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001 (5001)

### BOVINE RESPIRATORY DISEASE COMPLEX: CALF FEEDLOTS IN FRANCE

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Calf respiratory diseases are of great economic and medical importance in Europe and North America feedlots. For the establishment of adapted control measures, identification of the main etiological agents involved in these complex diseases is of primary interest.

Calves from 10 different feedlots of eastern France were examined for Bovine Respiratory Disease (BRD). In each feedlot, three serological samples were taken from the same 15 randomly chosen calves, the day of arrival, the disease day (dD) and at least four weeks after the dD. Bronchoalveolar lavages (BAL) were done the dD on ten sick and five healthy calves, preferentially chosen among the bled group of calves. Bacteriological studies on the BAL samples demonstrated a wide distribution of *Mycoplasma bovis* (M.bovis), present in 67 to 100% of the sampled animals, as opposed to rare *Mannheimia* or *Pasteurella* (5%) and no *Haemophilus* species isolation. Seroconversion rates above 20% to Respiratory Syncytial virus (RSV), ParaInfluenza III virus (PI3) or Bovine Viral Diarrhea (BVD), were considered as indicative of viral involvement on BRD outbreaks. RSV and BVD analysis were complicated by the feedlot vaccination scheme and need additional study. However the *M. bovis* seroconversion demonstrated that it was not only the most frequent agent, but was also involved in more than 50% of the BRD outbreaks.

This study shows the increasing involvement of *M. bovis* in feedlot calf BRD complex and the need to take it into consideration in the development of control schemes.

002 (1833)

### A COMPARISON OF TWO VACCINATION PROGRAMS ON ANIMAL HEALTH, FEEDLOT PERFORMANCE, AND CARCASS CHARACTERISTICS IN WESTERN CANADIAN FEEDLOT CALVES

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A field study was conducted under commercial feedlot conditions in western Canada to determine the relative effectiveness of two vaccination programs in fall-placed, auction market derived, feedlot calves. A total of 3,882 calves were processed and randomly allocated to one of two experimental groups: Program 1, which received a MLV IBR and BVD (types 1 and 2) vaccine and a *Mannheimia haemolytica* and *Pasteurella multocida* bacterin-toxoid (Express 3<sup>TM</sup> and Pulmo-guard<sup>TM</sup> PHM-1), or Program 2, which received a MLV IBR, BVD (type1), PI-3, and BRSV vaccine and a *M. haemolytica* bacterin-toxoid (Bovi-Shield® 4 and One-Shot®) upon arrival at the feedlot. Six pens were allocated to each experimental group.

The experimental groups were considered homogenous ( $P = 0.05$ ) with respect to average initial weight, average hip height, and average proportion of steers within each pen.

The initial undifferentiated fever (UF) treatment, overall chronicity, overall wastage, overall mortality and bovine respiratory disease mortality rates were significantly ( $P < 0.05$ ) lower in the Program 1 group as compared to the Program 2 group. There were no significant ( $P = 0.05$ ) differences in first UF relapse, initial no fever (NF) treatment, first NF relapse, hemophilosis mortality, metabolic mortality, arthritis mortality, or miscellaneous mortality rates between the experimental groups.

On a carcass weight basis, average daily gain was significantly ( $P < 0.05$ ) improved in the Program 1 group as compared to the Program 2 group. However, there were no significant ( $P = 0.05$ ) differences in the dry matter intake to gain ratio between the experimental groups. There was a significantly ( $P < 0.05$ ) higher percentage of carcasses grading yield grade (YG) Canada 3 in the Program 1 group as compared to the Program 2 group.

There were no significant ( $P = 0.05$ ) differences between the experimental groups in the percentages of carcasses grading quality grade (QG) Canada Prime, QG Canada AAA, QG Canada AA, QG Canada A, YG Canada 1, or YG Canada 2.

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003 (2642)

## A STUDY TO COMPARE THREE OXYTETRACYCLINE REGIMENS FOR THE TREATMENT OF ANAPLASMA MARGINALE CARRIER STATE IN BEEF CATTLE

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The study objective was to compare the effects of three oxytetracycline treatment regimens and no treatment on the carrier state of bovine anaplasmosis. Forty-six Angus X Simmental steers, aged 6 - 12 months, were inoculated IV with approximately  $2.6 \times 10^9$  *Anaplasma marginale* (Oklahoma isolate) infected erythrocytes. Animals were monitored for parasitemia on blood smear and changes in hematocrit. Serology was also conducted using a competitive ELISA *Anaplasma* Antibody Test Kit (VMRD, Inc. Pullman, WA). All subjects demonstrated clinical signs of anaplasmosis and recovered without treatment. At 66 days after infection animals were designated carriers based on a positive cELISA test (>30% inhibition) and a parasitemia = 1%. The ability of carriers to transmit *A. marginale* was demonstrated by sub-inoculation of blood into 45 splenectomized Holstein calves. Infection was also confirmed by nested PCR (polymerase chain reaction) followed by DNA hybridization. Forty of the steers were blocked by bodyweight and randomly assigned to 4 treatment groups. Treatment A consisted of a 300 mg/ml solution of oxytetracycline (Tetradure LA-300, Merial Canada Inc., Baie d'Urfe, Quebec) administered at 30 mg/kg, IM on day 0. Treatment B consisted of the same formulation administered at 30 mg/kg, IM on day 0 and again on day 5. Treatment C consisted of a 200 mg/ml solution of oxytetracycline (Liquamycin LA-200, Pfizer Animal Health, Exton, PA) administered at 22 mg/kg, IV, q 24 h for 5 days. This corresponds with the current OIE recommended treatment of anaplasmosis prior to export. Treatment group D consisted of untreated infected control animals. Carriers were monitored at 31 and 60 days after treatment using PCR and cELISA. All animals remained positive by nested PCR and DNA hybridization. cELISA values remained above 30% inhibition. Data for each group were statistically compared at each time point using the Tukey Kramer HSD method. Results indicated a significant ( $p < 0.01$ ) reduction in mean cELISA of group C when compared with group A and group D at 31 days after treatment. Differences were not evident at 60 days after treatment. At 60 days after treatment, 50 ml of blood from each carrier was sub-inoculated into a splenectomized Holstein calf. All except one calf, which died from *Salmonella* septicaemia post inoculation, developed clinical anaplasmosis. Results indicate that all evaluated treatment regimens failed to clear the anaplasmosis carrier state. Funding: Merial, Norbrook, ACFA, Alberta Livestock Industry Development Fund

004 (5028)

## PATHOLOGY OF VEAL CALF - RELATION WITH THE AGE

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We carried out 106 autopsies on veal calves breeding in individual or collective box. These autopsies were sometimes supplemented by bacteriological and virology analyses.

We studied the results according to the age of the animals. The five appointed periods are: 0-15 days, 16-30 days, 31-60 days, 61-100 days and 101-150 days.

The results observe are as follow:

1. 35% of the animals dead have less than 15 days and 15% less than 30 days, thus 50% of mortality are observed on animals during the first month of age. This first result can be brought closer to the clinical observations following the setting in batch of the animals. We observe an increase in mortality for the period 101-150 days at the end of the batch.
2. The pulmonary lesions are most numerous and represent 35% of studied cases. They are lesions of fibrinous pleurisy and of bronchopneumonia with hearths of necroses bacterial origin and lesions of red thickening homogeneous with or without emphysema probably viral. The enterotoxaemia with 23% of the cases result in more or less distend intestines and more or less red. The third important pathology with 20% of the cases is due to peritonitis following ulcers perforating stomach.
3. We can note from 0 to 15 days lesions of enteritis, pulmonary lesions as well as consecutive lesions acute lesions of fibrinous peritonitis to omphalites. From 15 to 30 days the pulmonary lesions increase, the lesions of enteritis disappear. From 30 to 60 days the pulmonary lesions culminate while the lesions of enterotoxaemia appear, accompanied by some ulcers with peritonitis. During the two last periods the pulmonary lesions disappear, the enterotoxaemia continue their evolution while the percentage of the ulcers stagnates.

The autopsies carried out in the farms constitute a simple and effective means to affirm a clinical diagnosis.

005 (1374)

## PHARMACO-ECONOMIC BENEFIT OF MELOXICAM (METACAM®) IN THE TREATMENT OF RESPIRATORY DISEASE IN FEEDLOT CATTLE

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Bovine respiratory disease (BRD) is recognized as the leading cause of illness and death in feedlots. The pharmaco-economic benefit of a single meloxicam (Metacam® 20 mg/ml) treatment in conjunction with an antibiotic therapy in cattle infected with BRD was evaluated in a blind, negative controlled, randomised study. Animals with clinical symptoms of BRD received a single subcutaneous administration of 20 mg/kg oxytetracycline with either a subcutaneous injection of 0.5 mg/kg meloxicam or 0.9 % isotonic saline. Rectal temperature, respiratory rate, appetite, dyspnoea, coughing, nasal discharge and general condition were recorded on Days 0 (prior to treatment), 1, 2, 3 and 7 using a weighted numerical score and scores were summed to generate a 'Clinical Sum Score' (CSS, range 7 to 24 points). To assess performance, animals were weighed on Days 0, 7, 35, 70, 105 and finally before slaughter. Carcasses were weighed and lung lesions were evaluated using a grid system.

Overall, 200 cattle (n=100 per group) with a mean body weight of 232 kg were evaluated. Over the first three days after treatment the reduction of the mean CSS AUC was significantly better in animals in the meloxicam group compared to animals in the control group ( $p < 0.05$ ). Mean body weight was significantly higher for meloxicam treated cattle from Day 70 ( $p < 0.05$ ; 337.53 kg vs. 327.23 kg) until slaughter ( $p < 0.01$ ; 450.18 kg vs. 428.25 kg). The mean average daily weight gain until slaughter was significantly higher with 1.23 kg in the meloxicam group compared to 1.12 kg in the control group ( $p < 0.01$ ). Mean percentage of pathologically affected lung was lower in the meloxicam group than those in the control group. Of the affected animals, meloxicam treated animals had significantly less area of lung affected ( $p < 0.05$ ). Mean carcass weight of the meloxicam group was significantly greater than the control group ( $p < 0.05$ ; 282.1 kg vs. 269.8 kg).

A single subcutaneous injection of meloxicam as an adjunctive therapy in the treatment of BRD in feedlot cattle resulted in sustained performance improvements and a substantial pharmaco-economic benefit.

Funding: Boehringer Ingelheim Animal Health GmbH

006 (5200)

## THE MANAGEMENT OF BELGIAN BLUE SUCKLING HERDS IN SOUTHERN BELGIUM: ON FIELD RESULTS

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Beef production from a suckling herd in Belgium is a quite recent farming method. It started in the sixties with the development of the double muscle type in the Belgian Blue breed.

A survey was carried out on 10 commercial beef farms in Wallonie, the South part of Belgium over a 9 years period. Records were obtained on calving, diseases and sales along with the monthly reproduction survey data. Live weight of the growing stock up to 20 months was recorded 4 times a year.

There were, on average, 100 heads as breeding stock. There was a large breeder effect both on the age and weight at first conception. About 90 % of the heifers were pregnant in the 14-26 months age range. Seventy percents of the heifers were pregnant at a live weight ranging from 360 to 440 kg. The heaviest heifers (top 25%) conceived on average at 453.8 kg and 20.9 months. By contrast, the lightest heifers (382.1 kg) were 16.6 months of age when they were pregnant. The calving interval, based on all the bred animals, varied from 389 to 441 days according to the farms. Growth curves were calculated on data obtained on 1104 heifers and 924 males. The more appropriate model was the stepwise linear model with two periods of constant growth rate and an inflexion point at 8 months. There were no differences between males and females during the first period (0.83 kg/d). The average daily gain of the males was much higher (1.05 kg/d) than the heifers (0.55 kg/d) during the 8-20 months period. The disease frequency varied largely according to the farms. An incidence higher than 10 % was observed in 3 farms for respiratory problems and in 3 other farms for digestive disorders. The females, which were sick during the first year, were culled at a rate significantly higher than the females without reported diseases. Surprisingly the remaining heifers conceived at a slightly younger age (17.5 vs 18.7 months) and a slightly heavier live weight (423.5 vs 418.5kg).

Since large variations were observed between farms in terms of animal performances, reproduction data and diseases frequencies, there is scope for improvement by better management practices.

007 (1440)

**SURVEY OF FEEDER CATTLE FOR PERSISTENT INFECTION WITH BOVINE VIRAL DIARRHEA VIRUS AND THE ECONOMIC COST OF SCREENING FOR PERSISTENTLY INFECTED FEEDER CATTLE**

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Bovine viral diarrhoea virus (BVDV) is responsible for a variety of economically important disease syndromes in beef cattle including respiratory disease and immune suppression in feeder cattle. Persistently infected (PI) cattle are the result of in utero exposure to the noncytopathic biotype of BVDV prior to the development of a competent fetal immune system and are considered the primary source of BVDV exposure in feeder cattle.

An immunohistochemistry (IHC) test for BVDV infection using skin biopsy samples can differentiate between PI animals and transient BVDV infections. Polymerase chain reaction (PCR) testing for BVDV can identify minute amounts of virus and can be used with pooled samples. The purpose of this research is to determine the prevalence of BVDV PI feeder cattle and to determine the sensitivity and specificity of pooled PCR compared to IHC to find PI BVDV animals. In addition, by using this prevalence, one can determine the cost of finding PI animals with IHC testing of skin biopsy samples collected in a whole population screening strategy to control BVDV in feeder cattle.

Whole blood samples and ear notch skin biopsies were collected from 938 cattle. Approximately one-half the cattle arrived at 8-10 months of age directly from herds of known origin that had been preconditioned with a vaccination program that included modified live BVDV vaccine. The other half was obtained from livestock markets at approximately 6-15 months of age and had no herd or individual history.

Apparent prevalence of PI animals was 0.32% (3/938) and the true prevalence was 0.33%. PCR was positive for every pool (2/2) that contained IHC positive PI animals, therefore sensitivity for PCR to identify the presence of PI animals in pooled whole blood samples was 100% when using IHC as the gold standard. PCR was positive for 3 of 29 pools that did not contain an IHC positive (PI) animal, making the specificity of PCR testing of pooled whole blood samples to identify PI animals 89.66% when using IHC as the gold standard.

The cost of whole-herd diagnostic testing on a per-true positive basis is equivalent to the necessary cost of the presence of a BVD PI feeder calf to justify the testing strategy. The breakeven cost of the presence of a PI feeder calf is US\$3,058, US\$4,476, and US\$5,895 if the true prevalence is 0.3% and the cost of diagnostic testing US\$8, US\$12, and US\$16 respectively.

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008 (2774)

**AN EXAMINATION OF THE RISK FACTORS ASSOCIATED WITH CHRONIC PNEUMONIA AND POLYARTHRITIS SYNDROME IN FEEDLOT CALVES IN SOUTH WESTERN ONTARIO**

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Chronic pneumonia and polyarthritis syndrome (CPPS) is associated with caseous microabscessation of the lung, and deposition of fibrin in the joints of the affected animal. The syndrome is associated with *Mycoplasma bovis*.

This disease, in most cases, results in debilitation and eventually death. In the fall of 2002, 37 producers in southwestern Ontario with 83 pens of assembled mixed breed cattle were visited. The purpose of this study was to determine if there were any particular risk factors associated with the diagnosis of CPPS in feedlot cattle under 800 pounds (364kg). Producers were chosen based on having greater than 100 head of feeder cattle the previous year and on their willingness to participate. The study questionnaire involved questions based on treatment protocol, management practices, housing conditions, and calf attributes. A follow-up telephone survey was conducted in January/February of 2003 to determine overall treatment and mortality rates, as well to ensure that none of the protocols previously reported had changed since the initial visit. Post mortems were done whenever possible to determine the cause of death, and when not possible, the number of days between first treatment and death was calculated. All animals dying seven or more days after first treatment were considered to have died with CPPS. 'Case' pens were designated as any pen with greater than 1.5% mortality due to CPPS and this resulted in 23 such pens. The overall rate and 95% confidence interval of CPPS in the feedlots visited was 1.35% (0.79-1.92) while the overall mortality rate was 1.81% (1.21-2.41). The average number of calves per pen in this study was 136 (112-159). Preliminary findings based on unconditional association have uncovered several factors that may be predictive for CPPS. These include the quality of the producer's records, the number of staff working with the calves, the number of animals treated for respiratory disease, and whether or not dry hay is removed from the diet within 21 days post-arrival. Other factors that will be included in the logistic regression analysis

include whether or not metaphylactic antibiotics were administered at arrival, whether the calves were fed by-product feeds, if the feed was medicated with antibiotics, and the number of truckloads of calves assembled in one pen.

Funding: OCA, BCRC

009 (2714)

#### EFFECT OF INTRANASAL VACCINATION AGAINST BOVINE ENTERIC CORONAVIRUS ON THE OCCURRENCE OF RESPIRATORY DISEASE IN A COMMERCIAL FEEDLOT

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The objective of this study was to measure antibody titers against bovine coronavirus (BCV), determine the frequency of intranasal BCV carriage and compare calves treated for bovine respiratory disease (BRD) among those given an intranasal vaccine against BCV with a group of controls. Four hundred fourteen heifer calves entering a commercial feedlot were randomly assigned to a treatment or control group. The treated group received 3.0 ml of an oral modified live vaccine against bovine enteric coronavirus (BECV) and rotavirus administered intranasally or 3.0 ml of saline. Calves were then confined to one of two separate pens, depending on vaccination status, for a minimum of 17 (median 39, range 17-99) days of observation. The presence of intranasal BCV antigen was measured on entry and antibody titer against BCV on entry and exit from the pen. Selection of calves for treatment of BRD, and scoring for severity of disease, were done by veterinarians blinded to the treatment status. Intranasal BCV was identified in 125/407 (31%) and serum antibody titers  $\geq 20$  against BCV in 246/396 (62%) of calves entering the feedlot. Seroconversion from an antibody titer against BCV of  $< 20$  to  $\geq 40$  occurred in 95% of control and 99% of vaccinated calves. Vaccination was associated with a decreased ( $P < 0.01$ ) risk and the presence of intranasal BCV on entry to the feedlot with an increased risk ( $P < 0.01$ ) of treatment for BRD. Among control calves, those with intranasal BCV on entry to the feedlot and those with antibody titer  $< 20$  were significantly more likely to be treated for BRD. These data provide further evidence of an association between BCV and respiratory disease in feedlot calves. An intranasal vaccine appears to reduce risk of treatment for BRD.

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010 (3259)

#### EFFICACY OF TULATHROMYCIN IN THE TREATMENT OF CATTLE AT HIGH RISK OF BOVINE RESPIRATORY DISEASE

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Three studies were conducted to a common protocol at research sites in Greely, CO, Tulare, CA, and Terre Haute, IN to evaluate the efficacy of tulathromycin (Draxxin®), a novel triamilide in the treatment of cattle at high risk of naturally occurring bovine respiratory disease. Animals were purchased at sale barns, commingled for approximately 2 days at assembly points, and then transported approximately 1000 miles to the designated study site. Approximately 24 hours after arrival, clinical attitude scores (CAS) and rectal temperatures were used to assess the clinical status of each calf and animals with CAS of  $< 1$  (normal or mild depression) and a temperature  $< 104$  F were selected for inclusion in the study. At each location, calves were allotted to one of five treatment groups with 20 calves per group (randomized block design). Treatments were a single SC injection of saline, tilmicosin (Micotil®) 10 mg/kg or tulathromycin at 5, 2.5, or 1.25 mg/kg. Each calf was evaluated daily for 14 days post-treatment with rectal temperatures and CAS assessments made by a clinician masked to treatments. Case definition of BRD was defined as a CAS  $> 1$  (1=mild depression, 2=moderate, or 3=severe depression) and a rectal temperature  $> 104$  F. Body weights were determined on days 0, 7, and 14. On day 14 post-treatment, lungs were removed and examined for gross pneumonic lesions. Morbidity rates were 67, 30, 16, 22, and 27% for the saline, tilmicosin, and tulathromycin-5, 2.5, or 1.25 mg/kg groups, respectively, with significantly ( $P < 0.05$ ) lower BRD morbidity in the antimicrobial-treated groups compared to the saline-treated group. Mortality rates were 18, 7, 0, 2, and 0% for the saline, tilmicosin, and tulathromycin-5, 2.5, or 1.25 mg/kg groups, respectively, with differences between saline and antimicrobial-treated groups significant ( $P < 0.05$ ). Rectal temperatures were lower in the antimicrobial-treated groups, but not different ( $P > 0.05$ ) among the groups over the 14-day study period. Percentage of pneumonic lung tissue was 13.6% in the saline-treated group, 7.4% for the tilmicosin-treated group, and less than 3.5% in the tulathromycin-treated groups with the differences being significant ( $P < 0.05$ ) between the tilmicosin and tulathromycin 2.5 and 5 mg/kg groups. There were no differences ( $P > 0.05$ ) in weight gain among the groups. These data support the selection of 2.5 mg tulathromycin/kg body weight as an effective

dose rate for reducing BRD morbidity in high-risk calves.  
Funding: Pfizer Animal Health

011 (3163)

#### LAMENESS AND CLAW LESIONS IN FIRST LACTATION HEIFERS - RELATIONS TO HOUSING AND POSTURE OF HIND LEGS

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Lameness persists to cause major economic losses and welfare problems in dairy production. A large portion of the lameness incidents originates from the corium and results in horn related lesions like solar haemorrhages, sole ulcers, white line disease and double sole. Prevention strategies must take the conditions on the farms into account. The prevention of the horn related lesions must start among the heifers in late gestation before the first signs of lameness occur. The persons best equipped to handle that task are the claw trimmers. Corrective trimming assuring normal posture of the legs and normal symmetrical claws may reduce the prevalence and severity of lameness, thereby promoting production and welfare.

We have performed a longitudinal prospective study in Denmark during 2002 in 4 farms with a total of 100 heifers calving in the winter and in the summer. Data on the heifers were collected during 6 visits. The first visit was four months before calving and the last visit in the beginning of the dry period. At each visit all heifers were scored for lameness, body condition, hind leg posture, claw shape, claw size, all claw lesions, and all lesions in the skin of the limb. Digital photographs were taken of the hind leg posture from lateral and caudal view and the posture was scored and the claws. All lesions in the skin and horn structures of the claws were described in detail and scored according to severity. The remaining cows in the herds were used as control cows.

We used random coefficient logistic regression analysis to estimate the relations between lesions and hind leg posture. Preliminary results indicate a strong association between wide based or cow hocked posture of the hind legs and lameness. There is also strong relation between asymmetrical claws and solar haemorrhage and lameness. Lameness is related to poor body condition and decubital lesions. There were significantly fewer lesions among the early trimmed heifers and the heifers trimmed after calving. The relation between lameness and posture may suggest that the breeding standards should be changed. Breeding goals focusing on how the udder affects the posture of the hind leg and lead to lameness should be explored as an option for the prevention of lameness.

012 (2406)

#### THE INFLUENCE OF FREESTALL SURFACE ON THE BEHAVIOR OF NORMAL AND LAME DAIRY COWS

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The objective of the study was to identify behavioral differences between cows housed in freestalls bedded with deep sand and cows housed in freestalls with rubber crumb mattresses, which may explain differences in lameness prevalence observed between the two types of farm.

