9BU, England.

Ivermectin administered subcutaneously to calves 3 & 8 weeks, or 3, 8 & 13 weeks after first turnout to pasture, has been shown to control parasitic bronchitis. Two studies were conducted to determine the immune status of the cattle to infection with Dictyocaulus viviparus during their second grazing season. In each trial, yearling cattle that had received early season prophylactic treatments with ivermectin during their first season at grass were grazed throughout an entire season on the same pasture as first-season calves. In one study, a group of lungworm vaccinated cattle, in their second grazing season, was turned out onto the same pasture. No anthelmintic treatment was needed by any ivermectin treated or lungworm vaccinated yearlings. At the end of the grazing season, all cattle and a group of parasite naive calves were challenged orally with either 10 or 22 third-stage larvae of D. viviparus per kg body weight. Evaluation of immunity was based on clinical observation, faecal larval output and in one trial, post-mortem examination. Under the conditions of these trials, the cattle which received early season treatments with ivermectin during their first grazing season showed a protective immunity to challenge with D. viviparus from the start of their second grazing season, and this immunity was observed to be equivalent to that of the group of second-year cattle protected against parasitic bronchitis by vaccination.

1B-1

IMMUNITY OF YEARLING IVERMECTIN TREATED CATTLE TO CHALLENGE WITH GASTROINTESTINAL HELMINTHS. W.G. Ryan*, J. Armour, K. Bairden, M.T. Fox & D.E. Jacobs. MSD AGVET, Hoddesdon, Herts, EN11 9BU, England.

Two trials were undertaken to study the immunity to gastrointestinal helminth challenge of cattle that had received early season treatments with ivermectin (IVM) during their first grazing season. In Trial A, two groups of yearling cattle, treated with IVM either 3 & 8 weeks, or 3, 8 & 13 weeks after turnout to pasture in their first year, were grazed on separate pastures. Each group shared pasture with a group of first-season parasite susceptible calves. In Trial B, a group of 6 yearling cattle that had received IVM 3, 8 & 13 weeks after turnout shared pasture with 6 yearlings that had suffered from parasitic gastro-enteritis (PGE) during their first season, and 6 first-season parasite susceptible calves. During the grazing season, no anthelmintic treatments were needed by any of the yearlings in either trial. Observations were made on clinical conditions, faecal egg counts, serum pepsinogen (or gastrin) levels and post-mortem worm counts (in Trial A only). The results showed that the IVM yearlings were resistant to challenge with gastrointestinal parasites (mainly Ostertagia sp. and Cooperia sp.) from turnout. Under the conditions of Trial B, the immunity of the IVM yearlings was equivalent to that of the group which suffered from PGE during their first season. In Trial A, the post-mortem counts from both IVM groups indicated that yearling cattle grazing heavily contaminated pasture can accumulate large burdens of arrested larvae in late autumn.

1B-2

RELATIONSHIP BETWEEN EOSINOPHILS IN CUTANEOUS BASOPHIL HYPERSENSITIVITIES AND SUSCEPTIBILITY TO TRICHOSTRONGYLUS COLUBRIFORMIS INFECTION. T.L.W. Rothwell* and L.R. Abeydeera. Department of Veterinary Pathology, University of Sydney, Australia, and Department of Veterinary Preclinical Studies, University of Peradeniya, Sri Lanka.

Guinea pigs with genetically determined resistance to primary infection with the nematode parasite T. colubriformis had more basophil and eosinophil leucocytes in cutaneous basophil hypersensitivity (CBH) reactions to keyhole limpet haemocyanin (KLH) than susceptible animals. In outbred guinea pigs there was a significant correlation between the number of eosinophils in 24 h CBH reactions to KLH and resistance to primary infection with T. colubriformis. These results suggest that examination of CBH reactions to non-parasite antigens might be useful in predicting inherent resistance or susceptibility to parasite infection.

1B-3

AN INCREASE IN INTESTINAL MUCOSAL MAST CELLS AND THEIR ACQUIRED RESPONSIVENESS TO LARVAL ANTIGENS IN VITRO IS CHARACTERISTIC OF INTESTINAL IMMUNITY TO ASCARIS SUUM IN PIGS. J.F. Urban, Jr.*, M. Ashraf & C.M. Lee, Animal Parasitology Institute, Agricultural Research Service, USDA, Beltsville, Maryland & The Department of Zoology, Howard University, Washington, D.C., U.S.A.

Protective immunity to A. suum can develop in pigs exposed to as few as 100 infective eggs given three times over a period of 2 weeks. Immunological components of the host response to infection include the production of serum antibody and blastogenic responsiveness of peripheral blood lymphocytes to larval excretory-secretory products (ESP). Pigs exposed once to 10,000 eggs show a significant antibody response within 14 days after infection, and a blastogenic response within 7 days after infection. Larvae migating in the immune host are destroyed primarily in the lungs and liver. Immune responses to larvae at the intestinal level, however, appear to require repeated and prolonged exposure to infection; complete immunity develops after 6 to 11 weeks. An increase in intestinal mucosal mast cells is detected histologically during the course of exposure. Intestinal mucosal mast cells isolated from these pigs respond in vitro to Ascaris antigens by the specific release of histamine. This responsiveness is first observed after 18 to 28 days of exposure of the pigs to infective eggs; an immediate-type skin reaction to Ascaris ESP develops concurrently. The relatively late development of intestinal immunity to A. suum larvae may be a function of a delayed reaginic antibody response and increased mucosal mast cell effector function.

Immunity and Vaccination / Immunité et vaccination

1B-4

FURTHER EVALUATION OF THE INTESTINAL MAST CELL RESPONSE AND ASSOCIATED CELL REACTIONS IN F. HEPATICA INFECTIONS: K. Pfister* and M. Spaehni, Institute of Animal Pathology, Dept. of Parasitology, University of Berne, 3001 Berne/Switzerland

Limited immunological investigations in F. hepatica-infected rats have revealed some coincidence between serum IgE-levels and a proliferation of mucosal mast cells (MMC), eosinophils (EOS) and neutrophils (NE) in the gut mucosa. To evaluate a possible role of intestinal reactions in anti-F. hepatica immunity, rats have been infected with 20 metacercariae of F. hepatica each, killed in groups in 7-day-intervals and analysed correspondingly. After an increase in the first week (gut penetration period) intestinal MMC decrease again by day 14 after infection (DAI) to levels detected in controls. Possibly due to an immediate release of mediators, the early MMC hyperplasia disappears again. Thereafter, from 21 DAI throughout the migratory and subsequent patency period of primary infections, MMC are significantly increased. Similarly, a marked MMC proliferation is detectable after reinfection. Flukes possibly also release MMC-stimulating factors as was shown in N. brasiliensis-infected rats. The present observation gives some evidence for a sensitization of the gut mucosa after a primary infection. Together with previous findings and an increase of intestinal inflammatory cells, our observations suggest the occurrence of an intestinal hypersensitivity reaction in F. hepatica reinfections.

1B-5

PROTECTION OF YEARLING PONIES AGAINST STRONGYLUS VULGARIS BY FOALHOOD VACCINATION. T.R. Klei*, D.D. French, M.R. Chapman, J.R. McClure, V.A. Dennis, H.W. Taylor, & G.W. Hutchinson. Veterinary Science, Louisiana State University, Baton Rouge, LA, 70803, U.S.A.

Thirty-two mixed breed pony mares and their foals were used. Prior to foaling mares were divided into two groups of 16 each. One group of mares and foals received regular (1X/8wk) treatment with ivermectin and the second group remained untreated. Ponies were maintained on similar native grass pastures. Half the foals in each pasture group (8) were vaccinated at 8 to 10 wks of age with 2 per os inoculations of 500 irradiated L_3 each. Foals were weaned at 3 to 4 mths of age and maintained on separate pastures. At 8 to 10 mths of age ponies were placed in box stalls and half of each treatment group (4) were challenged with S. vulgaris (5 x 1000 L_3). One nonvaccinated pony foal reared under helminth free conditions served as a control for the challenge infection. This control foal became anorexic, pyrexic, depressed and was euthanized 2 weeks post challenge (WPC) due to unrelenting colic. Lesions typical of acute verminous arteritis were found at necropsy. Ivermectin treated nonvaccinated challenged yearlings showed similar but less severe clinical signs and lesions. Ivermectin treated vaccinated challenged yearlings did not show these clinical signs, had markedly reduced to absent intestinal and arterial lesions and showed a 89% reduction in arterial L_4 burdens when necropsied at 3 WPC. Similar reactions although less dramatic were observed in the yearlings from the nonivermectin treated groups.

1B-6

STUDY ON THE RESISTANCE OF SHEEP TO FASCIOLA GIGANTICA CHALLENGE INFECTION. Shahnaz A.Ali,Jawad K.Kadhim*& N.A.AL-Zahery. Vet.Lab.Res.Inst.Abu-Ghraib,Iraq.

A significant resistance to the establish-ment of a subsequent infection was obtained on three equal groups of 5 sheep ,each infected with Fasciola gigantica. Each animal in the three groups was infected orally with 6 metacercariae/kg body weight of F. gigantica in a gelatine capsule. The infection in group A was allowed to proceed for 8 weeks before giving the treatment with diamphenethide, while group B treated at 15 weeks post-infection with the same drug given according to manufacturer recommended dose.Group C was left without treatment. A challenge test was given to both groups A&C at a dose rate of 6 m.c./kg b.w. two weeks after treatment of group A, while group B given 8 m.c./kg b.w. All animals were slaughtered at 25 weeks PI and flukes were recovered and counted for the purposes of this study.Results indicated that some evidence of an immune type response to challenge in all groups was observed,especially in group B. The resistance was reflected in reduced number of parasites recovered as well as themean length of the flukes was significantly less than other challenged groups.

1C-1

VACCINATION AGAINST CYSTICERCOSIS WITH INNER CELLS OF TAENIA CRASSICEPS LARVAE AND COMPARISON OF INNER CELLS AND TEGUMENT FROM ANTIGEN COMPOSITION POINT OF VIEW.
J. Prokopič+, K. Kudrna, L. Váňová. Institute of Parasitology, Czechoslovak Academy of Sciences, Czechoslovakia.

Vaccine based on the same antigenic groups in tegument and on the surface of each cell of parasitic organism has been successfully tested (100% efficacy) in mice infected with T. crassiceps larvae. Vaccine is composed of living and/or glutaraldehyde preserved cells prepared from inner tissues of T. crassiceps larvae. PAGE, western blotting and IFAT were used for analysis of antigens expressed in tegument and on the surface of inner cells and comparison of antigen composition of different species of cestodes. The same antigenic determinants were found in both tegument and inner cells. Also T. crassiceps, T. saginata, and Mesocestoides corti have several common antigens.

Immunity and Vaccination / Immunité et vaccination

1C-2

VACCINATION OF CALVES WITH SOMATIC AND EXCRETORY-SECRETORY PREPARATIONS OF THE NODULAR WORM, OESOPHAGOSTOMUM RADIATUM. L. C. Gasbarre* and A. Canals. USDA, Agricultural Research Service, Helminthic Diseases Laboratory, Beltsville, MD, USA, and I.N.I.A., Madrid, Spain.

Oesophagostomum radiatum, the nodular worm of cattle is highly pathogenic in previously uninfected animals. Infected cattle exhibit a persistent diarrhea, anorexia, and may also be anemic. Infection imparts a strong protection from reinfection. Naive calves were immunized with antigens derived from disrupted adult worms or with excretory-secretory products (ESP) collected from larvae undergoing the molt from the third to the fourth larval stage. Primary immunization was intramuscular with Complete Freund's Adjuvant; animals were reimmunized 2 weeks later with antigens plus alum intraperitoneally. Immunization with larval ESP had no effect upon the number of worms developing from the challenge infection, but it did significantly protect calves from parasite-induced weight loss. In addition, immunization with ESP induced elevated levels of O. radiatum-specific serum antibody of the IgG_1 and IgA isotypes. Cellular immunoreactivity could not be measured because ESP were strongly inhibitory for in vitro lymphocyte growth. In contrast, immunization with somatic antigens had a more marked effect on the challenge infection. Somatic antigen-immunization strongly stimulated both humoral and cellular immune compartments as ascertained by ELISA and in vitro lymphocyte proliferation. Vaccinated calves also shed significantly fewer eggs, and had a less pronounced anemia. Adult worms recovered at postmortem 5 weeks after patency are currently being analyzed to determine the effects of vaccination on this population.

1C-4

IDENTIFICATION OF A STRONGYLUS VULGARIS INDUCED EOSINOPHIL CHEMOTACTIC FACTOR FROM EQUINE PERIPHERAL BLOOD MONONUCLEAR CELLS. V.A. Dennis, T.R. Klei* & M.R. Chapman. Veterinary Science, Louisiana State University, Baton Rouge, LA, USA 70803.

Previous studies utilizing an in vitro chemotaxis assay indicated that soluble adult S. vulgaris female extract (SV-EXT; >100 ug/ml) was slightly chemotactic for eosinophils obtained from ponies with S. vulgaris induced eosinophilia (EOS) but not for neutrophils (PMN) from similarly infected animals. By use of a similar in vitro chemotaxis assay the incubation (37°C) of SV-EXT (50 ug/ml), heat inactivated autologous immune serum (10%) and different concentrations of mononuclear cells from hyperimmune ponies (sensitized mono) resulted in the release of a cytokine which was chemotactic for EOS. The number of cells required to generate this cytokine was 6×10^6 cells/ml. A kinetic study demonstrated that the highest chemotactic activity for EOS was generated in cultures by 90 minutes. This chemotactic activity was destroyed by heat inactivation (95°C, 30 min.) The cytokine was also demonstrated to be specifically chemotactic for EOS but not for PMN. However, the supernates from these cultures did induce a chemokinetic response in PMN.

1C-3

EFFECT OF DIETARY THREONINE ON THE IMMUNE RESPONSE IN PIGS AGAINST ASCARIS SUUM. D.A. Leon*, E. Koszalka, O. Barta, L.L. Southern & T.B. Stewart. School of Veterinary Medicine, Louisiana State University, Baton Rouge, USA.

The effect of dietary threonine deficiency (0.4%), adequacy (0.7%) and excess (0.9%) on the immune response of pigs infected with A. suum was evaluated. Each of 48 crossbred pigs were assigned to 1 of 3 treatments (3 dietary levels) and orally inoculated with 2000 infective eggs in each of 3 doses spaced 2 weeks apart. Infections were terminated by fenbendazole treatment during larval migration 7 days after each inoculation. 48 similar uninfected pigs allocated to the same 3 dietary treatments served as nonimmunized controls. After completion of immunization all pigs were fed a normal diet and challenged with 100 embryonated eggs. Specific antibody was measured by a triple antibody ELISA technique using an L2-L3 excretory-secretory antigen. Protective immunity was estimated by scoring liver lesions and adult parasite recovery at necropsy. A statistically significant difference in antibody response ($p < 0.02$) was found between pigs fed the deficient and adequate or excess threonine diets (OD=0.072, 0.054 and 0.056 respectively). Immunized pigs had a significant increase in antibody ($p < 0.01$) compared with nonimmunized pigs. Protective immunity to A. suum was demonstrated by a negative relationship between liver lesions and number of A. suum recovered. Immunized pigs had fewer ($p < 0.01$) A. suum than nonimmunized pigs. Dietary threonine levels had a negative effect on antibody production and a positive effect on parasite numbers.

1C-5

TWO VARIABLE SURFACE GLYCOPROTEINS FROM DIFFERENT TRYPANOSOMA VIVAX SERODEMES INFECTIVE FOR RODENTS. P.R. Gardiner* & M.W. Clarke. ILRAD, P.O. Box 30709, Nairobi, Kenya, & Dept. Microbiology & Immunology, University of Western Ontario, London, Canada.

Studies of the variable surface glycoproteins (VSGs) of T. vivax are hampered by the antigenic inhomogeneity of trypanosome populations in the ruminant host. However, we have described[1] the purification and characterisation of the VSG of ILDat 1.2, a clone of a naturally rodent infective serodeme from Nigeria in West Africa. Comparative studies of VSG structure and processing will be aided by the recent adaptation to rodents[2] of T. vivax stocks belonging to different serodemes from Uganda in East Africa. The ILDat 1.2 VSG has a molecular weight of 46 kD, and is myristilated and glycosylated, but a limited N-terminal amino acid sequence shows no homology to N-terminal sequences of VSGs from other trypanosome species. A 30 kD molecule which is myristilated and immunologically crossreactive with the 46 kD molecule is also present in ILDat 1.2 trypanosomes. Incubation of trypanosome lysates at R.T. for 30 min., a treatment which causes the conversion of membrane form to soluble VSG in T. brucei, results only in the detection of the 30 kD molecule on Western blots of ILDat 1.2. Preliminary studies of ILDat 2.1, a clone of one of the Ugandan stocks, shows stable expression of a 35 kD VSG as determined by cell surface biotinylation. This may constitute the smallest VSG so far described.

1. Gardiner P.R. et al. Science 235: 774 (1987).
2. Gathuo H.K. et al. J. Protozool. 34: 48 (1987).

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1C-6

THE PRESENCE OF ANTIBODIES IN NAIVE CATTLE AND RABBITS THAT REACT TO WHOLE TICK HOMOGENATE OF RHIPICEPHALUS APPENDICULATUS. A.O. Mongi*, P.B. Capstick, C.A. Aganyo, J.J. de Castro & R.M. Newson. International Centre of Insect Physiology and Ecology, Nairobi, Kenya.

Sera from thirty naive rabbits and 10 naive cattle were examined by immunodiffusion for the presence of precipitating antibodies. When reacted with whole tick homogenate up to three precipitin arcs were formed by the sera. Immunoaffinity studies employing immunoglobulins purified from naive sera revealed the presence of 9 protein subunits with molecular weights of 166,000; 90-92,000; 78,000; 67,000; 62,000; 60,000; 54,000; 40,000 and 30,000 daltons. Some of these protein subunits were also recognised by serum from rabbits immune to R. appendiculatus soluble tick midgut antigens, this serum also recognised a further nine proteins. The results indicate the presence of antibodies in "naive" experimental animals which cross react with tick antigens. They demonstrate the need to screen serum from animals intended for use in raising monospecific serum to individual proteins or in assessing immune responses against the feeding tick.

2A-1

DNA PROBES FOR DIAGNOSIS OF FILARIAL PARASITES. S.A. Williams* and L.A. McReynolds. Smith College, Northampton, Massachusetts and New England BioLabs, Beverly, Massachusetts, USA.

Cloned repeated DNA probes have been developed for the identification of a wide variety of human and animal pathogens. Cloned repeated DNA sequences make ideal DNA probes because their high copy number greatly increases the sensitivity of the detection assay. Frequently such DNA probes have limited utility because they cross-hybridize strongly to DNA from closely related species. The work reported here demonstrates that DNA sequence analysis of cross-reactive repeats cloned from two closely related species can reveal short regions of sequence divergence. Two species-specific oligonucleotide probes based on such a divergent region, were synthesized for the two closely related filarial parasites Brugia malayi and Brugia pahangi. These probes have proven to be both sensitive and species-specific in parasite detection assays. The identification of a divergent region within a shared repeat is a general approach that should prove useful in designing specific probes for a wide variety of human and animal parasites.

2A-2

NON-RADIOACTIVE DNA PROBES AS DIAGNOSTIC TOOLS FOR HYDATIDOSIS/ECHINOCOCCOSIS. K.W. Yap* & R.C.A. Thompson, Division of Veterinary Biology, School of Veterinary Studies, Murdoch University, Western Australia.

The application of DNA hybridisation techniques to a number of important parasitic diseases, has greatly assisted the identification and characterisation of the causative agents at specific and intraspecific levels. the recent development of less complex recombinant DNA procedures and the advent of non-radioactive tags has encouraged a wider interest in the use of DNA techniques as diagnostic tools. Using new techniques for DNA isolation and labelling, we have used both genomic DNA and a cloned ribosomal DNA sequence of Echinococcus granulosus as probes. Genomic DNA of E. granulosus (Australian mainland sheep strain) was isolated in pure form by a cetyltrimethyl-ammonium bromide precipitation technique. A small Bam H1 genomic library was constructed in bacterial plasmid, PBR322. The library was screened in situ using a photobiotinated heterologous ribosomal gene probe. Several recombinant plasmids were identified as containing inserts homologous to the ribosomal gene. One particular plasmid, pkYT 395, shown to give a stronger hybridisation signal, was analysed further. Both the genomic DNA and cloned ribosomal DNA sequences have been assessed for their potential as DNA probes, using photobiotin as a non-radioactive tag to detect differences between strains and species of Echinococcus.

2A-3

EXPRESSION OF ECHINOCOCCUS GRANULOSUS ANTIGENS IN ESCHERICHIA COLI. M.W. Lightowlers and M.D. Rickard*, University of Melbourne, Veterinary Clinical Centre, Princes Highway, Werribee, Victoria. 3030 Australia.

Serological techniques provide reliable diagnosis of human hydatid infection. However, difficulties with obtaining an adequate supply of Echinococcus granulosus cyst fluid for diagnostic tests and a search for improved specificity, have led us to investigate in vitro antigen production techniques. Immunochemical techniques were used to analyse the native antigens of Echinococcus granulosus which are immunogenic in patients with hydatid cysts. Protoscolex mRNA was used to prepare cDNA and this was cloned into the bacteriophage vector λgt10 producing 400,000 recombinant clones. Amplified insert cDNA was recovered and cloned into the expression vector λgt11. High titre sera from patients with hydatid cysts and a hyperimmune rabbit anti-sheep hydatid cyst fluid serum were used to screen 10^5 recombinant λgt11 plaques. Thirteen antigen positive clones were subsequently isolated and these are being assessed for their specificity in immunoassays with sera from patients with hydatid infection.

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2A-4

SUBSPECIES OF TRICHINELLA SPIRALIS CHARACTERIZED BY DNA STRUCTURE AND CORRELATED WITH INFECTIVITY FOR RODENTS AND SWINE. John B. Dame*+, K. Darwin Murrell, and Dante S. Zarlenga. USDA/ARS Animal Parasitology Institute, Beltsville, MD 20705, +University of Florida, Gainesville, FL 32610

Isolates of Trichinella differ in their potential to reproduce in rodents and swine. The structure of the genomic DNA from 24 isolates including isolates from the Arctic, Asia, Canada, Europe, Tanzania and the United States was examined and correlated with the capacity to infect mice and swine. DNA restriction fragment length differences identified by ethidium bromide staining and by hybridization with ^{32}P-labeled ribosomal RNA, served as molecular markers to classify each isolate. The 5 isolates derived from domestic swine and 9 of the sylvatic isolates had a high infectivity and reproductive capacity in both mice and swine. These 14 isolates, regardless of host origin or geographic origin, had similar DNA characteristics and were classified as T. spiralis spiralis. A DNA clone of repetitive DNA from T. s. spiralis, pBP2, was selected which hybridized only to the DNA of T. s. spiralis isolates. This clone is thus useful for determining which new, uncharacterized isolates are highly infectious for swine (i.e., T. s. spiralis). These results show that T. s. spiralis occurs in wild mammals, and this may be a serious obstacle to efforts to eradicate trichinellosis from domestic swine. The relatedness of the non-T. s. spiralis isolates is being assessed based on the structrure of the repetitive DNA and ribosomal RNA genes of these isolates together with their geographic origin and biological properties.

2B-1

CLONING AND CHARACTERIZATION OF DIROFILARIA IMMITIS ANTIGENS

Larry A. McReynolds*, Andres G. Grandea III, Claude Maina, New England Biolabs, 32 Tozer Rd., Beverly, Massachusetts, USA

The genome of Dirofilaria immitis was characterized by Cot hybridization and antigen cloning. The genome contains 79 million base pairs and has an AT base composition, as determined by DNA melting, of 73%. The chromatin of the parasite when digested with the endongeous nucleases gives a repeat ladder of 180 base pairs, which is consistant with the DNA bound to histones in a nucleosome structure similar to other eukaryotes. Two groups of clones were identified and further characterized from a λgt11 library constructed with cDNA synthesized from adult female mRNA. The first group contained part of the α tubulin gene isolated with specific antisera to tubulin. Sequence analysis of the insert demonstrates about 90% protein homology to other tubulin sequences, with the majority of the changes at the carboxy terminus of the protein. A second group of cloned antigens was determined by DNA sequence analysis and by Western blots to be paramyosin, a muscle protein of invertebrates. Sequence analysis of the insert reveals a coding region that has approximately 35% protein homology to both S. mansoni paramyosin and C. elegans myosin. Antisera enriched for the cloned antigen recognizes a protein of 97 kD, the size of paramyosin. The cloned antigen is recognized by antisera from both natural and experimental infections of filarial parasites in man and animals.

2A-5

STRAIN VARIATION IN ECHINOCOCCUS. R.C.A. Thompson, Division of Veterinary Biology, School of Veterinary Studies, Murdoch University, Western Australia.

Echinococcus exhibits a pronounced variability manifested by the existence of numerous genetically distinct strains. Such intraspecific variation is most widespread in the species E. granulosus which appears to be related to its occurrence in a broad range of both wild and domestic non-carnivorous intermediate hosts. Current evidence suggests there are strains adapted to sheep, cattle, pigs, horses, cervids and macropod marsupials, although the status of forms occurring in a variety of other host assemblages remains to be determined. Such variation in host specificity will obviously have a marked effect on the epidemiology of hydatid disease in different endemic areas. Control depends on adequate knowledge of transmission cycles which is not possible unless local strains can be identified and characterised. Moreover, there is increasing evidence that strains also vary in other epidemiologically important features, such as antigenicity, developmental biology and drug sensitivity. The recent application of biochemical and DNA analytical procedures has had a dramatic effect on our knowledge of strain variation in Echinococcus. It has been possible to verify the genetic basis of variation reported using other criteria, such as morphology and host specificity, and we now have a much clearer picture of the extent of strain variation. This means that isolates of Echinococcus can be accurately strain-typed, which will allow the origin of infection to be determined. Examples from Australia and Europe will be used to illustrate these points.

2B-2

THE CLONING AND EXPRESSION OF DIAGNOSTIC ANTIGENS FROM TRICHINELLA SPIRALIS MUSCLE LARVAE. D.S. Zarlenga and H.R. Gamble*. USDA, ARS, Animal Parasitology Institute, Beltsville, Maryland, USA.

Polyadenylated messenger RNA isolated from Trichinella spiralis muscle stage larvae was used to construct a cDNA expression library in lambda gt11. The library was screened with rabbit antibodies generated against a crude extract of muscle larvae (CWE) and greater than 180 clones were isolated. Rabbit antibodies to T. spiralis muscle larvae excretory-secretory (ES) products were used to screen this sublibrary and 13 plaques producing highly immunogenic proteins were selected and purified to homogeneity. Swine antisera to T. spiralis, Trichuris suis and Ascaris suum were used to selectively screen these clones to identify those producing antigen epitopes specific to T. spiralis. Two clones, TsAc-2 and TsAc-8, which displayed strong interactions with pig antisera to T. spiralis only were lysogenized in E. coli Y1089 and the protein extracted. Western blots of the crude fusion proteins revealed molecular weights of 133 kD and 129 kD, respectively. Northern blot analysis of total RNA with ^{32}P-labelled cDNA:lambda gt11 probes indicated single RNA transcripts for each clone with molecular sizes corresponding to 800-850 nucleotides. dscDNA inserts were estimated by southern blot analysis to be 500 bp and 340 bp, respectively, with no cross-hybridization observed between the cloned sequences. Dot blots using pig sera to screen crude fusion protein preparations, total bacterial protein, and CWE or ES products from T. spiralis, T. suis and A. suum corroborated the specificity and sensitivity of these clones as potential diagnostic antigens for swine trichinellosis.

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2B-3

IMMUNODIAGNOSIS OF ECHINOCOCCOSIS AND CYSTICERCOSIS: IDENTIFICATION OF SPECIFIC ANTIGENS, IN VITRO TRANSLATION OF PARASITE mRNA AND GENE EXPRESSION IN BACTERIA.

B. Gottstein.* Institute of Parasitology, University of Zürich, Switzerland.

Alveoloar echinococcosis in man is caused by the metacestode stage of Echinococcus multilocularis. With regard to immunodiagnosis, an antigenic polypeptide (M_r 54000, pI 4.8) has been isolated which demonstrates a high diagnostic sensitivity and species-specificity for E. multilocularis infections, including large-scale sero-epidemiological evaluations in endemic areas such as Alaska, France and Switzerland. Molecular biology techniques were used to improve quality and to obtain larger quantities of such antigens. One analytical approach was done by in vitro translation of mRNA purified from E. multilocularis protoscolices. Immunoprecipitation analysis of in vitro translated products resulted in the demonstration of species-specific and genus-specific antigens. Furthermore, a number of gene fragments from an E. multilocularis cDNA expression library have been isolated which code for antibody-binding polypeptides. Immunodiagnosis of human Taenia solium cysticercosis is complicated by cross-reactions due to infections with other helminths. The immunogramme of 71 patients originating from Latin-America, Asia, Europe and South Africa obtained by Western-blot analysis revealed the presence of 2 species-specific antigenic polypeptides at M_r 26K and 8K. No crossreactions were seen with the two bands in question when testing 147 patients with other helminth infections. In this way, combination of ELISA and Western blotting was shown to be a high qualitative tool in immunodiagnosis of T. solium cysticercosis.

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2C-1

USES AND ABUSES OF TESTS FOR IMMUNODIAGNOSIS OF CANINE DIROFILARIASIS. C.H. COURTNEY.* UNIVERSITY OF FLORIDA. GAINESVILLE, FL 32610, USA.

Data will be presented on the evaluation of 6 heartworm antigen immunodiagnostic test kits in more than 500 dogs whose heartworm infection status was confirmed at necropsy. The antigen tests in general had a higher degree of specificity than the earlier antibody-detecting tests, but sensitivity varied substantially between test kits. Several of the kits may be used to predict approximate numbers of heartworms infecting dogs. After successful elimination of adult heartworms by chemotherapy, dogs convert to test negative 8-12 weeks after treatment. Guidelines for the use of these tests in the diagnosis of canine dirofilariasis, pretreatment evaluation of the patient, and the confirmation of successful treatment will be proposed.

2C-2

STANDARDISATION DE L'EXPRESSION DES RESULTATS DANS LE DIAGNOSTIC SEROLOGIQUE DE LA LEISHMANIOSE CANINE : PROPOSITION D'UN SERUM DE REFERENCE. P. Haas*, M. Calamel, M. Lambert et M. Bayada. Laboratoire Vétérinaire Départemental, 06051 Nice cedex,France.

En raison de la variabilité des réactifs et des matériels utilisés dans les techniques de sérodiagnostic des maladies infectieuses et parasitaires, il est important d'essayer de standardiser l'expression des résultats. Dans ce but, nous avons élaboré un sérum de référence canin anti-Leishmania titré en Unités : Partant du Standard de l'OMS anti-Toxoplasma Humain, on a d'abord titré en Unités un sérum de référence anti-Toxoplasma canin (Titrage ELISA inter-espèces). Puis, à partir de ce dernier, on a titré en Unités un sérum de référence anti-Leishmania Canin (Titrage ELISA inter-germes). Il a ainsi été défini un sérum de référence canin anti-Leishmania titrant 1700 Unités/ml. Ce sérum est actuellement disponible lyophilisé en flacons, à Nice, France. Grâce à ce sérum de référence, il est désormais possible d'exprimer les résultats de toute recherche sérologique de leishmaniose utilisant une méthode quantitative (ELISA, immunofluorescence, hémagglutination passive etc...) en unités.