Twelve Wisconsin dairy herds were selected to include six sand stall herds (SAND) and six mattress stall herds (MAT). At a single milking, all lactating cows were locomotion scored and the prevalence of clinical lameness was calculated for each herd. For the duration of one 24 hour period, the mature cow high group pen on each farm was video filmed. Ten cows per farm were randomly selected and color marked with spray paint, so that they could be individually tracked. Each cow was locomotion scored. Location in the pen, activity and time spent performing each activity was recorded for each marked cow.

The data were analyzed using the PROC MIXED procedure of SAS. One way ANOVA was used to compare cow and herd level data and a mixed effect model was created to investigate differences in cow behavior between SAND cows and MAT cows.

Mean (SE) lameness prevalence was significantly higher in MAT herds (24.0%, 2.1) than in SAND herds (11.1%, 1.3). Mean (SE) lying time averaged 12.0 (0.22) h/d for normal cows in both SAND and MAT herds. Time standing in the stall with all four feet on the platform or perching with two feet on the platform and the rear feet in the alley was significantly different between the two groups. Normal cows in MAT herds stood in stalls for 2.4 h/d compared to cows in SAND herds that stood for 1.7 h/d ( $P = 0.048$ ). Time up in stall for slightly lame cows in MAT herds was 4.4 h/d compared to 2.1 h/d in SAND herds ( $P < 0.0001$ ) and for moderately lame cows in MAT herds time up in stall was 6.1 h/d compared to 1.8 h/d in SAND herds ( $P = 0.0183$ ). Moderately lame cows in MAT herds had 46% fewer lying sessions per day and lay down for only 10.0 h/d.

We speculate that the surface traction provided by sand allows lame cows to rise and lie down more easily, without fear of slipping, thereby maintaining normal lying session behavior in cows with sore feet. The pain associated with rising and lying in lame cows on a mattress stall surface leads to extended bouts of standing in the stall during a lying session. Extended time spent standing in the stall may be detrimental to claw health

increasing the duration of lameness in MAT herds.  
Funding: UW and Land O'Lakes Inc.

013 (2541)

#### CLAW TRIMMING ROUTINES AND BOVINE CLAW LESIONS IN DIFFERENT NORWEGIAN HOUSING SYSTEMS

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In many Norwegian dairy herds there are no routine claw trimming. These claws are occasionally or never trimmed. In most herds with routine trimming the claws are trimmed once a year. The trimming is performed by professionals or by the farmers. The present study was designed to assess how claw trimming can influence claw health in different housing systems.

Random sampling resulted in 55 tie stall herds (44 on concrete, 6 on rubber mats and 5 on other floors) and 57 cubicle herds (35 on concrete, 17 on rubber mats and 5 on other cubicle floors) being included in the study. Thirteen educated claw trimmers trimmed 2.607 cows during the spring of 2002. Claw lesions and previous trimming routines were recorded. In the tie stall group 20 herds were trimmed once a year; 3 twice; 22 occasionally; and 10 were never trimmed. In the cubicle herds the figures were: 21 - 3 - 22 and 11, respectively. In the tie stall herds with routine trimming significant fewer cows had remarks to claw health versus herds occasionally or never trimmed. In the routinely trimmed herds the hind claws had lower prevalence of dermatitis, heel horn erosions and hemorrhages in the white line and the sole. As to sole ulcers and white line diseases these differences were minor. Herds with occasional trimming had significant more lesions versus herds never trimmed.

In the cubicle herds with routine trimming significant more cows had remarks to claw health versus herds occasionally or never trimmed. In the cubicle herds with concrete floors the negative effect of routine trimming was increased with significant more heel horn erosions and hemorrhages in the white line and the sole. As to dermatitis, sole ulcers and white line diseases there were no significant differences. However, in cubicle herds with rubber mats routine trimming seemed to decrease the prevalence of all lesions except heel horn erosions. Herds housed in cubicles with concrete floors and occasional trimming had more lesions versus herds never trimmed.

These results confirm that routine trimming can be expected to prevent claw diseases in tie stalls. In cubicles the effect of trimming is more complex. In cubicles with concrete floors the trimming can provide disadvantages while trimming in cubicles with rubber mats seems to have a preventative effect on most claw lesions. The study indicates that occasional trimming ought to be replaced by routinely performed trimming of all cows in the herd.  
Funding: Norwegian Research Council

014 (3347)

#### BACTERIOLOGICAL ISOLATION AND SYNOVIAL FLUID MODIFICATIONS IN EXPERIMENTALLY INDUCED CALF INFECTIOUS ARTHRITIS

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The objective of this study was to evaluate the effect of a medical treatment in a septic arthritis model in calves by evaluating cytological and bacterial evolution of the synovial fluid.

Seven newborn Holstein bull calves were selected from the same dairy herd. They received the same amount of colostrum from a pooled colostrum bank. Inoculation of the right tarsus with 10<sup>8</sup> colony-forming units of viable *Escherichia coli* (Day 1) were performed at 13 to 19 days old. This strain of *E. coli* was susceptible to ceftiofur (minimal inhibitory concentration: 0.25 µg/ml). Antibiotics treatment was started on Day 2 for 20 days (ceftiofur 1 mg/kg, q 12 hrs, IV). Also, on day, a joint lavage was performed with 1 liter of Ringer's solution. Synovial fluid samples were collected aseptically on Day 1 (before inoculation), Day 2 (before joint lavage), Day 3, and Day 4 then every 4 days until Day 24. Samples were submitted for complete cytological examination. Bacterial culture was performed using blood culture bottle following manufacturer's recommendations. Physical examination, lameness and swelling were recorded daily by the same observer. Repeated measures linear model and Dunnett's post-hoc tests were used to evaluate the effect of day on total protein, whole blood cell and differential count.

Distension and periarticular swelling were obvious within 4 to 8 hours following inoculation. Lameness was more severe on Day 2 and 3 but improved rapidly to be normal on Day 9. Mild pain was detected during manipulation of the leg until Day 11 except for one calf where it lasted until Day 16. Persistent joint swelling was observed during all the study for 2 calves. On day 2, synovial bacterial culture was positive for *E. coli* for all calves and remained positive for 4 calves until Day 4 and 1 calf until Day 3. *Enterobacter* spp. was isolated on Day 8 and 20 on 2 different calves, and was considered a contaminant. Synovial total protein on each day of experiment was

statistically different of Day 1, but there was no significant difference between Day 20 and 24. WBC and neutrophils count were only statistically different of Day 1 on Day 2, 3, 4.

This experimental model successfully induced acute septic arthritis. Rapid recovery can be expected within a week when an appropriate treatment is instituted early in the course of the disease. *E. coli* could not be isolated 8 days after inoculation but signs of inflammation persisted until Day 20.

Funding: Fonds du centenaire

015 (3057)

#### SPASTIC PARESIS OF FEMORAL QUADRICEPS MUSCLE: A NEW CLINICAL FORM IN BELGIAN BLUE CALVES

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Spastic paresis of gastrocnemius muscles (P.S.G.) is a neuro-muscular disease affecting young cattle of every breed. Belgian Blue calves, however, are most commonly affected although the occurrence of the disease remains sporadic within herds.

The appearance of an atypical form of the disease where the femoral quadriceps muscle is affected has led to a retrospective study of 123 cases in order to establish a differential diagnosis for this condition.

Of the 123 Belgian Blue calves with spastic paresis of the hind limb, the great majority showed a continuous trampling when made to stand. They alternatively relieved one posterior then the other. The angle of the hock was often found to be excessively open. Diseased calves presented a stiff gait, with jerked movements and muscle spasm. Each spasm caused the suspended leg to swing backwards. In unilateral cases the limb was kept in constant hyperextension and was never in weight bearing position. All calves presenting the symptoms described above were diagnosed as P.S.G. Some of the 123 studied cases presented hyperextension (but less "open" hocks) and a forward swinging motion of the leg. In these cases, the gait resembled that of tin soldiers and, on palpation, the quadriceps muscle was in continual spasm. These animals only rose to feed, which led to a progressive deterioration of their general state. For instance, the appearance of escarres on the dorsal face of the front legs balls is a frequently observed complication. These calves had spastic paresis of the femoral quadriceps muscle and were regarded as P.S.Q.

In this study, P.S.G. (classic form) affected 105 calves, with no significant difference in gender (46 males - 59 females), their mean age was  $16 \pm 9$  weeks, their mean weight was  $127 \pm 53$  kg. In 74 % of these cases, the paresis was bilateral. P.S.Q. (atypical form) was found in 18 cases, most calves being bilaterally affected (17 of 18 cases). They were 11 males and 7 females; their mean age was  $4 \pm 3$  weeks with a mean weight of  $76 \pm 24$  kg.

In conclusion, cases where the quadriceps muscle was affected showed a typical forward swaying of the limb as opposed to the backward motion observed in P.S.G. Moreover, calves with the atypical form of the disease were significantly younger than those which were classically affected and were nearly always bilateral cases. This study gives new insights into the differential diagnosis of spastic paresis of the hind legs in calves.

016 (3312)

#### EFFECTS OF FUNCTIONAL CLAW TRIMMING ON PRESSURE DISTRIBUTION UNDER HIND CLAWS OF GERMAN HOLSTEIN COWS

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The objective of this study was to investigate the effects of Functional Claw Trimming (FCT), by assessing the pressure distribution of the weight-bearing surface (WBS) of the hind claws of 21 zero grazing Holstein dairy cows over a period of six month after FCT.

The punctual pressure distribution under the claws was recorded with an electronic measuring system that is based on changes of the capacitive resistance (four sensors per sq. cm); vertical pressure compresses the dielectric of capacitors. The measurements were carried out once before and thirteen times after the cows had been trimmed. For each measurement, the relative pressure load of each hind claw and the centre of gravity of the total WBS of the limb were determined. The WBS of each claw was split into an apical (fore) and a pulvinal (hind) segment for further analysis.

Before FCT the outer claws (OC) of the hind limbs bore on average 68% and the inner claws (IC) on average 32% of the total limb weight load (TLWL) with the pulvinal segment (PS) of the OC exhibiting an average load of 36% of TLWL.

FCT led to a 24% decrease in pressure load of the OC (reduction of 16% of TLWL to 52% of TLWL) and a 50% increase in pressure load of the IC (enhancement of 16% of TLWL to 48% of TLWL), compared to the pre-trimming status. The pressure load under the PS of the OC was reduced by 42% compared to the pre-trimming load (reduction of 15% of TLWL to 21% of TLWL). The load of the OC apical segment remained constant ca. 30%

of the TLWL. FCT results in a considerable load shift from the outer PS to the neighbouring IC. The additional weight load (i.e. 15% of TLWL) of the IC was split between the inner pulvinal segment (+ 9%) and the inner apical segment (+ 6%).

Before FCT the centre of gravity was located within the WBS of the OC, slightly apical to the site of a typical sole ulcer. The procedures of FCT shifted the centre of gravity towards the tip of the limb with a maximum of 8 mm and simultaneously 25 mm towards the region of the interdigital space. The decrease in OC load was mainly due to a load reduction of the outer PS. This is the desired effect for this area.

26 weeks after FCT there was no significant difference compared to the measurements before FCT. But about half of the animals reached already 4 months after FCT a status comparable with the pre-trimming status. If claw diseases are a major problem the interval between two trimmings should be cut down to 4 months.

017 (3357)

#### JOINT LESIONS BY DAIRY COWS - INFLUENCE OF BEDDING MATERIAL

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The purpose of this study was to detect how different types of cubicle flooring and litter materials affect the health of selected joints of dairy cows. The survey was carried out with 2457 lactating dairy cows in 56 different free-stall barns.

Forty-one of the visited farms had free-stall barns using soft lying mats of the same type and different litter materials (15 farms with ground straw, six with chopped straw, ten with sawdust and 15 with no litter applied). On the remaining farms the cows were housed in cubicles with straw manure-packs. The examination took place at the end of winter indoor housing. Inside the respective barns the installed cubicle system, lying surface as well as litter material used was identical. The free-stalls had been in place for at least one year.

By means of explicit examination skin and joint lesions were detected. The joint assessment of fetlocks, knees, carpal and tarsal joints took the different severity of the lesions into account. The findings were categorized into "hairless patches < 2 cm", "hairless patches > 2 cm", "skin abrasion < 2 cm", "skin abrasion > 2 cm" (in each case based on diameter) and "increase in circumference in bursa area, concealed". Non-parametric tests - Kruskal-Wallis H-Test, Mann-Whitney U-Test - were used to analyse data.

Looking closely at the results revealed that both cubicle systems cause injuries of all categories to cows. Those housed in cubicles with straw-manure packs had a significantly lower prevalence and severity of lesions ( $P < 0,01$ ) than cows housed in cubicles with soft lying mats with different litter applied. The use of litter on the soft lying mat tested in this study partly reduced the prevalence of joint lesions as well as their severity. The positive effect of pasture access on the health of joints as often cited in literature concerning dairy housing did no longer exist at the end of the winter indoor-housing period. Although 23 farms did not use brisket boards injuries in the assessed joints did not increase significantly.

Are straw-manure packs not used because of concerns about additional work or the lack of straw and instead soft lying mats, it can be concluded that by taking all examined joints into account ground straw is the most favourable litter material on the soft lying mat used in this study. Since the prevalence of injuries concerning carpal joints and hocks was in comparison to the other litter materials significantly lower ( $P < 0,05$ ).

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018 (1311)

#### KOVEX FOAM IN A LOOSE HOUSING SYSTEM - INFLUENCE ON CLAW HEALTH

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Infectious claw diseases incur a lot of costs in modern production animals. Digital dermatitis (Mortellaro disease) and foot rot are very infectious, causing the disease in the whole herd in a very short time. Until now, footbaths using solutions of disinfectants like formalin were used for prevention. Apart from the high input of labour, the high amount of solutions necessary and problems with the disposal after use (environment) the infrastructure needed alone poses a problem for the farmer. This is the report of the first use of Kovex Foam in this indication in a loose housing system in Austria.

Kovex Foam (Ecolab®) is a disinfecting foam consisting of hydrogen peroxide and peracetic acid. The residual organic compounds are easily degradable and harmless to the environment. The mean age of the cows was 4.4 years (range 2.5 to 13 years of age). 34 cows were of the Simmental breed, the remaining two were Holstein-Friesian. The claw score of 36 cows in a loose housing system was evaluated during claw trimming. Each claw was divided in 6 zones (model LIVERPOOL, 1990), the interdigital space being zone 7 and the coronary band and the remaining skin of the distal phalanx being zone 8. The claw score was computed by summation of zones

1 to 8, the total score being the sum of the individual scores of each cow's 8 claws. Lameness was also noted during movement in the stable. Digital photography was used for documentation. During a period of 8 weeks Kovex Foam was applied twice a day during milking on alternate weeks. In the holding area, the cows moved for up to 30 minutes in the foam. After 8 weeks, the claw scoring was repeated and statistical analysis performed (Wilcoxon-test).

All cows tolerated moving in the foam well, no cow trying to sample the green substance. Appetite and concentration of the faeces remained unaltered. There was a significant improvement ( $p < 0,01$ ) of the claw scores at the control examination (week 8). Heel horn erosions improved dramatically. The three cows with lesions caused by digital dermatitis on day 0 were healed after 8 weeks. Painful and slightly infected tylomas of three cows at the first examination were improved also.

No side effects were noted with a high acceptance of the workload by the farmers compared with that necessary for a footbath. The improvement of claw score at the control examination was statistically significant (Wilcoxon-test).

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019 (2501)

#### CLAW LESIONS IN NORWEGIAN DAIRY CATTLE HERDS HOUSED IN CUBICLE SYSTEMS VERSUS TIE STALLS. CONSEQUENCES FOR THE FUTURE.

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Approximately 88 % of Norwegian dairy cattle are housed in tie stalls. Within twenty years, there will probably be a demand for cubicle housing of all dairy cows in Norway and 50-70 % of existing barns will probably be rebuilt within the next 10 years. A Norwegian preliminary study indicated that claw lesions are more frequent in cubicle systems than in tie stalls. Feeding routines and housing are important factors in the etiology of lesions related to laminitis. Infectious claw lesions such as dermatitis and heel horn erosion are to a large extent influenced by a dirty environment. The present study was designed to assess the prevalence of claw lesions in cattle herds located in three regions of Norway and to estimate possible differences between cubicles systems and tie stalls. Random sampling of 55 herds housed in tie stalls and 57 housed in cubicle systems being included in the study. Thirteen hoof trimmers trimmed approximately 2650 female cattle elder than 1.5 years during the late winter and spring 2002. All of the hoof trimmers had short time previously attended three courses in diagnosing and recording of claw diseases. Claw lesions as well as environmental factors, management and feeding routines were recorded.

Approximately 72% of cows housed in cubicles systems had one or more remarks to claw health versus 48% in tie stalls. Hind feet were more affected than front feet in both housing systems, but the difference was less pronounced in cubicles. In the hind feet the following prevalences were recorded: 4.2% of the animals had dermatitis in tie stalls versus 5.7% in cubicles; 7.9% versus 38% had heel horn erosions; 7.3% versus 13.6% had hemorrhages in the white line; 11.7% versus 20.4% had hemorrhages in the sole; 2.8% versus 3.2% had sole ulcers and 5.5% versus 9.7% had white line diseases. Most lesions were mild.

The study confirms that in Norwegian dairy cattle both infectious claw lesions and lesions related to laminitis are more frequent in cubicle systems than in tie stalls. Changes in framework conditions for Norwegian farmers including increased herd size provoke fast adaptations when it comes to housing. As we move from tie stalls to cubicle housing systems, effort should be made to optimize the environment in new buildings. It is a big challenge for the future to achieve good conditions for the claws and hence good animal welfare in confined cubicle housing systems.

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020 (3376)

#### ARTHROTOMY AND ARTHRODESIS IN FIBRINOPURULENT ARTHRITIS OF THE FETLOCK JOINT IN ADULT CATTLE

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Commonly, acute cases of closed septic arthritis of the fetlock joint in older cattle show a sound response to systemic and local antibiotics combined with distension irrigation. However, frequently in subacute/chronic or in traumatic open septic arthritis above strategy remains unsuccessful due to pasty fibrinopurulent exudates or profound alterations to the articular surface. The aim of the study was to show exemplary, that arthrotomy (AT) and arthrodesis (AD) are simple and effective therapeutic measures in cases of open or chronic septic arthritis of the fetlock joint in adult cattle. One Galloway bull and three German HF cows (age 3 - 5 years) were studied. Front limbs were affected. Diagnosis was based on clinical examination, analysis of synovial fluid, sonographic and radiographic findings. AT was carried out in the bull (closed chronic fibrinopurulent arthritis, exostosis, bone

metaplasia of joint capsule) and two cows (open subacute/chronic fibrinopurulent arthritis, superficial proximal phalangeal [P1] osteitis). In one cow (chronic fibrinopurulent arthritis, profound metacarpal (MC) osteitis) AD was performed. All surgeries were done in lateral recumbency after retrograde intravenous regional analgesia (15 ml 2% Procaine). AT involved four vertical incisions each 5 cm long from dorsolatero/-medial and palmolatero/-medial allowing full access to joint cavities via the dorsal and palmar pouch, resp.. Fibrin, debris and necrotic tissue were removed. Corroded articular cartilage was abraded. The surgical approach for AD of the lateral and medial digit occurred via a lateral and medial (abaxial) horizontal incision (5cm) along the joint space, resp.. After debridement joint surfaces (cartilage/superficial bone tissue) of MC and P1 and inflammable affected bone tissue were entirely abraded by means of a high-speed surgical drill. During AT and AD the interdigital region, palmar and dorsal tendons, vessels and nerves were conserved. AT and AD included ample irrigation with Ringer solution and once local application of 3 Mil. IU Penicillin G. Incisions were sutured and a casting tape reinforced with a U-shaped iron was applied, so that the claws did not touch the ground. 12 days post surgery the cast was changed and sutures removed. Six weeks after surgery the cast was detached and a supporting bandage was used. Animals received 10 mg/kg BW IM Ampicillin for 21 days. All animals experienced unrestricted use after recovery for at least one year.

021 (2585)

#### CLINICAL RESPONSE IN HEIFERS GIVEN OLIGOFUCTOSE: A NEW MODEL FOR THE STUDY OF BOVINE LAMINITIS

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Oral administration of oligofructose (OF), a non-structural carbohydrate of several plants including grasses, has recently been used to study the development of acute laminitis in horses. At present, a plausible and repeatable model to study acute laminitis in cattle does not exist. A study was therefore undertaken to examine the clinical effect of OF in cattle. Twelve non-pregnant dairy heifers were acclimatized through four weeks to accept close handling, and fed only hay to ensure good ruminal function. After this period all animals could be walked by hand, accepted lifting of the front feet, palpation and hoof testing. Six animals were then given an oral dose of OF by stomach tube (at time = 0 h.) and compared to a control group (N=6) sham-inoculated with water. The clinical response, with a special emphasis on lameness, was monitored every six h. by three veterinarians blinded to previous results in a non-consecutive rotation system.

All heifers given OF became depressed, stopped eating and experienced diarrhea from +9 to +39h. By +33 to +45h feces returned to normal and the heifers started eating. Animals administered OF developed transient fever, profound metabolic acidosis and moderate dehydration, which were alleviated by supportive therapy. Four of six animals dosed with OF showed acute signs of laminitis starting from +39 to +45h and until euthanasia at +48h (P = 0.03). Although lameness was obvious, it could easily be missed by the untrained eye, because the heifers continued to stand and walk, and did not interrupt their eating behavior. No positive pain reactions or lameness were seen in control animals. In the present study, the sensitivity of the lameness examination was increased by training animals to accept close handling, and by the short time intervals between examinations. The risk of false positive classification was decreased by use of strict criteria for a positive diagnosis of laminitis.

Based on these results, we suggest that OF induced laminitis in cattle and horses share important common features in both pathogenesis and pathophysiology. The method provides a new experimental model to investigate the disease mechanisms of bovine laminitis.

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022 (2889)

#### DAIRY COWS DISPLAY SIGNIFICANT INTER-INDIVIDUAL VARIATION IN CLINICAL AND HAEMATOLOGICAL RESPONSES TO LIPOPOLYSACCHARIDES

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Lipopolysaccharide (LPS) is involved in the pathogenesis of a number of diseases in the bovine including coliform mastitis, neonatal coliform septicaemia, lung pasteurellosis and salmonellosis. The clinician often encounters that susceptibility to such diseases seems to differ markedly between individual animals and several authors have reported that the outcome of seemingly standardized experimental challenges to LPS or coliforms varies unexplainably between individuals. This rather well accepted individual variation of the response to systemic LPS exposure in cattle has not been evaluated systematically, nor has the combined effect of animal and the LPS dose.

The aim of this study was therefore to investigate how LPS responses differed between individual cows subjected to increasing doses of LPS.