2C-3

APPLICATION OF ELISA FOR BABESIA BOVIS IN EXPERIMENTAL INFECTIONS AND FOR MASS SCREENING OF EXPORTED BOS INDICUS CROSS BRED CATTLE.

G.W. Hutchinson*. I.P. Sukanto[1] & R. Hedleff[2],[1] Graduate School of Tropical Veterinary Science[2] and Queensland Department of Primary Industries[2], Townsville, Australia.

A previously described HRP-modified microplate ELISA for bovine babesiosis was used to monitor the dynamics of IgG responses in 12, 7-9 month old cross bred Sahiwal and Africander weaners following experimental infection with either vaccine (K strain) or virulent (R strain) B. bovis or B. bigemina (Q strain). Parasitemias were low and red cell parameters were not significantly affected. Calves with R-strain or non-infected controls became infected with Theileria spp. B. bigemina infected and control calves were non-reactive in the test until challenged with K-strain B. bovis. Antibodies in B. bovis infected calves were first detected 2-3 weeks postinoculation (pi), peaked at 5 weeks pi and persisted for a further 5-7 weeks. Those with heterologous strain had lower, slower and shorter IgG reactions than homologous strain infections but not sufficient to invalidate the test for field use. The ELISA was then used on 1123 sera from a shipment of cattle exported to Indonesia. Approximately 51% were reactive with highest (>90%) from coastal and Tableland areas. Most non-reactors were heifers or cows under 3 years old. Three year old steers had twice as many reactors as similar aged females. We concluded that the ELISA is highly specific for B. bovis and recommend that it be used to test export animals to avoid unnecessary live vaccination of immune animals.

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2C-4

SPECIFIC TOXOPLASMA GONDII ANTIBODY SYNTHESIS BY CONGENITALLY INFECTED SHEEP. J.P. Dubey, Animal Parasitology Institute, ARS, USDA, BARC-East, Beltsville, MD 20705.

To determine the interval between infection of the ewe and the development of T. gondii antibodies in the ovine fetus, 19 pregnant (45 to 90 day gestation) ewes were inoculated orally with sporulated oocysts of T. gondii. The ewes were killed between 14 and 62 days post-inoculation (DPI) and T. gondii antibody titers were determined in fetal and ewes sera using the modified agglutination test. Although all ewes developed titers of >1024 within 28 DPI, fetuses were seronegative up to 28 days but became seropositive between 35 and 42 DPI. All fetuses were found infected with T. gondii based on bioassay and lesions. T. gondii antibodies were detected even in severly decomposed, congenitally infected fetuses. Results indicate that serologic examination of the fetus is useful in diagnosis of toxoplasmic abortion in sheep.

2C-5

DEVELOPMENT OF IMMUNODIAGNOSTIC TESTS FOR TRITRICHOMONAS FOETUS INFECTION. A.Yule*,S.Skirrow, J.Staats, RH BonDurant.
Department of Reproduction, School of Veterinary Medicine, University of California, Davis,CA,USA.

More sensitive diagnostic tests are required for T.foetus infection and an antigen-detecting ELISA has been developed for this purpose. An affinity-purified rabbit immunoglobulin fraction served as both capture antibody and as biotinylated indicator antibody. While highly sensitive in the detection of culture-derived antigen (< 10ng trichomonal protein/ml), the assay showed poor sensitivity in the detection of antigen in cervical mucus from artificially-infected heifers, with only 75% of culture-positive samples being considered positive for antigen. In a direct comparison, 23/122 samples from naturally-infected dairy cows gave positive cultures, while only 10/122 samples were considered antigen-positive. No obvious qualitative differences were observed between 11 T.foetus isolates on immunoblotting, indicating that antigenic heterogeneity is unlikely to be a factor in the low sensitivity of ELISA. We are attempting to identify suitable disease markers indirectly through characterisation of the local antibody response. Preliminary results suggest that a local antibody response to high MW antigens (> 180 Kd) may possibly serve as an indicator of T.foetus infection.

Supported in part by USDA Competetive Grant (Animal Science) and the Californian Cattlemen's Association.

2D-1

INTRADERMAL REACTIONS IN CATTLE OF THREE ANTIGENS DERIVED FROM RHIPICEPHALUS APPENDICULATUS: ANTIGEN TITRATION, SPECIFICITY OF REACTION, SELECTION AND USE TO DETERMINE TICK EXPOSURE IN THE FIELD. P.B. Capstick*, J.J. de Castro & M. Nyindo.
International Centre of Insect Physiology and Ecology, Nairobi, Kenya.

Aqueous soluble extracts were prepared from unfed larvae, dissected salivary glands and a tissue culture cell line derived from the embryonating eggs of R. appendiculatus. Each extract was titrated for activity by intradermal injection in tick naive cattle and in cattle rendered immune by natural tick infestation. Larval and tissue culture antigens reacted only in tick immune cattle. Salivary gland antigen reacted in both tick naive and tick immune cattle and with larval antigen was not studied further. Tissue culture induced reactions commenced within 30 minutes of injection which increased to a maximum size in 1 hour. Reaction size was constant for 6 hours and then regressed, disappearing completely by 24 hours. When used in the field on animals maintained under weekly acaricide cover and presumably tick naive, positive reactions occurred in some animals possibly due to attack by other haematophagous insects, or undetected failure of acaricide application. It was concluded that tissue culture antigen could detect previous tick exposure and used to select tick naive cattle.

2D-2

IMMUNODIAGNOSIS IN *Bunostomum phlebotomum* INFECTION IN CALVES. M.P.Guimaraes*, E.Nascimento, A.C. R.Leite & W.S.Lima. Dept.Parasitologia ICB UFMG, C.P.2486, 30160-Belo Horizonte,MG. BRAZIL.

An attempt to achieve a more accurate and specific diagnosis for *B.phlebotomum* infection, a quite common parasite of calves in Brazil is in progress. Sixteen worm free 3-mont-old friezian calves were infected percutaneously with 3500 l_3 larvae of *B.phlebotomum*. The infection was followed up by EPG counts and blood examination, weekly. Serum was collected and stored. When the calves started eliminating eggs, we prepared coprocultures and all l_3 larvae obtained were stored at -70°C. After that, these larvae were sonicated and lyophilized to be used as antigen for ELISA test. Since the protein amount obtained from these larvae is very low, and for routine diagnosis it is very difficult to keep mono-infected calves, we will check the possibility to replace this material by antigens prepared with *Ancylostoma caninum* l_3 larvae.

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2D-3

SYNTHESIS OF NEOGLYCOPROTEINS FROM FASCIOLA HEPATICA GLYCOLIPID OLIGOSACCHARIDES. L.H.Semprevivo* & G.C.Coles. Department of Zoology, University of Massachusetts, Amherst, MA 01003, U.S.A.

Adult F.hepatica obtained from bovine livers were first extracted with isopropanol/hexane (2/3) to remove monomeric glycolipids followed by solvent E [water:ethanol:ethyl ether: pyridine: ammonium hydroxide (15:15:5:1 :0.017)] to extract glycolipid conjugate. The oligosaccharides were cleaved from the glycolipids by trifluoroacetolysis, derivatized with β-(p-aminophenyl) ethylamine and coupled to protein by diazotization. The products (neoglycoproteins) were found to react strongly with sera from F.hepatica infected rats, but poorly with serum from rats infected with Schistosoma mansoni and not with sera from uninfected rats. The ability of the neoglycoproteins to induce oligosaccharide-specific immune responses was demonstrated by immunizing animals with oligosaccharide-edestin conjugate followed by testing the sera by ELISA using oligosaccharide-chicken ovalbumin conjugates. The results indicate that these semisynthetic neoglycoproteins may have potential for use as diagnostic aids and vaccines.

2D-4

EXOANTIGEN-MEDIATED PROTECTION AND IMMUNOSUPPRESSION IN NAIVE ANIMALS IMMUNISED WITH SERUM FROM IRRADIATED RATS INFECTED WITH TRYPANOSOMA LEWISI. Charles M. Ndarathi, Chantal Proulx and Charles E. Tanner, Institute of Parasitology, McGill University, Ste-Anne-de-Bellevue, Quebec.

Trypanosoma Lewisi is a specific blood parasite of rats. Studies to identify the antigen which induces the solid immunity which results after the infection is resolved indicate that exoantigens from epimastigotes in the serum of irradiated rats protected animals when infection followed serum treatment by 7 days. This same serum contained an immunosuppressive factor(s) since infection was enhanced when the inoculum of parasites followed serum treatment by 2 hours. Trypanolytic and ablastic antibodies could be demonstrated in the serum of normal rats following immunization with this serum. Stimulation in vitro of T and B lymphocytes in spleen cell suspensions by Con A or LPS depressed in the presence of this serum from irradiated infected rats. Suppression of the response of T cells was more intense than that against B cells; suppression was dose-dependent. These results indicate that the target for the suppressor factor(s) in the sera of rats infected with T. Lewisi is the T cell, while protection is mediated by antibodies elicited by exoantigens. Enhancing and suppressing factors produced by the parasite into the serum of infected rats probably play a significant role in regulating infections with Trypanosoma Lewisi.

(Supported by NSERC Grant A4954)

2D-5

IMPORTANCE OF LYMPHOKINES IN THE CONTROL OF THE MULTIPLICATION AND DISPERSION OF LEISHMANIA DONOVANI WITHIN LIVER MACROPHAGES OF RESISTANT AND SUSCEPTIBLE MICE. M. Olivier*, C. Proulx and C.E. Tanner, Institute of Parasitology, McGill University, Ste. Anne-de-Bellevue, Québec, Canada.

Leishmania donovani is an obligate intracellular protozoan parasite of the macrophages of mammals which is transmitted by sand flies. Using the immunosuppressant cyclosporin A (CsA) which inhibits the production of IL-1, IL-2 and IFN, the levels of infection were increased 3-fold without affecting expression of the Lsh gene. The objective of the present study was to determine how activation of lymphokines affects the multiplication and propagation of the parasite within macrophages. Mice of the susceptible C57BL/6J and the resistant C57-L/J strains were treated with 200 mg/Kg CsA; they were then infected with 10^7 amastigotes IV and 2 weeks later macrophages were collected from the liver by perfusion and plated on coverslips for 4, 24 and 48 hrs. The percent of infected macrophages and the number of amastigotes/100 cells were counted after staining the coverslips with Giemsa. The number of infected macrophages and the number of amastigotes per macrophages was significantly higher in animals treated with CsA in both strains. This study demonstrates clearly that lymphokines or other soluble mediators produced by T cells act in part to control infection by L. donovani by minimizing both multiplication within macrophages and the dispersion of the parasite.

(Supported by NSERC Grant A4954)

2D-6

DETECTION OF SURFACE SPECIFIC ANTIGENS ON THE NEMATODE, NEMATOSPIROIDES DUBIUS. G.C.Coles* & L.H.Semprevivo. Department of Zoology, University of Massachusetts, Amherst, MA 01003, U.S.A.

Knowledge of the immunogenic epitopes on the surface of parasitic nematodes may be very important in the design, evaluation, and eventual production of vaccines for these pathogens. We report here an alternative method for identifying surface active epitopes which does not require radioactive isotopes or the time and expense associated with raising monoclonal antibodies. This method was developed using the mouse nematode, Nematospiroides dubius and relies upon surface specific polyclonal antibody (SSPA). The latter was prepared by incubation of adult N.dubius worms in cold immune mouse serum for 1 h, followed by rinsing in cold Hanks' balanced salt solution and removal of bound antibody with 3 M sodium iodide. Desalted SSPA rebound to the surface of living worms as shown by indirect immunofluorescence and reacted with a restricted set of high molecular weight proteins (glycoproteins?) as demonstrated by slab SDS-PAGE and immunoblotting. The SSPA also reacted by ELISA with neoglycoprotein synthesized from parasite glycolipid oligosaccharides.

Molecular Biology, Immunodiagnosis and Immunity / Biologie moléculaire, immunodiagnostic et immunité

2D-7

BLASTOGENIC RESPONSES OF LAMB LYMPHOCYTES AND THEIR EFFECTS ON THE LYMPHOCYTE RESPONSES OF ADULT EWES TO H. CONTORTUS ANTIGEN. A.M. Zajac,* C.J. Burger, J.W. Hansen. College of Veterinary Medicine, Virginia Tech, Blacksburg, VA 24061 U.S.A.

Lambs of common European breeds are unable to develop an effective immune response to trichostrongylid parasites before 6 months of age, although the basis of this unresponsiveness is unknown. Lymphocytes from peripheral blood (PB) and abomasal lymph nodes (ALN) of 12 week-old lambs were tested for responsiveness to phytohemagglutinin (PHA) and Haemonchus contortus larval antigen in a standard lymphocyte blastogenesis assay (LBT). Five worm-free and 5 trichostrongyle infected crossbred lambs were studied. Lamb lymphocytes were evaluated for their ability to modify responses of adult ewe PB lymphocytes to both PHA and H. contortus antigen. Cells of 3 adult ewes with previous exposure to natural infection were tested with lymphocytes from each of the 10 lambs. Irradiated lamb PB or ALN cells were added to adult ewe lymphocytes in the LBT test and the uptake of tritiated thymidine measured. Cellular responses of ewes appeared to be unaffected by the addition of lymphocytes from either infected or uninfected lambs. PB lymphocytes from lambs did not show a response to parasite antigen, however ALN cells from infected lambs showed an increased response (mean Stimulation Index 7.6) to H. contortus antigen compared to uninfected lambs (mean S.I. 2.4). These results suggest that lambs are able to respond to parasite antigens but that suppressor cell activity may not be involved in preventing the development of an effective resistance.

2D-8

IMMUNE RESISTANCE TO THE TICK AMBLYOMMA AMERICANUM IN THE SHEEP AND PROTECTION-ASSOCIATED ANTIGENS. O.O. Barriga*, F. Andujar & W.J. Andrzejewski. College of Veterinary Medicine, The Ohio State University, Columbus, Ohio 43210.

Ticks of cattle cause losses estimated in 10 billion kg of beef and 50 billion liters of milk per year in the world. Because acaricide application is too expensive and complex for many countries and ticks are developing resistance to these drugs rapidly, we are investigating the production of anti-tick immune resistance in ruminants with the model A. americanum-sheep. Three sheep were infested, 4-5 successive times each, with 100 pairs of adult ticks. After each infestation we recorded: the times to complete engorgement, to oviposition, and to hatching; the weight of the engorged females and of the egg-mass; and the survival of ticks to complete engorgement and to oviposition. We also studied by Western blots the antigens of tick salivary gland and digestive tract to which the sheep serum reacted after each infestation. In every case the times to engorgement and to oviposition were significantly greater, and the weight of the engorged ticks and of the egg-mass significantly smaller, after the 3rd-4th infestation or earlier. Three antigens to which tick-naive sheep did not react were detected after the first infestation (MW between 39,000 and 34,000), one additional one after the second and third infestation (MW 30,000), and three additional ones after the fourth infestation (MW 28,000, 22,000 and 17,000). Because the last three antigens appeared in coincidence with manifestations of anti-tick resistance, we believe that they may be related to protection.

2D-9

MEDIATION OF CELLULAR IMMUNITY TO EIMERIA TENELLA IN AVIAN AND BOVINE SOMATIC CELLS. Michael H. Kogut & Christine Lange*. Department of Animal Sciences, Rutgers, The State University, New Brunswick, NJ 08903.

The effect of lymphokine treatment of chicken and bovine cells on the development of E.tenella within these cells was studied. Treatment of primary chicken kidney cells (CK) or the established Madin-Darby bovine kidney cell line (MDBK) with concanavalin A-induced lymphokines from E.tenella-immune chicken spleen cells (cLK) both before and after infection with E.tenella sporozoites led to a significant suppression of parasite growth in both cell types within 48 h post-infection (p.i.). In the CK cells, there was no difference in the number of total intracellular parasites in the control and cLK-treated cells by 48 h p.i.; however, only 20% of these parasites were developing meronts in the treated cells versus 90% developing meronts in the untreated controls. In the MDBKs fewer total intracellular parasites were found in the treated cells at 48 h p.i., where only 24% were developing meronts compared to 93% in the controls. In contrast, treatment of both cell types with concanavalin A-induced lymphokines from E.nieschulzi-immune rat spleen cells had no effect on the development of the parasite within either cell type. The results from these experiments suggest that the effector molecule(s) in the crude avian lymphokine preparations lack host cell species-specificity, but exhibit a functional parasite specificity. These studies indicate that Eimeria-immune chickens are able to produce a parasite specific LK which inhibits the intracellular asexual development of the coccidia. Therefore, we report here an immune mechanism of protective immunity to coccidiosis and account for the species-specific immunity induced by the Eimeria of the chicken in vivo (Supported by Hatch and State Funds from New Jersey Agricultural Experiment Station grant #06110).

2D-10

THE DIAGNOSIS OF OSTERTAGIASIS IN FIRST SEASON GRAZING CALVES WITH SPECIAL REFERENCES TO BIOCHEMICAL AND SEROLOGICAL CHANGES - P Berghen, J Vercruysse*, P Dorny, H M Hiderson, Veterinary Faculty, Casinoplein 24, 9000 Gent, Belgium.

Bovine parasitic gastritis due to *Ostertagia ostertagi* is recognized as an economically important disease in Europe and most other temperate areas. Trials were conducted involving first-season grazing calves to evaluate the use of serum pepsinogen, *Ostertagia* antibody response , gastrin and albumin in the sequential development and diagnosis of ostertagiasis. Positive significant relationships were demonstrated between marked increases in the levels of serum pepsinogen and plasma gastrin, and antibody extention values to *Ostertagia* antigen. A negative significant relationship was found between serum pepsinogen and albumin. The significant relationship between the antibody titres to *Ostertagia* using the ELISA test with serum pepsinogen and gastrin, give cause for their future use as a diagnostic aid. Particularly the simplified method for detecting serum pepsinogen (Berghen et al, Am.J.Vet.Res., 4, 1987) is a usefull tool as it is a relatively simple test which can be executed rapidly.

Molecular Biology, Immunodiagnosis and Immunity / Biologie moléculaire, immunodiagnostic et immunité

2D-11

ENZYME LINKED IMMUNOSORBENT ASSAY (ELISA) FOR DIAGNOSIS OF CYSTICERCOSIS IN RABBITS. S. Yang*, Z. Wang & B. Shi. School of Veterinary Medicine, Purdue University, West Lafayette, Indiana.

Enzyme linked immunosorbent assay (ELISA) was developed for the diagnosis of rabbit cysticercosis caused by the metacestode of Taenia pisiformis, which is prevalent in China. Several factors which influence the ELISA test were investigated in order to obtain an optimum reaction. The cyst fluid was used as antigen and the indirect method for ELISA was adopted. The optical density (OD) was read at 492nm, and the immunity ratio (IR) between the sera of infected rabbits and controls was calculated. The sera were considered positive when the IR was more than 3. Seventy-nine infected and 47 uninfected sera were examined. The incidence of positive was 98.7% in the infected animals. All samples were also tested by indirect hemogglutination and the incidence was 89.8% in the infected animals. Therefore, ELISA was considered to be a simple and sensitive method for the diagnosis of cysticercosis in the rabbit.

2D-12

ACQUIRED IMMUNITY TO NECATOR AMERICANUS IN MICE. J.M. Behnke & C.A. Wells. MRC Experimental Parasitology Research Group, Department of Zoology, University of Nottingham, University Park, Nottingham, U.K.

Necator americanus causes chronic infections in the human host, which are borne throughout life by people living in endemic areas. Despite evidence for antibody responses to parasite antigens there is little to support the existence of host-protective immunity. Mice were infected with the hamster adapted strain of N. americanus and the course of primary and secondary infections was studied. During primary infection in BALB/c mice, larvae developed normally in the lungs, leaving on days 7-9, but failed to establish in the intestine. Acquired resistance to challenge infection was dependent on the dose of the initial infection and was reflected in reduced larval recoveries from both the skin and lungs. The broncho-alveolar leucocyte response, the capacity of broncho-alveolar leucocytes and serum to mediate adherence to L_3 and the specific antibody response to L_3 were enhanced during secondary infections. Nine days after challenge significantly more larvae were trapped in the lungs, but trapping was alleviated by cortisone treatment. Infections abbreviated by anthelmintic, at the skin or lung stage were as effective at inducing resistance to challenge as uninterrupted primary infections.

2D-13

Isolation of messenger RNA from Nippostrongylus brasiliensis and it's translation in vitro.
T.D.G. Lee and A.D. Befus
Department of Microbiology and Infectious Diseases
University of Calgary, Calgary, Alberta.

Using 10X washed preparations of adult N. brasiliensis we have obtained 1.88± 0.5ug total RNA from 1.8±0.2g wet weight of worms. RNA extraction was carried out by homogenization of fresh worms in ice cold guanidinium isothiocyanate (with sarcosyl laureate) and centrifugation through 5.7M cesium chloride. Oligo dT cellulose chromatography (0.3g per column) was used to enrich for mRNA (yield approx. 1%). After confirmation of RNA integrity by formaldehyde-agarose gel electrophoresis, mRNA was translated in vitro by using a rabbit reticulocyte lysate system supplemented with radioactive methionine. Translated products were immunoprecipitated with a 1/50 dilution of rabbit anti-adult worm homogenate and rabbit anti-purified allergen. No precipitation was seen with normal rabbit serum. Immunoprecipitation demonstrated that we have successfully isolated mRNA coding for N. brasiliensis antigens including the major putative allergen.
Supported by the Alberta Heritage Foundation for Medical Research.

2D-14

ANTI-IDIOTYPIC ANTIBODY INDUCED IN VITRO PROLIFERATIVE RESPONSES OF EIMERIA TENELLA SPECIFIC CLONED T CELLS. B Bhogal*, E Jacobson, and D Schmatz.
Merck Sharp & Dohme, Rahway, N.J. 07065

A battery of T lymphocyte clones (CTL) with specific reactivity to antigens from various developmental stages of E. tenella were generated from immune chickens (Bhogal et al., J.IMMUN., 137:3318). Some of these CTL exhibited discrete helper and suppressor activities and some produced macrophage stimulating factors for enhanced killing of the parasite. Out of 31 CTL, 3 clones showed proliferation when stimulated with anti-idiotypic antibody (anti-Id) 1073, thus substantiating the internal image nature of this polyclonal Anti-Id shown in an earlier study to induce antibody and cellular immune responses and protective immunity in chickens against E. tenella infection (Bhogal et al, 1987, Avian Immunology II, p 307, Eds. E. Weber & D. Ewert). A similarly prepared anti-Id 15-1 stimulated two additional CTL. Although the two anti-Id preparations were found to cross react in a competitive inhibition ELISA, they failed to show such cross reactivity in proliferation assays. The anti-Id blocked the proliferative responses of cloned T cells to parasite antigens when T cells were preincubated with sub-stimulatory concentrations of anti-Id. These results provide evidence that anti-Id can induce both T and B cell stimulation in the chicken and can thus provide a possible alternative approach for vaccination against poultry coccidiosis. It appears that the CTL generated from immune chickens may be better tools for identification of relevant parasite antigens for a subunit vaccine as well as for screening recombinant antigens.

Drug resistance / Résistance aux médicaments

3A-1

SURVEY OF ANTHELMINTIC MANAGEMENT AND RESISTANCE ON NEW ENGLAND SHEEP FARMS. J.P. Tritschler II*, D.J. Giordano & G.C. Coles. Department of Veterinary & Animal Sciences, University of Massachusetts, Amherst, USA.

Responses of a New England postal survey were subdivided into producers who had discontinued using an anthelmintic because they considered it ineffective (n=202) and those who had not discontinued (n=463). Differences between these groups were analyzed statistically for trends in anthelmintic management associated with perceived anthelmintic failure. Benzimidazoles (primarily thiabendazole) represented 83.6% of anthelmintics that were discontinued; followed by phenothiazine (10.9%). However, 66.2% of producers who discontinued using a benzinidazole still used some form of benzimidazole in their drenching program. Those producers who discontinued using an anthelmintic had a significantly ($P<0.001$) greater total number of lambs and more lambs pastured, but these lambs were grazed on similar acreage. In addition, they had higher lambing percentages, earlier breeding and lambing dates, and more extensive, planned drenching programs, suggesting that more intensive management is associated with perceived anthelmintic failure. In terms of anthelmintic management, producers that discontinued using an anthelmintic used a greater quantity of anthelmintics ($P<0.001$) and were more likely to alternate compounds within a calendar year ($P<0.01$), but not annually. These observations support studies indicating that frequent dosing increases the rate at which resistance develops and that alternating anthelmintic classes within a farming year will not delay appearance of anthelmintic resistance.

3A-2

USE OF AN IN VITRO LARVAL PARALYSIS ASSAY TO MONITOR THE SUSCEPTIBILITY OF OSTERTAGIA OSTERTAGI FROM VIGLUNDA, SWEDEN, TO MORANTEL TARTRATE. **M. Tornquist*, Swedish Farmers Meat Marketing Ass., Scan Vast, Skara, Sweden & R.E. Purnell, Pfizer Central Research, Sandwich, England**

For nine successive years Swedish Friesian calves grazing a pasture on a farm at Viglunda, Sweden, have each been given a Paratect bolus (or its prototype forerunner) at turnout. On a neighbouring farm, calves have grazed a similar pasture without treatment with morantel, pyrantel or levamisole. At the end of the ninth grazing season O.ostertagi larvae cultured from pooled faecal samples from calves grazing either the Paratect bolus pasture or the control pasture were sent to England, where Friesian male calves were orally infected with each strain. The calves provided larvae for use in the in vitro larval paralysis assay. Analysis of the data indicated that there was no significant difference between susceptibility of the two strains.

3A-3

DEVELOPMENT OF AN IN VITRO LARVAL PARALYSIS ASSAY TO MONITOR THE SUSCEPTIBILITY OF OSTERTAGIA OSTERTAGI TO MORANTEL TARTRATE

S.A. Langridge, Ciba-Geigy Agrochemicals, Cambridge, England & R.E. Purnell, Pfizer Central Research, Sandwich, England (presented by A.J. Weatherley, Pfizer Central Research, Sandwich, England).

An in vitro assay has been developed to monitor the susceptibility of field strains of O.ostertagi to morantel after repeated annual use of the Paratect bolus. Two sources of variation are considered - the donor animal and the assay itself. O.ostertagi larvae are cultured from pooled faecal samples from field sites. Doses of 40,000 larvae are given orally to 3 month old male parasite naive Friesian donor calves, and eggs are harvested from their faeces between days 28 and 35 after infection. Larvae cultured from the faeces are held for 6 weeks at 4°C and then used in the test which runs for 3 hours at 22°C and uses dilutions of morantel tartrate between 0.00001M and 0.01M. The data is transformed and analysed using SIGFIT analysis to enable comparison of various parameters of strain variation to be explored.

3A-4

RELIABILITY AND REPRODUCIBILITY OF THE LARVAL PARALYSIS TEST AS AN IN VITRO TECHNIQUE FOR THE DETECTION OF ANTHELMINTIC RESISTANCE. S.Geerts*, J.Brandt and F.Borgsteede°. Institute of Tropical Medicine, Veterinary Department, Antwerp, Belgium. °Central Veterinary Institute, Lelystad, The Netherlands.

In order to study the reliability of the larval paralysis test as an in vitro-assay for the detection of resistance against levamisole and morantel (Martin & Le Jambre, 1979) the influence of different parameters on test results was observed using resistant and susceptible Ostertagia ostertagi strains. The operator, the sample (10% of the larvae present in the suspension) the moment of reading the test (after 24, 48 or 72 hours), the incubation temperature (20 or 25°C) and the observation period of the larvae (5 or 15 seconds) had no statistically significant influence on the test results. Statistical differences were obtained only when L_3-larvae of different age (1 or 2 months) were used. Reversibility of the paralysis did not occur when levamisole concentrations $\leqslant 200\,\mu g/ml$ were used. The reproducibility of the test was fairly good, with a standard deviation varying between 15.8 and 22.2%. A morantel resistent O.ostertagi strain was not recognised as such by the larval paralysis test. The resistance factor was lower than 1, inspite of an efficacy of morantel being 77,4% as shown by a controlled test.

(supported by a Grant of I.W.O.N.L., Brussels).

Drug resistance / Résistance aux médicaments
Chemotherapy in cattle / Chimiothérapie chez les bovins

3A-5

IN VITRO SELECTION OF DRUG RESISTANT PARASITIC HELMINTHS. G.C.Coles, Department of Zoology, University of Massachusetts, Amherst, MA 01003, U.S.A.

Laboratory selection of drug resistant nematodes can be successfully undertaken by repeated passage through treated animals. However where parasites are highly pathogenic to the host, e.g.Schistosoma sp., relatively few worms can be exposed to drug by this method. To overcome this problem, schistosomules of S.mansoni were cultured sterilely in the presence of schistosomicides (amoscanate, oltipraz, oxamniquine, praziquantel) for 3 days prior to innoculation .into mice. Drug doses were selected that prevented >99.8% of worms developing. Selected strains were evaluated in in vivo trials in mice. Although no change in response to praziquantel occurred, there was a significant increase in resistance to oltipraz. The oxamniquine selected strain failed to respond at the maximum tolerated dose (500 mg/kg). The principles of in vitro selection should be applicable to other parasitic trematodes and to nematodes cultured to the infective larval stage in the presence of anthelmintics.

3A-6

MODELS FOR PREDICTING INSECTICIDE PERFORMANCE
C.A. Hall*, Ogilvy Hall Pty. Ltd., 1/298 Pacific Highway, Artarmon, 2064, N.S.W., Australia.

Regulatory requirements, to register claims on efficacy, have remained unchanged for many years although known to contain innumerable and unrepeatable variables. Published data indicate the pest should remain naive for as long as possible against new insecticides, since the duration of effectiveness for the compound is shorter the more varied the «resistant load». A model for testing insecticides in preventing blowfly strike (Lucilia sp.) on sheep was developed. The substrate for retention of insecticide was medium Merino wool, produced without recourse to other insecticidal treatment, and artificially contaminated singly or in combination with either faeces (5%), clay (kieselguhr) (2%) or urine (10 ml/ 40 gm of wool). Wool was treated in vitro, exposed to the prevailing weather, and sub-samples challenged with 1st. instar larvae at weekly intervals.
The model provided data showing no difference between compounds of the same chemical group, but with significant difference between contaminants and strains of resistant blowflies. The period for biological activity equated to the known field performance. Modification to this model also yielded tenable data for other new groups of insecticidal compounds.

4A-1

EFFICACY OF NETOBIMIN (SCHERING CORP.) AGAINST A MIXED INFECTION OF DICROCOELIUM DENCRITICUM AND FASCIOLA HEPATICA IN CATTLE. K. Pfister*, D. Ducommun, H. Kipfer, H. Kaufmann & W. B. Young. Veterinary School, University of Berne, P.O. Box 2735, CH-Beren/Switzerland; Schering-Plough Corp. Union, N.J. 07083 U.S.A.

The efficacy of Netobimin (Sch 32481) against a mixed infection of D. dendriticum and F. hepatica was examined in adult dairy cattle. Twenty cattle with natural D. dendriticum infections and some with chronic fascioliasis were used in this study. Each animal was superinfected with 200 metacercariae of F. hepatica. On day 83 after experimental superinfection (patency), 10 animals were treated with a single oral dose of 20 mg Netobimin/kg bodyweight. All cattle were killed 14 days after medication and the liver, gall-bladder and anterior small intestine processed for fluke recovery. The mean reduction of D. dendriticum was 82.79% and of F. hepatica 66.95%. The variation between cattle in the same group was considerable but not surprising when the different age and origin of the animals is taken into consideration, including a change in grazing pattern. Consequently, there was also a varying degree of preexisting bile duct hyperplasia and inflammatory lesions. With regard to the broad anthelmintic activity of the present compound,the attained reduction appears to be satisfactory. However, preliminary trials in D. dencriticum moninfections suggest that the extent of the bile duct proliferations including chronic inflam-mations have an influence on the availability of the drug for D. dendriticum. An alternative way of administration (same total dose over a pro-longed period of time) might possibly improve the efficacy further.

4A-2

EFFICACITE DU NETOBIMIN (SCH 32481) SUR LES PRINCIPAUX HELMINTHES PARASITES INTERNES DES RUMINANTS. SYNTHESE DE L'EXPERTISE CLINIQUE. Alain Marchand*. Service de Parasitologie, Ecole Nationale Vétérinaire, Nantes, France.

Le nétobimin (a) est un nouvel anthelminthique de la classe des Nitrophénylguanidines. Son spectre s'étend aux nématodes gastro-intestinaux et pulmonaires, aux cestodes et aux trématodes (Fasciola hepatica adulte et Dicrocoelium lanceolatum). Son efficacité a été mesurée par voie orale et sous-cutanée chez les bovins et par voie orale chez les petits ruminants. Les animaux inclus dans les expérimentations étaient infestés naturellement (excepté un essai concernant F. hepatica où l'infestation était expérimentale). Le nétobimin a été administré chez les bovins par voie sous-cutanée à la posologie de 12,5 mg/kg. Par voie orale, il a été utilisé chez les bovins, les ovins et les caprins aux posologies de 7,5 et 20 mg/kg. Les épreuves d'efficacité ont inclus des coproscopies, des dosages biochimiques (pepsinogène plasmatique), un suivi immunologique (méthode Elisa pour la fasciolose) et des autopsies. Par voie injectable chez les bovins, le nétobimin possède une efficacité supérieure à 95 % sur la majorité des strongles gastro-intestinaux et pulmonaires rencontrés dans cette espèce. Par voie orale à 7,5 mg/kg, le nétobimin montre une activité supérieure à 95 % sur les nématodes digestifs et respiratoires des ruminants. A 20 mg/kg par voie orale, le spectre s'élargit avec la même efficacité aux larves en hypobiose aux cestodes, aux formes adultes de F. hepatica et a D. lanceolatum (l'activité sur ce dernier parasite est supérieure à 98 %). Aux doses thérapeutiques, aucun phénomène de toxicité locale ou générale n'a été noté. Les différentes formulations de nétobimin peuvent donc s'intégrer dans les plans de prophylaxie des helminthoses internes des bovins, des ovins et des caprins.

(a) ND Hapadex (Rigaux-Galéna)

Chemotherapy in cattle / Chimiothérapie chez les bovins

4A-3

EFFECTS OF TWO YEARS OF STRATEGIC DEWORMING WITH FENBENDAZOLE ON A BEEF COW/CALF HERD IN MINNESOTA. J.C. Schlotthauer*, B.E. Stromberg, D.L. Haggard, R.J. Vatthauer and H.E. Henke. University of Minnesota, St. Paul, Minnesota, USA.

A two year study of the effects of strategic deworming with Fenbendazole on weight gain, pregnancy rates and internal parasite burdens was conducted in an established herd of 68 Shorthorn cows and their calves on pasture in west central Minnesota. The cows and their calves were allocated into two equal treatment groups based on sire and age. Treatment cows were dewormed annually in early May and mid-July and treatment calves were dewormed in mid-July with Fenbendazole at 2.3 mg/kg body weight. Treatment and control cows and their calves were rotationally grazed on equivalent but separate and adjacent cool season grass pastures from early May thru mid-October. Control cows tended to gain more weight on pasture than treatment cows but treatment calves had gained more than 15 kg body weight by weaning than did control calves. Treatment cows had significantly higher pregnancy rates in October than did the control cows. Fecal ova counts were markedly elevated in the control calves during the period of August into November. Tracer calves yielded Ostertagia sp., Haemonchus sp., Trichostrongylus sp., Nematodirus sp., Cooperia sp. and Moniezia sp.

4A-4

NETOBIMIN (HAPADEX) EVALUATION AGAINST GASTRO-INTESTINAL NEMATODES AND CESTODES IN ALPACAS. JOSE ALVA M.*, MED. VET. IVITA - UNMSM (SAN MARCOS UNIV.), PERU.

TWENTY-SEVEN 4 TO 5 MONTHS OLD ALPACAS NATURALLY PARASITIZED WITH SEVERAL NEMATODE SPECIES AND TAENIA WERE USED TO EVALUATE THE EFFICACY OF NETOBIMIN. THREE GROUPS OF NINE ANIMALS EACH WERE TREATED PER OS. IN GROUP A, TREATED AT 7.5 MG/KG BODY WEIGHT EFFICACY WAS 74%, 98%, AND 86% FOR OSTERTAGIA OSTERTAGI, O. CIRCUMCINCTA AND T. AXEI, RESPECTIVELY. AGAINST L. CHAVEZI, N. LAMAE, N. SPATHIGER AND C. ONCOPHARA EFFICACY WAS 75%, 73%, 87%, AND 85%, RESPECTIVELY. EFFICACY AGAINST 4TH STAGE LARVAE FROM THE ABOMASUM AND LIVER WAS 87% AND 80%, RESPECTIVELY. THE DRUG WAS EFFECTIVE AGAINST TAENIA SP. EVALUATED BY SCHORING REDUCTION IN SOMATIC VOLUME (73.6%) AND NUMBER OF SCOLICES (91.4%). IN GROUP B, TREATED AT 20 MG/KG, EFFICACY WAS 94%, 93% AND 81% FOR O. OSTERTAGI, L. CHAVEZI, N. LAMAE, RESPECTIVELY AND 100% FOR O. CIRCUMCINCTA, T. AXEI, N. SPATHIGER, C. ONCOPHORA. TAENIA SP. AND 4TH STAGE LARVAE FROM ABOMASUM AND LIVER. GROUP C WAS UNTREATED CONTROLS.

4A-5

IVERMECTIN: PRODUCTIVITY AND CONTROL OF NEMATODE PARASITES IN CATTLE. J.C. Williams, J.W. Knox, K.S. Marbury, & M.D. Kimball. Louisiana State University Agricultural Center, Baton Rouge and Bossier City, USA.

The pathologic and economic effect of nematode parasitism in beef cattle is of most importance in weaner-yearlings. Epidemiology of these parasites was investigated over several years in Louisiana and the data have been used to formulate plans for control of ostertagiasis and other infections based on strategic treatment and pasture management. Three strategic treatments over long grazing periods have been very effective. A test of the 3 treatment plan was conducted from weaning (14 NOV 1985) through 8 OCT 1986 (328 days). Sixty-eight head of weaner, crossbred calves were randomly allotted into 4 groups of 17/Gp based on body weights. Group treatments were: 1-ivermectin (200mcg/kg, s.c.)x1 on 14 NOV; 2-ivermectin x3 on 14 NOV, 4 FEB, 2 JUL; 3-ivermectin x2 on 14 NOV, 2 JUL; 4-fenbendazole (5mg/kg-paste)x2 on 14 NOV, 2 JUL. All animals were weighed and feces, blood, and pasture herbage were collected at monthly intervals. Tracer calves (n=2/Gp) were grazed on all pastures during 1 month in fall and spring; representative yearlings were also killed for worm population analysis in APR (n=2/Gp) and OCT (n=3/Gp). Highest rate of gain was made by all groups from MAR-JUL; group 2 was consistently highest from MAR-AUG, and Gp 3 had second highest gains during MAY-JUL. Final average weights and (total gains) in descending order were: Gp 2-364 kg (164 kg); Gp 3-352 kg (150 kg); Gp 4-339 kg (137 kg); Gp 1-318 kg (119 kg).

4B-1

PARASITE CONTROL PROGRAMS FOR PRE-WEANED CALVES IN SUBTROPICAL ARGENTINA. G.M. Bulman*, J.M. Bulman, C.A. Fiel & R.R.Ambrustolo. MSD AGVET, 1638 Vincente Lopez, Buenos Aires, Argentina.

A total of 140 Brahman/Hereford pre-weaned (4-month-old) calves were used to compare various proposed schedules for using ivermectin to treat calves in this age group with the usual practice of withholding antiparasitic treatments until the animals are weaned. Weight gains, fecal egg counts, and larval cultures were monitored at monthly intervals for a total of four months (until weaning). Calves treated at monthly intervals with ivermectin had the greatest mean weight gains. Mean total gains for calves treated either once (Day 0) or twice (Day 0 and Day 62) were similar to each other and were only slightly less than those for calves treated monthly. Untreated control calves gained the least and generally had much higher fecal egg counts than calves treated with ivermectin.

4B-2

PRODUCTIVITY EVALUATIONS OF IVERMECTIN PARASITE CONTROL PROGRAMS IN PRE-WEANED CALVES IN BRAZIL. O. Bastos*, M. E. Bavia, M. Malacco, F. V. Heiderich & E. L. Bordin. MSD AGVET, Caixa Postal 8734, Sao Paulo, SP, Brazil.

A total of 225 pre-weaned calves from 4 farms were used to compare parasite control programs in different regions of Brazil. Calves at each farm were allocated to 3 groups of equal numbers and equal body weight distributins. Treatments, randomly assigned to each group, were: control - treated for ectoparasites only as needed; IVM x 2 - treated with ivermectin by subcutaneous injection at 1 and 4 months after start of the trial; IVM x 3 - treated with ivermectin on Day 0 and again, 2 and 4 months later. Calves at each farm grazed together for the 6-month trial period. Comparisons were made among the groups for weight gains and economic returns at the end of the 6-month trial period. Combined mean weight gains were 8.7 kg (IVM x 2) and 6.7 kg (IVM x 3) greater for calves treated with ivermectin than for controls. Net returns from improved weight gain, after drug costs, averaged $5.14 (IVM x 2) and $3.27 (IVM x 3) more in the ivermectin groups than for controls.

4B-3

TREATMENT STRATEGIES FOR PARASITE CONTROL IN GRAZING STEERS IN A TEMPERATE CLIMATE REGION OF ARGENTINA. R.R. Ambrustolo*, C.M. Entrocasso, C.A. Fiel, G.M. Bulman and C.A. Biondani. MSD AGVET, 1638 Vincente Lopez, Buenos Aires, Argentina.

Three different treatment strategies using ivermectin injectable were compared with the current treatment program at the farm or with no treatment in 100 weaned steer calves in Buenos Aires, Argentina. Treatment schedules for ivermectin included: monthly throughout the entire trial, 4 treatments (May, July, August, and December), and 3 treatments (May, July, and December). The current program used for comparison was fenbendazole, given orally in May, July, and December, in combination with mange dips as needed. One group of calves remained untreated for parasites as controls. Body weights, fecal egg counts, and fecal larval cultures were monitored at monthly intervals for approximately one year. Strategically timed treatments with ivermectin during the time of peak parasite challenge (July and August) provided optimal weight gain benefits in the trial. Mean gains were predictably low in the untreated control group.

4B-4

COMPARISONS OF IVERMECTIN WITH CONVENTIONAL TREATMENTS IN GROWING CATTLE IN TROPICAL OR SUBTROPICAL AREAS OF BRAZIL. M. Farias & E. L. Bordin*. MSD AGVET, Caixa Postal 8734, Sao Paulo, SP, Brazil.

A total of 228 cattle, approximately 1.7 years old, representing several breeds, from 5 farms in Rio Grande do Sul, Brazil were used to compare antiparasitic programs using ivermectin with other parasite control programs used in this region. Cattle at each farm were allocated to 2 treatment groups with equal body weight distributions and were randomly assigned to receive treatments with ivermectin (with or without supplemental tick dips) as needed, or to receive other antiparasitic products, according to routine practice at the farm. Comparisons were made between groups for weight gains, treatment costs, and net returns. Frequency and timing of treatments varied from farm-to-farm according to parasite challenge present. Overall, cattle treated with ivermectin averaged 10.7 kg more in weight gain and returned an average of $9.89/head net profit over other parasite control programs at the farms.

4B-5

PERFORMANCE OF FATTENING BEEF CATTLE TREATED WITH IVERMECTIN OR OTHER TREATMENTS IN SUB-TROPICAL AREAS OF BRAZIL. M. Malacco, M. Farias, E. L. Bordin*, F. V. Heiderich & O. Bastos. MSD AGVET, Caixa Postal 8734, Sao Paulo, SP, Brazil.

A total of 232 beef cattle from 4 farms in different states in the sub-tropics of Brazil were used to evaluate a parasite control program with ivermectin, developed for improving productivity in fattening animals. At each location, cattle were allocated in pairs, according to body weight, to treatment with ivermectin (given on Days 0 & 90) or to the current conventional treatment program at the farm. Cattle at each farm grazed together for the 6-month trial period. Body weights, parasite burdens, and economic expenditures and returns were monitored for treatment groups at each farm. Combined mean weight gain was 7.8 kg ($p<0.01$) better for cattle treated with ivermectin than for their conventionally-treated counterparts. Net returns averaged $2.59/head more for cattle treated with ivermectin, mainly as a consequence of the additional body weight and reduced labor for administering treatments.

Chemotherapy in cattle / Chimiothérapie chez les bovins
Ectoparasite control in cattle / Contrôle des ectoparasites chez les bovins

4B-6

EVALUATIONS OF PRODUCTIVITY IN REPLACEMENT HEIFERS IN SUBTROPICAL ARGENTINA.

G.M. Bulman*, J.M. Bulman, R.R. Ambrustolo, C.A. Fiel & B. Beckwith. MSD AGVET, 1638 Vincente Lopez, Buenos Aires, Argentina.

Potential for improved productivity (achievement of adequate body weight and physical maturity for first service by 21 to 23 months of age) through control of parasitism was studied in 290 Brahman/Hereford late-born replacement heifers in the subtropical northeast of Argentina. Recently weaned heifers were randomly assigned to treatments: Group 1 - ivermectin at 200 mcg/kg, by subcutaneous injection, monthly; Group 2 - ivermectin at strategic times, according to epidemiological data collected during the trial; Group 3 - levamisole phosphate at 10 mg/kg, by subcutaneous injection, given at the same times as ivermectin in Group 2. Body weights and fecal egg counts were monitored monthly and rectal palpations for determinations of physical maturity (pelvic width) were performed immediately before first service. At approximately 18 months of age, heifers treated with ivermectin had mean body weights of 300 kg (minimum needed for first service) or more; cattle treated with levamisole, however, did not reach the minimum weight for breeding by this time. Rectal palpations at 21 to 23 months also revealed greater percentages of heifers with sufficient pelvic width for service in both groups treated with ivermectin than in the group treated with levamisole.

5A-1

AVERMECTIN B_1 AGAINST THE TICK BOOPHILUS MICROPLUS IN CATTLE: RESULTS OF A TITRATION TRIAL.

Bridi, A.A., Carvalho, L.A., Cramer, L.G., Amaral, N.K.* & Gross, S.J. Merck Sharp & Dohme Research Laboratories, Sao Paulo, Brazil.

To determine the effective dose of avermectin B_1 against the tick B. microplus, twenty-five cattle with induced infestations were used. The treatments were: vehicle control; avermectin B_1 at 100, 200 or 300 mcg/kg, once subcutaneously and ivermectin at 200 mcg/kg, once subcutaneously on day 0. Twenty-four-hour tick collections were made on days 1, 2, 3, 5, 7 and 3 times weekly through day 35. After collection, female ticks from each animal and collection day were counted and weighed, and a sample was incubated for oviposition and egg hatchability. Mean daily tick count from day 1 to day 35 was 64.5, 16.1, 12.4, 5.1 and 5.6 for the control, avermectin B_1 at 100 mcg/kg, avermectin B_1 at 200 mcg/kg, avermectin B_1 at 300 mcg/kg, and ivermectin groups, respectively. Mean daily weight of ticks collected was 20.3, 2.4, 1.6, 0.9 and 0.9g. Reduction over controls of mean index of reproduction was 90, 94, 96 and 97 percent, respectively. There was a nearly significant response to level of avermectin B_1, with fewer ($p=0.079$) ticks collected from cattle treated at 200 or 300 mcg/kg than 100 mcg/kg, and fewer ($p=0.61$) ticks collected from cattle treated at 300 mcg/kg than 200 mcg/kg. Cattle treated with ivermectin had tick counts intermediate between the avermectin B_1, 200 mcg/kg and 300mcg/kg groups, but results were not significantly different from either ($p=0.093$ and $p>0.10$, respectively).

5A-2

PERSISTENT ACTIVITY OF INJECTABLE IVERMECTIN IN THE CONTROL OF THE CATTLE TICK BOOPHILUS MICROPLUS.

L.G. Cramer, A.A. Bridi, N.K. Amaral* & S.J. Gross. Merck Sharp & Dohme Research Laboratories, São Paulo, Brazil.

To study the persistence of protection against B. microplus after a single subcutaneous treatment with ivermectin, eight tick-free calves were used. The calves were allocated by restricted randomization on bodyweight to two groups: untreated controls and a group treated with ivermectin at 200 mcg/kg, once subcutaneously. Animals were infested with about 5,000 unfed tick larvae 3 times weekly from day 0 to day 21 (10 infestations). Twenty-four-hour tick collections were made 3 times weekly from day 21 through day 42. Female ticks dropped from each animal were counted and weighed. Cattle treated with ivermectin had significantly ($p<0.01$) fewer engorged female ticks dropping until day 28, when compared to the controls (0.4 vs 25.0). During days 31-35 and 38-42, the ivermectin group means were lower than control but not significantly so ($p>0.10$). Mean number of ticks from day 31 to day 35 was 42.5 and 14.6 for the control and ivermectin groups, respectively; mean number of ticks from day 38 to day 42 was 113.4 and 70.4. Ticks collected from the treated cattle had a consistently lower daily average weight than the controls over the entire collection period.

5A-3

CATTLE PRODUCTIVITY TRIAL USING IVOMEC IN A TICK INFESTED AREA OF ARGENTINA

C. Eddi (*), R. Niec, C. Benitez Usher, R. Dughetti and S. Gross. Dep. Vet. Science, Louisiana Agric. Exp. Station, L.S.U. Agricultural Center.

To compare the productivity of cattle treated regularly with ivermectin to that of cattle treated with other products, 75 heifers were allocated by restricted randomization on initial weight (Day -1) to the treatments: untreated control, ivermectin at 200 mcg/kg subcutaneously at 2-month intervals (6 times during the study); ivermectin at 3-month intervals (4 times); levamisole at 7.5 mg/kg subcutaneously and decamethrin dip, at 3 month intervals (4 times), albendazole at 7.5 mg/kg orally and decamethrin dip, at 3 month intervals (4 times). There were 3 paddocks per treatment, each containing 5 head. The cattle were weighed approximately monthly starting on day 0 and treated every second or third weighing, according to their allocated treatments. Ticks (engorging female Boophilus microplus) were counted on 2 cattle per paddock and fecal samples were collected from each animal at each weighing. The study lasted one year (366 days), from October 1983 to October 1984. To the end of the study, each medicated group gained significantly ($P<0.05$) more weight than the control group. There were no significant ($P>0.05$) differences among the medicated groups. Maximum weight gain was seen at day 134 (control and levamisole groups) and at day 190 (ivermectin and albendazole groups). The cattle lost from 6 to 30 kg between the day of maximum gain and the end of the study. Fecal EPG declined gradually in all groups during the trial, but the levamisole group tended to have higher means than the other medicated groups. Tick counts started low, increased to a maximum at day 153 in all groups except the one treated every 2 mo. with ivermectin, and returned to zero on day 219 in all medicated groups. Control means remained below 2 ticks per animal after day 219.

Ectoparasite control in cattle / Contrôle des ectoparasites chez les bovins Chemotherapy in sheep / Chimiothérapie chez les moutons

5A-4

INFLUENCE OF ADEQUATE PARASITE CONTROL ON CATTLE PRODUCTIVITY. L.F. Uribe* & S.G. Gross. MSD AGVET, Calle 30A No. 6-38 Piso 6, Bogota, Colombia.

Fourty-five Romosinuano steers, 12 to 18 months old and weighing 104 to 297 kg, were allocated by restricted randomization on body weight to three treatment groups: salvage control; ivermectin (200 mcg/kg, SC on Day 0 and as needed thereafter); combination treatment with levamisole (5 mg/kg, SC on Day 0 and approximately every 112 days), plus trichlorfon (1% spray on Day 0 and as needed thereafter), plus amitraz (200 ppm spray as needed). Criterion for administration of ivermectin or trichlorfon was the observation of Dermatobia hominis on at least half the animals in the treatment group. Amitraz was used when a mean of 20 or more engorged female Boophilus microplus ticks were observed on the right side of the animals. Fewer treatments were needed with ivermectin than with levamisole/trichlorfon/amitraz for adequate parasite control. Cattle treated with ivermectin averaged 40.1 kg, and cattle treated with levamisole/ trichlorfon/amitraz averaged 28.0 kg more in total weight gains than salvage controls. Treatment differences were not significant, however ($p>0.10$).

5A-5

EFFICACY OF TOPICALLY-APPLIED IVERMECTIN AGAINST DERMATOBIA HOMINIS LARVAE IN CATTLE. L.F. Uribe*, P.F. McMullin, L.G. Cramer & R.A. Barrick. MSD AGVET, Calle 30A No. 6-38 Piso 6, Bogota, Colombia.

Efficacy and persistence of a topical formulation of ivermectin against natural infestations of Dermatobia hominis larvae were studied in a total of 56 cattle in 2 trials in Colombia and 2 trials in Brazil. Half the cattle at each location were treated with the topical formulation of ivermectin; the other 28 cattle remained untreated as controls. Whole body counts of D. hominis larvae were made before and after treatment to assess the therapeutic effect of the drug. On Days 9 and 10 after treatment, animals treated with the topical formulation of ivermectin had significantly ($p<0.05$) fewer larvae than controls. Efficacy of the drug against the larvae was >99%. Reinfestation of treated animals was first observed 30 or 31 days after treatment; however, larvae numbers of D. hominis were still significantly less for treated animals than for controls at 43 or 48 days posttreatment in the 3 trials carried out to those days.

5A-6

CONTROL OF LICE ON CATTLE WITH SYNTHETIC PYRETHROIDS. R.N. Titchener*, West of Scotland Agricultural College, Ayr, Scotland.

The synthetic pyrethroids cypermethrin, permethrin, deltamethrin, flumethrin and cyhalothrin have been assessed for their control of cattle lice, particularly the long-nosed sucking louse, Linognathus vituli and the biting louse, Damalinia bovis. In addition two related chemicals fenvalerate and flucythrinate were also assessed. Pour-on preparations and sprays of these chemicals, gave complete or almost complete clearance of lice from infested animals. Once treated animals did not become re-infested. Pyrethroid formulations in plastic eartags used for fly control on cattle were less effective and it is suggested that to prevent insecticide resistance occurring in lice that eartags should be removed at the end of the grazing season.

6A-1

LUXABENDAZOLE (LBZ) A NEW BROADSPECTRUM ANTHELMINTIC - REVIEW ON PHARMACOLOGICAL AND TOXICOLOGICAL INVESTIGATIONS. B. Tiefenbach, Hoechst AG, D-6230 Frankfurt (Main) 80, FRG.

The pharmacological, toxicological and mutagenic properties of LBZ have been tested extensively. LBZ proved to be safe in almost all of 17 pharmacological models. In acute studies the maximum dose tolerated by rats was > 10,000 mg/kg body weight (b.w.); 2,000 mg/kg b.w. in rats caused no acute dermal toxicity. In sheep, 100 mg/kg b.w. did not lead to abnormal clinical findings. In 90 day studies in dogs, the maximum dose tolerated was 320 mg/kg b.w.; in 90 day studies in rats 2,500 mg/kg b.w. caused no morphological changes in any organs.- In relevant tests, LBZ was free from sensitizing properties; furthermore, it did not irritate the skin or mucous membranes.- LBZ showed no mutagenic properties in the micronucleus test, Ames' test, HGRPT-V79 point mutation test, UDS test, and in-vitro cytogenetic test.- In special tests for tolerance performed under field conditions, LBZ was safe in dosages of up to 100 mg/kg (= 10 times of the recommended dosage). These trials included lambs, rams (fertility) and ewes in all stages of pregnancy. Two metabolites (M1,M2) have been identified. The maximum dose of M1 tolerated in rats was > 10,000 mg/kg b.w.; the LD 50 of M2 in rats was 1,265 mg/kg b.w.; M1 and M2 had no mutagenic activities in the Ames' test and micronucleus test.- In six different test models, LBZ proved to be safe regarding environmental effects.

Chemotherapy in sheep / Chimiothérapie chez les moutons

6A-2

THE EFFICACY OF LUXABENDAZOLE (LBZ), A NEW BROAD SPECTRUM ANTHELMINTIC, AGAINST NEMATODES OF SHEEP.

E.M. Abbott, Hoechst Animal Health, Milton Keynes, U.K.

Controlled trials were carried out in both artificially and naturally infected sheep by workers in South Africa, Australia and six European locations. At dose rates of 7.5 and 10.0 mg/kg BW, LBZ was 97-99% effective against adult and immature stages of the major gastro-intestinal nematodes of sheep viz. Haemonchus contortus, Ostertagia spp, intestinal Trichostrongyles and Nematodirus spp. Efficacy against species of lesser importance such as Trichuris ovis, Oesophagostomum spp, Chabertia ovina, Gaigeria pachyscelis and Bunostomum spp was 93-100%. Efficacy against Dictycaulus filaria ranged from 80-100% and against other lungworm of small ruminants was 99-100%. Luxabendazole was also highly effective against larvae in the abomasum.

6A-3

THE EFFICACY OF LUXABENDAZOLE (LBZ) ON FLUKES AND TAPEWORMS IN SHEEP UNDER LABORATORY AND FIELD CONDITIONS

D. Düwel, Hoechst AG, Helminthology, P.O. Box 80 03 20, D-6230 Frankfurt/M. 80

LBZ is a new broadspectrum anthelmintic for oral administration. Its efficacy on Fasciola hepatica (F.h.) in sheep has been tested by various investigators. Results (%) of controlled tests in artificially infected sheep are as follows:

Dosage in mg/kg b.w.	n	Age of liver flukes 6 w	8 w	12 w	Authors
7.5	36	77.6	92.4	100	E.M.Abbott
	18	45.5	-	87.0	N.Anderson
	44	77.7	90.3	100	D.Düwel
	22	77.1	-	98.3	F.S.Malan
10.0	36	71.1	99.2	99.1	E.M.Abbott
	33	60.6	72.9	99.3	E.M.Abbott
	18	30.0	-	93.0	N.Anderson
	44	85.0	91.7	100	D.Düwel
	22	92.0	-	99.1	F.S.Malan

The good efficacy of 95-99% on adult F.h. after 10 mg/kg b.w. was also confirmed postmortem in naturally infected sheep (Euzeby, Hovorka, Kassai, Stoye, and their co-workers). A marked ovicidal activity was first noticed 30h after LBZ-administration and within a few days the egg out-put dropped to zero. A high percentage of Dicrocoelium dendriticum and Moniezia spp. are also elliminated (Grzywinski, Hovorka, Kassai, Pfeiffer, and their co-workers).
Trials were carried out according to W.A.A.V.P. recommendations (1982).

6A-4

FIELD TREATMENT OF PROTOSTRONGYLUS SPP. AND GASTROINTESTINAL PARASITES WITH FENBENDAZOLE IN ROCKY MOUNTAIN BIGHORN SHEEP.

William Foreyt, Department of Veterinary Microbiology and Pathology, Washington State University, Pullman, WA 99164.

The lungworm-induced pneumonia complex is a major mortality factor for Rocky Mountain bighorn sheep (Ovis c. canadensis) populations in North America. Fenbendazole, at precalculated dosage of approximately 10 mg/kg of body weight, was fed in pelleted feed each day for 3 consecutive days to over 200 wild Rocky Mountain bighorn sheep in Washington (n=65), Idaho (n=75), and Oregon (n=75) during the winter of 1985-86. Lungworm larvae were detected in feces from 84, 93, and 97% of the sheep from Washington, Idaho, and Oregon, respectively. Mean pre-treatment numbers of Protostrongylus spp. larvae per gram of feces (lpg) were 5.8 (WA), 13.2 (ID), and 24.3 (OR). Post-treatment samples had 0.1, 0 and 3.8 lpg, respectively, indicating high efficacy. Larvae were detected in 3% (WA), 0% (ID), and 67% (OR) of the animals after treatment. Numbers of other parasites were also greatly reduced, and reproductive rate (ewe:lamb ratios) improved after treatment. In a study with 6 pregnant and 6 non-pregnant captive bighorns at Washington State University, sheep were fed fenbendazole at 30 or 50 mg/kg BW (3 or 5 times the field dosage) each day for 3 consecutive days and no toxic effects were observed. Six healthy lambs were born to the pregnant ewes indicating the safety of the drug in pregnant bighorn ewes.

6A-5

THE EFFICACY OF NETOBIMIN® AT A DOSE-RATE OF 15 mg/kg AGAINST DICROCOELIUM DENDRITICUM IN SHEEP.

F.A. Rojo-Vázquez*, Aránzazu Meana, J.M. Tarazona Deptº Patología Animal I (Sanidad Animal), Univ. Comp. Madrid (España), J.L. Duncan Deptº of Vet. Parasitology, Univ. of Glasgow, Vet. School, Glasgow.

Twenty two 4-6 year old "Churra" Spanish breed sheep with a body weight from 22 to 38.5 kg were selected from a flock with a high incidence of Dicrocoelium dendriticum on the basis of faecal egg counts. After housed and identified, animals were divided in two groups of 10, according with the means of D.dendriticum eggs/gram. One of the groups was randomly assigned for treatment, and the other remained as untreated control. The other two sheep were also included in the treated group. The drug was administered at a dose of 15 mg/kg b.w. by drench.
The values of eggs in faecal samples were determined on days +2, +4, +8 and +14. Both groups of sheep were killed on day 14 post-treatment, and the liver, gall bladder and small intestine removed for the collection and counting D.dendriticum worms.
The mean values of fluke burdens in the treated group was 98.0, and the mean fluke burden in the control group was 1215.2. The difference between the two means was very highly significant ($p<0.00001$).
The efficacy index obtained at the dose-rate of 15 mg/kg was 91.9%.
It seems that Netobimin® at this level of dosage of 15 mg/kg body weight, by oral administration could be useful in the therapy of ovine dicrocoeliosis, with a good efficacy/price ratio.

Chemotherapy in ruminants / Chimiothérapie chez les ruminants

7A-1

ANTHELMINTIC F28249-α I. DISCOVERY OF ANTHELMINTIC ACTIVITY. I.B. Wood*, J.A. Pankavich, & M. E. Doscher, American Cyanamid Company, Princeton, NJ USA

The LLF28249-Antibiotic Complex was found to have antinematodal activity when it was tested as a whole fermentation mash against Caenorhabditis elegans in a microtiter assay (Wood, I.B. and Schenkel, R.H., 1982 Mol. Biochem. Parasitol. Suppl.; 5th ICOPA Abst:491). The lyophilized mash was 100% active at 500ppm in the diet for four days against 7 to 11-day old infections of Trichostrongylus colubriformis in the gerbil. The lyophilized mash was also 100% active against T. colubriformis at 50mg/kg or 200mg as a single subcutaneous (SC) injection or as a single oral gavage, respectively.

The principal component was determined to be F28249-α, using the T. colubriformis/gerbil assay to determine the activity of the TLC extracts. Compound F28249-α was 98% active at 0.1ppm in the diet against T. colubriformis. It was 94% and 99% active at 0.05mg/kg single oral dose or 0.2mg/kg SC, respectively.