Eight non-lactating, non-pregnant dairy cows each received three intravenous injections of *Escherichia coli* LPS (10, 100, and 1000 ng/kg, consecutively) at three-week intervals. This design minimized induction of LPS tolerance. The clinical, haematological and blood biochemical responses were monitored from one week before to six days after each challenge.

All three LPS doses induced classical signs of endotoxemia (depression, shivering, salivation, miosis, anorexia, hyperthermia, tachypnoea, tachycardia, ruminal stasis, diarrhoea, leukopenia followed by leukocytosis, thrombocytopenia, and altered serum concentrations of calcium, zinc and iron) in all the experimental cows. The intensity of all responses increased significantly with increasing LPS dose. However, individual cows differed significantly with respect to all clinical, haematological, and blood biochemical responses except for serum calcium concentrations. In the case of white blood cell and thrombocyte counts, more than half of the variation could be statistically attributed to the individual.

The results of the present study show that despite the existence of a dose-response relationship between LPS and the ensuing clinical, haematological, and blood biochemical responses, the majority of responses to LPS depend on the individual. This may indicate that cows differ considerably in their ability to resist an inflammatory insult. Individual variation may be associated with a large potential for breeding effects. Therefore more research is needed to elucidate the responsible mechanisms and to determine whether this ability is a heritable or an acquired condition.

023 (5004)

#### ABOMASITIS ASSOCIATED WITH SARCINA-LIKE ORGANISMS IN YOUNG DAIRY CALVES

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In the spring of 2001, a one-month old calf was presented to the Ambulatory Clinic of Cornell University for acute and severe bloat. Nasogastric intubation released foul smelling gas accompanied by sanguineous fluid. The calf was euthanised and a necropsy revealed an enlarged abomasum associated with mucosal blackish green striping and locally extensive hyperaemia, as well as important submucosal emphysema. A presumptive diagnosis of Braxy was made at that point, even though the disease is rare in North America.

Then in June of 2001, an 1800 lactating-cow herd had 3 apparently healthy calves acutely bloat and die in 24 hours. Two of those calves were necropsied on the farm and the findings were very similar to those on the calf from the first herd. The third calf was referred to Cornell University Pathology service for a full necropsy. The gross findings were again similar to those of the other calves. Upon histopathological examination, numerous basophilic cocci forming tight packets of four were seen in the abomasum, in addition to the diffuse and severe haemorrhage. The history of acute bloat with gross and histopathologic findings of emphysematous abomasitis makes *Sarcina*-like bacterial associated bloat the most likely cause of death in this case.

Bacteria of the genus *Sarcina* are gram-positive, non motile, packet-forming cocci that are anaerobic with exclusively fermentative metabolism. Two species belong to the genus *Sarcina*: *S. ventriculi* and *S. maxima*. They can tolerate extremely low pHs and sporulate at pH higher than eight. Their isolation is difficult and they produce a considerable amount of gas after 16 hours in culture. There are a few reports in the literature that suggest a link between *Sarcina*-like organisms and acute bloat in different species of animals: goat kids, calves, lambs, dogs and horses.

The disease was diagnosed in three additional herds during the fall of 2001. In order to try and prevent further deaths, penicillin was added to every milk feeding for calves 21 days old and younger. No new cases were diagnosed since. Research is needed to be able to better characterize this emerging disease. Once risk factors are known, it should be possible to act on those, thus avoiding the prophylactic use of penicillin for young dairy calves.

024 (1259)

#### NESTED PCR ON BLOOD AND MILK MACROPHAGES FOR THE DIAGNOSIS OF SUBCLINICAL BOVINE PARATUBERCULOSIS

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Objective: To determine the potential of PCR on blood and milk cells for the detection of subclinical cattle infected with *Mycobacterium avium* subsp. *paratuberculosis* (Map).

Procedure: A nested PCR probing for IS900, a specific insertion sequence of the Map genome, was developed and its efficiency was compared to ELISA serology in a cohort of 46 subclinically infected lactating Holstein cows from a herd with confirmed paratuberculosis (Johne's disease).

Results: The detection rate of the nested PCR was 52% (24 animals) positive in blood and/or milk samples as compared to 39% (18 animals) positive or suspicious on ELISA. In 5 of 12 animals (42%) the nested PCR identified subclinically infected cows when these were negative on ELISA. More animals were detected by nested

PCR on milk samples when compared to blood samples. Some cows were positive with both assays. Conclusion: Nested PCR testing of blood and milk samples showed a potential to detect subclinical animals infected with Map by taking advantage of a likely hematological phase of circulating infected monocytes in paratuberculosis. Positive signals obtained in subgroups of animals when the ELISA reading was negative may make the assay a candidate for early, silent infection detection.  
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025 (913)

#### INFLUENCE OF WEATHER ON THE OCCURRENCE OF ABOMASAL DISPLACEMENT IN DAIRY COWS

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For abomasal displacement of dairy cows the empirical indication was investigated if a specific weather situation is correlated with its occurrence. Therefore the hypothesis was tested if the weather situation, which is characterized by specific meteorological parameters or the temporal change of the weather situation, has an influence on the observed prevalence of abomasal displacements.

The empirical data of abomasal displacements were collected for years 2000 and 2001 in the area around Lisbon at 26 farms all with about 6500 Holstein-Friesian milk cows in total. The weather situation was characterized by following meteorological parameters on daily basis: Atmospheric pressure, relative humidity, precipitation, daily insulation, maximum air temperature, minimum air temperature, average wind velocity. The change of the weather situation was described by the mean absolute deviation (deviation of the meteorological parameters from the running mean over a period of 5 and 10 days) and by a method which was based on the principal component analysis of the entire data set.

For the weather situation only a weak influence on the occurrence of abomasal displacements could be found by a linear correlation and regression analysis for following parameters: water vapor pressure, relative humidity, temperature, temperature range, precipitation and insulation. Even if a high cross-correlation between these parameters could be found, a higher (lower) probability of abomasal displacement can be expected for following parameters: low (high) water vapor pressure, high (low) relative humidity, low (high) air temperature, low (high) temperature range, high (low) precipitation, low (high) insulation. For wind velocity and atmospheric pressure no statistically significant linear regression could be evaluated.

From the present work it can be concluded that the meteorological situation has an influence on the occurrence of abomasal displacement. Therefore the weather situation should be included among the predisposing causes of the occurrence of abomasal displacements.

026 (3364)

#### USING THE SIMPLIFIED STRONG ION APPROACH TO DETERMINE THE MECHANISM FOR AN ACID-BASE DISTURBANCE IN CALVES

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Acid-base abnormalities are frequently present in sick calves. The mechanism for the acid-base disturbance can be determined using the simplified strong ion approach, which requires accurate values for the total concentration of plasma non-volatile buffers (Atot) and the effective dissociation constant for plasma weak acids (Ka). We previously determined (Am J Vet Res 63:482-490, 2002) that the normal values for Atot (in mmol/l), Ka, and strong ion difference (SID) of adult bovine plasma were 0.36 mmol/g of total protein,  $0.87 \times 10^{-7}$ , and 44 mEq/l, respectively. The aim of this study was to experimentally determine Atot, Ka, and SID values for calf plasma, and to determine whether these values were similar to those obtained for adult bovine plasma.

Plasma was harvested from 9 healthy Holstein-Friesian calves (4 to 55 days old) and tonometered with carbon dioxide at 37 C. Plasma pH, carbon dioxide tension, and concentrations of quantitatively important strong ions (Na, K, Ca, Mg, Cl, L-lactate) and non-volatile buffer ions (total protein, albumin, phosphate) were measured over a pH range of 6.9 to 7.5. Strong ion difference was estimated from the measured strong ion concentration and nonlinear regression was used to calculate Atot and Ka from the measured pH and carbon dioxide tension and estimated SID; the Atot and Ka values were then validated using data from calves administered sodium bicarbonate.

Mean (SD in parentheses) values for calf plasma were: Atot = 19.2 (6.1) mmol/l (equivalent to 0.34 mmol/g of total protein or 0.62 mmol/g of albumin); Ka =  $0.84 (0.41) \times 10^{-7}$ ; pKa = 7.08. The calculated jugular venous SID for

normal calf plasma was 44 mEq/l. The Atot, Ka, and SID values were similar to those for adult cattle, and determining these values will facilitate the treatment of acid-base disturbances in diarrheic and septicemic calves. For example, the concentration of unmeasured strong anions (such as D-lactate) in calf plasma can be estimated by calculating the strong ion gap (SIG, in mEq/l) from the anion gap ( $[\text{Na}] + [\text{K}] - [\text{Cl}] - [\text{HCO}_3]$  in mEq/l) and net non-volatile buffer ion charge, whereby:  $\text{SIG} = \{0.34 \times [\text{total protein in g/l}] / (1 + 10^{7.08 - \text{pH}})\} - \text{anion gap} + 1.5$ . At normal pH, a 1 mEq/l decrease in SID (due to a 1 mmol/l increase in D-lactate concentration) will decrease pH by 0.012, a 1 mm Hg increase in carbon dioxide tension will decrease pH by 0.007, and a 1 g/l increase in total protein concentration will decrease pH by 0.003.

027 (3305)

#### SURVEY OF THE PREVALENCE OF PARATUBERCULOSIS, ENZOOTIC BOVINE LEUKOSIS AND ANIMALS IMMUNOTOLERANT TO BOVINE VIRAL DIARRHEA VIRUS IN QUEBEC COW-CALF HERDS

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In 2001, the Quebec Department of Agriculture, Fisheries and Food and the Fédération des producteurs de bovins du Québec jointly conducted a seroprevalence survey on Quebec cow-calf farms to estimate the current prevalence of paratuberculosis, enzootic bovine leukosis (EBL) and the prevalence of cow-calf herds likely to have at least one animal persistently infected with bovine viral diarrhoea virus (BVD). The survey conducted was a cross-sectional observational survey with the herd as the unit of interest. A two-stage random sampling proportional to the number of cow-calf herds in each region was used.

314 sera obtained from sentinel animals, i.e. aged 6 to 18 months and not vaccinated with a live vaccine, from 65 cow-calf herds were tested for BVD virus. The proportion of herds with at least three sentinels with antibody titres = 1:128 was 3.1% (i.e. < 7.24%, CI of 95%). The proportion of herds with at least two sentinels with antibody titres > or = 1:128 was also 3.1%.

1,394 bovine sera from 70 farms were analyzed for detection of antibodies to EBL virus. The proportion of herds with at least one cow seropositive for EBL virus was 32.8% (i.e. between 21.9% and 43.7%, CI of 95%). At the individual level, the apparent prevalence of EBL in beef cows was 4.2% (i.e. between 2.2% and 6.2%, CI of 95%). The results obtained for EBL are lower than those observed in the United States in 1997, but higher than those observed for Canada and Quebec in 1980.

1,698 bovine sera from 70 farms were analyzed for detection of antibodies to the bacterium *M. paratuberculosis*. The proportion of herds with at least one cow seropositive for paratuberculosis was 15.7% (i.e. between 7.4% and 24.0%, CI of 95%). The proportion of herds with at least two cows seropositive for paratuberculosis was 1.4% (i.e. < 4.12%, CI of 95%). At the individual level, the apparent prevalence of paratuberculosis in beef cows was 0.7% (i.e. between 0.3% and 1.1%, CI of 95%). These findings are comparable to those observed in other studies conducted in North America.

This study has provided an estimate of the prevalence of three important diseases in Quebec. These results could be used to assess the progression of these diseases during the coming years and will provide a scientific basis for the development and support of a control program.

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028 (1548)

#### RETHINKING BOVINE VIRAL DIARRHEA VIRUS PATHOGENESIS: UNDERSTANDING THE IMPORTANCE OF BVDV STRAIN ON THE INNATE IMMUNE SYSTEM

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Bovine viral diarrhoea virus (BVDV) continues to be the bane of the US beef and dairy industry. BVDV infections cause symptoms that vary from peracute death to inapparent infection. Even these inapparent BVDV infections can result in persistent infection (PI) of susceptible fetuses. The macrophage expresses cell surface markers that are important for phagocytosis and bacteria killing and also for stimulation of T helper cells and for immune surveillance and killing by cytotoxic T cells (CTL). In this study, our objective was to measure the effect of BVDV on the macrophage function (phagocytosis and pathogen killing) and surface marker expression (CD14, MHC I and MHC II). Bovine macrophages were developed from bovine monocytes and then infected with eight different strains of BVDV, 6 noncytopathic (NCP) and 2 cytopathic (CP). There were 3 type 1 and 5 type 2 viruses. The six noncytopathic strains were two highly virulent (HV) strains that cause severe acute disease, one strain that causes moderate disease and three avirulent (AV) strains that cause no clinical disease in the dams but do cause persistent infection in susceptible fetuses. Each of the strains was used individually to infect the macrophages and the phagocytic ability, microbicidal activity (fungal and bacteria) and NO production (microbicidal killing product) were measured. Surface marker expression for CD14 (receptor for gram negative bacteria) was measured using flow cytometry. Infection of macrophages with the HV resulted in 50-60% decrease in

phagocytosis by 24 hrs. These viruses had a similar effect on the microbicidal activity against bacteria and fungi and also decreased NO production. On the other hand the AV strains had no effect on phagocytosis or any of the other functions. Analysis of surface markers indicated that in macrophages infected with HV strains had a 40-60% decrease in CD14 expression while the AV strains had no effect on CD14 expression. The most interesting aspect of this research is that the clinical symptoms seen with the NCP viruses correlate directly to their effect on macrophages. This research indicates that virulence is not related to genotype and that different NCP BVDV isolates cause a wide spectrum of clinical disease that correlates to the effect on macrophages.  
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029 (837)

PCR AS A DIAGNOSTIC METHOD FOR DETECTION OF H. SOMNI ON TRANS-TRACHEAL ASPIRATED bronchoalveolar fluid from clinically normal calves and calves with pneumonia

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The aim of the present field study was to evaluate the diagnostic value of a species specific PCR test against *Histophilus somni* (earlier *Haemophilus somnus*). Trans-tracheal aspirated bronchoalveolar fluid (BAL) from 56 clinically normal healthy calves and 36 calves that developed pneumonia were collected in 6 different herds during September and November 2002. All 92 aspirations were analysed for Bovine Respiratory Syncytial virus (BRSV), Parainfluenza-3 virus, Bovine Coronavirus by antigen ELISA. Bacteria were detected by cultivation and *H. somni* additionally also by PCR. The results showed that 63% of the clinically normal calves harboured pathogenic bacteria (mainly *P. multocida*, *M. haemolytica* and *H. somni*) in the lower respiratory tract, and in 60% of these cases bacteria were found either in pure culture or as the predominant flora, something that could be expected to cause clinical disease. Among diseased calves, 97% contained bacteria in the lower respiratory tract, all of them classified as pure culture or many pathogenic bacteria in mixed culture. BRSV was detected in 53% of the diseased calves.

A comparison of *H. somni* specific PCR test to cultivation showed PCR to be most sensitive test. No significant relation between pneumonia and detection of *H. somni* by PCR could be demonstrated, whereas a clear significant correlation between pneumonia and detection of *H. somni* by cultivation was found.

030 (5026)

PROGNOSTIC VALUE OF BLOOD LACTATE CONCENTRATION MEASURED COW-SIDE USING A PORTABLE CLINICAL ANALYZER IN HOLSTEIN DAIRY CATTLE WITH ABOMASAL DISORDERS.

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Elevations in blood lactate concentration reflect tissue hypoperfusion and have been used to predict survival in critically ill humans and animals. Lactate can be practically measured using a cow-side portable clinical analyzer (PCA). The ability to predict return to profitable production in cows with abomasal displacement would greatly increase veterinarians' ability to decide how to proceed with treatment or choose culling. The purpose of our study was to determine normal blood lactate concentrations in healthy, early lactation cows and to determine if a cow-side test for blood lactate concentration could be used to predict return to profitable production in cows with abomasal disorders.

Blood lactate concentrations was measured with an I-STAT PCA using heparinized blood taken from the coccygeal vein in 27 normal healthy Holstein cows in their 1st to 5th lactation and 1 to 38 days in milk. Their mean blood lactate was  $0.62 \pm 0.37$  mM/L.

A prospective study (Jan 2002 to Dec 2002) was performed evaluating plasma lactate concentrations in Holstein cattle with left displaced abomasums (LDA), right displaced abomasums (RDA) and abomasal volvulus (AV).

Other data collected included the signalment, history, physical examination findings, presence of ketonuria, lactate concentration, blood gas, electrolytes, total plasma protein, and PCV. Heparinized blood samples were collected prior to fluid therapy and the biochemical variables measured immediately using a PCA. The cow was considered to have a positive outcome (PO) if she remained productive in the milking herd 30 days post-operatively and a negative outcome (NO) if she was culled or died in that time.

Seventy-eight cows were used for the analysis (LDA n=44, RDA n=20, AV n=14). Mean blood lactate concentrations were significantly higher in cows with NO (n=21) versus those with PO (n=58),  $4.67 \pm 3.69$  and  $2.37 \pm 2.1$  mM/L, respectively, ( $p=0.01$ , SAS Proc T-Test). NO cows also had a significantly higher heart rate (HR) and anion gap, and lower pH and chloride concentrations. There was no difference between lactate concentrations of productive cows or those that were culled or died with RDA and LDA, whereas there was a trend towards increased blood lactate concentrations being associated with NO in cases of AV ( $p=0.06$ , SAS Proc

Npariway). A multivariable logistic regression model (SAS, Proc Logistic) that includes HR, type of DA, chloride, and lactate as explanatory variables allows one to predict outcome; for example, a cow with a lactate of 7.4 mM/L will have a relative risk of 2.2 for having a non-productive outcome when compared to a cow with a lactate of 2.3 mM/L. Blood lactate concentration may be a useful predictor of outcomes in cows with abomasal disorders.

031 (1822)

#### ASSESSMENT OF BVDV CONTROL STRATEGIES IN A DAIRY HERD BY MODELING

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At the farm level, actions available to farmers to control infection by the bovine-viral-diarrhea virus include test-and-cull programs (elimination of persistently infected (PI) animals), biosecurity measures (prevention of virus transmission) and vaccination. In countries with no national program, the choice of a strategy depends on the probability of a new infection, the costs and benefits of possible strategies and the attitude towards risk of the decision-maker. There is a need for methods enabling to assess ex-ante the expected benefits, based on the predicted efficiency of alternative strategies under different circumstances. A simulation model was developed to assess the efficiency of control strategies in a dairy herd in various situations. Results of strategies combining test-and-cull and biosecurity were compared. The model outcomes were summarized to calculate the duration of infection in the herd (clearance was obtained when no shedding or PI-carrier animal was present anymore) and the number of new infections, of PI animals born and present, and of present animals with post-infectious antibodies. The model was stochastic to describe the variability in outcomes of a strategy (necessary for risk evaluation) and individual-based to represent a complex infection (horizontal and vertical transmission of the virus by PI and transiently infected animals) in a complex and structured population (demography and group separation of the animals in a dairy herd). Simulation experiments were done for a typical western-France dairy herd (38 cows, 34 young stock). With the do-nothing strategy, in case of a single virus introduction into the herd by a PI-carrier freshening heifer (the dam itself being immune), probabilities of self-clearance were 0.75 and 0.99 within 5 and 10 years. Duration and extent of infection differed according to the level of contacts between groups of animals in the herd: in 25% of the replications, with no, few or high contacts, respectively, clearance occurred after 296, 433 and 1171 days and 21, 33 and 90 infected animals. Reduction of the duration and extent of infection was studied for several levels of sensitivity of the PI-detection test, and several rates of horizontal virus transmission according to within-herd biosecurity measures. Similarly, the dynamics of the virus spread was described for several probabilities of re-infection of the herd, combined with several levels of biosecurity to prevent virus introduction.

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032 (3350)

#### DETERMINATION OF MYCOPLASMA BOVIS SUSCEPTIBILITIES AGAINST 6 ANTIMICROBIAL AGENTS USING THE ETEST METHOD

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The objective of this study was to determine susceptibilities of *M. bovis* against 6 different antibiotics using the Etest methodology.

Fifty-eight isolates of *M. bovis* originating from 55 affected cattle were evaluated. Specimen sources were lungs tissues (n=18), synovial fluids (n=14), tracheo-bronchial wash (n=14), milk (n=9), and external or inner ear discharge (n=3). Antimicrobial agents tested were azythromycin (AZT), clindamycin (CDM), erythromycin (ETM), enrofloxacin (ENR), spectinomycin (STM) and tetracycline (TE). Antimicrobial agent concentrations tested ranged from 0.016 to 256 mg/ml for AZT, ETM, CDM and TE, 0.002 to 32 mg/ml for ENR and 0.064 to 1021 mg/ml for STM. One hundred and 50 ml of organism suspensions were placed on 150 mm and 90 mm Hayflick agar plate, respectively. Five Etest strips were placed on the surface of the 150 mm plate and 1 on the 90 mm plate according to the manufacturer's instructions. Plates were incubated at 35 °C in an atmosphere of 5% of CO<sub>2</sub> in air for 72 hours. At this time, minimal inhibitory concentrations (MIC) were read by determining where the zone of growth inhibition intersected the MIC scale on the strip. *M. bovis* Donetta isolate was used as a control. Susceptibilities to the antibiotics tested were based on the National Committee for Clinical Laboratory Standard recommendations.

Since there was no growth inhibition, MICs were not determined for ETM. MIC<sub>50</sub> and MIC<sub>90</sub> obtained for AZT were 3 and >256 mg/ml, respectively (range: 0.5 to >256 mg/ml). Thirty three percent of isolates were considered sensitive. MIC<sub>50</sub> and MIC<sub>90</sub> obtained for TE were 4 and 8 µg/ml, respectively (range: 0.094 to >256mg/ml). Seventy one percent of isolates were considered sensitive, but 18 isolates had MICs of 4 µg/ml. MIC<sub>50</sub> and MIC<sub>90</sub> obtained for STM were 2 and >1021 µg/ml, respectively (range: 0.38 to >1021 mg/ml). Sixty three percent of isolates were considered sensitive. MIC<sub>50</sub> and MIC<sub>90</sub> obtained for CDM were 0.19 and >256 µg/ml, respectively (range: 0.094 to >256 mg/ml). Seventy six percent of isolates were considered sensitive. MIC<sub>50</sub> and MIC<sub>90</sub> obtained for ENR were 0.19 and 0.25 µg/ml, respectively (range: 0.047 to 0.5 mg/ml). Ninety three percent

of isolates were considered sensitive. For each antibiotic, resistance was not associated with the specimen source.

*M. bovis* susceptibilities were easily determined by the Etest demonstrating acquired resistance to TE, STM, AZT and CDM and a good efficacy of ENR.

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033 (2054)

#### LIVER FAT CONTENT AND LIVER FUNCTION OF COWS WITH LEFT DISPLACED ABOMASUM

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Introduction: Left displaced abomasum (LDA) is a common disease of dairy cows. Fatness of the animals in the dry period in addition to an excessive lipolysis in the periparturient period is discussed as one factor in aetiology. The purpose of the following studies was to investigate the incidence of fatty liver and restriction of liver function in dairy cows suffering from LDA.