In the initial sheep assay, F28249-α was 99.9% active at 0.2mg/kg orally or intramuscularly against artificially acquired infections of mature Haemonchus contortus, Teladorsagia circumcincta, and T. colubriformis.

7A-2

ANTHELMINTIC F28249-α II. EFFICACY AGAINST EXPERIMENTAL AND NATURALLY ACQUIRED NEMATODE PARASITISMS IN RUMINANTS. J.A. Pankavich*, I.B. Wood, & M. E. Doscher, American Cyanamid Company, Princeton, NJ USA

F28,249-α was evaluated against larval, and against larval and adult nematodes using an inoculum regimen and treatment schedule that permits evaluation of activity against two stages simultaneously. A single subcutaneous (SC) or an oral dose of F28,249-α was highly efficacious (>95%) at levels as low as 0.3mg/kg B.W. in sheep against 7-day old larvae of Haemonchus contortus, Teladorsagia circumcincta, Trichostrongylus axei, and T. colubriformis. In a trial with dual artificially acquired larval/adult infections, subcutaneous doses of 0.5, 0.2, and 0.1mg/kg were 99-100% effective against three of the species tested but inactive in eliminating Cooperia oncophora. In cattle, F28,249-α at 0.3mg/kg (SC) was effective in a combined larval/adult trial against Ostertagia ostertagi (96, 95%), T. axei (85%/93%), and Oesophagostomum radiatum (100%/100%), but ineffective against C. oncophora (89%/23%). Two mg/kg of F28,249-α SC or 0.3mg/kg orally was highly effective (98-100%) against both larvae and adults of the above species, including C. oncophora. In naturally infected cattle, harboring a wide spectrum of predominantly adult nematodes, excellent control (99-100%) was achieved against O. ostertagi, T. axei, C. punctata, Oes. radiatum and Trichuris ovis when F28249-α was administered at 1.0 (SC) or 0.3 mg/kg orally. F28,249-α was highly effective against Dicytocaulus viviparus in cattle. No tapeworm activity was obtained.

7A-3

PREVENTION OF THE SPRINGRISE IN HOUSED EWES BY ANTHELMINTIC TREATMENT DURING WINTER. T.W. Schillhorn van Veen and A.J. Murphy, College of Veterinary Medicine, Michigan State University, East Lansing, MI 48824.

During 4 consecutive years (1983-1986), two groups of 8 pregnant housed ewes were either treated with ivermectin or left untreated. The timing of treatment was respectively early March (just after lambing), February (during lambing), January (before lambing), or December (just after housing).

The effect of treatment was evaluated by fecal examination at bi-weekly or monthly intervals.

Treatment with ivermectin prevented the occurrence of a periparturient and springrise in egg output during all four years. Control ewes showed an increase in egg output from the end of February with maximum egg counts in March/April. Larval cultures revealed that over 70% of the egg output consisted of Haemonchus eggs.

During 1985 and 1986 a third group of ewes was treated respectively with fenbendazole and levamisole. In both groups the egg output declined after treatment but increased again after lambing; however the egg counts were lower than in the control group.

The results indicate that ivermectin at 200mcg/kg will remove the majority of inhibited larvae and, in housed animals; can be administered any time in winter.

7A-4

NEW DATA ON THE CHEMOTHERAPY OF FASCIOLOSIS IN SHEEP J.C. Boray*, Department of Agriculture, New South Wales, Veterinary Laboratories, Glenfield, NSW Australia

Amongst the currently available anthelmintics at recommended dose rates triclabendazole and clorsulon showed the highest efficacy [>90%] against early immature fluke aged 1 to 2 and 3 to 4 weeks respectively. The efficacy of rafoxanide was consistently higher than that of closantel against Fasciola hepatica aged 6 weeks susceptible to salicylanilides. Rafoxanide was less effective against some strains directly isolated from the field where regular treatments gave unsatisfactory fluke control. Both rafoxanide and closantel failed to remove fluke aged 6 weeks when the "resistant field strain" of F.hepatica was passaged or further selected in the laboratory. Albendazole and Netobimin were effective against fully developed adult fluke. Combined heavy infections with F.hepatica aged 4 and 6 weeks were treated with either triclabendazole, clorsulon, rafoxanide or closantel. Irrespective of the drug used the majority of destroyed fluke was present in the liver tissue or small bile ducts 4 weeks after treatment and a small number of dead fluke was still present for up to 8 weeks. The relatively slow clearance of fluke from the liver in heavy infections may influence clinical recovery of sheep after successful treatment.

Chemotherapy in ruminants / Chimiothérapie chez les ruminants
Parasite control / Contrôle des parasites

7A-5

EFFECT OF MONENSIN ON NATURALLY ACQUIRED COCCIDIOSIS IN LAMBS AT PASTURE. J. Hendriks, W.A. de Leeuw*, D.Oostendorp°, J.Wensvoort°. Central Veterinary Institute, Lelystad, Holland. °Research and Advisory Institute for Cattle Husbandry, Sheep Husbandry and Horse Husbandry, Lelystad, Holland.

In the Netherlands the frequency of coccidiosis in lambs at pasture is increasing. In most cases clinical illness occurs 2-5 weeks after turning out. There is an increasing need for chemoprophylaxis. In the period 1980-1983 several field experiments were carried out to test the efficacy of monensin as a feed-through using different dose rates. Every spring two groups were formed and kept under the same conditions. Ad lib. concentrate was available immediately after birth. The length of time that the concentrate was avilable depended upon the quality of the sward. The concentration of monensin in the supplement differed between the years and was 20, 50 and 65 ppm. in the experiment groups and 0 in the control groups. In 1985 a limit of 100-150 gr. concentrate/lamb/day using a 50 ppm. concentration in the experiment group was imposed.
Oocyst output, bodyweight, concentrate uptake and clinical status of the lambs was registered. At a dose rate of 0,5 mg. monensin/kg. bodyweight/day or more oocyst output was reduced to a minimum level, clinical illness was prevented and concentrate uptake was equal or lower. A general trend was that gain was greater in the monensin group than in the control group. This trend was not so clear in the 20 ppm. treatment and in 1985 when the supplementary food was limited.
In the Netherlands, especially under more intensive husbandry conditions addition of monensin to the concentrate can effectively prevent coccidiosis in lambs at pasture and improve food conversion.

8A-1

FIELD EVALUATION OF ANTHELMINTIC PROGRAMMES FOR THE CONTROL OF BOVINE PARASITIC BRONCHITIS. D.E. Jacobs* and M.T. Fox, Department of Microbiology & Parasitology, The Royal Veterinary College, University of London, UK.

The evaluation of control measures to combat bovine parasitic bronchitis are made difficult by the fact that field infections of Dictyocaulus viviparus are notoriously unpredictable (see for example Jacobs, D.E. & Fox, M.T., 1985, Vet.Rec., 116,75). A system has therefore been devised (Ryan, W.G., Armour, J., Bairden, K., Fox, M.T. & Jacobs, D.E., 1986, Proc. 14th Wld. Cong.Dis. Cattle, 1, 185) to ensure that potentially pathogenic pasture challenge occurs before developing immunity and dry summer weather can exert too great an influence on the pattern of events. This involves the use of seeder calves carrying low grade patent infection at about the time of turnout, the effect being to advance the epidemiological sequence by one parasitic cycle. This creates an artificially severe test but it provides valuable information prior to the initiation of trials on commercial farms. The system has proved successful for demonstrating the attributes and limitations of prophylactic programmes using ivermectin and oxfendazole pulse release boluses. It is currently being employed to evaluate various dosage forms of netobimin, including administration via drinking water, for the treatment of clinical lungworm disease.

8A-2

CONTROL OF PARASITES OF YEARLING CATTLE IN URUGUAY. C.A. Fiel*, D. Saladas, J. Berdie, R. Fostel, G.M. Bulman & R.R. Ambrustolo. MSD AGVET, 1638 Vincente Lopez, Buenos Aires, Argentina.

Programs using ivermectin for control of endoparasites in yearling cattle were compared with another parasite control program commonly used in the west central area of Uruguay. Cattle were assigned to receive either two or three treatments with ivermectin, levamisole as needed (determined by relative increases in fecal egg counts), or to be untreated as controls. Cattle of each group grazed on a separate paddock with a small group of cattle that were treated with ivermectin monthly for optimal parasite control. Body weight gains, fecal egg counts, and fecal larval cultures were determined at regular intervals. Greatest weight gains were observed in cattle treated monthly with ivermectin and gains for cattle treated either two or three times during the year were greater than those for cattle treated with levamisole. Untreated controls gained the least and salvage treatments were administered where required for extremely high parasite burdens in this group. Cooperia were the predominant genera identified in cultures.

8A-3

GASTROINTESTINAL PARASITISM OF YEARLING CATTLE IN THE HUMID PAMPAS OF ARGENTINA. C.A. Fiel*, P.E. Steffan, R.R. Ambrustolo, H.M. Vercesi & G.M. Bulman. MSD AGVET, 1638 Vincente Lopez, Buenos Aires, Argentina.

A two-year study was conducted in Buenos Aires, Argentina to determine patterns of seasonal hypobiosis, intensity variation, and nematode species involved in parasitism of yearling steers on open range. Fecal and pasture herbage samples were collected weekly for parasite egg and larval counts; blood samples were collected monthly for serum pepsinogen determinations; tracer calves and permanent yearlings were necropsied at monthly intervals for collection, identification, and enumeration of internal parasites. Patterns of parasitism in the cattle were generally similar for the two years of the trial. However, differences in intensity were apparent between the year, with heavy spring rains (September to December) during the second year resulting in heavier worm burdens and more prolonged pasture challenges. For both years, Ostertagia, Trichostrongylus, and Cooperia were the most predominant species at necropsy and arrested development of Ostertagia and Trichostrongylus was observed in spring and early summer (September to January) for the permanent calves, with peaks occurring during November. Peak levels of hypobiotic larvae were observed in the tracer calves in September. Thus, contrary to previous beliefs, hypobiosis is a spring - summer phenomenon in the humid pampas of Argentina.

8A-4

THE EFFECT OF ANTIPARASITIC TREATMENT ON MATING WEIGHTS OF YEARLING BEEF HEIFERS. P.R. Holmes*, MSD AGVET, South Granville, N.S.W., Australia.

Seventy five Hereford, weaner heifers were ranked by bodyweight & randomly allocated within weight blocks to 5 treatment groups at trial commencement in January, 1986. Group 1 acted as untreated controls. Group 2 was treated with avermectin B1 (200 mcg/kg); group 3 with oxfendazole (4.53 mg/kg); group 4 with fenbendazole (7.5 mg/kg); & group 5 with levamisole (8.9 mg/kg). All treatments were given in January, May, & July. Groups 3, 4, & 5 were also treated twice at a 14-day interval with fenthion (9.0 mg/kg) in July. Three replicates of 5 heifers were formed within each treatment group on the basis of bodyweight. Each replicate grazed on a 2.5 hectare plot from January until June. In June, all replicates were randomly allocated to 1 of 2 groups for mating on larger paddocks. Each group was mated to a 2-year-old, fertility-tested Hereford bull for 12 weeks. Marking of heifers by chinball dye, indicating service, was recorded daily. Pregnancy diagnosis using manual palpation was conducted 6 weeks after the completion of joing. Mean total liveweight gains were as follows: Controls +4kg; avermectin B1 +37kg; oxfendazole +20kg; fenbendazole +18kg; & levamisole +25kg. Pre-mating mean liveweights & subsequent pregnancy rates were as follows: Controls -234kg, 40%; avermectin B1-266kg, 93%; oxfendazole -249kg, 60%; fenbendazole -247kg, 60%, & the levamisole -254kg, 66%.

8A-5

SELECTION OF IVERMECTIN RESISTANT TRICHOSTRONGYLUS COLUBRIFORMIS IN LAMBS. D.J. Giordano*, J.P. Tritschler II & G.C. Coles. Department of Veterinary & Animal Sciences, University of Massachusetts, Amherst, USA.

A mixed population of Haemonchus contortus, Teladorsagia circumcincta and Trichostrongylus colubriformis was passaged for four generations. Lambs were dosed subcutaneously in successive passages on day 6 (D6) with ivermectin at 100, 200, 250, and 225 ug/kg body weight, respectively. No larvae of H. contortus were recovered after the first passage, and following the third drug exposure only T. colubriformis was present. Larvae of selected strain of T. colubriformis developed in vitro to third stage, sheathed larvae in concentrations of ivermectin that inhibited development of larvae from original strain of T. colubriformis. A definitive control test was run with 45 lambs. Treatments were 150 ug/kg subcutaneous (SC) D6, 200 ug/kg SQ D6, 200 ug/kg intraruminal (IR) D6 and 200 ug/kg SC D21 and all treatments were compared to untreated controls, selected or original strain as applicable. D6 IR and D6 SC 150 ug/kg treatments were >99% effective in both strains, although D6 SC 200 ug/kg treatment was 85% and 48% effective in original and selected strain, respectively. The D21 200 ug/kg was only 58% effective against the selected strain. There were significant ($P<0.001$) differences between original and selected strains of T. colubriformis for both fecal egg output and worm counts. Exposure of four generations immature T. colubriformis to ivermectin selected for partial resistance.

8A-6

CONTROL OF ZOONOTIC LYMPHATIC FILARIASIS OF MONKEYS AND CATS. V.Kumar*, J.Brandt & O.Vanparijs[1]. Institute of Tropical Medicine, Antwerp, Belgium and [1]Janssens Pharmaceutica, Beerse, Belgium.

Monkeys (Macaca spp.and Presbytis spp.) and cats are important reservoirs of subperiodic Brugia malayi lymphatic filariasis of man in certain Southeast Asian countries. For an effective control of the infection in humans, it is imperative to control the infection in the reservoir hosts also in order to reduce the transmission potential. Until now no means are available to control the infection in the reservoirs. Using laboratory model of a closely related filariid, B.pahangi, in multimammate rats, Mastomys natalensis, our studies have shown that micronized flubendazole (FBZ), mean particle rize: 2.7 µm, when incorporated into the routine feed of this host at 100mg/kg and fed ad lib. for seven days before infection and continued for another seven days post-infection, offered complete protection to the host. These animals showed a sustained level of FBZ in their plasma throughout the course of feeding medicated pellets. Apparently, a prolonged schedule of FBZ administration is necessary in achieving this prophylactic effect. The oral mode of drug administration has better acceptability for routine prophylactic use than the previously reported parenteral routes. FBZ incorporated into the feed of monkeys and cats and supplied to them as bait in endemic areas would help reduce the transmission potential of the disease in humans.

8A-7

TREATMENT OF PSOROPTIC MANGE OF RABBIT WITH IVERMECTIN

V.S. Pandey, Department of Paraclinical Veterinary Studies, University of Zimbabwe, P.O. Box MP 167, Mt. Pleasant, Harare - Zimbabwe

Rabbits (average weight 3.14 kg) naturally infected with ear mange mite, Psoroptes cuniculi were administered ivermectin s/c at the dose rate of 200µg or 400µg per kg of body weight. The effect of drug was monitored over a 4 week period by observing the regression of lesions and by microscopic examination for mites. The live mites disappeared in both groups six days after treatment and the animals remained negative till end of the trial. Lesions regressed faster in the group given 400µg of ivermectin. At the end of the 4 week period all animals had very little lesions at the bottom of the ear canal. It is concluded that 200µg/kg of ivermectin gives clinical and parasitological cure.

8A-8

SURVIVAL OF ADULT STOMOXYS CALCITRANS AND HAEMATOBIA IRRITANS FED BLOOD FROM IVERMECTIN-TREATED MICE. D.A. Ostlind*, D.V. Ewanciw & W.G. Mickle. Merck Institute for Therapeutic Research, P.O. Box 2000, Rahway, N.J. 07065 U.S.A.

The effect of blood from mice fed specified levels of ivermectin ad lib for 5 days on the survival of adult stable and horn flies was studied. Heparinized blood collected from ivermectin-treated mice was fed to adult flies once (Stomoxys) or twice a day (Haematobia) for 4 days. Daily examination showed 77 and 100% of the stable and horn flies, respectively, were dead 24 hrs. after initial consumption of blood from mice treated with 0.005% ivermectin in the diet. Using blood from mice given 0.0025% ivermectin, the corresponding mortality rates were 27% and 82%. With 0.000625% ivermectin there was little (less than 50%) mortality at 24 hr., but 87-100% of the horn flies were dead at 48 hr. These results show that relatively high dietary levels of ivermectin were required to produce blood concentrations capable of killing stable or horn flies and that stable flies were less sensitive to the drug than horn flies.

8A-9

A LARVAL DEVELOPMENT TEST FOR DETECTION OF ANTHELMINTIC RESISTANT NEMATODES. J.P. Tritschler II*, D.J. Giordano & G.C. Coles, Department of Veterinary and Animal Sciences, University of Massachusetts, Amherst, U.S.A.

There ia a needs for an in vitro method to detect resistance to a range of anthelmintics that also permits identification of resistant species in a mixed culture. Eggs, separated from feces by sucrose flotation, were diluted to 100-500/ml with water and 0.75mg heat treated lyophilized Escherichia coli/ml in multiplewell plates. Anthelmintics were added 24 hrs later and after 4-5 days the percentage of live larvae was determined. Susceptible and resistant strains of Haemonchus contortus demonstrated significant differences for both thiabendazole and phenothiazine, indicating cross-resistance. Significant differences were also found between susceptible and levamisole resistance H. contortus. Even at high concentrations, ivermectin had little effect on larval mortality; however, percentage of live larvae developing to sheathed, third stage served as a measurable criterium. Larvae grown in this system can be speciated and Trichstrongylus colubriformis was shown to be infective. It is concluded that in vitro larval development can be used to detect resistance to any type of anthelmintic in mixed nematode cultures.

8A-10

BACILLUS THURINGIENSIS ISRAELENSIS: LETHAL · SYNERGISM WITH BENZIMIDAZOLES FOR TRICHOSTRONGYLUS COLUBRIFORMIS EGGS. L. W. Bone* and G. C. Coles. Animal Parasite Research Laboratory, ARS, USDA, Auburn, AL, and Department of Zoology, University of Massachusetts, Amherst, MA, USA.

A toxin from crystals of the bacterium Bacillus thuringiensis israelensis is lethal to eggs and larvae of nematodes. Ovicidal activity of the toxin may result from alterations of egg permeability. Lethal synergism between the microbial toxin and commercial benzimidazoles was examined. Albendazole, cambendazole, fenbenazole, mebendazole, oxfendazole, oxifendazole, and thiabendazole were tested. Treatment of eggs with B. t. israelensis toxin decreased the LD_{50} values of all tested drugs except for cambendazole. The LD_{50} values for the drugs declined by 1.4 to 5.2 fold, depending on the anthelmintic. Thus, the microbial toxin may allow improved delivery of anthelmintic compounds against nematode eggs in addition to its own toxicity.

8A-11

ENTRAPMENT OF TRICHOSTRONGYLID LARVAE BY THE PREDACIOUS FUNGUS ARTHROBOTRYS OLIGOSPORA. P. Nansen, J. Grønvold & J. Wolstrup. The Royal Veterinary and Agricultural University. Sv.Aa. Henriksen. National Veterinary Laboratory, Copenhagen, Denmark.

The addition of the nematode-killing fungus Arthrobotrys oligospora to fresh cow pats containing trichostrongylid nematodes conferred a significant reduction of these parasites in the dung as well as in the surrounding herbage.
We compared the capabilities of larval stages of the trichostrongylid nematode Cooperia oncophora and the soil nematodes Rhabditis wohlgemuthi and Panagrellus redivivus to induce traps and they were all equally potent.Furthermore, regardless of the nematode species or stage the fungus trapped with same efficiency, although the third-stage C.oncophora was immobilized and killed later than the others.
Third-stage larvae of 9 different animal parasitic nematodes from cattle, sheep, pig, horse and mouse were rapidly captured when fungal traps had been pre-induced in high numbers, but the capabilities of the larvae themselves to stimulate trap formation varied much between species.
These and other findings have stimulated our interest in two directions, namely the potential use of predacious fungi in strategic biocontrol of nematode infections in livestock, - and the question of possible already existing natural relationships between these fungi and animal parasitic nematodes. Preliminary studies suggest that at least A.oligospora may be rather common in cow pats on permanently grazed pastures of different soil types in Denmark.

8A-12

CONTROL OF PARASITES IN GRAZING STEERS IN THE HUMID PAMPAS OF ARGENTINA. P.E. Steffan, R.R. Ambrustolo*, C.A. Fiel, C.M. Entrocasso & G.M. Bulman. MSD AGVET, 1638 Vincente Lopez, Buenos Aires, Argentina.

Trials were conducted in southeastern Buenos Aires to study different treatment strategies for parasite control in calves from weaning to slaughter. Treatments with ivermectin, either monthly, three times, or twice during the year of grazing, were compared with the usual practice of treating twice with fenbendazole (plus dips for ectoparasites), and with an untreated control group. The pasture usually grazed by cattle at the farm was divided into separate paddocks for each treatment group. Body weight gains, fecal egg counts, and pasture larval counts were measured at regular intervals. Results obtained in both trials demonstrated economic benefits for ivermectin treatment programs over the program with fenbendazole or untreated controls, due to improved weight gains. The importance of giving ivermectin in December for preventing maturation of inhibited stages of Ostertagia and Trichostrongylus during the ensuing months of January to March was also demonstrated in the trials.

8A-13

INTERNAL PARASITES OF MILKING GOATS IN FRANCE : EPIDEMOLOGY AND CONTROL. J. Cabaret and J.P. Raynaud. INRA, Station de Pathologie aviaire et Parasitologie, 37380 Monnaie, France and Rhône Merieux, 31057 Toulouse, France.

Internal parasites are very common in milking goats. Gastro-intestinal strongyles and protostrongyles are the most prevalent and at least 75 per cent of animals are infected. Infections with Moniezia or Dicrocoelium are observed in a limited number of herds, whilst Fasciolia infection is uncommon. The method of management is the principal causal factor, individuals kept indoors, in a field or on a paddock produce strongyle egg outputs of 3, 11 and 115 epg respectively. The same tendency is observed with Muellerius capillaris. Intensity of infection is strongly related to the surface-area of pasture available. For each category of management system the risk factors seen are; age of goat, size of herd, practice of using green forage for indoor herds and : for those at pasture, stocking rate and type of anthelmintic used (benzimidazole or not). High risk periods for gastro-intestinal strongyles and lungworms, are at the end of spring, beginning of summer and the middle of autumn. About 3 or 4 anthelmintic treatments per year are administered by farmers, related to reproductive status (pregnancy, parturition). Effectiveness of treatment is reduced because of considerable under-estimation of bodyweight of some animals in the herd. Use of oxfendazole (10 mg/kg bodyweight) on 2 occasions, just before turn-out and at the beginning of summer (July) allows reduction in infection level on sites where levels are low or moderate. This programme is insufficient for farms very heavily infected with gastro-intestinal strongyles and M. capillaris but improved control may be achieved by administering 2.5 mg/kg on each of 3 consecutive days.

8A-14

PRODUCTIVITY RESPONSES WITH IVERMECTIN OR OTHER TREATMENT PROGRAMS FOR PARASITE CONTROL IN CATTLE IN SUB-TROPICAL BRAZIL. O. Bastos, F. Heiderich, L. G. Cramer, E. L. Bordin* & S. J. Gross. MSD AGVET, Caixa Postal 8734, Sao Paulo, SP, Brazil.

Experiments were conducted over a one-year period in Zebu crossbred cattle from two farms in Brazil to develop a parasite control program based on ivermectin, in comparison with other currently used programs. Cattle with ages ranging from 15 to 20 months were randomly allocated to two treatment groups, providing for similar body weight distributions between groups at each farm. Treatments were: I) 200 mcg ivermectin/kg SC five times during the year; II) 3.75 mg levamisole hydrochloride/kg SC twice a year, plus trichlorfon SC once (Farm 1); or 5 mg albendazole/kg orally three times a year, plus topical trichlorfon seven times a year (Farm 2). Dermatobia hominis larvae and Boophilus microplus counts, body weight gains, and treatment expenditures were monitored throughout, and animal values were calculated at the conclusion of the trials. Mean weight gains were 24.7 kg ($p<0.05$) and 31.9 kg ($p<0.01$) greater for cattle treated with ivermectin than for those treated with conventional programs. On the basis of the additional weight gained by cattle treated with ivermectin, net profits were increased by $2.52 (U.S.)/head and $10.20/head over cattle given other treatments or products at these two farms.

8A-15

EFFICACITE DE L'IVERMECTINE DANS LE TRAITEMENT DES PROTOSTRONGYLIDOSES OVINES. A. Dakkak*°, B. Robin°°et Malika Kachani°, Département de °Parasitologie, Institut Agronomique et Vétérinaire Hassan II BP 6202 Rabat-Instituts, Maroc.°°Merck Sharp and Dohme Research Laboratories 20, rue de la Ville l'Evêque F-75008 Paris.

Si de nombreux anthelminthiques actuellement utilisés dans le traitement des bronchopneumonies vermineuses ovines sont, en général, très efficaces sur Dictyocaulus filaria et Protostrongylus rufescens, leur efficacité sur Cystocaulus ocreatus, Neostrongylus linearis et Muellerius capillaris reste limité. La présente communication rapporte l'efficacité de l'Ivermectine en solution injectable à 1,0 p100 sur ces parasites chez des brebis naturellement infestées. Chez les animaux traités (0,2mg/Kg de poids vif), les larves de D.filaria n'étaient plus retrouvées dans les fecès 8 jours après le traitement et le nombre de larves des Protostrongylidés subit une réduction de 94% par rapport aux témoins à partir du 13è jour. Les résultats des autopsies réalisées 22 jours après les traitements (5 brebis non traitées et 5brebis traitées) montrent une efficacité de 100% sur D. filaria et P. rufescens, de 86,84% sur C.ocreatus et de 69,40 % sur N. linearis. L'efficacité sur M. capillaris n'a été déterminée que pour la réduction du nombre de larves du premier stade qui est de 88 %.

Parasite control / Contrôle des parasites
Chemotherapy in canines and felines / Chimiothérapie chez les chiens et les chats

8A-16

GALE GENERALISEE DE LA CHEVRE : VALEUR THERAPEUTIQUE DE L'IVERMECTINE. A. Dakkak* et H. Ouhelli, Département de Parasitologie, Institut Agronomique et Vétérinaire Hassan II BP 6202 Rabat-Instituts, Maroc.

La présente communication porte sur l'utilisation de l'Ivermectine dans le traitement de la gale caprine naturelle provoquée par Sarcoptes scabiei var. caprae. Quatre vingt quatre chèvres de race locale âgées de 1 à 7 ans, élevées en système extensif sous forêt, toutes sévèrement infectées par S. scabiei, ont été traitées par l'Ivermectine (solution 1,0 p100) à la dose de 0,20mg/Kg de poids vif. L'intensité de l'affection a été appréciée par les signes cliniques et par la numération et le contrôle de la vitalité des acariens dans des prélèvements effectués sur 15cm^2 sur chaque flanc de 20 animaux 4 jours avant, puis hebdomadairement après le traitement, et dans les prélèvements effectués sur 30cm^2 sur chaque flanc chez 2 chèvres 4 jours avant puis tous les 2 jours après le traitement. Le traitement a entraîné la guérison clinique des animaux dans les 3 semaines qui suivent. Le nombre d'acariens et leur vitalité diminuent progressivement et, à la fin de la deuxième semaine aucun parasite n'a été retrouvé.

9A-1

ANTHELMINTIC EFFICACY OF FLUBENDAZOLE CHEWABLE TABLETS IN NATURALLY INFECTED DOGS. B.E. Stromberg*, B.P. Seibert, J.F. Laursen, J.C. Schlotthauer AND B. Michael. University of Minnesota, St. Paul, MN AND Pitman-Moore, Inc. Washington Crossing, NJ.

The efficacy of chewable Flubendazole tablets was evaluated in 86 dogs naturally infected with Ancylostoma caninum and Uncinaria stenocephala; Trichuris vulpis; Toxocara canis and Toxascaris leonina. Dogs were selected from the general population and included both sexes, different age groups and variable body weights. The dogs were allocated into two groups based on the species and ova count of helminth(s) present and designated as the treatment or control groups. The treated group received 15mg of flubendazole/lb of body weight (33mg/kg) for three days. Six days after the initial treatment all dogs were euthanized and necropsied. The entire gastrointestinal tract was opened and examined for parasites. All parasites recovered were identified to species. Efficacy was determined by comparing recoveries from the treated animals with the untreated controls. Flubendazole administered at 33mg/kg was greater than 99% efficacious against A. caninum, U. stenocephala, T. vulpis, T. canis and T. leonina. There appeared to be reduced efficacy against tapeworms (Taenia spp. and Dipylidium caninum).

9A-2

ANTHELMINTIC EFFICACY OF FLUBENDAZOLE PASTE IN DOGS AND CATS. O. Vanparijs*, L. Hermans & L. Van der Flaes. Janssen Pharmaceutica, B-2340 Beerse, Belgium.

Flubendazole is generally used in 5% powder formulation (Flubenol®) as an anthelmintic for pigs and poultry or in tablet formulation (Fluvermal®) for man. In this study flubendazole was tested as a 4.4% paste formulation against roundworms and tapeworms in young dogs and in cats. Two dose regimes were investigated in critical tests and field studies in dogs and critical test in cats. A dose regime of 22 mg/kg for 2 days was about 100% effective against Toxocara canis, Toxascaris leonina and Uncinaria stenocephala in dogs and Toxocara cati in cats. Three-day-treatment at 22 mg/kg showed to be necessary for sufficient efficacy against Trichuris vulpis and Taenia pisiformis in dogs and Hydatigera taeniaeformis in cats. Flubendazole paste was without any side effect and was well accepted by all young dogs and all cats.
(Supported by IWONL grant)

9A-3

OXFENDAZOLE EFFICACY IN DOGS. J.F.S. Reid, Syntex Research, 1348 Louvain-la-neuve, Belgium.

Oxfendazole efficacy was examined in dogs of various breeds and ages following a treatment regimen of 10 mg/kg administered on each of three consecutive days. Treatment was applied as an oral suspension given by plastic syringe or poured on the feed. Efficacy was examined against both naturally and artificially acquired infections of Toxocara canis, Toxascaris leonina, Uncinaria stenocephala, Trichuris vulpis and Taenia hydatigena. In a series of controlled critical studies, where the animals were necropsied 7-10 days post-treatment, oxfendazole efficacy was 99 % against adult T. canis and ranged from 84-92 % against immature parasites of 40 mm in length or greater, the older immature larva being more susceptible. Efficacy against adult T. leonina was 100 % and good effect was also seen against immature parasites, whilst efficacy against 6-7 day old U. stenocephala ranged from 89-99 % . Efficiency against T. vulpis was only moderate but the effect against 34 day old T. hydatigena was 94 % . Field studies in young puppies and bitches at 10 mg/kg or 30 mg/kg on three consecutive days confirmed the efficacy and safety of the anthelmintic.

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Chemotherapy in swine / Chimiothérapie chez les cochons

9A-4

ANTHELMINTIC F28249-α III. EFFICACY OF ORAL DOSES OF F28249-α AGAINST NATURAL INFECTIONS OF CANINE INTESTINAL NEMATODES. M. E. Doscher*, J. A. Pankavich, & I. B. Wood, American Cyanamid Company, Princeton, NJ USA

F28249-α, the principal component of the LL28249 Antibiotic Complex was tested against natural infections of the major canine helminths using critical test methods. When administered orally as a liquid formulation in gelatin capsules the following efficacies were obtained against adult worms:

Nematode	Oral Dose (Mg/kg)	Percent Efficacy
Toxocara canis	0.2	100
Toxascaris leonina	0.2	100
Ancylostoma caninum	0.2	100
Uncinaria stenocephala	0.4	100
Trichuris vulpis	0.6	100

When administered as a tablet formulated so that the dose was one tablet/20kg body weight (0.6mg/kg), 99-100% efficacy was seen against T. canis, A. caninum, U. stenocephala, and T. vulpis. AT 1/3 tablet/20kg body weight (0.2mg/kg), 100% efficacy was obtained against A. caninum and U. stenocephala and 81% against T. vulpis. No adverse reactions were observed.