Materials: 326 cows with LDA admitted to the Clinic for cattle were included in this study. On first day after admission a blood sample was taken and liver biopsy was carried out. Serum was analysed for bilirubin, urea, phosphorus, GLDH and ASAT. Liver fat content and concentrations of triglyceride were measured in biopsy specimen. Content of liver fat was measured gravimetrically and content of triglyceride by means of a commercialised test kit. T-Test has been used for statistical analysis.

Results: The 326 cows had an average age of 5.4 years and weight of 564 kg. Significant correlations ( $p < 0.05$ ) were found between the liver fat or concentrations of triglyceride and parameters in serum (ASAT, bilirubin and phosphorus). For each serum parameter correlations with triglyceride were higher than with liver fat content. But these correlations were too weak to conclude from the serum parameters to the content of liver fat. Cows with LDA mostly show liver fat content above physiological values of fat mobilisation post partum. The average content of liver fat was  $19.10 \pm 8.47\%$ . Only 25% of all the cows had normal fat values. The content of triglyceride was  $8.85 \pm 5.91\%$ . 12% of all the cows had contents of triglyceride higher than 15%, indicating a severe fatty liver.

Content of liver fat increased significantly with age of the animal and with month of lactation. There were no significant differences in content of liver fat between successfully cured cows and those who died. But animals that were not cured had significantly higher concentration of triglyceride in the liver ( $p < 0.05$ ). This indicates that liver fat content may rise clearly above physiological values in cows with LDA without impact on prognosis.

Conclusions: LDA in dairy cows often is accompanied by increase of content of liver fat. This increase remains without effect on prognosis when fatty acids were not metabolized to triglyceride. In cows who could not be cured content of triglyceride is significantly higher and could be used as prognostic criterion.

034 (886)

#### RUMEN LIQUOR TRANSFAUNATION FOR POST-SURGICAL TREATMENT OF COWS WITH ABOMASAL DISPLACEMENT

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Twenty Holstein cows with left sided abomasal displacements were surgically repaired, and then 10 were given 10 liters of rumen liquor from a normal donor. The remaining 10 cows were given 10 liters of tap water via orogastric tube. During surgery, the cows were given 2 liters of hypertonic saline solution, and ceftiofur. The cows were hospitalized for 5 days after surgery, and were examined twice daily for ketonuria. If ketones were detected, the cows were treated with 50% glucose intravenously until the urine normalized. Blood was collected from the cows prior to surgery, and on days 1, 3, and 5 post-surgery. Serum was harvested and concentrations of beta hydroxy butyrate, and nonesterified fatty acids were measured. Rumen fluid was collected prior to surgery, and then again on days 1, 3, and 5. Serum concentrations of butyrate, acetate, and propionate were measured, as were the concentrations of ammonia, and the pH, and daily milk output was measured. During the hospitalization, the cows were fed a total mixed ration formulated for the high string from one of the participating dairies. Daily feed consumption was measured, and orts were gathered at the end of the day and were weighed. Over the 5 observation days, the cows that received transfaunation produced cumulatively 260 kg more milk than the controls, and had less ketosis, and a greater reduction in NEFA from baseline values. Feed consumption of the transfaunated and the control cows for the 5 day observation period was respectively 53 and 37 kg. Acetate: propionate ratio was significantly greater on day 1 post-surgery in the transfaunated cows than in the controls. Transfaunation of cows after surgical repair of a left-sided abomasal displacement provided measurable benefits for at least 5 days post-surgery.

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035 (2959)

## THE EFFICACY OF A NOVEL TRIAMILIDE ANTIMICROBIAL, TULATHROMYCIN (DRAXXIN®) IN THE TREATMENT OF BOVINE RESPIRATORY DISEASE ASSOCIATED WITH MYCOPLASMA BOVIS

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The efficacy of Draxxin®, (tulathromycin), in the treatment of bovine respiratory disease associated with *Mycoplasma bovis* was determined in a challenge model study. A *M. bovis* strain with a high in-vitro MIC to tulathromycin of >64 mg/mL was administered ( $2.7-8.3 \times 10^8$  (cfu/mL) via the intra-tracheal route on three consecutive days (study days 0, 1 and 2). Using appropriate statistical methods, calves were allocated randomly in a ratio of 1:1 to one of two treatments: either Saline at 0.025 mL/kg bodyweight (T1: 43 animals) or tulathromycin at 2.5 mg/kg bodyweight (T2: 42 animals). Treatments were administered subcutaneously once on study day 4. From day -1 to day 21, animals were observed daily for clinical signs of respiratory disease. On days 21-22 at necropsy, bodyweights were recorded. At necropsy the percentage of the lungs affected by *M. bovis* lesions was recorded and lung lavage samples were collected for colony forming unit (cfu) determination and confirmation of *M. bovis* identification by PCR. Efficacy was assessed on the basis of mean *M. bovis* lung lesion scores, mortality (including animals euthanized for welfare reasons), mean rectal temperatures, peak rectal temperatures, the prevalence and severity of clinical signs of respiratory disease, body weight gain and number of *M. bovis* (cfu) recovered. Mortality, due to respiratory disease was significantly reduced ( $P=0.0073$ ) in the tulathromycin group (9.5%) compared with the saline-treated animals (23%), prior to study day 14. Mean *M. bovis* lung lesion scores were significantly reduced ( $P=0.0282$ ) in the tulathromycin-treated animals (14.2%) compared with the saline-treated animals (22.8%). Tulathromycin-treated animals showed a significant reduction in rectal temperature on study day 6 (48 hours post treatment) to study day 14 inclusive and on study days 19 and 20 ( $P<0.05$ ). The peak rectal temperature was significantly lower for tulathromycin-treated animals ( $P=0.0081$ ). For animals that remained in the study there were no significant differences in clinical signs between treatments ( $P>0.05$ ). The body weight gain and the numbers of *M. bovis* (cfu) recovered from lung lavage at necropsy were not significantly different between treatments ( $P>0.05$ ). In conclusion, tulathromycin administered, as a single dose of 2.5 mg/kg was highly effective in the treatment of respiratory disease associated with *M. bovis*, with a high in-vitro MIC (>64µg/mL).

036 (3371)

## HYPOPHOSPHATEMIA AND HYPERPHOSPHATEMIA IN DAIRY COWS WITH ABOMASAL DISPLACEMENT OR VOLVULUS

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Abnormal phosphorus homeostasis occurs in dairy cows with abomasal displacement or volvulus. The main aim of this study was to identify potential mechanisms for hypophosphatemia and hyperphosphatemia in cows with left displaced abomasum (LDA), right displaced abomasum (RDA), or abomasal volvulus (AV). Accordingly, the results of preoperative serum biochemical analysis and complete and differential blood cell counts for 1368 dairy cows admitted to the Free University Berlin clinic for surgical correction of LDA, RDA or AV between 2000 and 2003 were retrieved. Laboratory values were compared using t-tests on raw or transformed data, and linear and logistic regression analysis was performed.

Fifty seven percent of cows had normal serum phosphorus concentration [ $P_i$ ] whereas 34% (463/1368) were hypophosphatemic (serum [ $P_i$ ] $<1.4$  mmol/l) and 9% (122/1368) had hyperphosphatemia ([ $P_i$ ] $>2.3$  mmol/l). Serum [ $P_i$ ] was significantly lower ( $P<0.05$ ) in cows with LDA ( $1.60 \pm 0.53$  mmol/l; mean $\pm$ SD;  $n=1189$ ) than cows with RDA or AV ( $1.85 \pm 0.68$  mmol/l;  $n=179$ ). Serum [ $P_i$ ] was correlated with urea concentration ([Urea];  $r=0.39$ ), magnesium concentration ([Mg];  $r=0.25$ ), chloride concentration ([Cl];  $r=-0.21$ ), total bilirubin concentration ([Bilir];  $r=-0.09$ ), and the logarithm of aspartate aminotransferase activity (log AST;  $r=-0.09$ ). For cattle with LDA, serum [ $P_i$ ] was correlated with [Urea] ( $r=0.34$ ), [Mg] ( $r=0.20$ ), [Cl] ( $r=-0.19$ ) and [K] ( $r=0.07$ ). For cattle with RDA or AV, linear correlations existed between [ $P_i$ ] and [Urea] ( $r=0.45$ ), [Mg] ( $r=0.43$ ), and [Cl] ( $r=-0.27$ ). Using 8 serum biochemical values and the type of abomasal displacement, stepwise logistic regression analysis indicated that a diagnosis of LDA had the strongest influence on the presence of hypophosphatemia, followed by low [Urea] ( $<5$  mg/dl) and high AST activity ( $>130$  IU/l). For cattle with hyperphosphatemia, the results of stepwise logistic regression indicated that high serum [ $P_i$ ] was most strongly associated with a high [Urea] ( $>22$  mg/dl) and low [Cl] ( $<95$  mmol/l).

Our findings support the widely held assumption that hypophosphatemia in cows with LDA is primarily due to decreased feed intake, and is possibly associated with decreased hepatic function. In contrast, hyperphosphatemia in cattle with RDA or AV seems to be primarily caused by dehydration and decreased renal

perfusion. The results of this study should help identify and treat phosphorus disorders in cows with abomasal displacement.

037 (1514)

#### ACANTHOCYTOSIS IN CATTLE WITH ENDEMIC FLUOROSIS

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Osteofluorosis and fluorosed teeth are quite frequent problems that are very closely connected with the selenium supplementation in beef cows. The objective of the experiment was to use the scanning electronic microscope (SEM) to study the erythrocyte morphology and the intrinsic mechanism for erythrocyte damage of cows in a naturally high fluoride area. The protective function of supplemented selenium was also studied to provide theoretical and practical basis for endemic fluorosis.

16 cows were selected from naturally high fluoride area, fed with local stuff, and randomly divided into two groups of eight cows as follows: 1) high fluoride control group, 2) supplemented group with 0.25 mg/kg sodium selenite for 83 days. In addition, eight beef cows were selected from a non-high fluoride area as control groups and fed non-high fluoride area stuff.

The results indicated that fluoride contents of water, soil and feedstuff in high fluoride area were significantly higher than those of the health area, while the selenium was lower. Results of serum, hair and urine fluoride and blood selenium will be presented at the meeting. The high fluoride affected animals showed emaciation, light-white teeth plagues with longitude fissures, asymmetrical incisors, mandibular exostosis, and fistula unrecovered in long time. While selenium supplemented cows old hair lost earlier, better inspirit and upgrowths were discovered at day 83.

Erythrocytes from health normal control group were bright smooth biconcave discs with thick brim and thin center; few had deformed shape. At day 0, deformed erythrocytes from High fluoride cows had short, bulky and spur-shaped processes, which had blunt tops under moderate state and sharp tops under heavy state, resulting in polygonal or scantha-shaped erythrocytes, namely acanthocyte. At day 83, the majority of erythrocytes in selenium supplemented group had trend toward normal shape, and no obvious spur-shaped cells.

We conclude that the administration of proper selenium should be a practical and feasible way for prevention of endemic fluorosis in cattle

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038 (2671)

#### DEVELOPMENT OF A TECHNIQUE FOR INTRAOSSEOUS INFUSION IN CALVES

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Three clinically healthy Holstein bull calves between the ages of 1-3 months were used to develop a technique for, and determine the safety of, intraosseous fluid administration in calves. Intraosseous infusion has been used in human intensive care for volume resuscitation when vascular access may be difficult or delayed. This technique may be useful in the field for resuscitation of dehydrated calves that are technically difficult to catheterize or have thrombosed jugular veins. A 15 gauge Jamshidi sternal bone marrow needle was placed intraosseously in the medial aspect of the distal tibiae of each calf. This site was chosen due to minimal soft tissue covering the bone. A different inexperienced person was used each time to place the needle. Pressurized isotonic fluids were administered intraosseously. In two calves radiographic contrast material was injected via the intraosseous needle and its distribution into the circulation monitored using fluoroscopy. Contrast material exited the bone via the nutrient foramen proximally and via the physeal vessels distally to enter the saphenous vein. The mean time from injection to entry of contrast in the saphenous vein was 0.08 seconds. Time of needle placement and fluid perfusion rate was measured. The intraosseous needles were removed immediately after infusion, the site was covered with a light bandage for 24 hours to prevent fluids from leaking out of the infusion site. The calves were monitored twice daily and the infusion sites palpated. The calves' tibiae were radiographed 10 days after the procedure to monitor for any bony changes. Mean needle placement time was 51 seconds. Mean fluid perfusion rate was 2.1 L/hour. Most sites developed a mild periosteal reaction 4-5 days post procedure; however, no evidence of bony changes was seen on radiographs and no lameness was observed. Intraosseous infusion is a safe and efficient alternative to intravenous infusion for fluid administration in calves.

039 (1179)

#### EFFICACY AND PERSISTENCY OF A MOXIDECTIN LONG ACTING (LA) FORMULATION AGAINST THE CATTLE TICK, BOOPHILUS MICROPLUS, IN GROWING CATTLE UNDER CONFINED CONDITIONS IN QUEENSLAND, AUSTRALIA

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The second generation macrocyclic lactone moxidectin is widely used in many different formulations to control endoparasites and ectoparasites of cattle, sheep, horses and dogs. A new long acting (LA) injectable formulation has been developed for endoparasite and ectoparasite control in cattle.

The LA formulation was evaluated in the United States, Europe and South America against the major pathogenic endoparasites and ectoparasites of cattle. One such study was undertaken in Australia to evaluate the efficacy and the persistent activity against an artificial infestation of *Boophilus microplus* (the tropical cattle tick) in a pen trial in Queensland, Australia.

Fourteen Hereford cross steers and 2 heifers, 6 months of age, were artificially infested pre-treatment with 5,000 *B. microplus* larvae per animal at Days -22, -21, -19, -16, -14, -12, -9, -7, -5 and -2. Daily tick collections from Day -3 and -1 were summarized and the animals were ranked and allocated to 4 groups by number of engorged females of *B. microplus*. Treatments were allocated randomly to the groups. Group A received a dose rate of 0.75mg moxidectin/kg bodyweight (b.w.) of the 15% trial formulation; Group B received a dose rate of 1 mg/kg b.w. of the 10% trial formulation; Group C received a dose rate of 1.5 mg moxidectin/kg b.w. of the 15% trial formulation; Group D was the untreated control group. All groups were challenged with 2 x 5,000 larvae per animal per week post-treatment until the end of the trial. Adult female ticks dropping from each pen were collected daily for the first week, then twice a week until the end of the trial.

All dose rates (Groups A, B and C) showed high efficacy against *B. microplus*. An efficacy of >95% for tick control was achieved for 47, 51 and 66 days respectively. An efficacy of >95% for egg control was achieved for 58, 61 and 77 days respectively.

Funding: Fort Dodge Australia Pty. Limi

040 (3111)

#### PRELIMINARY EVALUATION OF THE EFFICACY OF HALOFUGINONE LACTATE (HALOCUR®) AS AN AID IN THE PREVENTION OF CRYPTOSPORIDIOSIS IN ONTARIO DAIRY CALVES

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*Cryptosporidium parvum* is a cause of diarrhea in calves less than one month of age. On certain dairy farms, the incidence of both shedding of *C. parvum* and clinical disease may be high. Control of cryptosporidiosis on dairy farms is difficult because of the high incidence of *C. parvum* shedding by calves and the resistance of *C. parvum* oocysts to disinfectants. Furthermore, there are currently no approved products in North America for the prevention of cryptosporidiosis. In Europe, halofuginone lactate (Halocur®) is marketed for the prevention of cryptosporidiosis in calves. The objective of this study was to evaluate the efficacy of halofuginone lactate as an aid in the prevention of cryptosporidiosis in Ontario dairy calves.

Commercial dairy farms, selected based on a history of neonatal diarrhea, participated in this double blind randomized study from February to July 2003. A total of 507 replacement heifer calves from 24 farms were enrolled at birth and randomly assigned to one of two groups. The treatment group received 5 mg of halofuginone lactate orally once daily for seven days, beginning the first day of life. The control group received an equal volume of placebo, administered in an identical manner. Fecal samples were collected from 305 calves on a weekly basis for the first three weeks of life at 3 to 9 days, 10 to 16 days, and 17 to 23 days of age. Fecal samples were also collected from another 202 calves once between 14 and 21 days of age. All fecal samples were analyzed for the presence of *C. parvum* oocysts using sucrose flotation and microscopy.

The overall calf prevalence of *C. parvum* shedding was 48%. The prevalence of shedding was significantly ( $p<0.05$ ) reduced in halofuginone lactate-treated calves as compared to placebo-treated calves. In the subset of calves sampled on three consecutive weeks, there were significant ( $p<0.05$ ) differences between treatment groups in the incidence of *C. parvum* detection during the first and second weeks of the study. Surprisingly, in the overall study population, halofuginone lactate treatment resulted in a significant decrease in mortality up to three weeks of age ( $p<0.05$ ). Specifically, halofuginone lactate-treated calves were 2.4 times less likely to die than placebo-treated calves ( $p<0.05$ ). In summary, halofuginone lactate has promise as an aid in the prevention of *C. parvum* shedding in Ontario dairy calves.

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041 (2223)

#### SERUM PEPSINOGEN ACTIVITY AND FECAL OCCULT BLOOD TEST IN DAIRY COWS WITH ABOMASAL DISPLACEMENT

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The purpose of our study was to evaluate the extent of injury of abomasal mucosa in cows via the measurement of serum pepsinogen activity and establishment of blood in feces. Our study involved the examination of 155 Holstein-Friesian cows with abomasal displacement. The left displacement of the abomasum (LDA) was present in 87 cows and the right displacement of the abomasum (RDA) with or without torsion in 44 cows. We measured the serum pepsinogen activity with the Paynter method and established occult blood in feces by the Benzidine test. We compared the results with the group of 22 clinically healthy cows, from which blood and fecal samples were taken just before slaughter. The sera of the cows, with abomasal displacement, had mean value of pepsinogen  $4,59 \pm 2,58$  U/L. The mean value of pepsinogen in cows with LDA was  $4,57 \pm 2,34$  U/L, whereas the cows with RDA, had a mean value of  $5,12 \pm 2,87$  U/L, though the difference was not statistically significant ( $P > 0,05$ ). The mean value of pepsinogen in the control group was  $3,14 \pm 1,06$  U/L. In 8 cows (5,2%) with LDA and 9 cows (5,8%) with RDA we established blood in feces. We attributed the increased level of serum pepsinogen, in cows with abomasal displacement to injuries of abomasal mucosa. From the results it is evident that the measurement of pepsinogen activity in serum and establishment of blood in feces offer better information on the status of abomasal mucosa and the course and prognosis of abomasal displacements.

042 (3325)

#### COMPLETION OF THE NORWEGIAN BOVINE VIRUS DIARRHOEA (BVD) ERADICATION PROGRAMME - A HIGHLY SUCCESSFUL STORY!

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Objectives: The Norwegian Animal Health Authority, TINE Norwegian Dairy BA, GENO - Breeding and AI Association and Norwegian Meat Research Centre, have over the last three years collaborated in order to complete the Norwegian BVD control- and eradication program. The program was established in 1992. In Norway, BVD is a disease under the Animal Diseases Act, and restrictions may be applied to infected herds. The progress of the BVD-programme can be illustrated by the number of herds with restrictions over time. The peak was reached in June 1994 with 2,949 herds with restrictions, and by January 2001 the number had declined to 147. The aim of the completion project was to eradicate BVDV from the Norwegian cattle population within three years. At the end of the project period, this aim is within reach. By November 2003 there are still 3 herds left with restrictions, with a few foetuses and calves at risk to be tested.

Methods: Annual testing for antibodies in bulk milk and pooled blood samples from approximately one year old animals using commercial ELISAs, are still the main methods used to detect infected herds. The progress of the program has been satisfactory since 1992, but due to the occurrence of re-infected herds up to 2001, adjustments were necessary in order to succeed with the total eradication. The main adjustments included the implementation of official regulations on regional levels concerning the use of common pastures and trade with live cattle. In addition a more frequent and thoroughly testing for BVD-antibodies and antigen was performed and high priority given to education and updated information to farmers, veterinarians and advisors on the disease and how to avoid re-infection.

Results: The results after the completion of the project period will be presented at the Congress, with emphasis on cost-benefit evaluations.

Conclusions: There are no doubts concerning the economic benefits of the eradication. At the end of the program, after 10 years of control- and eradication, we can conclude that the profit is almost three times higher than the total investments. In most disease eradication programs there are particular "end-phase" difficulties and special measures need to be taken when reaching the "tail" of cases. The eradication of BVD is no exception, and we have shown that this may be done using a zoo-sanitary approach.

043 (2653)

#### INVESTIGATIONS ON THE CLINICAL SIGNS OF HYPER D-LACTATEMIA IN CALVES

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Introduction: The similarities between the clinical picture of the D-lactic acidosis in humans (incoordination, ataxia, loss of memory, disorientation, disturbance of consciousness up to coma) which occurs following resection of large portions of the small intestines when undigested carbohydrates are transported into the large intestine, and that reported for calves with metabolic acidosis due to neonatal diarrhea led to the idea that clinical signs in acidotic calves are due to hyper D-lactatemia rather than to acidosis per se. Therefore it was the objective of the study reported here to investigate whether clinical signs can be induced by hyper-D-lactatemia in the absence of acidosis.

**Material and methods:** Ten calves, up to 2 weeks old, were randomly assigned to either the D-lactate or the control group. "Test calves" received an injection of 25 g sodium-D-lactate (223.07 mmol) in 100 ml Aqua ad inj., control calves were given the same volume of 0.9 % sodium chloride, both solutions were warmed, and injected intravenously within one minute. Clinical examinations were performed by two clinical examiners that were blinded to the status (test or control) of the calves, prior to injection in order to ensure that calves involved in the study were in good health, and in short intervals up to four hours following injection.

**Results:** Between 8 to 40 minutes from the start of the experiment each calf that had received sodium-D-lactate could be distinguished with certainty from the control calf on the basis of clinical signs. All experimental calves showed impaired palpebral reflex, that is eyes were closed with a delay and as if in slow motion. Three calves were somnolent, the remaining two appeared quiet and withdrawn. All calves showed a staggering, "drunken" gait. In four calves long periods of motionless or slightly waving or tottering standing with lowered head and drooping ears could be observed. By contrast, no impairment of the sucking reflex was recorded in any of the calves.

**Discussion:** In various attempts that have been made in the past to estimate the degree of acidosis in calves with neonatal diarrhea on the basis of clinical signs authors list alterations in posture and/or behavior as signs of metabolic acidosis. The results of this study demonstrate that with the exception of impairment of sucking reflex, all signs that have been attributed to metabolic acidosis in calves can be reproduced by inducing hyper-D-lactatemia without acidosis.