F28249-α is highly effective orally against the major species of canine nematodes.

9A-5

IVERMECTIN: PROPHYLAXIS AGAINST DIROFILARIA IMMITIS IN DOGS. R.E. Plue* & R.L. Seward. Merck & Co., Inc., Rahway, NJ.

Ivermectin for use as a heartworm preventive in dogs was recently approved for marketing by regulatory authorities in the United States and Canada (HEARTGARD^{30}™) and in Japan (CARDOMEC™). The safety and efficacy of ivermectin have been evaluated in more than 70 trials involving over 2000 dogs. A dose of 6 mcg/kg of ivermectin administered as a swallow tablet once monthly effectively prevented development of the tissue larval stage of Dirofilaria immitis. Adult heartworms appear to be refractory to ivermectin. Circulating microfilariae are susceptible to ivermectin but at greater doses than required to eliminate tissue larval stages.

Dogs given a single oral dose of 2000 mcg/kg or oral doses of 500 mcg/kg/day for 14 weeks exhibited no toxic signs. Repeated oral doses of 500-600 mcg/kg had no adverse effect on any reproductive parameter when administered to breeding males and females, including pregnant bitches.

Field trials involving more than 700 dogs of various breeds under practical conditions at several locations demonstrated that ivermectin administered as a swallow tablet once monthly at 6 mcg/kg was safe and effectively prevented heartworm disease in dogs.

10A-1

DOSE TITRATION OF NETOBIMIM ADMINISTERED IN FEED TO PIGS OVER 10 DAYS. R.K. Prichard*, Institute of Parasitology, McGill University, Macdonald College, Ste-Anne-de-Bellevue, Quebec, Canada.

Netobimin was titrated for control of adult Ascaris suum, Oesophagostomum spp. and Trichuris spp. in grower pigs by administration in feed at 6, 9, 12 and 15 ppm for 10 days. The medicated feed was well accepted and the netobimin well tolerated. Worm egg counts and post-mortem worm counts were markedly reduced for Ascaris, Oesophagostomum and Trichuris at treatment rates of 12 ppm or above. For Ascaris and Oesophagostomum, 15 ppm netobimim was 100% effective, and against Trichuris was 95% effective.

10A-2

USE OF NETOBIMIN IN FEED OF SWINE FROM WEANING TO MARKET WEIGHT. L. GRISI*, C. S. PIMENTEL AND E. A. MENDES. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO, BRAZIL.

FOURTY-EIGHT PIGLETS WERE DIVIDED INTO TWO TREATMENTS: NETOBIMIN 9 PPM FED CONTINUOUSLY IN SWINE FEED FROM WEANING TO MARKET WEIGHT AND NON-MEDICATED CONTROLS. EACH TREATMENT HAD SIX REPLICATES OF FOUR PIGLETS. ALL ANIMALS WERE ARTIFICIALLY INFECTED WITH 200 THIRD STAGE LARVAE OF OESOPHAGOSTOMUM SP. AND 200 EMBRYONATED EGGS OF TRICHURIS SUIS DURING 10 CONSECUTIVE DAYS AT BEGINNING AND AGAIN FROM DAY 61 TO DAY 70 OF THE TRIAL. INFECTIVE EGGS OF ASCARIS SUUM WERE GIVEN TO ALL PIGLETS AT BEGINNING OF TRIAL AND REPEATED 7 DAYS LATER USING 1,500 EGGS EACH TIME. EFFICACY OF NETOBIMIN IN PREVENTING THE DEVELOPMENT OF ASCARIS SUUM, OESOPHAGOSTOMUM SP. AND TRICHURIS SUIS DETERMINED AT NECROPSY WERE 100%, 100% AND 77.6%, RESPECTIVELY. PIGS WHICH RECEIVED FEED MEDICATED WITH 0.0009% OF NETOBIMIN HAD BETTER PERFORMANCE REGARDING DAILY WEIGHT GAIN, NUMBER OF DAYS TO MARKET WEIGHT AND AVERAGE FEED CONVERSION: 0.374 AND 0.362 KG/DAY, 176.34 AND 181.26 DAYS, 4.06 AND 4.12, RESPECTIVELY FOR MEDICATED AND NON-MEDICATED PIGS. COST BENEFIT ANALYSIS RESULTS WERE POSITIVE.

Chemotherapy in swine / Chimiothérapie chez les cochons
Pharmacokinetics / Pharmacocinétique

10A-3

EFFICACY OF FENBENDAZOLE AGAINST TRICHINELLA SPIRALIS. A.B. Childers*, J.M. Zaryske, D.B. Lawhorn & T.M. Craig. Department of Veterinary Public Health, Texas A&M University, College Station, Texas, United States of America.

The efficacy of fenbendazole and pyrantel in preventing encystation of T. spiralis in swine was compared in the first study. The pigs were divided into 3 groups: fenbendazole, pyrantel, control. The first 2 groups were fed medicated rations for 6 days prior to infection. Diaphragm, cheek and ham samples were collected at necropsy and digested. T. spiralis larvae were found in the tissues of the pyrantel and control groups but not the fenbendazole group. Fenbendazole was effective in preventing T. spiralis infection.

A second study to determine the efficacy of fenbendazole against encysted T. spiralis in swine used 3 groups of pigs: infected but non-treated, non-infected but treated, and infected and treated. At 55 days post-infection the treated groups were fed 1 mg/kg/day of 4% fenbendazole premix for 9 days. Diaphragm, cheek, ham and tongue samples were collected at necropsy and a portion of each sample was fed to rats to determine larval viability. The remainder of sample was digested to determine larval concentration. The treated group showed a significant reduction in both number and viability of encysted larvae.

(Supported by a grant from Hoechst-Roussel Agri-Vet Company.)

10A-4

EFFECT OF FENBENDAZOLE (FBZ), PYRANTEL TARTRATE (PT) AND ENVIRONMENT ON IMMUNITY TO ASCARIS SUUM L.L. Southern,* T.B. Stewart, E. Koszalka and D. Leon. Louisiana State Univ., Baton Rouge, USA.

The effect of FBZ and PT against natural (N) and experiemental (E) pig ascariasis was assessed. Three groups of pigs were housed in outside lots (OL) previously contaminated with A. suum eggs and 3 groups of pigs were housed in confinement (CF). All CF pigs were orally inoculated with 2000 A. suum eggs on day 1 of weeks 1, 3, and 5 of the experiment. One group each of N and E pigs was treated with FBZ (3 mg/kg body weight) in the feed for 3 consecutive days on weeks 2, 4 and 6 of the experiment. A second group each of N and E pigs was treated with PT in the feed (106 mg/kg of feed) during weeks 2 through 5. The third group of pigs within each infection type received no anthelmintic (C). Each pig was challenged with 100 embryonated A. suum eggs 7 days after termination of the last FBZ treatment. All pigs were killed 66 days after challenge. Daily gain, gain:feed and dressing percent were reduced ($P<0.02$) by OL. Numbers of A. suum recovered at necropsy were lowered ($P<0.03$) in pigs receiving FBZ or PT compared with C pigs. CF pigs had more liver lesions than OL pigs and FBZ and PT pigs had fewer than C pigs ($P<0.01$), however there was an environment x anthelmintic treatment interaction ($P<0.01$). FBZ pigs made slightly higher gains and had fewer ascarids, than PT, but these effects were not different ($P>.10$).

10A-5

EFFICACY OF IVERMECTIN AGAINST SCABIES AND NATURAL GASTROINTESTINAL NEMATODE INFECTIONS OF BUFFALOES, PIGS AND GOATS IN INDIA. B. S. Gill*. 110-A Aggar Nagar, Ludhiana 141001, India.

The incidence of scabies in buffaloes, pigs, sheep and goats has increased significantly in India in recent years. In view of its economic importance, and that of gastrointestinal nematodes, the activity of ivermectin in naturally infected buffaloes, pigs and goats was determined. Ivermectin was administered by subcutaneous injection (IVOMEC 1% w/v - MSD AGVET) at the dose of 200 mcg/kg in buffaloes and goats and at 300 mcg/kg in pigs. Efficacy was determined by the disappearance of mites from skin scrapings and the reduction in the numbers of worm eggs in the faeces. Results were dramatic with mites having disappeared within two weeks of the drug being administered in the majority of animals, with a marked improvement in skin lesions. The skin appeared normal within 9 weeks of treatment. The effect on nematodes was equally spectacular with infections of Ascaris suum, Trichostrongylidae, Oesophagostomum spp., Strongylidae and Bunostomum being eliminated with a week of treatment.

11A-1

PHARMACOKINETICS AND TISSUE RESIDUES OF LUXABENDAZOLE IN SHEEP. J.W. Steel* and D. Duwel. CSIRO Animal Health, Glebe, Australia and Hoechst AG, PO Box 800320, Frankfurt, FRG.

The pharmacokinetics of luxabendazole [methyl 5-(4-fluorophenylsulphonyloxy) benzimidazole 2-carbamate; LBZ] were determined in sheep after oral administration at 7.5, 10.0 and 12.5mg/kg by HPLC quantitation of plasma levels for 120h after dosing. The LBZ concentration-time profiles were similar at the three doses with a maximum level of 0.5ug/ml occurring at 20-24h, area under the curve of 29.8-31.8ug.h/ml and half-life of the elimination phase of approximately 20h. LBZ was 95% bound to serum proteins. Following oral administration of 10mg[^{14}C]LBZ/kg, total radioactivity and the concentrations of LBZ and its principal metabolites were determined in plasma, urine, faeces, milk and edible tissues. During the first 24h, LBZ accounted for 70% and the 6-hydroxy derivative for 21% of plasma radioactivity. 83% of the dose was excreted in faeces predominantly as unmetabolised LBZ (71% of total) and 13% in urine (5% as LBZ). Less than 1% was secreted in milk (75% as LBZ) with the highest concentration occurring between 8 and 24h. Tissue residues were determined at 2, 4, 7, 14 and 40d after dosing. At 2d total residues (ug/g) were liver 20.5, lung 4.0, kidney 4.6, fat 3.2 and skeletal muscle 1.0, with parent compound constituting 50-60% of the total in liver, lung and kidney. The half lives (d) for total residues were liver 4.6, lung 3.7, kidney 2.6, fat 1.0 and skeletal muscle 2.2.

11A-2

INFLUENCE OF DIFFERENT PHYSICAL FORMS OF TRICLABENDAZOLE ON ITS EFFICACY AND PHARMACOKINETICS IN SHEEP. R.J. Richards*, P. Mayer, G. Büscher, M.B. Strong & F.L. Bowen. Ciba-Geigy Animal Health, Basel, Switzerland and Kemps Creek, Australia.

The influence of particle size, crystal modification and dissolution time of triclabendazole (TCBZ) on the efficacy and pharmacokinetic behaviour of the product FASINEX was investigated. Groups of 8 sheep were infected with Fasciola hepatica and 4 weeks later treated orally with a suspension containing one of 5 different physical forms of TCBZ at the sub-therapeutic dose of 5 mg/kg. One group remained untreated. Blood samples collected from treated sheep at intervals after treatment were analysed for the sulphoxide and sulphone metabolites of TCBZ. Faeces samples were collected for egg counting and 16 weeks post infection all sheep were slaughtered, surviving flukes collected and counted. Group mean area under the TCBZ sulphoxide concentration curve (AUC) ranged from 193 to 282 mg/kg/hr. One group showed significantly lower AUC. This correlated with particle size and dissolution time of the TCBZ form. No correlation was seen with different TCBZ crystal modifications. Differences in fluke counts between groups were not significant. It is concluded that pharmacokinetics are more sensitive than efficacy for assessing drug variations.

The technical assistance of Messrs. J.R. Allison and S. Adams and Mrs. E.M. Kearney, the statistical evaluation by Dr. A Racine and the preparation of the various TCBZ forms by Dr. H.J. Fäh are gratefully acknowledged.

11A-3

EXPERIMENTAL PHARMACOLOGY OF ECHINOCOCCOSIS/HYDATIDOSIS IN VITRO: EFFECT AND KINETICS OF MEBENDAZOLE, PRAZIQUANTEL AND QUINONE DERIVATIVES. R.N.Lorenzini*, P.Betto & G.Settimj. Istituto Superiore di Sanità, Rome, Italy.

Various compounds selected on the basis of inhibition activity of the microtubular system have been tested on protoscoleces of E.granulosus in vitro. Protoscoleces have been obtained by hydatid cysts of sheep origin and maintained at 37°C for the experiment (24 hours). Compounds were employed on the basis of concentration which are achievable in vivo. Efficacy of the treatment has been evaluated by testing viability with dye uptake and protoscoleces motility. In the case that drugs were effective also pharmacokinetics was determined by HPLC. Mebendazole, praziquantel and quinone and some derivates resulted the most effective drugs in this model and we obtained linear results with pharmacological tests i.e. an increase of drug effect when dosages increase. Kinetics and linkage with protoscoleces in vitro and in vivo are similar.

11A-4

PHARMACODYNAMIC ASPECTS OF THE ANTHELMINTIC EFFICACY OF IVERMECTIN. J.A. Bogan*, Q.A. McKellar, I. McKinnon & E.W. Scott. Department of Veterinary Pharmacology, University of Glasgow, Glasgow, Scotland.

Ivermectin has superior activity against abomasal dwelling helminths than against those in the small intestine of sheep and cattle. Surprisingly ivermectin could not be detected in abomasal contents of sheep and cattle after subcutaneous administration even at a dose rate of 2,000 µg/kg (10x normal) while passive diffusion and biliary excretion produced high concentrations in the small intestine. In the mucus, however, of the abomasum and small intestine ivermectin concentrations were similar. In sheep infected with the small intestinal parasite Cooperia curticei efficacy was 61.1% and 90.4% at 7 and 14 days after subcutaneous treatment with ivermectin at a dose rate of 200 µg/kg. Those parasites remaining after treatment were located distally in the small intestine to those in untreated animals. It is hypothesised that the anthelmintic efficacy of ivermectin is in the mucus of the gastrointestinal tract and that the resistance of intestinal parasites to ivermectin treatment relative to abomasal parasites may be due to their re-establishment before they have been swept from their predilection site.

11A-5

SOME FACTORS AFFECTING ISOMETAMIDIUM PROPHYLAXIS AGAINST BOVINE TRYPANOSOMIASIS. A.S. Peregrine[1], O. Ogunyemi[2], D.D. Whitelaw[2], P.H. Holmes[1], S.K. Moloo[2] H.Hirumi[2], G.M. Urquhart*[1] & M. Murray[1]. [1]Faculty of Veterinary Medicine, The University of Glasgow, Scotland and [2]International Laboratory for Research on Animal Diseases, Nairobi, Kenya.

The parameters which surround the use of trypanocidal drugs have not been defined using the technology now available and in consequence considerable controversy surrounds the application of these drugs in field situations. This report describes the progress of a series of laboratory studies in cattle on isometamidium chloride, the major chemoprophylactic drug used in ruminants, and discusses the effect of factors such as trypanosome species, drug dosage, weight of trypanosome challenge, the presence of an established infection and the significance of antibody in relationship to protection.

(Supported by Grants from ODA and EEC).

Pharmacokinetics / Pharmacocinétique

11B-1

METHOD OF ENHANCING ACTIVITY OF A BENZIMIDAZOLE ANTHELMINTIC B.F. Chick*, R. Runkel and I.G. Pearson, Syntex Research Institute of Agriscience, 31 Victoria Avenue, Castle Hill NSW 2154 Australia.

The third generation benzimidazole anthelmintic oxfendazole demonstrates high efficiency with a broad spectrum of activity in sheep and cattle. After oral administration of the presently marketed crystalline oxfendazole in sheep, plasma levels of parent drug and its two metabolites, fenbendazole and fenbendazole sulfone peak at 24 hours and persist for up to 120 hours. Amorphous oxfendazole, a newly discovered more soluble solid form of oxfendazole, results in more rapid and more complete absorption when administered orally to sheep. Higher and earlier maximum plasma concentrations along with similar depletion rates, result in significantly increased total area under the plasma curves. Based on pharmacokinetic and efficacy results a dose of 2.75 mg/kg amorphous oxfendazole is equivalent to 5 mg/kg of the existing crystalline oxfendazole.

Detailed results of pharmacokinetic and efficacy studies will be presented along with discussion of the implications of this new formulation for the animal health industry.

11B-2

DOSE RESPONSE PHARMACOKINETICS AND METABOLISM OF PARENTERALLY ADMINISTERED NETOBIMIN IN CATTLE. J.W. Steel* and D.R. Hennessy. CSIRO McMaster Animal Health Laboratory, Glebe, NSW, Australia.

The anthelmintic netobimin is an ortho nitrophenylguanidino carbamate with a solubilising taurine moiety which facilitates parenteral administration as an aqueous solution of the tris salt. The pharmacokinetics and metabolism of [^{14}C] netobimin following subcutaneous injection at 12.5, 17.5, 25 and 37.5 mg/kg were examined in cattle fitted with abomasal cannulae. Plasma and abomasal fluid concentrations of total [^{14}C], netobimin and albendazole (ABZ) metabolites were determined over 48h after dosing. Netobimin was rapidly cleared from plasma ($t_{\frac{1}{2}}$ 1.5-2h) and ABZ sulphoxide (SO) and sulphone (SO_2) were detectable between 6 and 18h after dosing with peak concentrations at 10-12h and 12-18h respectively. The area under the plasma ABZ.SO profile (AUC) increased with dose to 25mg/kg with no further increase at 37.5mg/kg. In abomasal fluid both ABZ.SO and ABZ.SO_2 were detected from 6h and persisted until up to 30h, accounting for all [^{14}C] present during this period, with maximal concentrations occurring at similar times to those in plasma. AUC for abomasal ABZ.SO was rectilinearly related to dose over the entire range. These results together with other studies in sheep, indicate that parenteral netobimin is secreted into the intestines, probably in bile, where it is cyclised to ABZ metabolites which are absorbed and recycled to the abomasum via the plasma pool and gastric secretions. This mechanism is presumably important for activity of parenteral netobimin against abomasal and duodenal nematode parasites.

11B-3

PHARMACOKINETICS AND METABOLISM OF NETOBIMIN IN SWINE FOLLOWING ORAL ADMINISTRATION. B. D. Cameron*, N. Milner, C. Young and D. M. Lichtenwalner. Inveresk Research International, Ltd., Musselburgh EH21 7UB, Scotland and Schering Corporation, 1011 Morris Avenue, Union, N.J. 07083, U.S.A.

Netobimin is a new water-soluble phenylguanidine anthelmintic which is under development for oral administration to swine. Pharmacokinetic and metabolism studies were carried out using radiolabelled netobimin. Following oral administration of [^{14}C]-netobimin trisamine salt solution to domestic pigs, mean value of 82.5% of the dose was recovered in 120 hours post-dosing. Peak plasma levels of 3.1 ug equivalents/ml occurred at 18 hours post-dosing and declined slowly to 0.31 ug equivalents/ml at 240 hours post-dose. The liver was the target tissue having the highest levels of total radioactivity at sacrifice. Following oral administration to domestic pigs, netobimin undergoes extensive metabolism. The metabolites of urine, feces, plasma and liver were examined and will be discussed.

11B-4

THE KINETICS OF ALBENDAZOLE DISPOSITION IN SHEEP. D.R. Hennessy* and J.W. Steel, CSIRO, Division of Animal Health, Glebe, NSW, Australia.

Albendazole (ABZ) containing a trace of ^{14}C- ABZ was orally or intravenously administered at 4.75 mg/kg to sheep fitted with ruminal, abomasal and re-entrant biliary cannulae. Digesta fluid flow was determined from steady state infusion of Cr-EDTA and bile flow by recycling pump. ABZ metabolites were examined by HPLC. In plasma, ABZ sulphoxide (ABZ.SO) and ABZ sulphone (ABZ.SO_2) exhibited some degree of plasma protein binding and had a maximum concentration (C_{max}) of 1.51 ± 0.28ug/ml between 6-10h after oral administration and 0.53 ± 0.4ug/ml between 20-24h respectively. From intravenous results ABZ was rapidly metabolised ($T_{\frac{1}{2}}$ = 0.25h) and appeared to be sequestered in the liver as the plasma ABZ.SO and ABZ.SO_2 profiles were almost identical to those from the oral dose. Over the 96h experimental period 60% of the oral ABZ dose was excreted in urine and 15% in bile, the latter mainly as ABZ.SO and conjugated hydroxy ABZ.SO and hydroxy ABZ.SO_2 with 19% excreted in faeces. 40% of the oral dose passed through the abomasum as soluble ABZ, ABZ.SO and ABZ.SO_2. Results from these and other experiments indicate that a large proportion of the abomasal ABZ.SO and ABZ.SO_2 was derived from the plasma pool. These observations show that high concentrations of ABZ metabolites are present in digesta fluid and that they recycle across the gut wall which adds to exposure of lumen-dwelling parasites. In addition, plasma protein binding of ABZ metabolites together with possible sequestration of ABZ in the liver may contribute to ABZ flukicidal action.

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11B-5

ALBENDAZOLE AND ALBENDAZOLE SULFOXIDE : A COMPARISON OF BIOAVAILABILITIES IN CATTLE AND SHEEP

M-P. Tiberghien* Robert Young & Co., Scotland
J.A. Bogan, Glasgow University, Scotland

Oxfendazole and fenbendazole are two major broad spectrum anthelmintics which are metabolically related and interconvertible in vivo, oxfendazole being the sulfoxide of fenbendazole. The higher water solubility of the sulfoxide accounts for its greater systemic bioavailability after oral administration. Albendazole similarly is extensively converted in vivo to albendazole sulfoxide which is also more water soluble than albendazole. The bioavailabilities of albendazole and albendazole sulfoxide were compared after oral treatment at similar dose rates in cattle (7.5mg/kg) and sheep (5mg/kg). Plasma levels of albendazole and albendazole sulfoxide were determined and areas under the concentration/time curves were compared and showed no statistically significant differences. The residue patterns were also compared: albendazole and albendazole sulfoxide were both found in muscle, kidney and liver tissues after either treatment. This confirmed the interconvertibility of the two drugs. It was concluded that albendazole and albendazole sulfoxide have equivalent bioavailabilities in cattle and sheep after oral treatment.

12A-1

TOXICOLOGY OF NETOBIMIN IN LABORATORY ANIMALS.

D. G. Campbell*, Schering Corporation, P.O. Box 608, Allentown, N.J. 08501, U.S.A.

Netobimin, a phenylguanidine anthelmintic, is available for a number of food-producing animal species. No-effect levels in several toxicological tests are required for registration approval. Oral 90 day toxicity tests were performed in rats and dogs. Toxic signs in rats included skin lesions and testicular atrophy; the no-effect level was 93 mg/kg/day. Signs observed in dogs were vomition, soft feces, and diarrhea, with a no-effect level of 190 mg/kg/day. Teratology studies were conducted in rats and rabbits, and a two-generation reproduction study was performed in rats. At higher doses, netobimin was teratogenic and embryotoxic in both species, as well as abortifacient in rabbits. No-effect levels were 91 mg/kg/day in rats and 15 mg/kg/day in rabbits. Reproductive toxicity was similar for multiple generations in rats; the no-effect level was 15 mg/kg/day.

12A-2

IN VITRO AND IN VIVO MUTAGENICITY TESTING OF NETOBIMIN.

D. B. McGregor* and D. G. Campbell. Inveresk Research International, Ltd., Musselburgh EH21 7UB, Scotland, and Schering Corporation, Allentown, N. J. 08501 U.S.A.

Netobimin, a phenylguanidine anthelmintic, was subjected to a battery of tests of assess its genotoxic potential. Such studies are important for any drug to be used in food-producing animals. The test used were: (1) Ames' Salmonella typhimurium histidine locus reversion test, conducted with 5 strains in both the presence and absence of rat liver S9 mix; (2) Escherichia coli SOS repair activity test, conducted in both the presence and absence of rat liver S9 mix; (3) L5178Y mouse lymphoma cell assay for $tk^{+}tk^{-} \rightarrow tk^{-}tk^{-}$ mutations, conducted in both the presence and absence of rat liver S9 mix; (4) Rat primary hepatocyte culture unscheduled DNA synthesis assay, using a silver grain counting technique; (5) Mouse bone marrow cell micronucleus induction test with oral administration of the drug. In none of the in vitro assays was there evidence for genetic toxicity. A weak, significant response occurred in the micronucleus test, which was attributed to spindle dysfunction induced by drug interaction with tubulin and consequent inhibition of polymerization to microtubules. Such activity may be one basis for the anthelmintic activity of netobimin.

12A-3

ELIMINATION PAR LE LAIT DES RESIDUS DE NETOBIMIN (SCH 32481) ADMINISTRE A LA VACHE LAITIERE PAR LA VOIE SOUS-CUTANEE.

Louis P. Pinault* et Chantal F. Camus. Service Pharmacie-Toxicologie, Ecole Nationale Vétérinaire, Nantes, France.

Le nétobimin (NETOB) (a) est transformé in vivo notamment en métabolites à noyau benzimidazole tels que l'albendazole et ses dérivés d'oxydation, sulfoxyde (ABZSO) et sulfone. Après administration S.C., 2 composés sont caractérisés dans le lait : NETOB et ABZSO. Pour préciser leur cinétique d'élimination en vue de fixer des temps d'attente, le NETOB a été injecté par voie S.C. sous forme d'un soluté du sel de trométamol, à la dose de 12,5 mg/kg 1 à 2 lots de 5 et 6 vaches. Les échantillons de lait représentatifs des traites ont été conservés selon le cas à - 20° C ou + 4° C. L'extraction des résidus a été réalisée par chromatographie sur colonne C_8 Bond Elut (Analytichem), les extraits ont été analysés par HPLC sur colonne Hypersil ODS C_{18}, détection UV en utilisant le mébendazole comme étalon interne. L'élimination par le lait est brève, elle est surtout notable dans le lait de la première traite qui suit l'injection où le rapport des concentrations NETOB/ABZO est voisin de 5 et leur somme environ 1 ppm, soit approximativement 6 fois celle mesurée dans le lait de la deuxième traite. Ces teneurs permettent d'envisager l'emploi de cet anthelminthique chez la vache en lactation par la voie S.C. sans risque pour le consommateur.

Remerciements à la Station de Recherches Vache/Laitière de l'INRA - Rennes-St-Gilles pour l'entretien des animaux.

(a) ND Hapadex (Rigaux-Galéna)

Metabolism and Toxicology / Métabolisme et toxicologie

12A-4

SAFETY OF NETOBIMIN IN RUMINANTS. D. G. Campbell* and R. M. Slepetys. Schering Corporation, P.O. Box 608, Allentown, N. J. 08501, U.S.A.

Netobimin is a phenylguanidine anthelmintic available for oral treatment of sheep and cattle, and for parenteral administration to cattle. Label doses range from 7.5 to 20 mg/kg. Safety studies were conducted for each route of administration and species. Acute studies in sheep with doses rising every day to 155 mg/kg caused death in 2 of 4 animals. A single oral dose of 155 mg/kg had no effect. Doses up to 100 mg/kg/day for 3 days were well tolerated. Acute oral studies in cattle, both rising dose and single dose, indicated that 100 mg/kg or above was toxic. Treatment with 60 mg/kg/day for two days was well accepted, while the same dose for three days may cause severe rumen upset. Administration of 20 mg/kg/day for three days was also well tolerated. Acute parenteral studies in cattle up to 500 mg/kg showed that netobimin did not affect most measurable parameters. Subcutaneous injection was more acceptable than was intramuscular injection. Treatment with netobimin at 100 mg/kg/day for 3 days caused little or no effect.

12A-5

METABOLISM OF BENZIMIDAZOLE ANTHELMINTICS AND THEIR PRO - DRUGS : CONSEQUENCES IN PHARMACOLOGY AND THERAPEUTICS. P. Delatour (*), School of Veterinary Medicine of Lyon, Charbonnières, France.

The metabolic pathways described for benzimidazoles (hydrolysis, oxidation, reduction) are common to all representatives of the chemical series.Only the balance between the possible metabolic steps from a compound to another leads predominantly to active or inactive metabolites . Liver microsomes and ruminal flora seem to be the main locations of these reactions as well as of the cyclisation process of the pro - drugs (thiophanate, febantel, netobimin).Depending upon the animal species, the substrate and the specific oxidative reaction, FAD or cytochrome-dependent enzymes are involved , some of the latter being inducible experimentally. All these parameters cause each compound to have its particular pharmacokinetics and consequently its own spectrum of efficacy, toxicological potency, residues profile and even technological incidence (blue cheese making). The knowledge of these correlations enables a better use of benzimidazole anthelmintics and the development of new delivery systems.

12B-1

SAFETY OF IVERMECTIN APPLIED TOPICALLY TO CATTLE. Cox, J.L., Barrick, R.A., Brokken, E.S., Pulliam, J.D., Roncalli, R.A.*, and Sutherland, I.H., Merck & Co., Inc., Rahway, NJ.

Safety of ivermectin applied as a solution (5 mg/ml) from withers to tailhead of cattle was assessed in 39 trials. Plasma concentration from topically applied or injected ivermectin (IVOMEC Injection) was compared. 8 animals received ivermectin (500 mcg/kg topically), eight 200 mcg/kg sc and eight 400 mcg/kg sc. The group given ivermectin topically had lower area under the curve (196 ng day/ml) than did those given 400 mcg/kg sc (457.4 ng day/ml). Peak plasma level of topically dosed animals (17.3 ng/ml) was significantly less than for animals given 200 or 400 mcg/kg by injection (37.1 and 44.9 ng/ml, respectively). 3 trials were conducted to determine if any adverse reactions occurred. 4 groups of 4 steers aged 8-9 months were dosed with either 1000, 2500 or 5000 mcg/kg or vehicle. No overt signs of toxicity were seen. In the second trial 16 steers aged 7-9 months were dosed at 500 mcg/kg and 4 were necropsied at 7, 14, 28 and 42 days. Histologic lesions reflecting mild site irritation were the only observed reactions. In the third trial 16 Holstein steers aged 5-7 months had saline (1 ml) or ivermectin formulation (0.25, 0.5 or 1.0 ml) instilled in the lower conjunctival fornix. Steers given ivermectin had signs of mild irritation which had subsided by day 7. 35 trials conducted under commercial conditions had cattle of 16 crosses aged from 1 day to 14 years in 7 countries. Of 1332 given ivermectin topically at 500 mcg/kg, 1.5% showed slight irritation at application site. Of 471 given 1000 mcg/kg 4.2% had slight irritation at application site.

12B-2

COMPARATIVE EFFECTS AND SAFETY OF IVERMECTIN IN PREGNANT MARES. R.L. Asquith, J. Kivipelto*, J.W. Harvey, J.E. Bauer. Department of Animal Science and the College of Veterinary Medicine, University of Florida, U.S.A.