044 (2704)

AN ELISA TO DETECT LEPTOSPIRAL ANTIBODIES TO SEROVAR HARDJO IN BOVINE SERA AND MILK  
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Leptospire, belonging to the serovar Hardjo, are the major cause of bovine leptospirosis. This infection is responsible for financial loss in the dairy industry as a consequence of agalactia, abortion and reduced fertility. Control schemes are being investigated in a number of European countries and, thus, the availability of suitable methods to identify carrier animals, susceptible animals and immune cattle is crucial to the successful development of such control systems. Satisfactory methods for identifying carrier animals are not currently available. Microbiological methods are too slow, inaccurate and time-consuming. One quarter of infected animals are seronegative using the standard serological test, the microscopic agglutination test (MAT). There are numerous reports on the use of ELISA, when used as tests for detecting leptospiral antibodies. While these assays have been more sensitive than the MAT, they have suffered from a number of disadvantages including (i) specificity and (ii) antibody levels not reflecting the immune status of an animal, since both protective and non-protective antibodies are measured.

The authors have developed a monoclonal antibody based capture ELISA that detects an antibody response to a lipopolysaccharide outer envelope epitope, common to both *Leptospira borgspetersenii* serovar Hardjo and *L. interrogans* serovar Hardjo in either sera or milk. The monoclonal antibody has been shown to passively protect hamsters against homologous challenge. The assay had a sensitivity of 85% compared to a MAT figure of 60% when applied to the sera of over 300 chronically infected cattle, which were culture positive for Hardjo. The specificity of the test system was determined with rabbit hyperimmune sera against 12 common serovars of Leptospire and could only detect anti Hardjo antibodies and a small cross reactivity against serovar Saxkoebing. Following experimental infection of freshly calved heifers with *Leptospira borgspetersenii* serovar Hardjo, the ELISA detected specific antibodies in milk and sera after 3 weeks, which persisted to the end of lactation. In bulk tank milk, the assay was able to detect 1 seropositive animal in a herd of 100 lactating cows.

The assay is safe and easy to use, can be completed in only 80 minutes and should greatly simplify the introduction and implementation of control schemes for bovine leptospirosis. A rapid cow-side test has also been developed.

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045 (1211)

EFFECT OF ORAL ELECTROLYTE SOLUTION FORMULATION ON ABOMASAL EMPTYING RATE IN HOLSTEIN CALVES

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Oral electrolyte solutions (OES) are routinely administered to dehydrated calves with diarrhea. Different OES formulations are thought to be emptied at different rates from the calf's abomasum, thereby altering the abomasal luminal pH-time relationship and the percent of the ingested volume that is exposed to a pH that is lethal for

ingested bacteria. The aim of this study was therefore to determine and compare the abomasal emptying rates of 3 common OES components using scintigraphy. Five healthy male Holstein calves (<30 days of age) with a cannula in the abomasal body were fed 2 l of milk replacer or isoosmotic (150 mM) solutions of sodium acetate, NaHCO<sub>3</sub>, or NaCl containing 10mCi of Technetium-pentetate in a randomized crossover design. The power exponential formula of Siegel et al (1988) was used to calculate the abomasal half emptying time (t<sub>1/2</sub>) from the scintigraphic measurements. Abomasal luminal pH was measured continuously using a flexible glass pH electrode. Scintigraphy indicated similar abomasal emptying rates following suckling of isoosmotic sodium acetate (least squares mean t<sub>1/2</sub> = 54 min), NaHCO<sub>3</sub> (t<sub>1/2</sub> = 46 min), and NaCl (t<sub>1/2</sub> = 69 min), whereas the abomasal emptying rate of milk replacer was significantly (P <0.05) longer (t<sub>1/2</sub> = 140 min, standard error = 18 min). Maximal abomasal luminal pH was highest following suckling of NaHCO<sub>3</sub> (pH<sub>max</sub> = 7.32) and lowest following suckling of NaCl (pH<sub>max</sub> = 3.98), with sodium acetate (pH<sub>max</sub> = 5.98) and milk replacer (pH<sub>max</sub> = 5.30, standard error = 0.54) being intermediate. We conclude that isoosmotic solutions of sodium acetate, NaHCO<sub>3</sub>, and NaCl empty quickly from the calf's abomasum and at similar rates, but vary markedly in their ability to alkalinize the abomasum. Our results suggest that administration of an isoosmotic OES containing NaHCO<sub>3</sub> may alkalinize the gastrointestinal tract of milk-fed calves, thereby promoting survival of bacterial pathogens, compared to an OES containing sodium acetate or NaCl.

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046 (1331)

#### DEVELOPMENT AND VALIDATION OF ACETAMINOPHEN ABSORPTION AS A METHOD FOR MEASURING ABOMASAL EMPTYING RATE IN HOLSTEIN CALVES

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The rate of abomasal emptying plays an important role in the resuscitative response of calves to oral electrolyte solutions; however, a practical and inexpensive method for assessing abomasal motility in calves is presently unavailable. Acetaminophen absorption provides an accurate measure of gastric emptying rate in human infants and adult horses. The aims of this study were therefore to develop and validate the acetaminophen absorption method for measuring abomasal emptying rate in suckling calves. Five Holstein bull calves (<30 days old) were fed 2 l of milk replacer, 2 l of milk replacer and parenteral atropine (0.01 mg/kg IV then 0.02 mg/kg SC every 30 minutes), or 2 l of an isoosmotic (150 mM) solution of NaCl, NaHCO<sub>3</sub>, or sodium acetate. Acetaminophen (50 mg/kg body weight) and technetium-pentetate (10 mCi) were added to each test solution immediately before suckling, and jugular venous blood samples were collected periodically after feeding for up to 12 h. Plasma was then harvested and plasma acetaminophen concentrations were determined spectrophotometrically using a colorimetric assay. Three different pharmacokinetic models (oral administration one or two compartment models; first derivative of the modified power exponential formula as described by Maes et al., 1994) were fitted to the data, and pharmacokinetic values were obtained for all 3 models. Scintigraphy was used as the gold-standard measure of emptying rate, and the power exponential formula of Siegel et al. (1988) was used to calculate the scintigraphic half emptying time (t<sub>1/2</sub>). Scintigraphy t<sub>1/2</sub> ranged from 29 to 201 minutes. The model based on the first derivative of the modified power exponential formula provided the best fit to the data, based on Akaike's information criterion value. There was a good to excellent correlation between scintigraphy t<sub>1/2</sub> and acetaminophen t<sub>1/2</sub> (r = +0.84), C<sub>max</sub> (the maximal concentration; r = -0.90), and T<sub>max</sub> (the time after start of suckling that C<sub>max</sub> occurs; r = +0.81). We conclude that acetaminophen absorption provides a cheap, safe, practical, non-invasive, and accurate method for measuring abomasal emptying rate in calves.

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047 (3388)

#### COW LEVEL PREVALENCE OF PARATUBERCULOSIS IN DAIRY COWS IN ATLANTIC CANADA

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In many countries, prevalence of *Mycobacterium avium* subsp. paratuberculosis (Mptb) or Johne's disease appears to be increasing, based on an observed higher frequency of clinical disease and serological prevalence studies (Boelaert et al., 1999; Muskens et al., 2000; Nielsen et al., 2000). In a random sample of dairy cows in Atlantic Canada cow-level seroprevalence was 2.6% (VanLeeuwen et al., 2001). However, because sensitivity of Mptb antibody ELISAs is between 15 and 75%, depending on the stage of infection (Dargatz et al., 2001), an ELISA in a population of early-infected cows will underestimate the Mptb-prevalence. For this reason, the study presented here used culture and histology of ileum and lymph nodes to detect infected cows, with the intention of more accurately estimating Mptb-prevalence.

During a 10-month period in 2001-2002, culled dairy cattle (n=984) were selected using a systematic random

process at a regional abattoir in Atlantic Canada. Serum, terminal ileum, and two mesenteric lymph nodes (ileo-cecal region) were collected from each animal, along with body condition score (BCS) and level of ileum thickening (LIT) and lymph node enlargement. Culture was done using VersaTREK™ broth solution media. After incubation in the broth media for 6 weeks, all samples were acid-fast stained (Ziehl-Neelsen stain) and those samples that were positive for the presence of acid-fast bacteria were sub-cultured onto solid media (Herrolds egg-yolk) for confirmation.

In total, 158 (16.1%) animals were Mptb-positive, with culture of the lymph nodes yielding positive cultures more frequently than culture of ileum (11.1% and 8.5%, respectively). Histological testing was far less sensitive than bacteriologic methods for detecting infected cattle. A seasonal pattern of positive cows was also detected, with the highest proportion of cows being Mptb-positive in June (42.5%). There was no relationship between culture status and BCS or LIT.

Because the sensitivity of ELISA is low in animals in early stage disease, the 16.1% prevalence found in this study is a more accurate estimate of the true cow-level Mptb-prevalence than the 2.6% the serological study found in the same region. Because cattle are infected early in life, and almost all cows eventually go for slaughter, we believe that the bias to the estimate of Mptb-prevalence using slaughterhouse cows is minimal.

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048 (2454)

#### PROSPECTIVE CLINICAL STUDY OF THE EFFECT OF PENTOBARBITAL SODIUM IN EUTHANASIA OF CATTLE

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Introduction: Euthanasia of cattle is among the tasks with relevance to animal welfare practicing veterinarians face frequently. Since the procedure usually takes place with the owners present, methods ensuring a quick and gentle death are required. A search of the literature yielded no study involving the use of pentobarbital for euthanasia of cattle.

Method: So far 87 cattle admitted to the Clinic of Ruminants of the University of Munich that had to be euthanatized have been included in this prospective study. Sodium pentobarbital (Eutha®77, Essex Tierarzneimittel) was used in a dosage of 40 mg / kg (0.1 ml per kg). Application was i.v. through injection needle or an indwelling catheter. Only cases in which the injection was unequivocally complete (as ascertained by aspiration of blood at the end of the injection) were included. Parameters evaluated included time (seconds) between the beginning of injection and cessation of reflexes, breathing, cardiac action, and occurrence of vocalization, excitations (movements), muscular fasciculations, or re-appearance of breathing.

Results: Animals went down after 16 (15) s (mean (median)), breathing stopped after 37 (22) s, cardiac arrest occurred after 123 (83) s, palpebral and corneal reflexes after 25 (23) s and 58 (37) s respectively. Dilatation of pupils was maximal after 185 (185) s. In 97% of the cases, animals collapsed, only one animal fell over in a forward motion; in 63% no vocalization was noticed, in 25% grumbling, in 9% a short groan was recorded, grumbling and bellowing each occurred in one case. No movements were recorded in 77%; if they occurred, they were restricted to the head and limbs, and were of short duration (11 s). Fasciculation of skin muscles were observed in 25%. Breathing re-appeared in 7%, and a final gasp occurred in 4%.

The dosage is half of that prescribed for horses. Based on the observations made in this study both the drug and the dosage appear to fulfill the requirements for quick and gentle euthanasia of cattle. The results are preliminary. The study is designed to include 150 cases and is expected to be concluded in March of 2004.

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049 (3380)

#### A HYPERNATREMIC SYNDROME IN VEAL CALVES AT THE END OF THE FATTENING PERIOD

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Introduction: A disorder of veal calves older than five months was reported by Dutch veterinarians that had an incidence of < 1% and was characterized by depression and loss of condition. The disease occurred on farms where different types of milk powder from different producers were fed. Blood sampling revealed increased activities of the enzyme GLDH, but liver biopsies showed a parenchyma with a normal texture that did not differ from that of healthy veal calves.

Methods: A clinical examination was performed and blood samples were obtained from sick and apparently healthy calves for determination of WBC, RBC, PCV, electrolytes, urea, creatinine, blood gas analysis and liver enzyme activities during an acute outbreak.

Results: Within days calves older than 22 weeks of age substantially lost weight (up to 20 - 30 kg) and showed enormous thirst. The animals were markedly dehydrated and, inconsistently, showed CNS symptoms (depressed consciousness, muscle twitching, tremor of the head or the whole body). Blood sampling revealed substantial

differences between sick (n=6) and apparently healthy calves (n=5): PCV  $0.34 \pm 0.05$  versus  $0.29 \pm 0.03$  1/1, WBC  $13.3 \pm 5.0$  versus  $9.08 \pm 2.2$  G/l, serum sodium  $156.8 \pm 20.3$  versus  $140.8 \pm 1.3$  mmol/l, serum chloride  $120.3 \pm 21.6$  versus  $101.4 \pm 2.7$  mmol/l, blood pH  $7.237 \pm 0.07$  versus  $7.35 \pm 0.02$ . Similar results were obtained during a second outbreak in a different group. Increased GLDH activities were inconsistently observed. Most animals were successfully treated by administration of electrolyte solutions. Besides brain edema, necropsy delivered no specific findings.

Conclusions: A sodium chloride intoxication was diagnosed. Analysis of the composition of the milk replacer, however, gave no increased levels of sodium chloride. Mistakes during the preparation of the product could be excluded. The same milk replacer was administered in the period preceding the disease and did not cause problems in the majority of calves in the group. A hypematremic, hyperosmolar syndrome is described in humans with diabetes mellitus that shares similarities with the disease. Diabetes mellitus type II has been shown to develop in veal calves in the course of the fattening period due to feeding lactose rich milk replacers. Increased GLDH activities could be related to circulatory disturbances in the liver or to the induction of this enzyme by increased blood glucose concentrations as has been reported for dogs with diabetes mellitus type II.

050 (2247)

#### AGE-RELATED CHANGES IN SERUM CONCENTRATIONS OF THREE ACUTE PHASE PROTEINS: SERUM AMYLOID-A, HAPTOGLOBIN AND ALPHA1-ACID GLYCOPROTEIN IN NEWBORN DAIRY CALVES

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Acute phase response (APR) is the first stage of the inflammatory defense reaction of the host to infection and tissue damage. One of the predominant features of APR is hepatic production of acute phase proteins (APPs). In bovines, the most important APPs are serum amyloid-A (SAA), haptoglobin (Hp) and alpha1-acid glycoprotein (AGP). They have proven to be good diagnostic markers of inflammation. Before using them to evaluate inflammatory conditions in neonatal calves, it is important to determine how early life maturation and adaptation influence physiological levels of serum APP concentrations. Thus, blood samples from 13 Holstein Friesian calves (5 males and 8 females), born on the Helsinki University Suitia Research Farm, were obtained 3 days after birth and then weekly until weaning (2 months of age). The calves were raised in individual stalls for the first 1-2 weeks after birth and were fed twice a day with colostrum and whole milk. Calves were then moved to the group pen with an automatic milk feeding system. A clinical examination was performed in conjunction with each blood sampling. If signs of disease were observed during clinical examination, the sample was excluded from the study and all haemolysed samples were excluded from Hp analysis. The Wilcoxon signed rank test was used to analyse the influence of age on APP concentrations by comparing mean values at each age point with those at the next age point and with the last sample. For Hp, only the first sample (3 days of age) had a significantly higher mean concentration than the last one. A clear decrease in SAA concentration during the first 3 weeks of life was evident; the mean SAA concentration decreased from  $69.32 \pm 22.6$  mg/l (3 days) to  $17.07 \pm 11.6$  mg/l (24 days). Stabilization to adult SAA levels was achieved after 3 weeks of age. The AGP continued to decrease between 3 and 38 days after birth. The decrease was very sharp between the 3-day samples (mean concentration  $928 \pm 303$  mg/l), the 10-day samples ( $485 \pm 167$  mg/l) and the 17-day samples ( $310 \pm 121$  mg/l). Stabilization of AGP serum concentrations occurred after 1 month of age. These findings suggest an important function of APPs in the well being of neonatal calves and stress the importance of considering the age of the calf to correctly interpret APP results.

Funding: Research Foundation of Veterinary Medicine, Helsinki, Finland

051 (3373)

#### DIETARY FAT SUPPLEMENTS IN CATTLE: EFFECTS ON PANCREATIC INSULIN RESPONSE AND PERIPHERAL INSULIN RESPONSIVENESS

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By means of hyperglycemic and euglycemic-hyperinsulinemic clamps effects of dietary fat supplements on pancreatic insulin response and peripheral tissue insulin responsiveness in cows were studied. 6 non-lactating and non-pregnant rumen fistulated German HF cows were used (Latin Square). Fat supplements (5% of DM) were palmstearin fat (C16:0:57%, C18:0:35%), linseed (C18:3n3:62%, C18:2n6:14%, C18:1n9:16%) and sunflower oil (C18:2n6:69%, C18:1n9:25%). Supplementation periods were four weeks, wash-out periods 10 weeks intervals. Palmstearin was administered intraruminally, linseed and sunflower oil intraabomasally. Rations were isocaloric. Before and after each supplementation period muscle biopsies (analyzed for fatty acid composition in the phospholipid fraction) were obtained and clamps performed. During hyperglycemic clamps (HGC) steady state glucose infusion rate [SSGIR-HGC], steady state plasma insulin [SSPI-HGC] and insulin sensitivity index [ISI-HGC] were assessed. Euglycemic-hyperinsulinemic clamps (EHGC) revealed steady state

glucose infusion rate [SSGIR-EHGC], steady state plasma insulin [SSPI-EHGC], insulin elimination rate [IER-EHGC], insulin sensitivity index [ISI-EHGC]).

Baseline muscular phospholipid mean fatty acid composition was not affected by palmstearin supplements, whereas significant changes were induced by linseed (mean  $\pm$  sem before and after supplementation: C18:3n3:  $2.3 \pm 0.3$  vs.  $9.7 \pm 0.4\%$ ; C18:2n3:  $14.2 \pm 0.5$  vs.  $19.9 \pm 1.2\%$ ; C18:1n9:  $19.1 \pm 0.7$  vs.  $12.2 \pm 0.2\%$ ;) and sunflower oil (C18:2n6:  $14.2 \pm 0.5$  vs.  $32.9 \pm 1.91\%$ ; C18:1n9:  $19.0 \pm 0.7$  vs.  $9.9 \pm 1.1\%$ ). Mean baseline values in HGC (SSGIR-HGC:  $10.9 \pm 1.4$  [ $\mu\text{mol}/\text{kg}\cdot\text{min}$ ], SSPI-HGC:  $88.4 \pm 11.4$  [ $\mu\text{IU}/\text{ml}$ ], ISI-HGC:  $0.130 \pm 0.016$  [ $(\mu\text{mol}/\text{kg}\cdot\text{min})/(\mu\text{IU}/\text{ml})$ ]) and in EHGC (SSGIR-EHGC:  $22.0 \pm 1.6$ , SSPI-EHGC:  $702 \pm 69$ , IER-EHGC:  $0.0119 \pm 0.0001$  [ $\text{min}^{-1}$ ], ISI-EHGC:  $0.033 \pm 0.005$ ) were not significantly affected by palmstearin and linseed oil supplements. After sunflower oil supplementation SSPI-HGC ( $55.1 \pm 6.7$ ), SSGIR-EHGC ( $19.0 \pm 1.0$ ) and ISI-EHGC ( $0.028 \pm 0.004$ ) decreased and IER-EHGC ( $0.0145 \pm 0.0005$ ) rose compared to baseline.

Although dietary sunflower and linseed oil supplementation led to considerable changes in mean muscular phospholipid n6- and n3-fatty acid proportions, resp., the effects on clamp characteristics in cows were unexpected small compared to monogastrics. Only sunflower oil supplements induced a small reduction of the pancreatic insulin response and a decrease in peripheral insulin tissue responsiveness.

052 (1362)

#### ANTIOXIDATIVE STATUS OF HEALTHY COWS IN THE PERIPARTAL PERIOD - A COMPARISON BETWEEN DIFFERENT ANTIOXIDATIVE PARAMETERS

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The aim of the study was to examine different methods of verification of the antioxidative status in healthy cows, as there were superoxide dismutase (SOD), glutathione peroxidase (GPX), Trolox equivalent antioxidative capacity (TEAC), antioxidative capacity of water soluble substances (ACW), and antioxidative capacity of lipid soluble substances (ACL), and to compare these methods at different dates around parturition.

Material and methods: We examined 34 clinically healthy cows of one farm. The SOD activity was measured in the erythrocyte lysate with two methods: I) with a test kit from Oxis at the spectral photometer and II) with a test kit from AnalytikJena AG at the photochem. The GPX activity was measured in heparinized whole blood with a test kit from Ransel. Furthermore we measured the TEAC in blood serum at the spectral photometer. After preparation of the blood serum the ACL was measured with a testkit from AnalytikJena AG at the photochem. The ACW also was measured in blood serum with a test kit of AnalytikJena AG at the photochem.

Results: The SOD activity showed a tendency of decrease around parturition and a slightly postpartal increase. Both methods for the measurement of SOD activity were significant ( $p < 0,01$ ) correlated. In contrary to the SOD activity, the TEAC showed a significant ( $p < 0,05$ ) peripartal decrease (from one week ante partum to one week post partum) and a far later increase (only after eight to twelve weeks postpartum). The ACW, however, also reflecting water soluble antioxidants like the TEAC, showed no correlation at all to the TEAC or to other parameters. The ACW increased significantly ( $p < 0,01$ ) and rather rapidly after parturition. The ACL significantly ( $p < 0,05$ ) decreased ante partum and then significantly ( $p < 0,01$ ) increased postpartal. Similar to the ACL there was to be found a slightly decrease of GPX activity ante partum and a slightly increase postpartum. No significant correlations were to be found between the different antioxidative parameters.

Conclusions: There are several methods for measuring the antioxidative status of a cow. However, they turn out to behave varying in healthy cows around the parturition. The only commonness is the decrease at the early postpartal period. Antioxidants, which can be taken in with the food, showed a faster postpartal increase than other antioxidants. This should be considered before the choosing of methods of measuring the antioxidative status.

053 (695)

#### ELIMINATION KINETICS OF CEFTIOFUR HYDROCHLORIDE FOLLOWING INTRAMAMMARY ADMINISTRATION IN LACTATING DAIRY CATTLE

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Ceftiofur is a  $\beta$ -lactam antibiotic approved in North America for the treatment of respiratory disease, metritis, and interdigital necrobacillosis (foot rot) in both beef and dairy cattle. The drug is approved for parenteral (intramuscular and subcutaneous) use only, and label use does not result in drug concentrations in milk above the legal limit of 0.1 mg/ml (100 ppb). However ceftiofur is sometimes used in an extralabel manner by veterinarians for the intramammary treatment of coliform mastitis. This practice does result in residues above the legal limit and has caused several instances of milk residue violation in North America. The purpose of this study was to determine the elimination kinetics of ceftiofur in milk following an intramammary infusion. In 5 lactating dairy cows, 300 mg (6 ml) of ceftiofur hydrochloride were infused into the left front and right rear quarters of each cow. Approximately 12 hours later, an additional 300 mg of ceftiofur hydrochloride were infused into the left front and right rear quarters after milking. Milk samples were then collected from each quarter every 12 hours (at

milking time) for a total of 10 days. The concentration of ceftiofur and its metabolites were determined by HPLC in each of the milk samples to assess the rate of drug elimination. Although there were considerable variations present between quarters and individual cows, all treated quarters were below the legal tolerance limit for ceftiofur concentrations in milk (0.1 µg/ml) by 168 hours (7 days) following the last intramammary dose of antibiotic. No drug concentrations were detected in any milk samples beyond this time period. Based on the results of this study, milk from treated quarters should be discarded for a minimum of 7 days following intramammary ceftiofur administration.