Mares (n-20) approaching 3 months of pregnancy were assigned randomly to 1 of 4 treatment groups. Treatments were: A - an IM injection of ivermectin at 600 mcg/kg, B - various conventional anthelmintic drugs at the manufacturers' recommended dose, C - an IM injection of the ivermectin vehicle (placebo) and D - no anthelmintic treatment during the trial. All anthelmintic treatments were administered at 60 day intervals up to and including the date of parturition. Fecal egg counts, arginase, hemoglobin and hematocrit values were determined at bi-weekly intervals during the trial and there were no statistically significant differences determined between the treatment groups for these parameters. None of the mares showed any adverse clinical signs during the course of this study and all twenty mares delivered live foals which remained on the research farm until they were sold as yearlings. Mares treated with ivermectin had significantly ($P<0.01$) lower EPG counts than mares in the other treatment groups. Multiple hematological and clinical chemistry values were determined for all mares and resulting foals within 12 hours postparturition. A one-way ANOVA showed no clinically relevant statistically significant differences between treatment groups in either mares or foals at 12 hours postparturition. This study suggests that ivermectin at 600mcg/kg is safe and highly efficacious when administered to pregnant mares.

Metabolism and Toxicology / Métabolisme et toxicologie
Pathophysiology / Pathophysiologie

12B-3

TOXICITY OF A CLOSANTEL AND ALBENDAZOLE COMBINATION ANTHELMINTIC IN ANGORA GOATS AND MERINO TYPE SHEEP. T.D. Gunter*, P.C. van Schalkwyk, W.S. Botha. South African Bureau of Standards, Veterinary Test Unit, East London, Republic of South Africa.

A commercially available broad spectrum anthelmintic containing albendazole 1,9% m/v and closantel-sodium 3,0% m/v was administered to groups of Angora goats and Merino type sheep three times at monthly intervals at different dose rates. The recommended dose is equivalent to 3,8 mg/kg albendazole and 6 mg/kg closantel and the highest dose administered was four times this. No signs of toxicity were detected clinically, haematologically, or on post mortem examination at the end of the three months. Lesions that could be related to chronic albendazole toxicity were noticed on histopathological examination in some animals. Of the twelve animals remaining from the initial study four animals were subsequently dosed with the same remedy once at ten times the recommended dose rate and another four at twenty times the recommended dose rate. Four animals remained as untreated controls. Again no clinical signs of toxicity were noticed. Fourteen days later the control animals were given forty times the recommended dose, the four that received ten times the recommended dose were given thirty times the recommended and the other four were again given twenty times the recommended dose. All of the animals showed signs of both albendazole and closantel toxicity clinically and histopathologically. Eleven of the twelve animals died.

12B-4

TERATOGENICITY STUDIES IN RATS AND SHEEP TREATED WITH LUXABENDAZOLE/ F.S. Malan*. Hoechst Research Farm, P.O. Box 124, Malelane 1320, Republic of South Africa.

The anthelmintic drug luxabendazole (LBZ) was examined for teratogenic properties in rats and sheep. LBZ was administered orally to groups of 20 female Wistar rats from the 7th-16th day of pregnancy once a day in doses of 6.3,10,16,25,250 or 2500 mg/kg body mass. Foetuses were examined on the 21st day for abnormalities. There was no indication of teratogenicity. Five hundred and twenty five South African mutton Merino ewes aged from 1 to more than 4 years were synchronized and artificially inseminated. Those that didn't conceive from A.I. were served by rams. Ewes were randomly divided into 3 groups: untreated controls - 236 ewes; dosed with luxabendazole at 100 mg/kg - 152 ewes; dosed with luxabendazole at 75 mg/kg - 137 ewes. Dosing was carried out by stomach tube when the embryos were either 10,12, 14,16,18,20,22,24,26,28 or 30 days old respectively. The following were recorded: ewes that lambed normally, ewes that aborted, barren ewes, normal lambs born, abnormal lambs born, stillborn lambs. The following abnormalities were recorded: cryptorchidism, incompletely fused scrotum, arthrogryposis, brachygnathia inferior, mummification. Luxabendazole had no effect on the incidence of abnormalities when the treated groups were compared with the undosed controls using either the X^2 test or the accurate Fischer test ($p>0,05$). LBZ is a safe drug to be used in pregnant sheep.

12B-5

ALTERNATIVE TREATMENTS FOR PARASITE CONTROL C.A. Hall*, Ogilvy Hall Pty. Ltd., 1/298 Pacific Highway, Artarmon, 2064, N.S.W., Australia.

The conventional paraciticides have, a high development cost, reduced periods when high efficacy can be obtained before a resistance is expressed, a possible environment pollution and human contact toxicity.
Ecto and endo parasites congregate at sites of predilection which aid survival. Boophilus sp. in neck folds, escutcheon, ears etc., Lucilia sp. in skin folds of the neck and shoulders and other wet areas, nematodes according to the pH of intestinal contents.
Evidence suggests a high correlation between fleece moisture and sheep blowfly strike, under a variety of conditions, e.g. age, sex, site and strain of sheep. Desicants which reduce or control increases in fleece moisture offer a possible alternative treatment. In fine or medium wooled Merino sheep, desicants containing oxides of zinc and aluminum reduce the incidence of natural blowfly strike compared with controls and a diazinon treatment. H_2 receptor blockers change the low pH of gastric secretions toward neutral levels. In sheep treatment with cimetidine reduced infestations of H. contortus and Ostertagia sp. from the abomasum.
Changes to the host environment offers a method of treatment irrespective of the resistance status of the pest and could reduce possible environment pollution.

13A-1

BLOOD PATHOLOGY IN SPONTANEOUS GASTRO-INTESTINAL HELMINTHIASIS OF POULTRY. P.C. Sekhar*, Department of Zoology, Osmania University, Hyderabad- 500 007, India.

Effects of natural infestation with single or multiple species among cestodes Raillietina tetragona, R. echinobothrida, R. cesticillus, Cotugnia digonopora, Choanotaenia infundibulum and Hymenolepis carioca and a nematode Ascaridia galli on cellular and chemical constituents of blood and serum in cockerels and pullets of domestic fowl, Gallus domesticus, were reported. Macrocytic hyperchromic anaemia in which erythrocytes depleted in numbers, increased in size and possessed greater quantity of corpuscular haemoglobin; hypoglobulinemia; and hyperlipemia resulted in cockerels. Microcytic hypochromic anaemia in which erythrocytes increased in numbers, reduced in size and possessed lesser quantity of corpuscular haemoglobin; hyperglobulinemia; and hypolipemia resulted in pullets. Elevated haematocrit; lowered blood haemoglobin; reduced corpuscular haemoglobin concentration, acceleration in sedimentation rate and increased resistancy to haemolysis of erythrocytes; thrombocytopenia; leucocytosis or leucopenia with relative and absolute lymphopenia and heterophilia; hyper or hypoproteinemia associated with hyperalbuminia and elevated albumin to globulin (A/G) ratio; and hypoglycemia were observed in these anaemic cockerels and pullets. Elevated haematocrit was suggested for diagnosis of gastro-intestinal helminthiasis in poultry.

Pathophysiology / Pathophysiologie

13A-2

Strongyloides stercoralis migration in dogs. G.A. Schad, L.M. Aikens*, and G. Smith. University of Pennsylvania, Philadelphia, PA, U.S.A.

Skin penetrating nematodes that mature in the gastrointestinal tract are generally considered to undergo lung migration. Recently, however, several investigators have questioned this route for Strongyloides, suggesting that, in S. ratti at least, larvae undergo "head migration", moving subcutaneously to the nasopharyngeal area and from there to the duodenum. Our studies of disseminated strongyloidiasis in dogs failed to demonstrate large larval populations in lungs. This contributed to the growing doubt that classical lung migration occurs in strongyloidiasis. To resolve these doubts, migration of S. stercoralis in dogs was investigated with selenomethionine-labelled larvae. Ten-day-old, commercially reared Strongyloides-free pups were infected in the inguinal area with 5,000 labelled infective larvae. Migration from this site to the duodenum was monitored by autoradiography of compressed organs removed from the pups at necropsy. At 0-48 h post-infection larvae were found in the skin, subcutaneous tissue and muscles in a pattern suggesting radial dispersal from the infection site. Between 48 and 90 h they moved rapidly to the duodenum. These studies confirmed neither lung nor head migration. To sample for lung migration longitudinally, transtracheal washes were done repetitively on 8-wk-old dogs. Again, too few larvae were recovered to support the lung migration hypothesis unless pulmonary transit is very rapid. Computer-based data analyses using a compartmental mathematical model have not resolved this problem.

13A-3

PATHOGENICITY OF NEMATODIRUS SPATHIGER IN LAMBS. R.M. Connan. Department of Clinical Veterinary Medicine, University of Cambridge. UK. CB3 OES.

The pathogenicity of this species is uncertain. In circumstances which suggested the presence of GI parasitism in the lambs on a farm in September, N. spathiger at 10,000/Kg, was the dominant species on the pasture. To test its pathogenicity, 8 naive lambs and 8 lambs which had been given repeated infections from 6 weeks old were challenged from 5 months old with 220-430 N. spathiger L3/Kg/day. All were individually fed dried grass nuts with 14 per cent protein and experiments included appropriate ad lib and pair-fed controls. Lambs were killed 21, 39 and 53 days after the commencement of infection. Highest infections, representing up to 64 per cent establishment, were present at 21 days but were almost eliminated by 53 days. The effects of the parasitism were minimal. Although 4 of the secondarily infected animals showed intermittent softening of the faeces or mild diarrhoea, the appetite and growth rate of only one was temporarily depressed. Diarrhoea did not accompany primary infection but 2 lambs did show transitory appetite and growth depression. All the remaining animals appeared unaffected despite the probable presence of 50-115,000 worms.

13A-4

THE OCCURRENCE AND VITALITY OF CYSTICERCUS TENUICOLLIS IN THE OMENTUM MAJUS OF SHEEP M.-A. Hasslinger & R. Weber-Werringhen. Veterinary Faculty, University of Munich, Kaulbachstr. 37, D-8000 München 22 (FRG)

During the course of one year the Omentum majus of 4.710 slaughter sheep was examined for Cysticercus tenuicollis. In 785 animals (16,7%) an average infestation intensity of 2.2 cysticerci per animal could be found; maximal 117 C.tenuicollis occurred in one animal. For internal reasons it was not possible to infect dogs as adequate final hosts, in order to check the vitality and the assumed infectivity. Therefore the criteria had to be judged according to the state of the cysticerci of the tapeworm with respect to their consistency and their ability to contract. Out of 1.706 detected cysticerci, 1.416 (83%) were vital and 1.332 (78,1%) seemed to be capable to infect. The results concerning the occurrence and vitality of T.hydatigena metacestodes are discussed comparatively and aspects of prophylaxis and therapy in modern sheep farming are mentioned.

13A-5

EXAMINATION OF WOOL FOR DETECTION OF DAMALINIA OVIS INFESTED FLOCKS. F.C. Wilkinson*, G.A. Wise. Department of Agriculture, 3 Baron-Hay Court, South Perth, Western Australia.

Over half the Damalinia ovis on sheep are removed with the fleece at shearing and are baled with the wool. These lice die but their carcases remain indefinitely in the fleece. As a part of wool yield testing prior to sale, bales of wool are core tested. A sub sample of 40 grams of scoured core wool is dissolved in boiling 10% caustic soda. The residue, mainly vegetable matter, is strained and dried before being assessed for weight of seed/shive and other matter. If lice are present they are in the seed/shive portion of the residue. Their exoskeletons can be easily seen if the seed/shive is spread onto a clear plastic sheet and viewed by a 10X magnifying video camera connected to a high resolution monitor. To assess the sensitivity of the test, wool clips from 90 flocks with varying degrees of D. ovis infestation were tested. An average of 4 fleece lines per wool clip were examined. In 73 clips one or more fleece lines had one or more lice detected by the test. The sensitivity of the test was thus 82%. The test is to be used routinely for detection of lice and monitoring progress of a lice eradication programme in Western Australia, where 35 million sheep are run on 11,000 farms. (Supported by the Australian Wool Corporation. Test developed by the Australian Wool Testing Authority).

Pathophysiology / Pathophysiologie

13A-6

PLASMA PEPSINOGEN CHARACTERISTICS IN CATTLE DURING THREE DIFFERENT INFECTION REGIMENS OF OSTERTAGIA OSTERTAGI. Q.A. McKellar* & P.D. Eckersall, Departments of Veterinary Pharmacology & Clinical Biochemistry, University of Glasgow, Glasgow, Scotland.

The plasma pepsinogen activity in previously parasite naive calves and in immune adult dairy cattle was investigated after different exposure regimens to the abomasal nematode O.ostertagi. Plasma pepsinogen activity was estimated by a standard enzyme degradation technique using a bovine serum albumin substrate, and a more detailed study of the pepsinogen biochemistry was undertaken using fast protein liquid chromatography. Calves infected orally with third stage larvae (L_3) of O.ostertagi or infected with adult O.ostertagi by direct transplantation into the abomasum had raised plasma pepsinogen activity, Mean - 5.7 international units (I.U.) and 3.9 I.U. respectively, as did four year old dairy cattle challenged with O.ostertagi L_3 (2.5 I.U.). Plasma pepsinogen activity was disproportionately high when compared with necropsy worm burdens, after transplantation of adult parasites into previously naive calves. The pepsinogen activity in the plasma of these calves, and in the plasma of dairy cattle after exposure to challenge with O.ostertagi L_3 rose more quickly than it did in previously parasite naive calves infected orally with O.ostertagi L_3. In each of the parasitic infection regimens two forms of pepsinogens; pepsinogen I (PGI) and pepsinogen II (PGII) were identified, and the ratio of PGI:PGII was approximately similar (30:1) in each situation.

13B-1

BLOOD ENZYMES AND WEIGHT GAIN OF SARCOCYSTIS MIESCHERIANA INFECTED PIGS. A. Daugschies. School of Veterinary Medicine, Hannover, W.-Germany.

Effects of S. miescheriana on blood enzymes and body weight were compared in stress sensitive (H+) and stress insensitive (H-) pigs. Ten H+ pigs and ten H- pigs were each inoculated orally with $5x10^4$ sporocysts of S. miescheriana. Twelve H+ and ten H- pigs served as non-infected controls. Five days a.i. and 58 days p.i. all pigs were myostress challenged (CK-test). From 3 weeks a.i. to 13 weeks p.i. body weights were determined and blood samples taken at weekly intervals. CK and ASAT were determined in blood plasma. The Sarcocystis infection resulted in significantly increased enzyme values in both H+ and H- pigs. The myostress injection at 5 days a.i. (1st CK test) resulted in significantly higher enzyme values in H+ pigs, while myostress injection at 58 days p.i. (2nd CK test) yielded higher enzyme activities in the infected pigs regardless of stress susceptibility. The mean body weight of the infected pigs was significantly reduced. Blood enzymes are suitable to distinguish hereditary stress susceptibility for pig breeding purposes. The similar elevated blood enzyme levels in both infected H+ and H- pigs may mask this feature. Prolonged sarcosporidial infection should be considered when using blood enzyme values as a selection criterion for breeding pigs. Lowered growth rates point to the economic significance of this parasitosis.

13B-2

LOCAL RESPONSES IN SMALL INTESTINE AND ABOMASUM OF CALVES INFECTED WITH COOPERIA ONCOPHORA OR OSTERTAGIA OSTERTAGI. K. Frankena*#, J. v/d Berg#, J.M.V.M. Mouwen## and J. van Dijk##. # Dept. of Anim. Husb., Agric. Univ., Wageningen, The Netherlands. ## Dept. of Path., Vet. Univ., Utrecht, The Netherlands.

In a pilot experiment 6 calves, having cannulas in small intestine and abomasum, were repeatedly infected with small doses of C. oncophora or O. ostertagi larvae for 5 weeks. After anthelmintic treatment a concurrent challenge infection was given. Courses of local immune responses in small intestine and abomasum were monitored by sampling mucosae of both organs weekly.

Small intestine. During primary C. oncophora infections IgM plasma cells were found within 2 weeks after the first inoculation. Numbers of eosinophils and IgG2- and IgA plasma cells were increased during the fourth and fifth week. After challenge these three celltypes responded earlier when compared to the primary infection. Globular leucocytes were found during the third and fourth week after challenge.

Abomasum. Results for O. ostertagi infected abomasae were quite similar as for C. oncophora infected intestines except that no IgM and globular leucocyte responses were found. After challenge a marked basophilic reaction was noticed.

Results of this pilot indicate that techniques used are adequate for further investigation of the complex local immune responses to gastrointestinal nematodes in cattle. In these responses eosinophils, basophils, globular leucocytes and plasmacells might be involved.

13B-3

PARASITOLOGICAL, PATHOLOGICAL AND METABOLISM STUDIES ON COOPERIA ONCOPHORA INFECTIONS IN CALVES.
P.N. McWilliam*[2], J.J. Parkins[1], J. Armour[1], P.H. Holmes[1] and K. Bairden[1]
Faculty of Veterinary Medicine, The University of Glasgow, Scotland.[1]
Pfizer Limited, Sandwich, Kent, U.K.[2]

Daily infections of calves with 10,000 Cooperia oncophora larvae for a six-week period resulted in reduced feed intake and weight gain with impaired nitrogen retention and loss of plasma proteins into the gut compared with a parasite-free control group. Digestive efficiency was not affected by infection. Necropsies were conducted in weeks 3, 6 and 10 following the initial larval dose when infection occurred in the duodenum, jejunum and ileum and many larval stages were present in the mucosa of the small intestine with stunting and thickening of the villi and excessive mucus production. After 12 weeks most C. oncophora had been expelled but some loss of plasma proteins into the gut was still occurring. A third group of calves was similarly infected but had prior administration of a morantel sustained release bolus which was shown to prevent the changes observed in the infected animals.

Pathophysiology / Pathophysiologie
Zoonoses / Zoonoses

13B-4

"TRIC-F", AN ANTIGEN BINDING PROTEIN THAT IS FORMED IN MICE INFECTED WITH THE INTESTINAL NEMATODE TRICHINELLA SPIRALIS. H.K. Parmentier[1], E.J. Ruitenberg[1,2*], P.W. Askenase[3] & H. van Loveren[2]. [1]Dept. of Immunology, Vet. Faculty, Utrecht, The Netherlands. [2]Dept. of Pathology, Nat. Institute of Public Health and Environmental Hygiene, Bilthoven, The Netherlands. [3]Dept. of Internal Medicine, Yale University, New Haven, USA.

The T-cell dependent influx of inflammatory cells in the gut of T.spiralis infected mice requires the release of serotonin by as yet unindentified cells. In this respect it resembles murine T-cell dependent cellular infiltrates characteristic for skin delayed-type hypersensitivity (DTH) responses to contact sensitizers. In the latter models binding of antigen to antigen-specific T-cell derived factors attached to mast cells induces these mast cells to release serotonin, thus facilitating the local influx of T-cells and inflammatory cells. These antigen-specific factors with activity analogous to IgE can be obtained and purified from lymphocyte cultures within a few days after primary in vivo sensitization.
Data will be presented that indicate that also in T.spiralis infected mice antigen-binding protein(s), designated Tric-F, are produced by T-cells at an early phase of infection, that have similar biochemical, biological and physiological characteristics as T-cell factors operating in skin DTH. Though the function of Tric-F remains to be further elucidated, evidence is provided that this protein is involved in both initiating and feedback suppression of intestinal inflammation, but not in expulsion of adult T.spiralis worms from the gut.

13B-5

MEASUREMENT OF BODY COMPOSITION: ITS RELEVANCE IN PARASITOLOGY
W. Mulligan*, University of Glasgow Veterinary School, Scotland.

The influence of parasitic infections on production is often assessed in terms of body weight changes in the host. Ideally this should be extended to take account of changes in body composition, measured if possible by non destructive methods of analysis. Neutron activation is a valuable technique to use in such studies but requires special facilities in the form of a suitable neutron source and whole-body counter. Information on body composition can also by obtained by compartmental analysis based on isotope dilution procedures. Of these the measurement of total body water by the dilution of TOH has been extensively investigated. Although simple in principle, considerable care is required in several aspects of the analytical procedure to guarantee adequate precision and in the interpretation of results where the normal relationship between body water and 'lean body mass' is disturbed by pathological processes.

14A-1

HUMAN TOXOCARIASIS: ROLE OF IgE IN DIAGNOSIS.
C. Genchi*, P. Falagiani, G. Mistrello, G. Riva & I. Masi. Faculty of Veterinary Medicine, University of Milan; Lofarma Laboratories, Milan, Italy.

In previuos studies it was observed that the immunological response to migrating larvae of Toxocara canis in human beings belonged to both IgG and IgE classes. In such studies the presence of IgE antibodies (RAST method) seemed to be more reliable for the diagnosis of ocular syndrome. Aim of the present study was to identify IgE-binding antigenic fractions. Excretory-secretory antigen obtained by cultivating T.canis 2nd stage larvae was employed. The analysis of the antigen was carried out by crossed immunoelectrophoresis (CIE) and crossed radio immunoelectrophoresis (CRIE) in an IgE system. Radio allergo sorbent test (RAST) and ELISA were used for detection of antibodies in sera. Three different antigens were identified by CRIE analysis. Some of these antigens showed to react with IgE antibodies. The CRIE patterns observed with sera from patients seemed to be different in relation to the two major syndromes (ocular and visceral).
(Supported by M.P.I. Grant (40%).

14A-2

CONTROL OF ENDEMIC NEUROCYSTICERCOSIS BY A LARGE-SCALE TREATMENT OF HUMAN TAENIASIS: ECUADORIAN EXPERIENCE.
Z.Pawlowski*, A.Davis, H.Dixon & M.Cruz. Parasitic Diseases Programme, World Health Organization, Geneva & Centro de Investigacion y Entratamiento en Neurociencias, Quito.

Hyperendemic human cysticercosis remains a serious public health problem in some areas and traditional control measures, such as meat inspection, sanitation, changes in pig husbandry cannot be effected rapidly. In such situations large-scale chemotherapy of human Taenia solium taeniasis offers an attractive alternative in theory. In study area in Loja Province Ecuador, neurocysticercosis in man was common (prevalence of epilepsy 12,4 per 1000), prevalence of human taeniasis varried from 0 to 20%, prevalence of pig cysticercosis was between 0 and 11%. Of 13,290 people examined, 9,326 were treated orally with a single dose of praziquantel (3.4-8.7 mg/kg body weight; mean 5.4 mg/kg) The treatment was accepted well and only a few side-effects of minimal clinical importance were reported. Expulsion of a tapeworm was noted in 149 people. The final evaluation of this chemotherapeutic studies will be presented in detail. It can be concluded from this study that large scale chemotherapy with praziquantel protected several hundreds of people against the risk of neurocysticercosis at least temporarily. The duration of protection will be ascertained by long term follow-up.

Zoonoses / Zoonoses
Pathophysiology and Biochemistry / Pathophysiologie et biochimie

14A-3

ECHINOCOCCUS GRANULOSUS STRAINS AND POSSIBILITY OF THEIR USAGE FOR PREVENTION OF ECHINOCOCCOSIS. A.S.Bessonov, V.B.Yastreb. The All-Union K.I.Skryabin Institute of Helminthology, Moscow, the USSR.

I6672 cattle, 8375 sheep and I7323 pigs were examined in the European part of the USSR for hydatidosis. Active functioning of two E.granulosus strains: pig in the West and sheep in the South-East of the region was established. Period of preimaginal development of sheep strain from Kazakhstan was shorter than of pig strain from the Ukraine (48.3 ± 2.42 days and 58.8 ± 2.26 days), and period of preinfective development of larvocysts was longer in sheep strain (I6 months) than in pig one (I2 months). Protoscoleces of larvocysts of the first strain administered to white mice intraperitoneally survived well and formed secondary larvocysts, and protoscoleces of larvocysts of the second strain did not survive. Protoscoleces and adult cestodes of the both strains had some morphological differences (the number and sizes of hooks, the number of proglottids and size of cestode). Immunization of sheep and pig with heterologous E.granulosus strains (sheep - with pig strain and pigs - with sheep strain) did not prevent their infection with homologous strains. However the latter mostly perished at different stages of development and did not survive till infective stage.

14A-4

HYDATIDOSIS IN BUFFALOES (BUBALUS BUBALIS). H.S. Gill. Department of Microbiology, University of Maiduguri, PMB 1069, Maiduguri, Nigeria.

In India, buffaloes comprise 1/3 of the total bovine population and are the main source of milk and beef. A survey of hydatid cysts in 605 buffaloes was carried out in the abattoir at Barielly, U.P., India. An infection rate of 32.7 percent was recorded. The infection rate was low (28.7%) in males as compared to that in the females (33.8%). Of all the cysts, 58.1 percent were in lungs alone, 13.5 percent in liver alone and 28.4 percent in both lungs and liver. A fertility rate of 88.0 percent was noted. In some brood capsules, the origin of protoscolices was either endogenous or both endogenous and exogenous. The dogs fed hydatid cysts from buffaloes started shedding eggs of Echinococcus granulosus between 57 and 59 days. The high infection rate of hydatid cysts in buffaloes recorded was due to the fact that in India the carcasses and slaughter house offals are left for stray dogs.

14A-5

DOMESTIC AND WILD ANIMALS INFECTED WITH GIARDIA OF THE DUODENALIS TYPE. G.M. Faubert, Institute of Parasitology, McGill University, Montreal, Canada.

Giardia duodenalis has a worldwide distribution and according to a recent World Health Organization estimate, there are 200 million people infected. It is one of the top ten parasitic infections affecting man. In Canada, the number of giardiasis cases reported is equal to that of Salmonella cases. The debate over interspecies transmission of Giardia, especially between humans and other mammals has been active intermittently for more than 80 years. Those who believe that Giardia is strictly host specific have ascribed species status to the organisms on the basis of the animal host from which they are obtained. However, recent studies have demonstrated that, at least in some cases, Giardia can be transmitted between animal species. Because of the role that the beaver plays in water-borne giardiasis, the disease is often called "beaver fever". In this presentation, it is my aim to demonstrate that other animals (wild and domestic) can also play a role in water-borne giardiasis. The disease can also be transmitted after personal contact with infected domestic animals. (Supported by NSERC and MRC).

15A-1

ELECTRON MICROSCOPICAL STUDY ON BOVINE ONCHOCERCIASIS: DAMAGE TO BOVINE SKIN ASSOCIATED WITH MICROFILARIAE OF ONCHOCERCA GUTTUROSA (NEUMAN: 1910). G.N. Isitor*[1], V.C. Ogbogu[2] & Y.O. Ogunkoya[2].

School of Veterinary Medicine, Faculty of Medical Sciences, Eric Williams Medical Sciences Complex, University of the West Indies, St. Augustine, Trinidad, W.I.

[2] Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.

Transmission electron microscopical study of nodular and scabby lesions of Zebu (White Fulani) cattle naturally infested with Onchocerca gutturosa microfilariae revealed damages on dermal collagen fibres. The damages ranged from loss of usual periodicity along fiber lengths, and ill-delineation of individual fibres to total degeneration and necrosis of tissue components especially around dead Mff. Amorphous electron dense deposits representing either elastic fibres or immune complexes were abundant within collagen bundles of Mff. infested specimens, and tended to disrupt bundle arrangements. The overall collagen fiber damage was attributable to direct possible chemical-enzymatic action of living Mff. as well as indirect disruptive effect of excessive electron dense deposits, and reactions around dead Mff.
(Supported by Ahmadu Bello University Grant).

15A-2

THE CELLULAR REACTIONS IN THE SKIN OF RABBITS IN RESPONSE TO SIMULTANEOUS FEEDING OF RHIPICEPHALUS APPENDICULATUS AND AMBLYOMMA VARIEGATUM.

A.A. Latif. The International Centre of Insect Physiology and Ecology, Nairobi, Kenya.

Histological examination of the host skin at the site of tick attachment were carried out on rabbits 48 h after simultaneous infestation with two tick species, R. appendiculatus and A. variegatum. The comparisons were made with nymphs on 3 groups and these were tick-naive and sensitized rabbits to either tick species by repeated feeding. A. variegatum feeding lesions in tick-naive rabbits were extensive and the total number of inflammatory cells was about 10 times greater than the feeding lesions of the other species. The host reactions of rabbits which were sensitized to either species was characterized by the development of clearly demarcated and compact lesions and intra-epidermal vesicles and bullae were formed which was not apparent with the tick-naive group. The feeding of A. variegatum nymphs on rabbits sensitized to R. appendiculatus produced a similar type of reactions. On the other hand, the cellular response and tissue reactions of R. appendiculatus in the skin of sensitized rabbits to the other species was negligible. This situation partly substantiate the results from the tick feeding performance. Thus, rabbits made resistant to R. appendiculatus also showed considerable resistance to the other tick species while R. appendiculatus nymphs fed successfully to normal sizes on rabbits resistant to A. variegatum.

15A-3

DERMATITIS IN DOGS ASSOCIATED WITH PELODERA STRONGYLOIDES.

S. Nikander*. College of Veterinary Medicine, Laboratory of Parasitology, 00550 Helsinki, Finland

Pelodera strongyloides, is normally a freeliving small saprofytic mematode, which under favourable conditions may invade the skin of domestic animals. In dogs, nine cases have been verified in Finland since 1975. The skin lesions are mainly located to body parts wich have contact with the ground when the dog is sitting or laying down. The size of the lesions varies from small papula to large affected areas. The coat is tangled on the papula, but later on the skin becomes hairless, hyperemic, wet and crustated. Intense pruritus leads to excoriation and secondary infections. In skin scrapings from affected areas, larvae and adults of Pelodera strongyloides have been identified. In histological sections the nematodes were found in hair follicles. Injuried areas were infiltrated by granulocytes, eosinophilis and mast cells. Organic phosphorous compounds and ivermectin have been succesfully used in the treatment of affected dogs.

15A-4

THE ROLE OF DEHYDROGENASES AND ESTERASES IN COENURUS CEREBRALIS (MULTICEPS MULTICEPS) A PARASITE OF SHEEP.

G.V.Rama Krishna* & Qamar Hasan
Department of Zoology, Nizam College, Osmania University, Hyderabad, India.
Department of Parasitology, A & M University, Texas, U.S.

The localization, distribution and significance of different dehydrogenases like, succinate, lactate, malate, glutamate, isocitrate and glucose 6-phosphate dehydrogenase have been studied in detail in the frozen sections of Coenurus cerebralis (Multiceps multiceps) collected from the brain of sheep. It has been observed that reversal of tricarboxylic acid cycle is functional in this cestode. Glycolytic enzymes were more active. The presence of glucose 6-phosphate dehydrogenase in this worm indicates that hexose mono phosphate shunt may be functional. The different types of esterases were also localized using different substrates and inhibitors. Acetylcholinesterase was found to be more active than other esterases. The neuroanatomy of the worm was traced with the help of esterase localization.

15A-5

BINDING PROPERTIES OF DIETHYLCARBAMAZINE IN RELATION TO MODE OF ACTION.

N.A. Pampori, N. Agarwal & V.M.L. Srivastava*. Central Drug Research Institute, Lucknow, India.

Chemotherapeutic action of diethylcarbamazine (DEC) is believed to begin with the rapid entrapment of microfilariae in liver where they are destroyed by a complex process. To understand the mechanism of this trapping, interaction of DEC with liver plasma membrane of rodent hosts as well as with the macromolecules of biological importance was examined. The membrane was prepared by density gradient centrifugation. Incubation with ^{14}C-labelled DEC followed by repeated washing by centrifugation indicated that the drug reacted with the membrane in a nonspecific manner possessing both saturable and unsaturable components. Binding with serum determined by equilibrium dialysis exhibited similar pattern except that the saturation in this case was achieved at much lower concentration of DEC. The data obtained with a variety of macromolecules, particularly with the homopolymers of amino acids, suggested that the saturable binding possibly involved ionic interaction while the unsaturable component occured due to hydrophobic bonds. The nonspecific nature of DEC interaction accompanied with its affinity for all types of substances and tissues do not provide any convincing clue for the accumulation of microfilariae specifically in liver in response to the drug administration.

(^{14}C-DEC was obtained from Stanford Research Institute, U.S.A. as a gift by World Health Organization).

Pathophysiology and Biochemistry / Pathophysiologie et biochimie
Trypanosomiasis / Trypanosomiose

15A-6

INTERVENTION DES PROSTAGLANDINES DANS LA RELATION HOTE-PARASITE : CAS DES INFESTATIONS HELMINTHIQUES DE L'ABOMASUM DU MOUTON. A. Dakkak*, Département de Parasitologie, Institut Agronomique et Vétérinaire Hassan II BP 6202 Rabat-Instituts, Maroc

L'enregistrement en continu de la différence du potentiel transmural de l'abomasum (DDP) chez des moutons soumis à des infestations expérimentales par Haemonchus contortus ou Ostertagia circumcincta montre que l'intégrité de la muqueuse abomasale est modifiée dès les premiers contacts des réservoirs gastriques avec les parasites. L'augmentation de la DDP est associée, au niveau du contenu abomasal, à une augmentation de la concentration en ions HCO_3^- et du pH et à une diminution des concentrations en ions K^+ et Cl^-. Ces résultats ont suggéré l'intervention des prostaglandines dans la relation hôte-parasite qui a été étudiée. L'inhibition de leur synthèse supprime l'augmentation de la DDP normalement concomitante du parasitisme et profite au développement des vers. Inversement, l'administration in situ de leur précurseur, l'acide arachidonique, restaure, après avoir accentué momentanément les troubles provoqués par le parasitisme, l'intégrité de la muqueuse abomasale et élimine plus de 90 % des vers.

16A-1

AFRICAN TRYPANOSOMIASIS IN CATTLE: IMPROVED PERFORMANCE BY CHEMOPROPHYLAXIS. Max Murray*, Glasgow University Veterinary School, Scotland, J.C.M. Trail, ILCA, Nairobi, Kenya & S.H. Maloo, Veterinary Department, Kenya.

Tsetse-transmitted trypanosomiasis represents one of the most important constraints to livestock development in Africa. No field vaccine is available and efforts to control tsetse by insecticide are costly and complex. Although trypanocidal drugs exist, there is a lack of data on their cost-effectiveness in terms of overall animal performance, and a lack of confidence that they can be used on a large scale, particularly in village managed systems where 90% of Africa's cattle are maintained. However, at Mkwaja Ranch, Tanzania, the use of the prophylactic drug Samorin at times of greatest trypanosomiasis risk (average of 4 treatments per year) achieved a level of productivity in Boran cattle, in an area where tsetse challenge is so severe that cattle rapidly succumb if untreated, approximately 80% of that of Kenya Boran reared in tsetse-free ranches considered the best in the world. At the same time, in a village location in a tsetse-infested area in the Coast Province of Kenya, the strategic use of Samorin (three times a year) increased the productivity of East African Zebu by over 30%. The fact that these results were based on very large databases collected over several years offers hope for livestock development in the vast tsetse-infested areas of Africa by the rational use of trypanocidal drugs as an integral part of management.

16A-2

A RATIONAL APPROACH TO THE DEVELOPMENT OF NEW DRUGS AGAINST TRYPANOSOMIASIS. F.R. Opperdoes, Research Unit for Tropical Diseases, International Institute of Cellular and Molecular Pathology, B-1200, Brussels, Belgium.

African trypanosomes, the causative agents of sleeping sickness in man and nagana in cattle, are totally dependent on glycolysis as their sole energy producing pathway. In these organisms glycolysis is partly located inside membrane-surrounded organelles, called glycosomes. These organelles are unique to Trypanosomatidae. The glycolytic enzymes may, therefore, constitute an excellent target for chemotherapeutic attack. We have isolated nine of the glycolytic enzymes of Trypanosoma brucei and have studied them in detail. The genes coding for four of these enzymes have been characterized and sequenced and two of the enzymes have already been crystallized. The complete three-dimensional structure of one of them (triosephosphate isomerase) has been solved. Sequence and structural comparison with homologous enzymes from other organisms has revealed unique properties on the surface of at least three of the trypanosomal enzymes which could be exploited for the development of new drugs.

16A-3

CHROMOSOME PROFILES OF TRYPANOSOMA CONGOLENSE ISOLATES FROM THE COASTAL AREA OF KENYA. R.A. Masake*, V. Nyambati, V.M. Nantulya and S.K. Moloo, ILRAD, P.O. Box 30709, Nairobi, Kenya.

Immunity to tsetse-transmitted Trypanosoma congolense can readily be induced in animals under experimental conditions, but the immunity elicited is serodeme (variable antigen repertoire or strain) -specific. A vaccine against T. congolense would only be feasible, therefore, if the number of serodemes for this trypanosome species is limited. At present this information is lacking because the technology for serodeme identification is rather cumbersome. Recently we have used the orthogonal field-alternation gel electrophoresis technique to examine the relationship between serodeme and the electrophoretic profile of chromosome-sized DNA molecules of several T. congolense populations. We found that trypanosome populations belonging to the same serodeme displayed a similar chromosome profile with respect to the number and relative position of chromosome bands. We have extended these observations by analyzing the chromosome profiles of 90 different clones derived from 41 isolates from the Kenya coast. The 90 clones were divided into 7 distinct groups, herein designated as "karyodemes". The clones within each karyodeme had an identical chromosome profile with respect to number and relative position of the bands. Using variable antigen repertoire-specific serum from spontaneously recovered cattle or goats, it was demonstrated by cross-neutralization that clones within a karyodeme express the same VAT-repertoire. It would appear, therefore, that identity in chromosome-sized DNA-molecular bands correlates with serodeme identity.

Trypanosomiasis / Trypanosomiose
Chemotherapy in equines / Chimiothérapie chez les chevaux

16A-4

EXPERIMENTAL INFECTIONS OF DOGS WITH NORTH AMERICAN ISOLATES OF TRYPANOSOMA CRUZI. S.C. Barr, R.A. Holmes, C. Brown, V.A. Dennis, & T.R. Klei. Vet. Micro. & Parasitol., Louisiana State University, Baton Rouge, LA., 70803, USA.

The occurrence and biological characteristics of T. cruzi isolates from a dog, opossum and armadillo have been previously described by our laboratory. The dog T. cruzi isolate (T.c.-D) shows different in vitro, in vivo and zymodeme patterns from opossum (T.c.-O) and armadillo (T.c.-A) isolates. CF1 mice infected with T.c.-O and T.c.-A show higher parasitemias, weight gains and tissue amasigote levels than mice infected with T.c.-D. In an attempt to establish infections in dogs, 4 week old pups were inoculated by different routes (s.c. & i.p.) and doses of culture forms. Four female pups (litter mates) developed severe acute necrotizing myocarditis necessitating euthanasia 2½ weeks post infection with T.c.-A. One male pup inoculated with T.c.-D maintained a low parasitemia but no clinical disease. In a subsequent study, the three T. cruzi isolates were inoculated into 2 pups each (1 male, 1 female) and monitored using clinical, EKG, M-mode echocardiographic, nonselective digital subtraction angiographic, clinical pathologic, parasitologic and pathologic parameters. Pups infected with T.c.-O and T.c.-A showed similar changes in the above parameters including acute mycocarditis at 2½ weeks. Two pups survived the acute myocarditis to develop clinical chronic cardiomyopathy. Pups infected with the dog isolate developed a low level parasitemia and no disease. This is the first report of experimental infections in dogs using North American T. cruzi isolates.

18A-1

SEASONAL INCIDENCE AND IMPACT OF GASTROINTESTINAL PARASITES ON DEVELOPING PONY FOALS IN LOUISIANA. D.D. French*, T.R. Klei, M.R. Chapman & H.W. Taylor. Veterinary Science, Louisiana State University, Baton Rouge, LA., 70803, USA.

Thirty-two pony mares and their foals were divided into two similar groups and placed on separate but similar 8 acre pastures in Feb. 1986 and monitored through Dec. 1986. One group of mares and foals served as nontreated controls and the other group received anthelmintic (ivermectin) treatment at regular 8 week intervals. Condition of mares and foals of both groups was monitored by a scoring system, body weights and back fat values as determined by ultrasonic techniques. Fecal egg per gram counts (EPG) and strongyle larval cultures were made at monthly intervals. Pasture strongyle larvae (L_3) burdens were assessed biweekly by collection of pasture grass samples. Peak transmission of equine strongyles occured in May and October. Pasture larval burdens were dramatically reduced during the hot summer months. Eight week anthelmintic treatment effectively reduced pasture larval burdens by 93 to 100% and EPG values in the treated group remained at or near 0. Strongyloides westeri transmission was almost completely inhibited in foals of treated mares. Parascaris equorum eggs were not seen in treated foals. Large strongyle larvae and associated lesions were absent in treated foals. Yearlings raised from treated mares weighed an average of 45% more than those from nontreated controls. Other measurements of condition showed similar marked differences between groups, quantitatively demonstrating the role of parasitism in foal development.

17A-1

THE AFRICAN TRYPANOTOLERANT LIVESTOCK NETWORK. J.C.M. Trail* and G. d'Ieteren. International Livestock Centre for Africa, P.O. Box 46847, Nairobi, Kenya.

The African Trypanotolerant Livestock Network groups together scientists studying one of the most promising of the possible solutions to the problem of African trypanosomiasis, the increased utilisation of trypanotolerant livestock. In collaboration with national research and development institutions and private organisations, an extensive network of research sites has been established in different trypanosomiasis areas throughout tropical Africa. The overall aim is to improve livestock production in tsetse-infested areas of Africa by achieving a better understanding of genetic resistance, acquired resistance, environmental factors which affect susceptibility and the efficacy of control measures. This paper indicates the distribution of field programmes that are contributing to the Network and illustrates the wide range of combinations of tsetse populations and livestock systems from which data are being collected. Results obtained from 1984-1986 on aspects of tsetse challenge, trypanosome prevalence and livestock productivity show important linkages that have merited the establishment of additional in-depth studies. In terms of the eventual production of genetically improved trypanotolerant livestock, selection criteria need to be defined that are easily and cheaply measured. The relationships between the measures of parasitaemia level in the blood and packed red cell volume per cent (PCV) and the important performance traits contributing to overall livestock productivity are evaluated.

18A-2

EVALUATION OF THE ACTIVITY OF IVERMECTIN AGAINST PARASCARIS EQUORUM. J.A. DiPietro*, T.F. Lock, & K. S. Todd, Jr., College of Veterinary Medicine, University of Illinois, Urbana, IL, USA.

Two controlled studies were carried out to evaluate the efficacy of ivermectin against intestinal and migratory stages of P equorum. In the first study 20 ponies, naturally infected with P equorum, were treated with either 0.2 mg of ivermectin /kg (n=10) or placebo (n=10; controls). Significantly ($p<0.02$) higher mean total numbers of P equorum were found in the small intestinal contents of the controls, 51 and 21, than in the ivermectin treated ponies, 0 and 3, at necropsy 14 and 35 days post-treatment (PT) respectively. Gross examination of liver and lung tissues revealed damage as a result of P equorum infections in all ponies. P equorum eggs were detected in the feces of all ponies prior to treatment, in control ponies throughout the study, and in ivermectin treated ponies until 7 days PT. In another study 15 pony foals were inoculated with 1500 infective P equorum eggs. Treatments administered 11 days post-inoculation (PI) included 200 mcg of ivermectin /kg as paste (n=5) or liquid (n=5) and no treatment (controls;n=5). The foals were euthanatized 25 days PI and 4th-stage P equorum larvae were not found in foals treated with ivermectin liquid or paste, while significantly ($P<0.05$) higher mean numbers (960.9 ± 2.00) were found in the controls.

Chemotherapy in equines / Chimiothérapie chez les chevaux

18A-3

CONTROLLED TRIAL OF DIENBENDAZOLE (VET 220) AND ANALOG VET 220-S AGAINST PRE-PATENT AND PATENT PARASCARIS EQUORUM RESULTING FROM EXPERIMENTAL INFECTION.
T.R. Bello, Sandhill Equine Center, Southern Pines, N.C., 28387, U.S.A.

Antiascarid effect of dienbendazole (VET 220) was determined in a controlled trial of 24 pony weanlings, each given 10,000 infective Parascaris equorum eggs and treated when the infection became patent. Single treatments of VET 220 were given at 0, 2.5, 5.0 or 10.0 mg/kg. A more stable analog, VET 220-S, was tested in a controlled trial of 18 pony weanlings. These also were given 10,000 P. equorum eggs at 4 weeks of age and treated at 9 to 11 weeks before the infections became patent, but when the worms had almost attained adult mass. The VET 220-S was given at 0, 2.5 or 5.0 mg/kg. Feces passed for 7 days was collected and examined. Ascarids in weanlings at necropsy were compared with those in feces and in the controls. Efficacy of VET 220 was 94, 100 and 100% against mature P. equorum and that of VET 220-S was 90 and 100% against large-mass prepatent infections. No adverse effects were related to treatment with either analog. There was no clinical improvement after treatment of prepatent infection, but noticeable improvement of attitude, appetite and apparent intestinal mobility in ponies treated with patent infections.
(Supported by Agrimont S.p.A., Milan, Italy).

18A-4

CONTROL OF BENZIMIDAZOLE-RESISTANT EQUINE CYATHOSTOMES AND OTHER NEMATODES WITH A COMBINATION PASTE CONTAINING OXFENDAZOLE AND PIPERAZINE.
J. B. Bentley, I. G. Pearson* and B. J. Freckelton, Syntex Research Institute of Agriscience and Syntex Agribusiness Australia, P. O. Box 92, Pennant Hills N.S.W. 2120 Australia.

Resistance of equine cyathostomes to benzimidazole anthelmintics is recognised in Australia and other countries. Although these small strongyles are less important clinically than the large strongyles, they can contribute to clinical disease and the continuing presence of small strongyle eggs in faeces interferes with follow-up checks on the efficacy of anthelmintic therapy. Piperazine (PIP), at doses of 80 to 100 mg of piperazine base/kg, is effective in controlling these parasites. Oxfendazole (OFZ) at 10 mg/kg, is highly effective against ascarids, large stronglyes and pinworms of horses. Mixtures of PIP at 5 to 20 mg/kg were studied in combination with OFZ at 10 mg/kg. Efficacy >99% was obtained at 20 mg PIP plus 10 mg OFZ/kg against natural infections of OFZ-resistant cyathostomes as well as the other parasites sensitive to OFZ. A convenient oral paste has been developed. This series of trials involved a total of 193 horses and efficacy was determined on the basis of post-treatment reductions in faecal egg counts. Samples were taken immediately prior to treatment and 7 to 14 days later.

18A-5

COMPARATIVE ANTHELMINTIC CONTROL OF EQUINE STRONGYLOSIS.
G.G. Lumsden & W.G. Ryan*. MSD AGVET, Hoddesdon, Herts, EN11 9BU, England.

To study required frequency of use of equine anthelmintics in grazing horses, comparisons were made among treatments with commercially available paste preparations of fenbendazole, pyrantel embonate and ivermectin, at four trial sites in Britain. A total of 108 horses were randomly allocated to treatment groups on the basis of pre-treatment faecal egg counts and age. At each site, horses grazed as a single group throughout the trial. Faecal egg output was monitored for eight weeks after treatment. Faecal samples from thirty of the thirty-six horses treated with ivermectin did not contain parasitic nematode ova during the eight week trial period. A total of nine positive counts ranging from 50 eggs per gram (epg) to 450 epg were detected in samples from the other six horses during the trial. In comparison, 30% or more of the pyrantel treated horses excreted parasitic nematode ova from five weeks post-treatment, and at each site, fenbendazole failed to totally eliminate faecal egg output even at the first sampling day one week post-treatment, suggesting the presence of benzimidazole resistance. On the basis of faecal egg output suppression, the results indicate that grazing horses treated with ivermectin paste would not require a second treatment for at least a further eight weeks. By contrast, to achieve similar control with pyrantel treatment, intervals should not exceed five to six weeks.

18A-6

ORAL LIQUID IVERMECTIN FOR HORSES: EFFICACY AND DURATION OF EFFECT.
R.J. Bell, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

A field trial was performed to determine the efficacy of ivermectin oral liquid administered to horses as a drench or by stomach tube. The efficacy of ivermectin oral liquid was compared to that of ivermectin paste (Eqvalan). In February 1986, 100 horses of various ages in two locations were randomly assigned to four groups - controls, no medication; ivermectin liquid as a drench; ivermectin liquid by naso-gastric intubation; ivermectin paste. On Day 0, 80% of the horses were found to have strongyle-type eggs (238±38 epg) and 59% of the horses had Parascaris equorum eggs (597±93 epg) in their feces. Fecal samples on Day 14 showed no parasite eggs in any ivermectin treated horses but 96% of the control horses had either strongyle-type or ascarid eggs in their feces (139±15 and 344±15 epg, respectively). On Day 14, ivermectin paste was administered to the control group. A significant reduction in fecal egg counts was maintained for 16 weeks following initial treatment. There was no significant difference between groups wormed by any route on Day 0 but fecal egg counts were significantly lower in the control group given ivermectin paste on Day 14. This indicates the effect of ivermectin may be declining between week 14 and week 16 post treatment.

(Supported by MSD Agvet)

Diagnosis / Diagnostic

19A-1

SENSITIVITY OF THE COPROLOGICAL TEST FOR SOME HELMINTHIASES OF RED FOXES. G. Poglayen*, M.Martini, V.Guberti & G.Battelli. Istituto di Malattie infettive, Profilassi e Polizia Veterinaria. Università di Bologna, Italy.

In order to evaluate the concordance between the results gained from coprological examination and those from necropsy, faecal samples and guts from 103 red foxes (Vulpes vulpes), shot in the province of Forlì (Italy), were examined for intestinal helminths. At the microscopic examination (dome after flotation in a sugar solution, of specific gravity 1.3), 4 animals were found positive for cestodes, 43 for Toxocara canis, 2 for Trichuris vulpis, and 16 for Ancylostomatidae. At the necropsy, 37 animals were found positive for cestodes (3 Dipylidium caninum, 10 Mesocestoides lineatus, 3 Taenia crassiceps, 13 T.hydatigena, 7 Taenia sp.,and 1 not identified), 47 for T.canis, 3 for T.vulpis, and 15 for Uncinaria stenocephala. Sensitivity values of the coprological test were: 10.8 % for cestodes, 91.5 % for T.canis, 66.7 % for T.vulpis, and 86.7 % for U.stenocephala. 3 foxes positive for eggs of Ancylostomatidae resulted negative. Mc Nemar's X^2 test for the discordance between the coprological results and necropsy ones gave a significant value ($P < 0.05$) only for cestodes.

(Supported by a grant of the Ministry of Education)

19A-2

IDENTIFICATION OF STRONGYLID EGGS BY MULTIVARIATE ANALYSIS OF MORPHOMETRICS. J.R. Georgi* New York State College of Veterinary Medicine, Cornell University, Ithaca, New York 14853, USA.

Eggs from the uteri of equine, ovine, and bovine strongylid nematodes and from the feces of hosts with known pure and mixed infections were viewed through a microscope equipped with a drawing tube focused on the surface of a digitizing tablet. As the perimeter of each egg was traced with the tablet's cursor, X and Y coordinates of every point were relayed to a microcomputer programmed to capture and store them. A second program then converted X and Y coordinates into 8 parameters: major axis, minor axis, perimeter, area, and area and perimeter of each pole. Each "pole" included 1/20 of the length of the major axis. Parameter values of sets of 100 eggs from up to 20 host species of strongylids from a particular host species were transformed into logarithms and subjected to stepwise discriminant analysis (BMDP, 7M). Slight morphometric differences between uterine and fecal eggs did not interfere with the utility of the former as reference standards. Between 75% and 100% of eggs of Haemonchus contortus, Ostertagia circumcincta, Trichostrongylus axei, T. colubriformis, Bunostomum trigonocephalum, Nematodirus spathiger, and N. filicolis were identified correctly depending on the morphometric distinctiveness of each of these species. (Supported by the Travers Fund and Project EZRA.)

19A-3

DIAGNOSIS OF SUBCLINICAL INFECTION IN HORSES ON LONG-TERM ANTIPARASITIC TREATMENT. T.R. Bello, Sandhill Equine Center, Southern Pines, N.C., 28387, U.S.A.

Long-term anthelmintic efficacy in 25-33 Thoroughbred horses under horse farm conditions was determined for 3 years. Treatment intervals were 8 weeks using pyrantel pamoate alternating with fenbendazole, then followed by ivermectin only for the next 2.5 years. Horses were treated with oral paste formulations of these drugs, based upon body weight. Diagnosis of infection was determined by parasite eggs-per-gram (EPG numbers obtained by centrifugal flotation of feces in sucrose solution (Sp.G. 1.20) collected at 2 week intervals. Strongyle larvae-per-gram (LPG) and larval differential counts were made by representative aliquots and by larvae concentration from Baermannized 14 day cultures of 100 Gm. of feces. Persistence of subclinical infection was seen by emergence of large and small strongyle species in the concentrated cultures that had provided negative EPG and LPG values. (Supported by Merck & Co., Rahway, N.J.)

19A-4

VARIOUS PROJECTS TO PROMOTE THE HEALTH AND LONGEVITY OF DONKEYS BY PARASITE CONTROL. *E.D. Svendsen*, W. Jordan, F. Taylor, A. Aluja, G. Evstathiou, D. Bliss. The International Donkey Protection Trust, Sidmouth, Devon, England.*

Current reports on anthelmintic work carried out in Mexico with reference to species identification, current results from Greece and details of setting up of new trial in Cyprus, Kenya and Ethiopia with specific regard to the donkey and mule to provide extension of working life. Special reference to bot infestation and other debilitating internal parasites. Setting up of sanctuary in Lamu, Kenya and introduction of first Professional Handbook of the Donkey, 245 page volume collating facts never previously available and already in demand on a world wide basis.

Diagnosis / Diagnostic
Chemotherapy in Poultry / Chimiothérapie chez les volailles

19A-5

MEDICATION OF CATTLE WITH THE ANTHELMINTIC NETOBIMIN IN DRINKING WATER. R.K. Prichard* and C. Trudeau, Institute of Parasitology, McGill University, Montreal, Québec, Canada H3A 2T6.

Netobimin, 2- {(Methoxycarbonylamine)-{2 nitro-5-(n-propylthio) phenylimino}, methylamino} ethane sulphonic acid can be prepared as a relatively insoluble zwitterion or as a water soluble ionic salt (e.g. trisamine). This allows it to be given by oral suspension, by injection, in-feed, or by dissolution in drinking water. In cattle it has been found that a drench of 7.5 or 20 mg/kg is effective against gastro intestinal nematodes, including arrested Ostertagia ostertagi larvae, lungworm, cestodes and trematodes. Evaluations of netobimin by in-drinking-water administration have shown that 2.8 mg/kg per day for 7 days is highly effective against both experimental and natural infections of O. ostertagi and Cooperia spp.

20A-1

DICLAZURIL (PINN), A NEW ANTICOCCIDIAL FOR BROILER CHICKENS. O. Vanparijs, L. Desplenter, G. Braem*, Janssen Pharmaceutica N.V., B-2340 Beerse, Belgium.

The anticoccidial activity of diclazuril, a new compound belonging to the benzeneacetonitriles, was studied in 2 series of experiments. Young chickens were infected (day 0) with Eimeria acervulina, E. brunetti, E. maxima, E. mitis, E. necatrix or E. tenella. The birds were given feed containing various dose levels of diclazuril from day 0 till day 7 in a dose titration study and from day -1 till day 6 in battery trials. Dose levels in the feed varied between 0.1 ppm and 10 ppm. Also infected untreated (IUC) and uninfected untreated (UUC) birds were included. The evaluation parameters were survival rate, relative weight gain, oocyst counts and dropping (titration) or lesion score (battery). The anticoccidial index (ACI) was calculated. In both series of experiments the IUC birds seriously suffered from coccidiosis as shown by negative influences on all parameters (ACI : 90-134). In medicated animals, a dose-related improvement of the ACI was noted. At the 1 ppm dose level of the battery trials, survival and relative weight gain was as good or almost as good as for the UUC group. Oocyst production was completely eliminated for all Eimeria species except for E. mitis and E. acervulina with very few oocysts counted. Lesion scores were drastically reduced and even zero for E. tenella (ACI 200) and E. acervulina (ACI 200) or almost zero for E. necatrix (ACI 197), E. brunetti (ACI 196) and E. mitis (ACI 188). With E. maxima (ACI 185), the reduction in lesion score was somewhat less pronounced but still no oocysts were found. The results indicate that diclazuril is a potent anticoccidial which is active against all major Eimeria species in chickens.
Further experiments are being conducted.

20A-2

CONTROL OF COCCIDIOSIS BY VACCINATION IN TWO YEARS OF COMMERCIAL ROASTER CHICKENS WITH A NEW VACCINE. E.-H. Lee* & A. Kennedy, Vetech Laboratories Ltd,, Rockwood, Ontario and Martin Feed Mills Ltd., Elmira, Ontario, Canada.

Eight consecutive crops or two years of commercial roaster chickens in an Ontario farm were successfully raised relying entirely on a new vaccine for coccidiosis control. The coccidiosis vaccine is a live vaccine licensed by Agriculture Canada to Vetech Laboratories Ltd. since May, 1985. (It is distributed as Immucox by Cyanamid Canada Inc. in Canada). A total of about 125,000 birds were vaccinated or averaged 15,600 birds per crop. The average daily gains of vaccinated birds were 3% significantly ($p<0.05$) higher than those of the seven consecutive monensin-medicated crops raised immediately before the use of vaccine. This was achieved despite the fact that the vaccinated birds were 20% more crowded (10.3 versus 8.9 birds per m2). The vaccinated birds averaged 3.03 kg in 59.7 days versus 3.26 kg in 65 days of medicated crops and with comparable feed conversion (2.22 for vaccinated and 2.36 for medicated birds). No anticoccidials were used in either the water or the feeds throughout the eight crops. Data on the use of the vaccine in broilers, breeders and layers will also be presented.

20A-3

EFFECT OF HALOFUGINONE ON EXPERIMENTAL CRYPTOSPORIDIOSIS IN THE BOBWHITE QUAIL (COLINUS VIRGINIANUS) M.G. Levy* and D.H. Ley, School of Veterinary Medicine and Core Center in Diarrheal Diseases, North Carolina State University, USA.

Effective drugs for the treatment or prevention of cryptosporidiosis are presently unavailable. Screening of potential therapeutic agents is hampered by lack of an appropriate small animal model. Infection of the bobwhite quail with a quail isolate of Cryptosporidium results in a severe, life-threatening enteritis. Patency is achieved on the second day following infection of 2-week old birds with 10^5 oocysts. Severe signs, including enteritis characterized by a fluid-filled intestinal tract and muscle wasting are noted soon thereafter. The severity of disease is quantitated by examining the ratio of gut to whole body weight which is approximately 0.08 in uninoculated control birds and reaches 0.24 seven days following infection. Birds given access to halofuginone hydrobromide treated feed beginning 2 days prior to infection and continuing thereafter didn't become patent until day 4 PI which is equivalent to reducing the inoculum dose 1000-fold, exhibited reduced enteric signs (gut weight:body weight-0.13) and significant protection from muscle wasting. Further evaluation of this drug in other species appears warranted. (Supported in part by NIH grant 5-P30-DK34987).

Chemotherapy in Poultry / Chimiothérapie chez les volailles
Epidemiology and Population Dynamics / Epidémiologie et dynamique des populations

20A-4

TREATMENT OF NEMATODIASIS IN LAYING HENS WITH FENBENDAZOLE (FBZ) AND ITS INFLUENCE ON EGG PRODUCTION. A. Ramisz, District Institute of Veterinary Hygiene, Cracow, Poland.

The efficacy of FBZ on Ascaridia galli, Heterakis gallinae, and its influence on egg production was tested in a farm with 6,770 hens in laying weeks 30-32. 100 faecal samples each were tested 3 days before and 6 days after treatment; autopsies were done in several hens. FBZ was given as medicated feed in a dose of 8 mg FBZ/kg b.w. daily for three consecutive days. Before treatment, 76 and 11 samples were positive for A. galli and H. gallinae respectively; both species were determined at autopsy, food consumption was only 113 g/hen (normally 140 g/hen in this flock), the egg production was 76%. After treament, infection was almost eliminated, worm-egg reduction was 98.7%. 14 days after treatment food consumption was 133 g/hen, and the egg production was 85%. The dose regime used is fully effective against immature and adult Capillaria spp. and Syngamus trachea in poultry and game birds, too (1,2,3,4). FBZ shows a distinguished effect in nematodiasis in laying hens combined with a distinct increase of egg production.

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20A-5

BATTERY STUDIES ON THE ANTICOCCIDIAL EFFICACY OF MADURAMICIN AMMONIUM IN CHICKENS. I. Varga University of Veterinary Science, Budapest, Hungary.

Anticoccidial efficacy of the ionophorous antibiotic maduramicin ammonium (Cygro^{R}, American Cyanamid Co.) at recommended dietary level of 5 mg kg^{-1} for registration purposes was compared with that of monensin at 100 mg kg^{-1} (A: Elancoban, Eli Lilly, and B: Bulgarian product Monensin 100, Pharmachim), and also with a mixture of maduramicin 2.5 plus compound BCR-4 90 mg kg^{-1}. The chickens including a total of 648 wingtagged Hybro cockerels in 9 replicates were infected at the age of 7 days with oocysts of Eimeria tenella (Hungarian strain) to bring about reasonable mortality. Parameters to measure drug efficacy were as follows: coccidiosis-induced mortality, weight gain of surviving animals between days -1 to days 8 after infection, calculated metabolic body weight gains over a 9 days' period, faecal scores on days 4 to 6 after infection, oocyst production on day 8 after infection, rate of chickens showing macroscopic lesions in the caeca and those containing any forms of coccidia in the mucosal scrapings. As compared with the uninfected untreated and infected untreated controls, all treatments proved effective on the ground of each parameter. Difference between the treated groups showed no statistical significance ($p > 0,05$). In numerical terms, the efficacy showed an order as follows: maduramicin 5 mg kg^{-1} (best), maduramicin 2.5 plus BCR-4 90 mg kg^{-1}, monensin 100 mg kg^{-1} (A), monensin 100 mg kg^{-1} (B).

21A-1

EPIDEMIOLOGY OF BOVINE DICTYOCAULIASIS IN LOUISIANA (USA). C.S. Eddi* and J.C. Williams, Louisiana State University, School of Veterinary Medicine and LSU Agricultural Center, Baton Rouge.

A trial was carried out for a period of one year on a permanent pasture naturally infected by a varying number of yearling cattle (12-15). Seasonal variation of infectivity was monitored by monthly slaughter of tracer calves, slaughter of pairs of resident yearlings at 30-60 day intervals, herbage larval recovery, and by Baermmanization for L1 in feces of resident cattle. A clinical outbreak of dictyocauliasis occurred during January-March, 1986 and was associated with peak levels of pasture infectivity. No evidence of hypobiosis was observed in tracer or resident animals. Carrier animals were considered responsible for oversummering transmission of the infection. Pairs of tracer calves were grazed in August and September on a pasture that was heavily contaminated in May, and then left free of cattle during June-July. These animals were not infected by D. viviparus, showing that larvae do not survive summer conditions. However, a pair of tracer calves grazed in February, on a pasture heavily contaminated in December and kept free of cattle until February, was infected with the parasite, showing that the larvae could survive the winter conditions very well. Although soil samples were taken regularly on a monthly basis to study the epidemiological importance of the soil as a source of infection, infective larvae were not recovered from soil samples at any time. The epidemiological pattern observed in the present study provides basic information about the mechanism of disease outbreaks and provides more effective means of prevention and control.