Funding: FARAD - USA

054 (2416)

COMPARISON OF THE RATE OF ISOLATION, GENOTYPE, AND IN VIVO TOXIN PRODUCTION OF CLOSTRIDIUM PERFRINGENS ISOLATED FROM THE GASTROINTESTINAL TRACT OF COWS WITH HEMORRHAGIC BOWEL SYNDROME AND HERD MATES WITH LEFT DISPLACED ABOMASUM

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Hemorrhagic Bowel Syndrome (HBS) is a highly fatal intestinal disease of adult dairy cows and is characterized by acute, progressive, segmental intraluminal hemorrhage and obstruction within the small intestine. In multiple reports, *Clostridium perfringens* type A and/or type A+B2 is the sole enteric pathogen that can be consistently isolated from intestinal lesions of affected cows. In this study, 10 cows with HBS and 10 herd mates with left displaced abomasum (LDA) were compared on the basis of the rate of *C. perfringens* isolation, genotype, and in vivo toxin production. Gastrointestinal contents were obtained from ruminocentesis and multiple enterocentesis sites at surgery or necropsy. Samples were cultured under anaerobic conditions using 1) direct culture on blood agar, 2) enrichment in chopped meat broth, and 3) heating at 80 degrees C for 10 minutes (to induce spore activation), followed by enrichment in chopped meat broth. *Clostridium perfringens* isolated from these samples were genotyped using multiplex polymerase chain reaction. Enzyme-linked immunosorbent assay (ELISA) was used to detect the major toxins alpha, beta-1, and beta-2 in gastrointestinal contents. Data were analyzed by logistic regression appropriate for the matched case-control study design and the repeated sampling of subjects. For all *C. perfringens* isolated from cows in this study, type A and type A + B2 were the only genotypes identified. Type A was isolated from 93 of 170 samples (55%) from HBS cows and 34 of 177 samples (19%) from LDA cows. Independent of culture method or site sampled, the odds of isolating *C. perfringens* type A from cows affected with HBS was 8.5 times greater than for cows with LDA ( $P < 0.01$ ). Type A+B2 was isolated from 77 of 170 samples (45%) from HBS cows and 41 of 177 samples (23%) from cows with LDA. Independent of culture method or site sampled, the odds of isolating *C. perfringens* type A+B2 from cows affected with HBS was 3.3 times greater than for cows affected with LDA ( $P < 0.01$ ). Alpha and beta-2 toxins were the only major toxins identified by ELISA. These toxins were detected only in the gastrointestinal samples of a small proportion of cows with HBS. In multiple sites of the gastrointestinal tract, cows with HBS appear to be more heavily colonized with *C. perfringens* type A and A+B2 than herd mates with LDA.

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055 (1038)

DEVELOPMENT AND VALIDATION OF AN ULTRASONOGRAPHIC METHOD TO MEASURE ABOMASAL VOLUME AND EMPTYING RATE IN HOLSTEIN CALVES

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The rate of abomasal emptying may play an important role in the etiopathogenesis of abomasal disorders in calves; however, a practical and rapid method for assessing abomasal motility is presently unavailable. The aims of this study were therefore to develop and validate an ultrasonographic method for measuring abomasal volume and emptying rate in suckling calves. Six male Holstein calves (<30 days old) were fed incremental volumes of milk replacer (250 to 500 ml increments up to 3 l) and ultrasonographic measurements of abomasal dimensions (width, length, depth) were obtained, within 3 min after suckling, by applying a 3 MHz sector probe to the ventral abdomen in transverse and sagittal planes. In a second study, 6 male Holstein calves (<40 days old) were fed milk replacer (60 ml/kg body weight) and ultrasonographic measurements were obtained within 3 min after suckling. In a third study, 5 male Holstein calves (<30 days old) were fed 2 l of milk replacer or an isoosmotic (150 mM) solution of NaCl, NaHCO<sub>3</sub>, and sodium acetate containing 10 mCi of technetium-pentetate. Abomasal dimensions were ultrasonographically determined immediately before feeding and periodically after feeding for 4 h. Abomasal volume were calculated from the ultrasonographic measurements by modeling the abomasum as an

ellipsoid and using the power exponential formula of Siegel et al (1988) to calculate the half emptying time ( $t_{1/2}$ ). Incremental feeding indicated an excellent correlation ( $r = 0.98$ ) between measured and suckled volume; abomasal volume in ml =  $1.00(\text{fed volume in ml}) + 144$ . Feeding milk replacer at 60 ml/kg also indicated an excellent correlation ( $r = 0.94$ ) between measured and suckled volume; abomasal volume in ml =  $0.94(\text{fed volume in ml}) + 157$ . There was a good correlation ( $r = 0.76$ ) between ultrasonographic  $t_{1/2}$  and scintigraphic  $t_{1/2}$ . We conclude that ultrasonographic measurement of abomasal dimensions provides an accurate estimate of abomasal volume. We also conclude that ultrasonography provides a practical, rapid, and non-invasive method for determining abomasal emptying rate in calves. Ultrasonography also avoids the administration of marker substances that may be problematic or not allowed in food producing animals. However, because abomasal volume depends on both the rate of abomasal secretion and the rate of emptying, ultrasonographic determination of emptying rate in calves will be most accurate when a standard meal is fed to ensure repeatable secretion rates. Funding: Max Kade Foundation

056 (1041)

#### EFFECT OF ERYTHROMYCIN, NEOSTIGMINE, AND METOCLOPRAMIDE ON ABOMASAL MOTILITY AND EMPTYING RATE IN SUCKLING HOLSTEIN BULL CALVES

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Abomasal hypomotility and decreased abomasal emptying rate may play a role in the etiopathogenesis of abomasal disorders in calves. Accordingly, the aim of this study was to determine and compare the efficacy of different prokinetic drugs in increasing abomasal motility and emptying rate in calves. Five healthy male Holstein calves (15 to 40 days old) with a cannula in the abomasal body were monitored for 5 hours from time = 0 min, fed milk replacer (60 ml/kg) at 60 min, and received the following 5 treatments in random order: metoclopramide (0.1 mg/kg, IM, at 30 and 150 min), neostigmine (0.02 mg/kg, SC, at 30 and 150 min), erythromycin (8.8 mg/kg, IM, at 30 min), low dose erythromycin (0.88 mg/kg, IM, at 30 min), or placebo (control). Abomasal emptying rate was assessed by: (1) counting the number of abomasal luminal pressure waves, (2) calculating a motility index (sum of all pressure wave amplitudes >10 mm Hg), (3) measuring mean abomasal luminal pressure, and (4) ultrasonographic determination of abomasal volume. Ultrasonographic measurements of abomasal dimension (width, length, height) were obtained periodically after suckling by applying a 3 MHz sector probe to the ventral abdomen in transverse and sagittal planes. Abomasal volume was calculated from the ultrasound dimensions using the formula for an ellipsoid, and the power exponential formula of Siegel et al (1988) was used to calculate the abomasal half emptying time ( $t_{1/2}$ ). Erythromycin (8.8 mg/kg) immediately increased ( $P < 0.05$ ) the frequency of abomasal luminal pressure waves from  $0.2 \pm 0.2$  (mean  $\pm$  SD) to  $2.0 \pm 1.1$  per min, the motility index from  $4 \pm 4$  to  $59 \pm 55$  mm Hg/min, and the mean abomasal luminal pressure from  $10 \pm 4$  to  $17 \pm 7$  mm Hg, whereas metoclopramide, neostigmine, and low dose erythromycin did not alter these indices of abomasal motility. Ultrasonography indicated that erythromycin (8.8 mg/kg) markedly increased the abomasal emptying rate ( $t_{1/2} = 65 \pm 14$  min) compared to control ( $t_{1/2} = 101 \pm 17$  min), whereas metoclopramide ( $t_{1/2} = 107 \pm 23$  min), neostigmine ( $t_{1/2} = 89 \pm 12$  min), and low dose erythromycin ( $t_{1/2} = 92 \pm 35$  min) had no effect. We conclude that parenteral administration of erythromycin (8.8 mg/kg, IM) caused an immediate and profound increase in abomasal motility and emptying rate in healthy suckling calves. Our results suggest that erythromycin, when administered at the labeled antimicrobial dose (8.8 mg/kg, IM), may be a useful prokinetic agent in milk-fed calves.

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057 (2593)

#### DETERMINATION OF MINIMUM INHIBITORY CONCENTRATIONS OF DANOFLOXACIN AND OTHER COMMONLY USED CATTLE ANTIMICROBIAL AGENTS AGAINST MYCOPLASMA BOVIS ISOLATED FROM CATTLE WITH CLINICAL DISEASE

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1Purdue University, 1175 ADDL, West Lafayette, Indiana, 47906, United States of America; 2Pfizer Animal Health, Veterinary Medicine R&D, 7000 Portage Rd. MS190-38, Kalamazoo, MI, 49048, United States of America. The objective of this study was to measure the in vitro activity of danofloxacin and 12 other antimicrobial agents against *Mycoplasma bovis* isolated from cattle in North America. Minimum inhibitory concentrations (MIC) were determined by the Animal Disease Diagnostic Laboratory (ADDL) at Purdue University using published microdilution procedures (Wu, C.C., et al, Veterinary Microbiology, 2000, 76:25-30). A total of 46 *M. bovis* isolates cultured from lung, transtracheal wash, bronchial lymph node and milk samples were tested: 29 isolates from clinical field studies of bovine respiratory disease conducted in late 1999, and 17 isolates from field samples submitted to ADDL between 2001 and 2002. Samples were taken from cattle with no known history of antimicrobial therapy. Isolates were collected in California, Idaho, Nebraska and Indiana, although the origins of

cattle were not determined. Antimicrobial agents tested were compounds commonly used globally for the treatment of livestock infections. The MIC was defined as the lowest concentration that inhibited growth, indicated by color change of a pH indicator. Inocula of *M. bovis* cultures used to obtain MIC contained between 103 to 105 Color Changing Units/mL, and were the same for all wells on any given plate. The procedure was controlled via testing of *Mycoplasma bovis* ATTC 25523 in each batch, and use of positive and negative growth wells in each plate. The range of dilutions tested, maximum MIC, MIC50, and MIC90, respectively, are listed for each antimicrobial tested (in µg/mL): danofloxacin, 0.015-2, 0.5, 0.25, 0.25; enrofloxacin, 0.015-2, 1, 0.25, 0.5; ceftiofur, 0.06-8, >8, >8, >8; cefquinome, 0.06-8, >8, >8, >8; amoxicillin/clavulanate, 0.12/0.06-16/8, >16/8, >16/8, >16/8; trimethoprim/sulfadiazine, 0.5/9.5-4/76, >4/76, >4/76, >4/76; gentamicin, 2-16, >16, 8, 16; spiramycin, 0.5-64, 32, =0.5, 32; oxytetracycline, 0.5-64, >64, 16, 32; marbofloxacin, 0.015-2, 1, 0.5, 1; tilmicosin, 1-64, >64, >64, >64; spectinomycin, 2-128, >128, 4, 16; and florfenicol, 0.25-16, 8, 4, 4. Susceptibility of these isolates varied with the class of antimicrobial agent tested. Danofloxacin, enrofloxacin and marbofloxacin provided the most potent in vitro activity.

Funding: Pfizer Animal Health

058 (3286)

#### COMPARISON OF ANALYTICAL METHODS AND CHARACTERIZATION OF PREANALYTICAL FACTORS FOR SERUM GLOBULIN DETERMINATION IN HEALTHY DAIRY CATTLE

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Clinically healthy lactating cows sometimes exhibit variation in serum globulins, which may be due to their physiological state, herd environment or management. The objectives of this study were: 1- to determine the accuracy of colorimetrically-based total serum globulin values by correlating them with electrophoretically-determined serum globulin fractions as the reference method, 2- to correlate total globulin concentration with IgG levels as the immunoglobulin mainly responsible for serum globulin concentration; and 3- to evaluate several potential sources of preanalytical variation in serum globulin concentration. Materials and methods: Experiment 1. Sera were analyzed by colorimetry and by electrophoresis for total globulin and albumin on 86 lactating Holstein cows. Experiment 2: Sera from 75 cows were analyzed to correlate colorimetrically-based total serum globulin concentration with IgG levels. Experiment 3: Sera from 18 lactating Holstein cows were analyzed to characterize diurnal variations, fluctuation over a 15-week period and the effects of blood sampling site on colorimetrically-based total serum globulin levels. Our results showed that colorimetrically-based total serum globulin concentration correlated well with electrophoretically-determined total globulin levels ( $r^2=0.87$ ), g-globulin fractions ( $r^2=0.91$ ) and IgG levels ( $r^2=0.91$ ). Total globulin diurnal concentrations varied significantly ( $p=0.01$ ). However, globulins do not vary significantly over a 15-week period ( $p=0.639$ ). Total serum globulin concentration in blood sampled from the jugular vein was on average 2.35 g/L higher than those obtained in blood sampled by coccygeal venipuncture ( $p < 0.0001$ ). Sampling associated to feeding or milking was not associated with a significant fluctuation in serum globulin concentration ( $p=0.508$ ).

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059 (2460)

#### THE CLINICAL EFFICACY OF BANAMINE INJECTABLE SOLUTION FOR THE MANAGEMENT OF PYREXIA AND/OR INFLAMMATION ASSOCIATED WITH NATURALLY OCCURRING ACUTE BOVINE MASTITIS

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Objective: To evaluate the efficacy of Banamine (flunixin meglumine) for the management of pyrexia and udder inflammatory variables associated with acute bovine mastitis. The dosage of flunixin was 2.2 mg/kg bodyweight, administered intravenously once upon enrollment. Banamine (Finadyne Injectable Solution) is currently approved in many countries for reduction of pyrexia and endotoxemia associated with Bovine Respiratory Disease (BRD) in beef cattle.

Study Design: A field trial was conducted in 14 commercial dairy farms. Newly diagnosed cows with clinical signs of acute mastitis (as evidenced by abnormal milk and/or udder inflammation and pyrexia of  $\geq 40^\circ\text{C}$ ) were included. A total of one hundred seventeen (117) cows were enrolled. Cows were randomly allocated to two treatment groups: Banamine at 1 mL/22.7 kg (2.2 mg/kg) IV (58 cows) or physiological saline at 1 mL/22.7 kg (59 cows), given once, IV in the jugular vein. The udder inflammation variables (pain, swelling, and firmness) were scored on a scale from 0 to 3. Clinical scoring used in the success/failure assessment was performed at 4 hours post-dose administration. A cow was designated a treatment success for pyrexia when the rectal temperature decreased  $\geq 1.1^\circ\text{C}$  from the inclusion rectal temperature OR the temperature of the cow has decreased to the normal rectal temperature indices of  $38.6 \pm 0.5^\circ\text{C}$ . A cow was designated a treatment success for inflammation variable when the selected quarter improved by 2 or more grade scores OR returned to normal.

Results: A total of one hundred (100) cows were evaluated for efficacy for pyrexia (eighty-seven (87) of those

were evaluated for inflammation variables). Statistically significantly higher success rates for the reduction of pyrexia were seen after test article treatment. Success rate in the Banamine Injectable Solution group was 94.0% and only 18.0% in the saline group. The Banamine Injectable Solution treatment group success rate for the reduction of pyrexia was statistically significantly superior to the saline group ( $p < 0.0001$ ). Success rate for pain in the Banamine treatment group was 27.5% vs. 6.4% in the saline group. The success rate for swelling in the Banamine treatment group was 12.5% vs. 0.0% in the saline group.

Conclusion: Under the conditions of this trial, Banamine Injectable Solution was safe and effective treatment for the reduction of pyrexia, udder pain, and udder swelling associated with acute mastitis in dairy cattle.

Funding: Schering-Plough Animal Health

060 (3370)

#### EVALUATION OF THREE COW-SIDE DIAGNOSTIC TESTS FOR THE DETECTION OF SUBCLINICAL KETOSIS IN FRESH COWS

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The objective of the study was to evaluate the performance of three semiquantitative cow-side diagnostic tests for the detection of subclinical ketosis in fresh dairy cows, compared to the gold standard serum  $\beta$ -hydroxybutyrate (BHB). The cow-side tests were: (1) a commonly used test strip detecting acetoacetate in urine (Ketostix, Bayer Corporation, Elkhart, Indiana, USA), (2) a commonly used powder test used on milk, also detecting acetoacetate (KetoCheck, Great States Animal Health, St. Joseph, Missouri, USA), and (3) a milk test strip detecting BHB (KetoTest, Sanwa Kagaku Kenkyusho Co. Ltd., Nagoya, Japan, distributed by Elanco Animal Health/Provel, Guelph, Ontario, Canada).

The study was performed in a transition management facility housing dry and just-fresh cows for two large dairies in Wisconsin, USA (total 2500 milking cows). Serum, milk and urine samples were collected from fresh cows of all parities between 2 and 15 days in milk. Sensitivity and specificity of the cow-side tests were calculated over the range of possible cut-off points for each test, using a serum BHB threshold of 1400  $\mu\text{mol/L}$  to distinguish between normal and abnormal cows.

Groups of fresh cows were sampled on 16 different occasions from September 2002 to January 2003 ( $n = 859$  serum samples, from 545 cows). The overall prevalence of serum samples with BHB greater than 1400  $\mu\text{mol/L}$  was 7.6%, ranging by sampling day from 0% to 20.8%.

The KetoCheck powder used on milk was highly specific (99%), but poorly sensitive (41%), even at its most sensitive cut-off point (trace). The sensitivity and specificity of the Ketostix urine strip were 78% and 96% respectively using the cut-off point of 15 mg of acetoacetate/dL of urine ("small"), 49% and 99% at the cut-off point of 40 mg/dL ("moderate"), and 12% and 100% at the cut-off point of 80 mg/dL ("large"). The KetoTest milk strip had a sensitivity and a specificity of 73% and 96% using the cut-off point of 100  $\mu\text{mol}$  of BHB per L of milk, 27% and 99% at the 200  $\mu\text{mol/L}$  cut-off point, and 3% and 100% at the 500  $\mu\text{mol/L}$  cut-off point.

Funding: Balchem Corporation, Elanco Animal Health

061 (2561)

#### ASSOCIATION OF PREPARTUM PLASMA NON-ESTERIFIED FATTY ACID CONCENTRATIONS WITH POSTPARTUM METABOLIC DISEASES IN HOLSTEIN COWS

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The objective of this study was to determine the association of plasma NEFA concentrations with the risk of Metritis, Retained Placenta (RP), Ketosis, and Left Displaced Abomasum (LDA) in dairy cows.

Materials and Methods: Late gestation cows ( $>268$  d) were housed in a close-up pen and fed a totally mixed ration. About 70 cows were in this pen at any given time. Feed was continuously available and offered daily at 6 h. Weekly blood samples were taken from 4 to 15 animals selected at random for 10 weeks. Each cow was sampled only once. Plasma NEFA concentrations were determined by an enzymatic technique (WAKO). A Logistic regression model was formulated using a "step-down" technique. NEFA, LNEFA (Log of NEFA), Parity, days from parturition at the time of sampling, and twin or single birth were the initial independent variables. Variables were eliminated from the model when p values were greater than .25.

Results: Of the 135 cows sampled; 9 calved with twins, 15 developed RP, 22 Metritis, 11 LDA, and 56 developed Ketosis. The mean days from blood collection until calving was 4 and the mean plasma NEFA concentration was  $.29 \pm .01$  mEq/L. The mean plasma NEFA concentrations for cows with RP and without RP were  $.38 \pm .05$  and  $.28 \pm .01$  mEq/L, for the cows with and without Ketosis were  $.32 \pm .02$  and  $.27 \pm .02$  mEq/L and for the cows with and without LDA were  $.39 \pm .04$  and  $.28 \pm .01$  mEq/L. The odds ratio for the effect of NEFA on RP, Ketosis,

and LDA were 2.3 ( $p=.07$ ), 1.7 ( $p=.09$ ) and 3.1 ( $p=.04$ ). This suggests that a unit increase in NEFA increases the risk of RP by 2.3 fold, Ketosis by 1.7 and LDA by 3.1 fold. Effect of NEFA on the development of Metritis was not significant. Twinning had significant effect on the development of Metritis ( $<.001$ ) and RP ( $<.0001$ ) but not on Ketosis and LDA.

Conclusions: Monitoring of plasma NEFA concentrations one week prior to calving may be a practical means of detecting increased risk of RP, Ketosis and LDA. No evidence of association of plasma NEFA with the development of Metritis was found. Most significant finding of this study was the strong association of plasma NEFA concentrations with the risk of developing LDA.

062 (1676)

#### THE IMPACT OF RUMENSIN CONTROLLED RELEASE CAPSULE ADMINISTRATION ON POSTCALVING HAPTOGLOBIN CONCENTRATIONS AS A POTENTIAL INDICATOR OF IMMUNE FUNCTION

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This study was designed to assess haptoglobin as an indicator of inflammatory disease and as a marker of immune function in dairy cattle. The impact of Rumensin Controlled Release Capsule (CRC) administration precalving on haptoglobin levels was also evaluated.

The study population was from 1010 cows within 25 Holstein dairy herds near Guelph, Ontario, Canada. Rumensin CRC or placebo capsules were randomly assigned within herd 3 weeks prior to expected calving. Serum samples were obtained at enrolment and weeks 1, 2, 3, 6, and 9 post-calving. Serum from weeks 1 and 6 was submitted for quantification of haptoglobin concentration using a Hitachi 911 automated serum analyzer. Haptoglobin results were entered into a database that included serum analysis and cow health. Haptoglobin, treatment, parity, season calved, twins, initial body condition score and clinical disease up to 95 days in milk were used for statistical analysis.

Haptoglobin concentrations were higher in week 1 than week 6 ( $P < 0.05$ ). In univariate analysis, several diseases were significantly associated with haptoglobin concentrations. However, occurrence of disease appeared to confound the data interpretation. Thus, analyses were stratified by the presence or absence of disease. In non-diseased animals, multivariate regression indicated that twins and first parity were associated with higher haptoglobin in week 1. Treatment with CRC was associated with lower haptoglobin in week 6. In diseased animals, Week 1 haptoglobin concentrations were higher for cows with retained placenta, first parity animals and cows that were later culled. Week 6 haptoglobin concentrations, in diseased animals, were higher for cows with mastitis, displaced abomasum, and those subsequently culled. There was a significant interaction between CRC treatment and first parity. Diseased heifers in week 1 postcalving treated with CRC had higher haptoglobin concentrations, while non-diseased CRC treated heifers had a lower haptoglobin concentrations. Haptoglobin served as a good indicator of inflammatory disease and as a potential marker for immune function. Rumensin CRC treatment appeared to have an effect on immune function by causing increased haptoglobin concentrations in sick cows, perhaps reflecting a better ability to respond to disease challenge. The lower haptoglobin concentrations in CRC treated non-diseased animals may be a reflection of reduced subclinical disease.