21A-2

A STUDY OF THE EPIDEMIOLOGY OF ANAPLASMOSIS IN NIGERIA. S. A. AJAYI, Parasitology Division, National Veterinary Research Institute, Vom, Nigeria.

Epidemiological studies on the prevalence of infections with Anaplasma marginale and A. ovis in clinically healthy cattle, camels, sheep and goats in Nigeria were carried out by serological and bloodsmear examination techniques. The indirect fluorescent antibody test, rapid card agglutination test and capillary-tube agglutination test were employed for the serological studies. Giemsa stained thin films were used to demonstrate Anaplasma ovis infections in sheep and goats. Serum and blood samples tested were collected randomly and their mode of collection cut across the country.

Antibodies to A. marginale were demonstrated in the majority of cattle tested.

The result of the serological and bloodsmear examination studies indicate that infections with A. marginale and A. ovis are enzootic in the cattle, sheep and goat population throughout the country. Investigations on the occurrence of antibodies to A. marginale in camels from a limited area in northern Nigeria were also carried out. There was serological evidence of exposure to A. marginale in Nigerian one-humped camels.

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21A-3

PASTURE SWEEPING FOR CONTROL OF EQUINE PARASITES AND COLIC. R.P. Herd. College of Veterinary Medicine, The Ohio State University, Columbus, Ohio, U.S.A.

Studies in England and U.S.A. established the value of twice weekly fecal collection for the control of equine parasites and colic. In these studies pasture larval counts never exceeded 1000 L3/kg for cleaned pasture, whereas counts rose as high as 10,000 L3/kg for anthelmintic treatment groups and 18,000 L3/kg for control groups. Colic was observed in an anthelmintic treatment group, but not in the cleaned pasture groups. The removal of feces increased the grazing area by about 50% through elimination of ungrazed roughs that normally develop around feces. A vacuum power unit and suction hose proved unsatisfactory for fecal collection because of repeated clogging of the suction hose. However, a tractor drawn Jacobsen 720E sweeper routinely used by municapalities and golf clubs to keep grounds clean proved effective in picking up horse manure from flat, even pastures. It also clipped excess pasture growth and removed uneaten hay, weeds and debris. The Jacobsen 720E sweeper has a 5 ft. sweeping width and a 14 HP engine that drives 2 reels of counter-rotating and interlocking rubber fingers that deposit manure in a 5 cu. yd. hopper. The pasture hygiene approach is of special value to farms with a high concentration of horses on limited grazing, and especially useful for weanlings and yearlings, where anthelmintic therapy is sometimes inadequate. If pastures are swept regularly, anthelmintic treatments can be reduced to once a year. This approach offers greater flexibility in parasite control programs and an important step in conserving anthelmintic efficacy by reducing selection pressure for drug resistance. Current studies are aimed at determining if once weekly pasture sweeping is effective.

21A-4

BOVINE OSTERTAGIASIS: INFECTIVE LARVAL RECOVERIES FROM HERBAGE FROM GRAZED AND UNGRAZED CATTLE PASTURES IN WESTERN U.K. K. Bairden*, J. Armour, Glasgow University, Faculty of Veterinary Medicine, P.N. McWilliam, Pfizer Ltd., Sandwich, Kent.

Two studies conducted in the North and Southwest of the United Kingdom showed that infective larvae of Ostertagia ostertagi were able to survive on pastures for at least two and in some cases three years. Examination of herbage samples taken from fenced off sections of areas previously grazed by cattle, revealed the presence of larvae in each of the four years of the Northern study the numbers of larvae per kilogram dried herbage (L3/kdh) ranging from 5000 at the begining of the trial to 357 during the latter part of the final year and in most samplings over the three year period in the southwest trial (numbers of L3/kdh ranging from 7142 in 1984 to 1053 in 1986). Larval recoveries from the ungrazed areas were generally much lower than those from the set stocked paddocks but a sufficient number of infective stages were present to pose a threat of infection if cycled by parasite naive cattle. This is confirmed by the worm burdens acquired by parasite naive tracer calves which were grazed for ten to fourteen days at turnout each spring and at the end of the grazing season in October.

21A-5

IMPACT OF ARTHROBOTRYS OLIGOSPORA ON KINETICS OF TRICHOSTRONGYLID L_3 ON PASTURE. H.A. Hashmi* and R.M. Connan, Department of Clinical Veterinary Medicine, University of Cambridge, U.K. CB3 OES.

Experiments were designed to show whether when A. oligospora spores are added to fresh faeces containing trichostrongylid eggs, they could destroy the larvae developing under field conditions and whether by passage through the host the fungus could reduce the size of the subsequent generation of parasitic larvae. Pairs of equal paddocks (each of approximately 0.25h) were contaminated with the faeces of donor lambs and grazed by initially worm free lambs. In three experiments begun in May, June and August, A. oligospora added to faeces containing Haemonchus contortus eggs before they were broadcast, reduced the L_3 by 36-43%. Broadcast separately, the fungus reduced L_3 of ostertagia circumcincta by 43%, but where spores were concentrated on only 5% of the pasture area, the fungus was without effect. A. oligospora can therefore greatly reduce L_3 numbers when it can directly colonize the faeces but it probably does not significantly pass through the G.I. tract of the sheep.

21A-6

USE OF A GEOGRAPHICAL INFORMATION SYSTEM TO MODEL POTENTIAL HABITAT OF FOSSARIA BULIMOIDES BASED ON A SOIL MAP. S.H. Zukowski*, J.B. Malone and J.M. Hill. School of Veterinary Medicine, and Remote Sensing and Image Processing Laboratory, Louisiana State University, Baton Rouge, LA

Habitats of the lymnaeid snail Fossaria bulimoides on a 681 ha farm in coastal southwest Louisiana were surveyed in the spring of 1985, mapped, input to the data base of a geographic information system and compared to a soil map from a recent survey. This region of saline to fresh marsh is punctuated by cheniers, ridges that originated as beaches during periods of higher sea level. The marsh is comprised of clay soils of aquic to peraquic moisture regimes; soils on the cheniers vary in ratio of sand to clay. Areal analysis of the 2 maps showed that Fossaria habitat is concentrated around interfaces of various chenier soils with the peraquic creole clay marsh soil. This relationship is more constant along the chenier waveface and less so on the backslope. A computer model was generated to map potential habitat based on these findings. A band 30 to 70m wide along the waveface occupied about 5% of the farm and predicted about 51% of the habitat; a band of 40 to 90m wide along the backslope occupied about 20% of the farm and predicted an additional 27% of the habitat. The model covered 25% of the farm to predict 78% of the habitat. This area can be reduced 20-30% when salinity is mapped, as much of the farm is too saline to support the snail, and more factors can be added to further refine the model. When extrapolated to a 25,000 ha study area, predicted habitat occupied about 12% of the study area. The validity of the extrapolation remains to be assessed.

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21B-1

EVALUATION OF SOME RISK FACTORS FOR BOVINE PARASITOSES IN ITALY. G. Battelli, M. Martini*, G. Poglayen, R.Restani. Istituto di Malattie Infettive, Profilassi e Polizia Veterinaria, Università di Bologna, Italy.

Coprological examination of cattle from Northern and Central Italy revealed the following prevalence rates: 14.3% (n=1462) for fascioliasis (FA), 12% (n=1166) for dicroceliasis (DI), and 35.8% (n=4369) for gastro-intestinal strongylosis (ST). Grazing practice, foreign origin of the animals, fresh grass feeding seem to be important risk factors. The following values of Relative Risk were estimated: (1) grazing practice: 3.9 for FA, 3.6for DI and 1.9 for ST; (2) foreign origin: 5.4 for FA, 1.6 for DI and 1.3 for ST; (3) fresh grass feeding: 2.2 for FA, 8.7 for DI (not estimated for ST); (4) grazing practice associated with foreign origin: 10.1 for FA, 5.3 for DI and 2 for ST. All these values are statistically significant ($P < 0.05$). Percent of cases in the exposed animals (Attributable Risk) due to grazing practice and foreign origin was 90.1%, 81.2% and 43.7% for FA, DI and ST respectively.

(Supported by C.N.R. Grant, Progetto Finalizzato IPRA)

21B-2

ESTABLISHMENT OF BASELINE DATA FOR THE PREVALENCE OF FASCIOLA HEPATICA IN OKLAHOMA CATTLE. H.E. Jordan*, J.C. Fox, B.J. Johnson, C.E. Barnett & K.J. Melcher. College of Veterinary Medicine, Oklahoma State University, United States.

Sera from 1328 cattle were tested for presence of antibodies to Fasciola hepatica. Sera originated from animals in 73 of 77 the counties in Oklahoma. A modified FIAX technique using antigens prepared from homongenate of liver flukes (F. hepatica) was used to find sera with significant levels of antibody. High titered sera were found in 134 of the 1328 animals. The positive animals resided in 44 of the 77 counties. The overall prevalence was found to be 10.0 percent. Ranches are currently being studied for endemic transmission of the parasite.

21B-3

SEROEPIDEMIOLOGY OF NEMATODE INFECTIONS IN CATTLE: ITS POSSIBLE ROLE IN THE ECONOMIC APPRAISAL OF FIELD INFECTIONS AND TREATMENT. H.W. Ploeger, A. Kloosterman & G.J.W. Schoenmaker. Dept. Anim. Husb., Agric. Univ., Wageningen, The Netherlands

On 100 commercial farms nematode infection levels of calves, yearlings and cows were estimated by examination of faeces and of serum. The growth performance of first season grazing calves was assessed by measuring and weighing. A negative relation was found between growth and infection level ($P < .05$). On 23 farms the effect of IVOMEC® treatment of calves at housing was assessed. A significant ($P < .01$) effect of 7.42 kg Liveweight was found at the end of the stall season. The relation between treatment effect and infection level was positive, but not significant.
In 31 herds, 285 dairy cows were treated with IVOMEC® and 242 left untreated. On a herd basis the mean treatment effect was 126 Kg milk/cow/lactation period, but this effect was extremely variable between herds, ranging from - 839 to $\pm$ 1287 kg. It was however positively related to herd infection level ($r=.36$; $P < .05$). On an individual cow basis the effect appeared to be 205 kg. The difference with the 126 kg mentioned earlier could be explained by a generally higher response in the larger herds.
Thus serology provided a key both for prediction and for demonstration of the effect of anthelmintic treatment on milk production.

21B-4

INFLUENCE OF AN ALTERNATE GRAZING SYSTEM OF ANIMAL HUSBANDRY ON NEMATODIRUS BATTUS INFECTION IN LAMBS. R.L. Coop*, F. Jackson & E. Jackson. Moredun Research Institute, Edinburgh, Scotland.

A 3 year study was conducted on a farm practicing annual alternation of sheep and cattle to provide 'safe' pasture for either species. Ewes and twin lambs grazed last year's cattle pastures from mid April and winter born calves were turned out in mid May onto the previous season's sheep grazing. Pasture larval levels and cattle and sheep worm egg outputs were monitored from April to September each year. The number of lambs which scoured, passed moderate numbers of N. battus eggs and required anthelmintic treatment increased over the 3 years (3% to 28%). The number of N. battus larvae on the pasture increased considerably despite grazing cattle in the intervening year. Examination of faeces from the calves showed that they excreted low numbers of N. battus eggs (around 20-80 e.p.g. during June/July) which were capable of developing and infecting the following seasons lamb crop. The relative importance of the cattle contamination and that which results from a 2 year carry-over of infection is currently under investigation.

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21B-5

RELATION OF FARM MANAGEMENT FACTORS TO NEMATODE INFECTION LEVELS IN CALVES YEARLINGS AND MILKING COWS MEASURED ON 100 COMMERCIAL FARMS BY MEANS OF SEROLOGY AND FAECAL EXAMINATION. A. Kloosterman & H.W. Ploeger. Dept. Anim. Husb., Agric. Univ., Wageningen, The Netherlands.

Infection levels of lungworm and gastrointestinal worms (Ostertagia ostertagi and Cooperia oncophora) were estimated on 100 dairy farms in calves, yearlings and milking cows. This was done by faecal egg counts, larval differentiations, larval counts for lungworm and by determining antibody levels and serum pepsinogen values in September 1985. Significant positive correlations were found between parasitological and serological parameters. Significant differences between age groups were found in egg output and in serological results. The variations in infection levels between farms were significant. The results of serological or parasitological or both kinds of observations were shown to be related to date of turnout. No direct relations between farmsize, supplementary feeding, anthelmintic treatments or intensity of grazing and infection levels could be demonstrated, except for the yearlings where intensity of grazing was positively correlated with the serological results.

21C-1

SURVIVAL ON THE GROUND OF RHIPICEPHALUS APPENDICULATUS (ACARINA:IXODIDAE) AT THREE SITES IN KENYA. R.M. Newson*, International Centre of Insect Physiology and Ecology, P.O. Box 30772, Nairobi, Kenya.

Data are needed for use in population modelling of the African brown ear tick R. appendiculatus in order to develop methods of integrated control. In Kenya there is slight annual variation in day length, local temperature regimes vary markedly with altitude, and rainfall is strongly seasonal at most sites. Individual fed females were confined in nylon gauze packets, as also were groups of unfed larvae, nymphs and adults. Sets of 4 replicates were placed at soil level under natural cover in small protective wire cages, and one cage is removed and examined each month. Four successive batches of ticks are being observed. There are marked differences in survival in groups less than 1m apart in apparently uniform habitats. Mean time to 50% mortality has varied from 170-440 days for adults and 90-220 days for nymphs. Larval results are highly variable as larvae are sensitive to both dehydration and prolonged contact with moisture. In the absence of predation the mean survival of engorged ♀♀ to oviposition is >85%, and of ova to hatching is 12-88%. Each batch of ticks is showing time-dependent survival, rather than the age-dependent curves seen with free-living ticks.

21C-2

GASTROINTESTINAL NEMATODE INCIDENCE IN WESTERN CANADIAN DAIRY HEIFERS. W.R. Cox*, Pfizer Canada Inc., 6404 6A St. S.E., Calgary, Alberta, Canada; D.L. Lemiski, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

A study was conducted to estimate the prevalence and levels of gastrointestinal nematode infections in dairy replacement heifers in Alberta, Saskatchewan and Manitoba. Fecal samples were collected from 566 grazing heifers on 34 randomly selected farms distributed over the three prairie provinces. Fecal egg counts were performed using a modified Wisconsin centrifugation technique. The overall mean farm fecal egg count was 127.9 eggs per 7.5 mL feces (79.9 eggs/5 g feces), with a range of 5.4 (3.4 eggs/5 g) to 624.9 (390.6 eggs/5 g) eggs per 7.5 mL feces. On every farm examined, gastrointestinal nematodes were demonstrated and 93.3% of all individuals tested positive. Three herds were sampled sequentially through the summer months. Mean fecal egg counts tended to rise through the summer and peak in late August or September.

21C-3

POPULATION DYNAMICS OF ENDOHELMINTHS OF SOME FISHES. A. K. Sinha*, Department of Zoology, Co-operative College, Jamshedpur, INDIA.

Single or concurrent infections was noticed in 74% males and 84% females of Clarias batrachus. Species wise Lytocestus indicus showed highest incidence followed by Lytocestus longicollis, Lucknowia indica and Pseudocaryophyllaeus indica in C. batrachus. Like C. batrachus, 42% males and 51% females of Channa punctatus had single or concurrent infections. In this fish the maximum incidence was of Euclinostomum heterostomum followed by Pallisentis nagpurensis, Senga raoi, Allocreadium handia and Ascarops nema. In both the models endohelminth population had an annual cycle. It was maximum during maturation and spawning period of host. In both the cases variance was greater than mean depicting high over dispersion, 'K' value being less than one. Concurrent infections had led to competitive exclusion, niche segregation and/or reduction in number of helminths. Studies on incidence, intensity and co-efficient of partial association in concurrent infections showed positive association between L. indicus. L. longicollis and L. indica and negative interaction between P. indica and L. longicollis in C. batrachus. In C. punctatus positive interaction was seen in P. nagpurensis and E. heterostomum and negative interaction in P. nagpurensis with S. raoi, P. nagpurensis with A. nema with A. handia.

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21C-4

COMPARATIVE SUSCEPTIBILITY OF MERINOS AND ROMANOV SHEEP TO DIFFERENT HELMINTH PARASITES

L. GRUNER*(1), J. CABARET (1), J. BOUIX (2), G. MOLENAT (3) (1), INRA, Station de Pathologie Aviaire et de Parasitologie, 37380 MONNAIE, (2), INRA-SAGA, BP27, Auzeville, 31326 CASTANET TOLOSAN Cedex, (3), Domaine du Merle, Route d'Arles, 13300, SALON DE PROVENCE (France)

To study the breed resistance of sheep to different helminth parasites, preliminary observations based on faecal egg and larval counts followed by cultures were done on 290 grazing ewes, equally distributed between Merinos of Arles, Romanov and cross breeds. The ewes were set stocked together for 4 years on irrigated pastures at 20 ewes/ha. Trematode and Nematode parasites being more numerous in autumn, the study was performed in December 1985 and 1986. Nearly half of the ewes lambed in June, the others in October; one half of the flock spent summertime in the mountains and the other half was left on the same pastures.

Egg counts were higher in ewes that lambed in October and in those that stayed on the pastures. The expression of parasitic level significantly increased from Merinos to crossbreed and Romanov ewes for gastro-intestinal nematodes (Teladorsagia circumcincta, Trichostrongylus vitrinus, Chabertia ovina, Nematodirus spp.), Moniezia spp. and Dictyocaulus filaria, and, by contrast, decreased for Fasciola hepatica and Protostrongyles (mainly Neostrongylus linearis). The mechanisms of resistance involved seemed different between the breeds for the two groups of helminth parasites.

(Supported by EEC Grant Agrimed 602)

21C-5

THE HELMINTH FAUNA OF THE CATS IN BITOLA (SR MACEDONIA - YUGOSLAVIA).

N.D. Hristovski*, The Junior Agricultural School, University of Bitola, P.O. Box 76, 97000 Bitola, Yugoslavia.

From the period of 1968 to 1987 we were able to examine some individuals of the domestic cats from Bitola and its vicinity. From the number of 12 individuals we found the following helminths: Toxocara cati in 3 individuals, Dipylidium caninum in 1 individual, Hydatigera taeniaeformis in 3 cats and Echinococcus granulosus in 2 individuals.

The helminth fauna which we established in the cats during this period is very similar to those in other regions in the neighbouring countries and in Europe. The examined cats were found free in the town or its vicinity. They eat the rubbish from the people. etc.

This is the first examination of the cats for the presence of the helminths in this region.

21C-6

SITUATION ACTUELLE DU CYSTICERCOSIS PORCINE AU MEXIQUE. A. Acevedo*, M.T. Quintero Facultad - de Medicina Veterinaria y ZootecniaUniversidad Nacional Autônoma de México.

Un des problèmes les plus remarquables de santé au Méxique est celui du Cysticercosis par Cysticercus cellulosae qui concerne aussi le porc comme l'homme, Au Méxique se sont réalisés des études sur plusieurs aspects de ce problème Parmi eux mems avons les suivants des études - sur la fréquence de C. cellulosae aux porcs sacrifiés aux plusieurs abbatoirs de la Républi que Mexicaine Aux abbatoirs sont sacrifiés à peu pres 17 millions des porcs chaque anneé et de ceux-ci, 1.5% ont êtê dêcomisés à causé du cysticercosis. Un autre aspect qui a été étudié est celui qui appertrenne aux pertes economiques occasionêes par la dêcomision des porcs avec du cysticercosis a l'abbatoir c'est comme ca, qu' on a vu que de ce 1.5% dêcomisé le 68.5% de l' invertissement fait est perdu. Un autre aspect qui a été etudié est celui de la détection- d'anticorps contre C. cellulosae aux porcs sacrifies L'on a trouvé un pourcentage de 30.4% Jusqu'an 38.6% des animaux post détectés en employant la technique du immunoelectroforesis Des études ont été aussi realisées quiconcernent le traitment du cysticercosis porcine par des produits comme le Mebendazole,Praziquantel et Flubendazol. Cette papier resume l' investigation faite à propos du porcine Cysticercosis au Méxique.

21C-7

LES ACARIENNES DU GENDRE RAILLIETIA AU MEXIQUE-

M.T. Quintero*, A. Acevedo. Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Na - cional. Facultad de Medicina Veterinaria y Zoo- tecnia, Universidad Nacional Autônoma de México.

Les acariennes du gendre Raillietia sont des habitantes du conduit auditif de plusieurs animaux. Au Méxique ces acariennes ont été etudiés dépuis plusieurs années (depuis 1978 Jusqu'au present). Dans une premiere étage la fréquence du Raillietia auris au bétail bovine procedent des plusieurs departements de la Re publique Mexicaine a été etudiée. A partir de ceux travaux on a conclu que Raillietia auris existe dans 12 departements de la République, On les a trouvé dans les phases d'oeuf, larve, nymphe et adulte, mâles et femelles, ayant sa plus large frequence comme femelles Comme une continuation du récherche de R. auris l'on a trouvé une nouvelle espèce decrite avec le nom de R. caprae Quintero, Bassols et Acevedo dans le Sinaloa, Mexique. Les phases de oeuf, larve et d'adulte male et femelle e'taient trouvees mais pas celles de nymphes. Plus tard on a fait une etude sur la frequence de R. caprae en du betail caprine originaire d' autres departements de la Republique Mexicaine,avec une frequence du 24%. Un autre aspect sur le quel on a travaille c'est celui des lesions macroscopiques que R. caprae produit aux caprines, on a conclu qu'ils peuvent provoquer- la presence de petequis et otitis, ou rupture de la membrane du tympan. Cette papier resume l'investigation faite a propos du Raillietia acariennes du Mexique.

Drug delivery / Modes d'administration des médicaments

22A-1

EFFICACY OF AN ALBENDAZOLE INTRARUMINAL DEVICE IN LAMBS. S.L. Bell*, Department of Agriculture, The University, Newcastle upon Tyne, NE1 7RU, England. & R.J. Thomas, School of Veterinary Medicine, University of Zambia, Lusaka, Zambia.

The efficacy of an albendazole slow release bolus against gastrointestinal nematodes was evaluated under field conditions. 2 groups of lambs were grazed together on a 1.5 acre pasture naturally contaminated with Ostertagia ostertagi. In June the pasture was divided equally and each group was allocated to a separate paddock. Each lamb in group A received a bolus, with group B as untreated controls. Weight gains and parasitological parameters were monitored. Infective larvae on paddock B peaked at 70,683 l/kg dry matter in August associated with a faecal egg output of 1,831 epg, clinical symptoms and death of 2 lambs. Mean egg counts of group A did not exceed 5 epg after administration of the bolus and worm burdens at slaughter in September were less than 5% of those of group B (viz 91,165). Group A lambs had a mean liveweight advantage of 4 kg at slaughter. Thus the bolus provided an effective method for controlling trichostrongyle infection and pasture contamination.

(Supported by a grant from Smith Kline Animal Health Ltd.)

22A-2

EFFICACY OF ALBENDAZOLE SLOW RELEASING DEVICE AGAINST GASTRO-INTESTINAL NEMATODES IN SHEEP

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The efficacy of Albendazole Slow Releasing Device against trichostrongylid infection in sheep, based upon EPG, pasture contamination and postmortal parasitological examination, was assessed. The trial was conducted in 40 naturally infected animals, devided into two groups, kept separately for 4 months on two contiguous "clean" paddocks. Seven days after treatment EPG in treated group went to zero and the animals remained coprologically negative during a whole experimental period. While numbers of infective larvae on pasture, where the treated animals grazed, decline (from 48.3 L3/kg to 0), number of larvae on the pasture of control animals significantly rose (from 31.2 L3/kg to 312 L3/kg) and stayed high during the trial. After P.M. examination calculated efficacy of A.S.R.D. against H.contortus, Trichostrongylus spp., Cooperia spp., and Strongyloides papillosus was 100%. The efficacy against Ostertagia spp. and Nematodirus spp. was slighlty lower, 98.58% and 96.58% respectively.

22A-3

CONTROL OF PARASITES OF CATTLE WITH IVERMECTIN APPLIED TOPICALLY. Cox, J.L.*, Barrick, R.A., Brokken, E.S., Roncalli, R.A., and Sutherland, I.H., Merck & Co., Inc., Rahway, NJ.

In 40 controlled trials (641 cattle) efficacy of ivermectin in a solution applied topically was assessed against endo- and ectoparasites. Ivermectin (500 mcg/kg) was applied in a strip from withers to tailhead. Animals were usually restrained to prevent grooming of application site. Parasite numbers were determined at necropsy or by periodic determination of those in or on the skin. For most parasites there were 2 or more trials. Reductions ($p<0.05$) of the following parasites were >95% (except where indicated): Haemonchus placei adult and L_4 (92.8), Ostertagia ostertagi adult, L_4 and inhibited L_4, Trichostrongylus axei adult and L_4, Cooperia spp adult and L_4, C. oncophora adult, C. punctata adult, Trichostrongylus spp (small intestine) adult (80.1) and L_4 (84.0), Nematodirus spp L_4, Strongyloides papillosus adult, Oesophagostomum radiatum adult and L_4, O. venulosum adult, Trichuris spp adult (86.5), Dictyocaulus viviparus adult and L_4. Dermatobia hominis larvae were reduced by 99% at 9-10 days after dosing and by 98% at 30-31 days. Live Hypoderma spp larvae were recovered from 81.5% of controls and 1.5% of treated cattle in 3 trials. Numbers of engorged female Boophilus microplus dropping from cattle decreased from >400 in controls to <5 by 6 days after dosing. Numbers of Damalinia bovis and Linognathus vituli were reduced to very low levels without recrudescence on treated animals 7 days after dosing. Chorioptes bovis and Sarcoptes scabiei were not detectable in scrapings after 21 days, whereas controls remained infested throughout 56 days.

22A-4

PROPHYLACTIC MEDICATION WITH NETOBIMIN IN DRINKING WATER OF GRAZING CALVES N.E. Downey*, Agricultural Institute, Dunsinea, Castleknock, Dublin 15, Ireland.

In the first of two similar trials, calves in four groups, A-D grazed in separate plots. Animals in groups A-C received anthelmintic medication in their drinking water to suppress trichostrongylid egg output. Medication was given during five periods (each of 7 days duration) beginning two weeks after Spring turnout (April 30). Anthelmintic and dosage rate in mg/kg/calf/day were: groups A and B netobimin, 1.5 and 2.8 respectively, group C oxfendazole, 1.0. Group D acted as control. Trichostrongylid infection on control herbage increased markedly in September/October. By contrast, infection remained at a low level in all the treatment plots and in the treated calves. Groups B and C gained more weight than controls though not significantly. In the second trial, there were three separately-grazing groups, X-Z, Groups X and Y receiving the following medication, administered as already described: group X, netabimin and group Y, oxfendazole at, respectively 2.8 and 1.0 mg/kg daily during dosing periods. Group Z acted as control. All calves were artificially infected with Dictyocaulus viviparus on July 25 and in-water medication introduced for groups X and Y at the early onset of respiratory symptoms. With the exception of one calf which succumbed mainly on account of pre-existing microbial pneumonia, the medication brought D.viviparus infection under control. Medication also controlled trichostrongylid infection and significantly increased calves' weight gain.

22A-5

FIELD EFFICACY OF SAFE-GUARD™ EMPROAL® MOLASSES DEWORMING SUPPLEMENT BLOCKS IN HEIFERS NURSING FALL-BORN CALVES AND FALL WEANED STOCKER CALVES.

J.E. Miller*, D.G. Morrison, F.J. Peterson, G.H. Myers, F.G. Hembry, C.P. Bagley, J.C. Williams, and B.M. Olcott. School of Veterinary Medicine and Louisiana Agricultural Experiment Station, Louisiana State University, Baton Rouge, LA, and Hoechst Roussel Agri-Vet Co., Somerville, NJ, U.S.A.

Two trials were conducted to evaluate consumption and efficacy, based on egg counts, of Safe-Guard™ Emproal® Molasses Deworming Supplement Blocks. In trial 1, 40 fall weaned stocker calves and in trial 2, 22 heifers (2-3 years old) were randomly assigned to control and treated groups after initial deworming with fenbendazole paste or drench in early November, 1986. Newborn calves nursing the heifers were not treated. Medicated blocks were offered twice (December and February to stocker calves and December and March to heifer/calf pairs) each time preceeded by an adaptation period using non-medicated blocks. Target consumption was reached in both trials for each treatment. A reduction in consumption was noticed during periods of rain. Efficacy was 100% in both stocker calf treatments. Efficacy was 100% and 99.7% for heifers and nursing calves respectively for the December treatment. Efficacy data for the March treatment is pending. Nursing calves were observed to consume the blocks along with their dams. Fenbendazole medicated blocks offer another alternative to a deworming program where the handling of animals is either inconvenient or not possible.

Late addition / Abrégés additionnels

8A-17

EFFICACY OF HERBAL PREPARATION IN CONTROL OF ECTOPARASITES IN DOMESTICATED ANIMALS.

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Ectoparasites like ticks, mites, lice and fleas have posed a serious problem to the livestock and pet owners in India and abroad by way of their recurent invasion on animals leading to various haemoprotozoan diseases and lowered productivity. Available drugs in use against these ectoparasites have been found to produce high toxicity, narrow therapeutic index, inconsistent results, drug resistance and undesirable residues in milk, meat and eggs. A herbal preparation 'Pestoban' recently developed by Indian Herbs Research & Supply Company against ectoparasites was therefore given a trial on 200 dairy cattle and buffaloes and 62 dogs naturally infected with ectoparasites. Representative number of ectoparasites collected from affected animals before start of drug trial were killed by chloroform and preserved in 70 percent alcohol for identification. The herbal medicine diluted with water in the ratio of 1 : 10 was applied over the body of affected animals once a day for two consecutive days. The medicine was found to be 76 percent effective against ticks and 92 percent against lice, flea and mite in experimental animals. The drug seems to be a contact poison without any harmful effect on treated animals.

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THE USE OF AN OXFENDAZOLE PULSE RELEASE BOLUS IN THE CONTROL OF GASTRO-INTESTINAL NEMATODIASIS AND PARASITIC BRONCHITIS IN FIRST-SEASON GRAZING CALVES.

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The efficacy of an oxfendazole pulse release bolus system (OPRB) for the control of parasitic gastroenteritis and parasitic bronchitis in first-season grazing calves was evaluated in Belgium. In 1985 calves (n=22) were allocated in two groups, an OPRB was administered to one group of animals at the time of turnout, the other group remained untreated. In 1986 calves(n=30) were allocated in three groups an OPRB was administered to one group of animals at turnout, in the second group the OPRB was administered in July and the third group remained untreated. The efficacy of the OPRB was assessed by comparison of faecal worm egg counts, larval differentiation, serum pepsinogen concentrations, antibody response (Ostertagia, Cooperia, Dictyocaulus), total plasma protein and albumin concentrations and weight gains found in both control and trial animals throughout the grazing season and the housing period. The OPRB given at turnout or mid summer provided good control of parasitic gastroenteritis dominated by Ostertagia. The pathogenic effects of parasitic gastritis were greatly reduced as clearly shown by the significantly lower values of serum pepsinogen and Ostertagia antibody titres, better liveweight gains and normal total plasma protein and albumin concentrations. In 1985 the OPRB group exhibited clinical signs of parasitic bronchitis at the end of the grazing season, suggesting that the OPRB given at turnout may not adequately control parasitic bronchitis in all cases at all times.