Funding: Elanco Canada

063 (3064)

#### FEEDING ANIONIC SALTS - EFFECTS ON THE HEALTH STATUS OF DAIRY COWS AND THEIR CALVES

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Feeding diets with negative dietary cation-anion difference (DCAD) to dry cows is a common method in preventing parturient paresis. Administration of anionic salts leads to metabolic acidosis, which is usually compensated for by adult animals. On the other hand, the balance of the acid-base status of newborn calves is very unstable. External influences such as dystocia, aspiration of amniotic fluid, respiratory diseases and especially diarrhoea may cause fatal metabolic acidosis. There is a lack of scientific evidence suggesting as to whether calves born to cows supplemented with anionic salts have metabolic acidosis or not. In our trial, 36 multiparous dairy cows were allocated to three groups ( $n=12$ ). Cows of group 0 served as a negative control (ration DCAD=230 meq/kg DM), animals of group I received 150 g/d anionic salts (ration DCAD=102 meq/kg DM) and cows of group II received 300 g/d anionic salts (ration DCAD=-7 meq/kg DM), of which began 3 weeks prior to the date of parturition. Examinations conducted in cows: dry matter intake (DMI, kg/d), blood and blood gas analysis, urine analysis. Examinations conducted in calves: APGAR-Score (vitality), blood and blood gas analysis (pursued a scheme: 15 blood gas analyses within the first 72 hours of life). Statistical evaluation (ANOVA) showed that DMI of cows (mean 12.4 kg/d) did not differ significantly between groups. Content of blood  $Ca^{++}$  (ionised blood Ca) of cows was 1.23 mmol/l (0), 1.24 mmol/l (I) and 1.22 mmol/l (II), respectively and blood pH did

not differ significantly between groups ( $p>0.05$ ). The lack of significant differences can be seen as a consequence of high K contents in the ration and because of inadequate acidification. On the other hand, the net acid-base excretion (NSBA) was 118 mmol/l (0), 69 mmol/l (I) and 53 mmol/l ( $p<0.05$ ), respectively. The pH value in urine was 8.47 (0), 8.42 (I) and 8.19 (II) ( $p>0.05$ ). Mean blood pH values from the first blood samples, which were taken within the first 30 minutes after the birth of the calves, were 7.35 (0), 7.29 (I) and 7.24 (II) ( $p<0.05$ ), respectively. Lapse of blood pH in calves of group I and group II took 10-14 hours to achieve the level of blood pH of calves in the control group (pH 7.39). These results indicate that calves born to cows supplemented with anionic salts have a significantly lower blood pH during the first hours of their lives.

Funding: Government

064 (2042)

#### IMPACT OF FATTY LIVER ON MILK PRODUCTION IN HIGH YIELDING DAIRY COWS

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Introduction: In dairy cows, lack of energy around partus increases rate of lipolysis, which results in fatty liver and malfunction of the organ. Then energy metabolism is impaired which leads to a decrease of milk yield. A field study included was carried out, to look for the prevalence of fatty liver and liver malfunction and their impact on milk production.

Material and methods: The studies took place on seven high producing dairy cattle farms in East Germany. Milk production ranged from 8.000 kg to 10.000 kg (FCM), herd size ranged from 300 to 1200 cattle. Farms were visited once a month. Serum samples were taken from ten apparent healthy cows each of the first week and the 3-5. week of lactation. Concentrations of the following parameters were measured in serum: phosphorus, bilirubin,  $\beta$ -hydroxybutyrate, ASAT, GLDH, g-GT. Additional from each cow liver biopsy was carried out and content of liver fat was measured by a solution of copper sulphate with decreasing density. For each cow, the following parameters of milk-production were collected: milk yield of first milk-test, 100-d-milk yield, 100-d-milk fat% and 100-d-milk protein%.

Results: 75% of all the cows had concentrations of liver fat, which correspond to the ranges of normal lipolysis. Cows of first week of lactation had slightly higher content of liver fat than cows of the other group. Liver fat concentrations increased with number of lactation up to third lactation, then they decreased. Significant but weak correlations were found between content of liver fat of each lactation group and the serum parameters ASAT, GLDH, GGT, and  $\beta$ -hydroxybutyrate. Correlations were better for cows with severe fatty liver. For both lactation groups, significant but also weak correlations were found between content of liver fat and percentage of milk fat and milk protein on day 100. Correlations with protein were negative. Correlations were weak because differences in milk yield and milk components were remarkable only when cow suffered from severe fatty liver. A moderate content of liver fat had no significant impact on 100-d-milk production.

Conclusions: Liver biopsy is a useful tool in herd health management for detecting fatty liver directly on the farm. There were significant correlations to parameters of serum and parameters of milk production. Only cows with severe fatty liver showed lower milk production, which results in lower percentage of milk protein and higher percentage of milk fat.

065 (3224)

#### AN EVALUATION OF RUMEN-PROTECTED CHOLINE AND MONENSIN CONTROLLED RELEASE CAPSULE ON MILK PRODUCTION, HEALTH AND METABOLIC FUNCTION OF PERIPARTURIENT DAIRY COWS

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During early lactation, dairy cows undergo a phase of negative energy balance, which may lead to metabolic disorders and subsequent losses in production. To help reduce this, ionophores are often administered to ruminants. Administration of monensin controlled release capsules (CRC) prior to calving improves energy balance, while choline aids in fat metabolism and transport. Choline, however, can be a limiting nutrient in lactating dairy cows. The objective of this study was to determine whether there is an interaction between these two supplements on metabolic parameters and milk production. Three weeks prior to expected calving, 185 Holstein cows were randomly assigned to receive one of the following: a monensin CRC, a daily top-dress of 56g rumen-protected choline (RPC; Reashure® choline, Balchem Encapsulates, New Hampton, NY) until 28 days post-calving, both supplements (RPC+RPC), or neither (CON). Blood samples were collected at enrollment, one week before calving, and in the first and second weeks post-calving. Liver biopsies were obtained from multiparous cows within 48 hours of calving and repeated 3 weeks later. Daily milk records up to 60 days in lactation and health records were also obtained. Adjusting for parity and BCS at enrollment, beta-hydroxybutyric acid (BHBA) concentrations in the first week post-calving were lower in the CRC and RPC+RPC groups than

controls (990, 1140 and 1553  $\mu\text{mol/L}$  respectively,  $P=0.05$ ). Non-esterified fatty acid (NEFA) concentrations in the first week post-calving were lower in the CRC group compared to control (0.51 and 0.70  $\text{mEq/L}$ , respectively,  $P<0.01$ ). In both the last week pre-calving and the first week post-calving, the concentrations of serum urea were higher in the CRC group (4.03 & 4.54  $\text{mmol/L}$ , respectively) and RPC+RPC group (4.12 & 4.51  $\text{mmol/L}$ , respectively) in comparison to the CON group (3.67 & 4.02  $\text{mmol/L}$ , respectively) ( $P<0.05$ ). During the first week post-calving higher serum glucose concentrations were observed in both the CRC and RPC+RPC groups in comparison to the CON group (2.76, 2.72 and 2.43  $\text{mmol/L}$ , respectively,  $P<0.05$ ). Between 5 and 8 weeks into lactation, the RPC and the RPC+RPC groups produced on average 1.9 and 1.4  $\text{kg/d}$ , respectively, more milk than the CON group ( $P<0.05$ ). There were no significant differences in milk production between the CRC group and the CON group.

Funding: University and Industry

066 (5033)

#### ASSOCIATIONS BETWEEN PREPARTUM METABOLIC INDICATORS AND KETONE CONCENTRATIONS POST-CALVING IN TRANSITION DAIRY COWS

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An investigation was conducted to determine associations between various metabolic and biological variables in the prepartum period and  $\beta$ -hydroxybutyrate (BHBA) concentrations in the first two weeks postpartum. A total of 136 Holstein cows and heifers were enrolled in this study at three weeks prior to the expected calving date. Serum samples were obtained at enrolment, one-week before expected calving, on the day of calving, and at one and two weeks post-calving. Serum was analyzed for BHBA, non-esterified fatty acids (NEFA), glucose, urea and bilirubin concentrations, as well as aspartate aminotransferase (AST) activity. Cows were assigned a body condition score (BCS) at enrolment and upon completion of the clinical trial. Daily dry matter intake (DMI) was measured for all animals for the entire experimental period. Associations between serum profile items, BCS and DMI pre-partum and BHBA concentrations post-partum were explored.

There were significant associations between DMI in the week before calving, NEFA concentrations in the week before calving and BCS at enrolment, and BHBA concentrations in the first week postpartum. There was a significant positive association between NEFA concentration in the week pre-calving and BHBA in the first week postpartum. NEFA concentrations in the week prior to calving of  $\geq 0.6$   $\text{mmol/L}$  was associated with a 3 times ( $P=0.10$ ) increased risk of subclinical ketosis following calving (BHBA  $\geq 1400$   $\mu\text{mol/L}$  serum). When NEFA concentrations in the week before calving were greater than or equal to 0.7  $\text{mmol/L}$ , there was a 4.8 times increased risk ( $p<0.05$ ) of subclinical ketosis in the first week postpartum. Also, the average DMI over the last week prior to calving was significantly negatively associated with the BHBA concentration in the first week postpartum. If the DMI was  $\geq 12$   $\text{kg/d}$  in the week prior to calving, there was a 5.7 times ( $p<0.05$ ) increased risk of subclinical ketosis in the first week postpartum. BCS at enrolment was not significantly associated with BHBA postpartum. From the results of this study, it is clear there is considerable promise in monitoring animals precalving for predicting an increased risk of disease after calving. The associations and cutpoints for NEFA and DMI found in this study could prove to be useful tools in transition cow monitoring programs on-farm.

Funding: Elanco Animal Health

067 (3399)

#### THE EFFECT OF SOME DRUGS INJECTION TO PREGNANT HEIFERS ON BLOOD ANTIOXIDANT STATUS

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The purpose of the trial was to establish the effect of injection of vitamins connected with Se (antioxidants) or the lysozyme dimer (immunomodulator) on the activity of chosen antioxidant enzymes and the total antioxidant status in pregnant heifers. Examinations were carried out during winter season in one farm on 21 heifers aged 22 - 24 month. Between 21st and 14th day before expected parturition seven heifers were once i.m. injected with antioxidants (Vitamin A-600 000 i.u.; Vitamin D3-200 000 i.u.; Vitamin E-1.5  $\text{mg/kg}$  b.w., Selenium-0.022  $\text{mg/kg}$  b.w.), and next seven with lysozyme dimer (Lydium-KLP®) in dose of 0.02  $\text{mg/kg}$  b.w. versus 7 non-treated control animals. Blood samples were taken before injection and then in 24 h and 72 h after injection and between 7th and 14th day after calving. The activity of superoxide dismutase (SOD), glutathione peroxidase (GSHpx), glutathione reductase (GSHred) and total antioxidant status (TAS) were measured by colorimetric method with the use of Randox kits. The mean value of SOD activity 21 - 14 days before expected calving was  $704.8 \pm 294.6$   $\text{U/ml}$ , GSHpx  $59222 \pm 23699$   $\text{U/l}$ , GSHred  $110.8 \pm 22.5$   $\text{U/l}$  and TAS  $0.33 \pm 0.15$   $\text{mmol/l}$ . These indicators not changed in the control group exception a non statistical decrease in SOD activity after parturition. The statistically significant increase in blood SOD activity was noted only in the first day after injection of vitamins combined with selenium. These antioxidants also caused the non significant increase in blood GSHpx activity in 4th day following

the injection and in first week after calving (statistically significant). The injection of antioxidants or lysozyme dimer did not change the activity of blood GSHred. However, the increase in the TAS was stated on 1st (non significant) and 4th (statistically significant) day following the single injection of lysozyme dimer. The number of retained placenta, puerperal metritis or clinical and subclinical forms of mastitis during first month after calving did not differ among groups.

068 (1932)

#### PRODUCTION AND HEALTH OF PASTURE-FED DAIRY CATTLE FOLLOWING ORAL TREATMENT WITH THE IONOPHORE LASALOCID

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This study evaluated the effect of the ionophore lasalocid on the productivity and health of seasonally calving, pasture-fed dairy cows. Cows (n=1020) from 4 herds were enrolled in a split herd, prospective intervention study. Cows were blocked by breed, age code (i.e. 2, 3, 4 to 8 and > 8 years old) and ranked on previous production before being assigned to 2 groups. Cows were treated orally or in-feed with 300 to 350 mg/cow/day of lasalocid starting 3 weeks before, and ending 18 weeks after, the start of the seasonal calving period. The cow's milk production was determined on 3 occasions at approximately monthly intervals (herd tests 1 to 3) and all disease occurrences recorded. Body condition score (BCS) was determined fortnightly on a 1 to 10 scale in a subset of 20 treated and 20 control animals from each herd. Milk production, composition and log 10 somatic cell count (SCC) were analysed for each herd test independently using a generalised linear model with herd, age code and treatment as fixed effects and days in milk as a covariate. Repeated measures ANOVA was used to analyse BCS and logistic regression to analyse the probability that a cow was diagnosed with any disease or clinical mastitis alone.

Lasalocid treatment increased milk volume at herd tests 2 (20.3 vs. 19.9 SED = 0.24, L/cow/day for lasalocid vs. control, respectively; P=0.05) and 3 (19.4 vs. 19.0 SED = 0.24, L/cow/day for lasalocid vs. control, respectively; P=0.05), increased milk solids (1.609 vs. 1.576 SED = 0.016 kg milksolids/cow/day for lasalocid vs. control respectively, P=0.04) and milk fat production (0.891 vs. 0.870 SED = 0.010 kg milk fat/cow/day for lasalocid vs. control respectively, P=0.04) at herd test 3. The percentage of fat and protein and the log 10 SCC were not affected by treatment (P>0.2). Lasalocid treatment was associated with a lower total disease prevalence (56/504 (11.1%) vs. 93/516 (18.0%) for lasalocid vs. control, respectively, P<0.01) and a lower prevalence of clinical mastitis (37/504 (7.3%) vs. 60/516 (11.6%) for lasalocid vs. control, respectively, P=0.02). Body condition score did not differ between the lasalocid and control cows (4.65 vs. 4.64 SED=0.06 mean BCS for lasalocid vs control, respectively; P=0.87) and there was no time by treatment effect on BCS (P=0.62).

Lasalocid-treatment of pasture-fed dairy cows resulted in reduced disease prevalence and increased production without changes in milk composition, SCC or BCS.

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069 (1686)

#### THE RECUMBENT COW - THE ROLE OF CLINICAL SIGNS

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Introduction: The objective of this prospective survey-based study was to elucidate the role of phosphorus in the clinical picture.

Materials and methods: 394 cases of recumbency in cows from 101 veterinary practices were included. The veterinarians were requested to fill in a questionnaire covering clinical observations for each case, and to submit blood samples from both the case and a healthy control cow from the same herd in as close a lactation stage as the case cow as possible.

Results and discussion: The risk for recumbency in the 5th lactation was 21.6 times as high as in the first lactation. In lactations beyond the 7th, the risk was 26.8 times as high. No correlation with milk yield seems to exist. A good linear correlation was found between serum P and Ca levels ( $P = .16 + .52 \cdot Ca$ ;  $r = .68$ ). Both serum Ca and P levels were lower in control animals during the periparturient period than in those at any other stage, but higher than in periparturient cases. Average values in control animals (Ca: 2.19 mmol/l; P: 1.64 mmol/l) were still in the reference ranges used (Ca: 2 - 3 mmol/l; P: 1.6 - 2.3 mmol/l). 5 % of values for Ca, but 12.5 % of values for P were below the respective reference ranges, indicating that the lower limit of the reference range for P may have been too high. Using the lower limits of the reference ranges indicated above, four groups can be formed (proportion of cases falling into the groups in parentheses): low Ca and normal P (group 1; 4.1 %), normal Ca and normal P (group 2; 15.1 %), low Ca and low P (group 3; 62.4 %), normal Ca and low P (group 4; 18.4 %). Using bivariate statistical methods and regression analysis, we checked 12 clinical signs. When only data from recumbent cows with normal calcium levels were analysed, hypophosphataemia was present more frequently in animals not observed to ruminate (60.8 %) than in those that did ruminate (34.2 %). No other significant

differences were found.

In feeding trials with cattle, in which serum P levels as low as .2 to .3 mmol/l were produced and maintained for 60 days, no cases of recumbency were observed (Rodehutschord et al., 1994). Diurnal variation in serum P levels is reported to be pronounced. Given these facts and the results of our study, we conclude that hypophosphataemia is no major causal factor in recumbency of cows.

070 (2317)

#### BLOOD GLUCOSE CONCENTRATION AS PROGNOSTIC INDICATOR IN COWS WITH ABOMASAL DISPLACEMENT

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In a retrospective study we evaluated blood glucose concentration in Holstein Friesian cows with abomasal displacement, surgically treated at the Clinic for ruminants in Ljubljana from 1998 to 2003. 148 cows with abomasal displacement were operated, 107 (72,3%) with left and 41 (27,7%) with right. Blood chemistry was done in all the surgically treated cows before the surgery. The surgical therapy was successful in 131 (88,5%) cows, 100 (93,5%) with left and 31 (75,6%) with right abomasal displacement, which were also discharged from the hospital, 17 (11,5%) cows, 7 (6,5%) with left and 10 (24,4%) with right abomasal displacement had to be euthanized within 2 weeks following the surgery because of bad clinical status. The mean blood glucose value prior to surgery was  $4,86 \pm 2,40$  mmol/l in cows, which survived after surgery, and  $7,84 \pm 4,12$  mmol/l in cows that had to be euthanized after surgery. Blood glucose in cows that had to be put down after the surgery is statistically significantly higher than in those that survived ( $p < 0,001$ ). Statistically significant difference ( $p < 0,001$ ) was established between blood glucose concentration in cows with left,  $4,64 \pm 2,08$  mmol/l and cows with right,  $6,68 \pm 3,80$  mmol/l, abomasal displacement. No statistically significant difference was established between blood glucose concentration in cows with left abomasal displacement that survived after surgery,  $4,61 \pm 2,06$  mmol/l and those that did not,  $5,05 \pm 2,37$  mmol/l, while there was statistically significant difference ( $p < 0,001$ ) between cows with right abomasal displacement that survived after surgery,  $5,67 \pm 3,17$  mmol/l and those that had to be euthanized,  $9,80 \pm 4,02$  mmol/l. We are of the opinion that hyperglycemia, especially in right abomasal displacement, may be associated with disturbed pancreas function due to impaired outflow of pancreatic juice and disturbed blood circulation in parenchyma of pancreas because of anatomical change of duodenum and omentum.

071 (2520)

#### FEED SUPPLEMENTATION WITH OMEGA-3 OR OMEGA-6 FATTY ACIDS DIVERGENTLY AFFECTS IMMUNE RESPONSIVENESS IN DAIRY COWS

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Polyunsaturated fatty acids (PUFA) e.g. n-3 and n-6 PUFA are added to feed of dairy cows to increase the energy density and to change the proportions of unsaturated fatty acids in the milk in order to meet consumers expectations. PUFA and their derivatives have been recognized as anti-inflammatory mediators in man and various monogastric animal species. The potentially inhibitory effects are assumed to be linked to production of derivatives of either the eicosanoid or the prostaglandin pathway. There are only few reports on the effects of dietary PUFA on immuno-responsiveness in cattle, as they were assumed to be biohydrogenated in the rumen. However, recent developments in food processing allow to bypass the rumen, so that the PUFA can be absorbed in the intestines.

The objective of our studies was to investigate, whether dietary PUFA would affect distinct immune functions in dairy cows. To this end, in a Latin square design, six Holstein heifers received fat supplements of either sunflower oil (SO: C18:2n-6 rich) or linseed oil (LO: C18:3n-3 rich) by intra-abomasal infusion for four weeks each with washout intervals of 10 weeks. Dietary palmiticstearin served as control. The following immune parameters were determined: WBC and differentials, lymphocyte subsets, ConA, PHA-induced lymphocyte proliferation, expression of adhesion molecules and leukocyte markers. In addition, in an in vitro experiment, different concentrations of PUFA were added to lymphocytes stimulated with ConA in four-day cultures.

The different fat supplements had no significant effect on WBC counts, differentials and leukocyte subsets. Expression of CD49d was increased in cows fed LO. Proliferative responses of lymphocytes from cows fed LO showed significant increase after ConA stimulation and those fed SO significant increase after PHA stimulation. In vitro lymphocyte blastogenesis induced by ConA was dose dependently inhibited by C18:2n-6 but not by C18:3n-

3.

In summary, dietary influence on immune responsiveness was prominent when assessing CD49d expression, clearly presented on higher percentages of cells in LO fed animals. Proliferative responses of lymphocytes were inconsistent as both SO and LO rich diets showed increased lymphocyte proliferation in the feeding trial, but showed a significant dose dependent inhibition of ConA induced proliferation, in the presence of C18:2n-6 when tested in vitro. The latter results reflect the findings in man and other animal species.

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072 (3099)

#### METABOLIC PROFILING TO EVALUATE TRANSITION COW NUTRITION AND HEALTH STATUS

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Use of metabolic profiles to determine health status has been advocated, but acceptance has been limited due to costs and interpretation difficulties. Different criteria are needed to determine disease potential rather than disease diagnosis using blood metabolite concentrations. Objectives of this study were to determine if any diagnostic relationships are present between prepartum blood metabolite concentrations and postpartum health status.

Metabolic profiles were performed on plasma samples collected from 111 cows on 13 commercial dairy farms for three time periods. Time periods were defined as: Early dry (ED), >30 days prior to calving; Closeup Dry (CU), 3 to 21 days prior to calving and Fresh (FR), 3 to 21 days postcalving. Analyses included in this metabolic profile include urea nitrogen (BUN), creatinine, glucose, total protein, albumin, total bilirubin, alkaline phosphatase (ALP), creatine kinase (CK), gamma-glutamyltransferase (GGT), aspartate aminotransferase (AST), sorbitol dehydrogenase (SDH), sodium (Na), potassium (K), chloride (Cl), calcium (Ca), phosphorus (P), magnesium (Mg), total cholesterol (Chol), triglycerides (TG), beta-hydroxybutyrate (BHB) and nonesterified fatty acids (NEFA). Disease diagnosis and treatment events were recorded. Relative risk of postpartum disease was determined using contingency tables of selected metabolite concentration categories and health status.

Fresh cow Alb concentration was stratified into three groups: <30 g/l, 30 to 35 g/l and >35 g/l and associated with health status. Percent of FR cows experiencing a health event within each group was 67, 61 and 32, respectively ( $P < 0.02$ ). Within FR cows, Chol concentration increased ( $P < 0.01$ ) with increasing Alb concentration. Cows with CU Alb concentrations <32.5 g/l were 1.46 ( $P < 0.04$ ; 1.04-2.04 95% CI) times more likely to experience a postpartum disease event. Cows with FR Alb concentration < 33.0 g/l were 1.79 ( $P < 0.003$ ; 1.19-2.70 95% CI) times more likely to have a disease event. If NEFA values were >0.4 mEq/l in either CU or FR samples, cows were 1.57 ( $P < 0.03$ ) and 1.47 ( $P < 0.04$ ) times more likely to have a disease event, respectively. Disease risk was greater if NEFA concentration was >0.6 mEq/l at CU (1.69,  $P < 0.02$ ) and FR (1.85,  $P < 0.0007$ ) periods. No metabolites measured in the ED period were associated with disease risk. These preliminary data suggest Alb and NEFA concentrations in CU and FR periods can be used to predict potential disease risk.

Funding: Pennsylvania Dept of Agric

073 (1752)

#### DEVELOPMENT AND APPLICATION OF AN ELISA TO DETECT ANTI-FASCIOLA HEPATICA ANTIBODIES IN BULK TANK MILK

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In the UK the incidence of fasciolosis in cattle and sheep, assessed by the proportion of positive submissions to the Veterinary Laboratories Agency of England and Wales, has increased from 4.5% in 1993 to 14.2% in 2002. Despite this increase in the incidence of disease, little is known about the prevalence of infection in dairy cattle in England and Wales. Clinical cases of fasciolosis are rarely reported in dairy cattle but there is an increasing incidence of Salmonella dublin infections and many are subsequently found to be associated with Fasciola hepatica.

Bulk tank milk ELISA's are now used widely to estimate the level of infection within a herd of many pathogens including BVDV, leptospira, etc. Here we report the development, validation and application of a bulk tank milk ELISA for F. hepatica. The ELISA is based on excretory/secretory antigens of F. hepatica, bulk tank samples are tested undiluted and a monoclonal anti-bovine IgG is used to detect bound antibody. Results are expressed as a percentage of a positive control (PP). Serum and faeces from 20% of the milking herd from 61 farms were collected and a corresponding bulk tank sample was collected at the same time.

The correlation between herd seroprevalence and the bulk tank PP value was 0.83. A PP value of 27 or above was used to indicate a seroprevalence within the herd of above 25%. Using this as a diagnostic cut off value, the

diagnostic specificity was 81% (95% confidence intervals 67% - 96%) and the diagnostic sensitivity was 93% (95% confidence intervals 83 - 100%).

Approximately 100 bulk tank samples were collected each month over a two year period from a BVDV surveillance project organised through the VLA, and tested using the *F. hepatica* bulk tank ELISA. The location of the Regional Laboratories that had submitted each sample was used to indicate its geographical origin. The results suggest that 48% of herds tested showed evidence of *F. hepatica* infection. Regional variations were apparent with the highest number of positive herds (78%) detected from the Carmarthen region (West Wales) and the lowest (15%) from Luddington (Eastern region). There was no evidence of seasonal variation in the level of exposure.

Funding: DEFRA

074 (2946)

#### EVALUATING AN ELISA FOR MONITORING PARASITE BURDENS IN DAIRY CATTLE

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Fecal egg counts are the most commonly used technique for monitoring parasite burdens in domestic livestock. In adult cattle, fecal egg counts are generally very low and are not a reliable indicator of parasite burden. An indirect, microtitre based ELISA, based on a crude whole worm *Ostertagia ostertagi* antigen has been developed for use on serum or milk samples, to provide an estimate of the parasite burden in cattle. However, before introducing this test for routine use in dairy cattle health management programs, it is necessary to validate the assay.

However, since there is no "gold standard" measure of parasite burden, it is necessary to use indirect methods to assess the reliability of this test.

There are four potential approaches to assessing the ability of the ELISA to measure parasite burdens.

1. ELISA optical density (OD) values can be compared to fecal egg counts (FEC) even though individual FEC are not a reliable indicator of parasite burden. Two studies involving 280 and 418 cows respectively found low correlations between individual test-day FEC and ODs (generally <0.3) but moderate correlations (0.55 - 0.73) if results were averaged over individuals and cows.

2. The effect of herd management practices on ELISA values can be determined. Several Canadian studies have consistently found associations between management practices that would be expected to result in higher parasite burdens (particularly level of pasture exposure) and OD values.

3. The relationship between ODs and milk production can be evaluated. Two studies using bulk milk samples both found that a herd at the 75th percentile of OD values produced approximately 1.25 kg/day less than a herd at the 25th percentile. Two clinical trials (based on eprinomectin treatments) have found that milk production was lower in untreated cows with high OD values compared to untreated cows with low ODs.

4. The relationship between ODs and anthelmintic treatment response can be evaluated. A multicentre clinical trial based on treatment of cows at calving found that cows with high OD values in late lactation had greater treatment responses both in terms of milk production and reproductive performance. Results from a more recently completed multicentre clinical trial will be presented in separate presentations.

Collectively, the results of all the studies referred to above indicate that the ELISA is a useful tool for monitoring parasite burdens in adult dairy cattle.

Funding: multiple

075 (897)

#### CLINICAL SIGNS AND OOCYST SHEDDING PATTERNS OF CRYPTOSPORIDIUM PARVUM IN EXPERIMENTALLY-CHALLENGED NEONATAL CALVES FED DECOQUINATE

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Introduction: Dairy producers and veterinarians have experimented with the use of decoquinate, a coccidiostat, in milk or milk replacer to prevent or reduce clinical symptoms and oocyst shedding from cryptosporidiosis. The purpose of this study was to evaluate the feeding of decoquinate in milk replacer to neonatal calves

experimentally-challenged with different number of *Cryptosporidium parvum* oocysts on oocyst shedding patterns.

Materials and Methods: Seventy-five Jersey bull calves were purchased from one commercial dairy over a 5-week period. Calves were housed in individual hutches and fed milk replacer with or without 2 mg/kg/d [1mg/lb/d] decoquinate. Calves were randomly assigned to treatment or one of 5 challenge groups (0, 50, 100, 1000, 10,000 *C. parvum* oocysts in 60cc saline per os on day two after arrival). The calves were maintained on the trial for up to 28 days. Calves were assessed clinically for diarrhea and dehydration. Fecal samples were submitted for oocyst enumeration three times weekly.

Results: Treatment did not affect onset to diarrhea, onset to shedding nor duration of diarrhea or shedding.

Duration of shedding was associated with challenge dose and days until onset of shedding ( $p=0.005$ ;  $R^2=0.21$ ). Duration of diarrhea was associated with week of arrival and days until onset of diarrhea ( $p=0.0009$ ;  $R^2=0.41$ ). Days to onset of shedding were associated with the week of arrival and the days to onset of diarrhea ( $p=0.004$ ;  $R^2=0.25$ ).

Conclusions: Daily treatment with decoquinate at the dose used in this trial did not affect oocyst shedding or clinical symptoms associated with cryptosporidiosis. However, there is clear indication that if oocyst challenge could be reduced in some way, the duration of shedding, and hence environmental loading of *C. parvum* oocysts, could be reduced.

Funding: Center for Food Animal Health

076 (3383)

#### INFLUENCE OF PREVENTIVE VACCINATION OF HEIFERS AGAINST LUNGWORM ON CLINICAL PROBLEMS RELATED TO LUNGWORM IN THREE DAIRY HERDS.

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While *Dictyocaulus viviparus* infections were considered to be responsible for problems in cattle during their 1st grazing season, nowadays both in the UK as in The Netherlands clinical lungworm infections are responsible for serious problems in adult cattle (David, 1997; Holzhauer et al., 2003).

To prevent these problems, a clinical trial was performed on three herds with a confirmed lungworm history in the previous year, to investigate the influence of preventive vaccination of heifers (Huskvac®, Intervet) before introduction on pasture with the other dairy cows. All heifers were serologically (lungworm-Elisa) and coprologically (Baermann) examined before and after the both vaccinations, 100 days after introduction on pasture and at the end of the grazing season. Before pasturing, cows in each herd were checked for the presence of *D. viviparus*.

Information on production was collected by combining I&R-information with information of the Dutch herd book milk recording system.

Only in herd 2, the vaccinated heifers showed a slight temporary cough in response to the vaccination. No other deviations were observed. Mild coughing that could be associated with lungworm infection was observed in herds 2 and 3 in a minority of the unvaccinated heifers. No differences in milk production between the vaccinated and the control group could be found. Serological and faecal examination of the dairy cows before introduction on pasture confirmed the existence of at least one *D. viviparus* carrier amongst the dairy cows. Hundred days after introduction on pasture lungworm infection was confirmed based on serological results of the control group. In herd 1 an infection could not be confirmed.

Preliminary conclusions: Preventive vaccination against *D. viviparus* can be safely used in (pregnant) heifers, before introducing on pasture with the dairy cows. Vaccination gives good protection of heifers against natural lungworm infection and is preventing lungworm outbreaks in the dairy-herd.

077 (1268)

#### SEASONAL PREVALENCE OF BOVINE THEILERIOSIS IN VETERINARY CLINICS OF KAZEROUN (FARS PROVINCE)

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Theileriosis is caused by a protozoan parasite of the genus *Theileria* in cattle. Characteristic signs include fever, pallor of mucous membrane, anemia and finally death. In this study the seasonal prevalence of the disease in Kazeroun (Fars province) were evaluated. Giemsa stained blood smears from suspected cases referred to Kazeroun veterinary clinics were taken and studied with light microscope (magnified 100 times); Giemsa stained biopsy smears of lymph nodes, if there was any swelling of superficial lymph nodes, were taken, also.

Four hundred cattle have been evaluated in one-year. 40 positive cases of Theileriosis have been diagnosed in these four hundred animals. The highest morbidity rate was seen in spring with frequency rate of 45%. In summer and autumn the frequency rates were 32.5%, 17.5%; and the lowest morbidity rate was seen in winter with frequency rate of 5%.

The highest morbidity rate was seen in June with frequency rate of 25%. Regarding age, 42.5% of the animals were younger than one and 57.5% were older than one and also the disease was observed in females (60%) greater than males (40%) and also cross bred cattle, were more susceptible (70%) than native ones (30%).

In studying the nineteen Giemsa stained biopsy smears of lymph node that were taken, 78.94% had the schizonts in lymphocytes and 21.06% were without schizonts. Regarding clinical signs, 69.23% of cases had manifestation of lymph node enlargement, 66.66% had pallor of mucous membranes or anemia and 28.2% had fever.

The attached infected vector ticks were from the genus *Rhipicephalus* and *Hyalomma* that are generally detached in spring and summer.

KEY WORDS: Bovine theileriosis, Seasonal prevalence

Funding: private

078 (3123)

#### EFFECT OF EPRINOMECTIN TREATMENT AT CALVING ON MILK PRODUCTION IN DAIRY HERDS WITH LIMITED PASTURE EXPOSURE

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Previous research has identified a substantial beneficial effect on milk production (0.94 kg/day) of treatment at calving with eprinomectin pour-on (EPRINEX®, Merial Inc.), in dairy herds exposed to pasture. The objective of this study was to determine the effect of treatment at calving in herds that are totally confined or semi-confined during the summer. In totally confined herds lactating and dry cows were housed throughout the summer and had no access to pasture. In semi-confined herds lactating and dry cows had limited outdoor exposure to a small pasture or paddock but were still fed a ration that met all their nutritional requirements. The study was a double-blind, randomized clinical trial that was performed in 64 herds enrolled with DHI and distributed in 4 regions in Canada and 1 state in the United States. The study was carried out between February 2002 and February 2003. Cows were randomly allocated to receive eprinomectin or a placebo with treatment being administered on or close to the day of calving. In May/June 2002, 8 fecal samples were collected from each farm and fecal egg counts were determined. Monthly bulk tank milk samples from each farm were tested with an indirect ELISA using a crude *Ostertagia ostertagi* antigen. Monthly test-day milk production data were recorded for 200 days after calving. In general, fecal egg counts were very low (mean=2.86, range=0-134). Mean herd bulk milk ELISA optical density ratios (ODR) for the whole year ranged between 0.22 and 0.8. The ODR values were dichotomized into high and low using a cut-point of 0.5. Treatment effects were analyzed using a linear mixed model with herd and cow as random effects. The analysis was restricted to 4789 cows (23956 test day records) treated between 21 days before and 7 days after calving. Overall, there was no significant effect of treatment ( $P=0.64$ ). However, there was a very marginally significant ( $P=0.149$ ) interaction between treatment and ODR, which suggested a larger treatment effect (0.58 kg) in high ODR herds than in low ODR herds. The confidence intervals for the treatment effects in both high ODR herds (-0.333, +1.104) and in low ODR herds (-0.5344, 0.1378) were both wide and included zero. Consequently, this study failed to show a beneficial effect of eprinomectin treatment in totally confined or semi-confined herds.

Funding: Merial Canada

079 (1769)

#### PRODUCTION, MANAGEMENT, DISEASE INCIDENCE AND ANTIMICROBIAL RESISTANCE IN WISCONSIN ORGANIC AND CONVENTIONAL DAIRY HERDS

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Milk production, management, disease prevalence and antimicrobial resistance were compared in 2000-2001 between 30 Wisconsin organic dairy farms and 30 matched conventional dairy herds. The organic farms had been producing organic milk for a minimum of 3 years (mean = 8 years). Our study objectives were to compare disease prevalence, culling, management and milk production between the two different management systems. The organic farms had significantly fewer cattle than did the conventional herds ( $p=0.017$ ). The average daily milk production per cow in organic dairy herds (20.2 kg/day) was significantly lower than that of conventional herds (23.7 kg/day), although comparisons are complicated by the increased use on organic farms of extensive grazing, smaller cattle and a greater percentage of non-Holstein cattle. The incidence of clinical mastitis on organic farms (28 cases per 100-cow-years at risk) was not statistically different from that seen on conventional farms (32 cases per 100-cow-year at risk). No significant difference in bulk tank somatic cell count was observed between organic (262,000 cells per ml) and conventional farms (285,000 cells per ml) farms. The average annual cull rate was 18.0 cases per 100-cow-years for the conventional farms and 17.2 for the organic farms ( $p = 0.426$ ). Of the 118 bulk tank milk samples in Wisconsin, 71 samples (60%) yielded at least one *Staphylococcus aureus* isolate, and a total of 331 *S. aureus* isolates were collected and tested for resistance to 15 antimicrobials. The susceptibilities of *S. aureus* were also compared with a parallel Danish study. A significant lower rate of resistant *Staphylococcus aureus* was detected to only one antimicrobial (ciprofloxacin) on organic farms in our Wisconsin study and on

conventional farms in the parallel study in Denmark (avilamycin). *Staphylococcus aureus* isolates from Wisconsin had a higher rate of reduced susceptibility to 7 of 14 antimicrobials (bacitracin, gentamicin, kanamycin, penicillin, sulphamethoxazole, tetracycline, and trimethoprim), whereas Danish isolates had higher rate of reduced susceptibility to only two drugs (ciprofloxacin and streptomycin). In general, differences in antimicrobial susceptibility between organic/økologisk and conventional farms were small relative to the differences between the two countries.

Funding: US government: CDC, FDA

080 (1683)

#### THE EFFECT OF JOHNE'S DISEASE ON CULLING AND MILK PRODUCTION IN NINE ONTARIO DAIRY HERDS

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The objective of this study was to evaluate the influence of Johne's disease (JD) on culling and milk production on Ontario dairy herds. During the summer of 2002, 9 Holstein dairy herds from Ontario with a previous history of JD were enrolled in this study. At farm visits, blood and fecal samples were collected from all milking and dry cows (868 cows). Serum samples were submitted to the AHL, for a commercial ELISA. Fecal samples were sent to AntelBio Systems (Lansing, MI) for traditional fecal culture. Milk samples were collected from all milking cows at the herd's next DHI test day (690 cows). The milk samples were sent to AntelBio for an in-house milk ELISA. Test results were not returned to the producers until January 2003. Milk production and culling data were retrieved from the DHI database. 305-day milk production (actual or projected) was compared to JD status as predicted by the three diagnostic tests. A separate model was made for each test with the effects of mastitis (linear score), days in milk (DIM), parity and herd controlled in each of the models. Culling data was collected between the farm visit date and Dec. 31, 2002. Cox proportional hazards models were used to evaluate the days to culling stratified by JD status with separate model for each test, and controlling for herd, DIM, parity, pregnancy status and linear score. Of the 868 cows tested with the serum ELISA, 165 tested positive (19.0%), and 77 of the 690 lactating cows tested positive on the milk ELISA (11.2%). Fecal culture identified 91 positive cows (10.5%). The mean herd size was 96 cows and the average 305-day milk production was 8,900 kg. 136 cows were culled during the time producers were unaware of test results. Fecal culture positive cows produced 548 kg less milk ( $p=0.005$ ). Similarly, milk ELISA positive cows had a decrease of 457 kg versus milk ELISA negative cows ( $p=0.016$ ). There was no statistical difference in 305-day milk production in seropositive cows ( $p=0.263$ ). Survival analysis showed that fecal culture positive cows were 3.16 times more likely to be culled than non-shedding cows ( $p<0.001$ ). Milk ELISA positive cows were 2.27 times more likely to be culled than milk ELISA negative cows ( $p=0.002$ ). There was a tendency for serum ELISA positive cows to be culled 1.72 times more than seronegative cows ( $p=0.05$ ). For the 9 herds in this study, JD is significantly limiting milk production and cow longevity.

Funding: Elanco Animal Health

081 (2017)

#### PRESENTATION OF A PREVENTIVE HERD HEALTH SERVICE FOR DAIRY CATTLE IN SWEDEN

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Calculations show that there are great differences between herds with regard to costs caused by poor animal health. A system for preventive herd health service, FRISKKO, ("Healthy cow"), has been introduced by the Swedish Dairy Association. The goal is improved animal health, safe and ethically produced products and improved production economy in the herd by reducing costs caused by poor animal health. This should be achieved by using available knowledge and herd data systematically and consistently, building a network of advisors such as cattle health veterinarians, veterinary practitioners, feeding advisors, breeding advisors, claw trimmers, etc. The FRISKKO Basic Service includes annually one visit by the animal health veterinarian, usually together with either the herd's veterinary practitioner or feeding advisor. A comprehensive herd investigation including the entire chain from calf to cow is made. Key health parameters which indicate the herd health status in comparison with other herds, are based on data from the dairy, the AI recording, milk-recording and animal disease recording systems are presented to give a review of the herd health status and a simple assessment of economic losses caused by health disturbances. A consultative letter (stating priority orders if requested) is produced. The farmer keeps records of drugs and agents (linked to data from milk-recording). There is also a follow up visit of one of the involved advisors. Evaluation has been made in two different areas of the country by comparing key parameters in the trial groups with control groups before the FRISKKO service was initiated, and after 2.5/1.5 years. The control groups were selected to conform with the trial groups in terms of geographical area, size, production and health key parameters when the evaluation started. The result was recorded as differences from the initial position and showed an increased income in the trial groups of 66 Euro /61 Euro per

cow and year. This progress was mainly due to a lower culling rate, a reduced disease frequency, improved milk quality, higher milk yield and decreased age at first calving. Another positive effect was a reduced drug use, in line with the ongoing Swedish campaign aiming at minimizing the use of antibiotics.

Funding: Swedish Dairy Association

082 (2449)

#### THE USE OF DECISION TREE ANALYSIS TO IMPROVE LDA DECISION MAKING

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Introduction- In food animal practice, medical decisions are usually made on the basis of economic impact to the dairy, rather than on perceived individual animal value or emotional attachment. A decision that must be routinely made on dairies is what to do with cows that develop left displaced abomasums (LDA). Given the variety of management options available, veterinarians have the potential to make different recommendations depending upon the cow's historical value, parity, current stage of lactation, other concurrent disease, level of milk price, and relative replacement cost. Decision trees are systematic quantitative tools that may be used to improve the ability to select the best course of action in situations, such as LDA, where the clinical decision is complex and outcomes are uncertain. The objective of this project was to demonstrate the use of a decision tree model for the selection of either surgery or marketing for beef, given an early lactation dairy cow with LDA.

Model Development- The LDA decision tree was designed using Microsoft Excel and TreePlan, an Excel add-in. Assumptions used in the model included: a veterinarian performs the procedure and probabilities for recovery, death, and culling were taken from the literature as well as from communication with herdsman and veterinarians from the local area; costs for surgical intervention, therapy, and follow-up, as well as prices for replacement heifers, market cows, and milk were based on current market prices in California; and that marketed cows are immediately replaced with an early lactation primiparous cow. Present value for a cow was based on her time-adjusted future predicted income over feed cost using parity-based culling risks, herd specific reproductive efficiency, previous and/or future predicted individual cow milk production data, current feed cost estimates, and predicted milk prices.

Results- Under the assumptions used in the model, milk price, parity, cow relative value, and replacement cost were the primary decision drivers. During times of low milk prices, dairymen must produce more marginal milk to cover the replacement costs and each individual animal merits more investment from a treatment perspective. Under current conditions of low milk prices and high replacement costs, dairymen should be more willing to select surgical correction for LDA's as compared to previous milk markets where higher milk prices made it easier to pay for more aggressive culling.

083 (5029)

#### PROGRAM TO INCREASE THE NUMBER OF VETERINARY STUDENTS GOING INTO FOOD ANIMAL PRACTICE

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There is a shortage of veterinarians graduating from North American Veterinary Colleges and Schools going into food animal practice. California is currently experiencing a need for additional veterinarians in food animal, mainly dairy, practice. This may become a critical factor in our ability as a profession to meet the needs of the food animal industries. One possible solution is to encourage and mentor veterinary students in food animal medicine throughout the four years of school. As the costs of a veterinary education rise, it is important to make opportunities financial feasible by offering a scholarship or salary.

The School of Veterinary Medicine, University of California at Davis has developed a program designed to encourage students to pursue a career in dairy practice and to better prepare the students in the program for such a career. The program is described to incoming and first year students, who are encouraged to apply. Successful applicants are offered a \$2000 scholarship and paired with a dairy for 6 weeks in the summer. The dairy is selected based on its quality and the willingness of the owner and herdsman to teach the student the various operations such as calf raising, milking, feeding, treating sick cows, record keeping, managing employees, etc. During subsequent summers students who elect to continue in the program again receive a scholarship and are paired with an outstanding dairy practice where they are mentored and encouraged to pursue a career in dairy/food animal practice. Students may pursue other interests and return to the program after an absence of one summer. During the summer of 2003, there were 18 students participating at a cost in scholarships of \$36,000. Feedback from students, dairies and veterinarians has been very positive.

This program may serve as a model for other programs designed to address the shortage of dairy veterinarians and food animal practitioners.

084 (929)

#### THE EFFECT OF GROUP SIZE ON HEALTH AND GROWTH RATE OF CALVES HOUSED IN GROUPS WITH

**AUTOMATIC MILK FEEDERS**

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Large group pens with an automatic milk feeding system offer better possibilities for a rational management of calves, compared to single pens with bucket feeding, and are used increasingly for young dairy calves in Sweden. This housing system also better meets the calves' behavioral needs. However, large groups pens have been found to be associated with an increased risk of respiratory diseases and a reduced growth rate. The present study compares the health and growth rate of calves kept in pens with automatic milk feeders at two different group sizes. The experiment was performed in 9 commercial dairy farms in southwest Sweden, each equipped with two pens with automatic milk feeders without possibility for direct contact between calves from different pens. The calves were housed individually until 7-14 days of age, and were then allocated to one of the two group pens by means of random number lists. The lists were constructed so that a similar age difference was achieved in the two pens and that one kept approximately 6-9 calves while the other kept about the double number. The calves were monitored from birth to 56 days of age. Their heart girth was measured at the start and end of the experiment. Diseases were recorded by the farmers and by a veterinarian, who visited the farms every third week to clinically examine the calves. The effects of group size on the risks of diarrhea and respiratory disease and on the growth rate were evaluated using multiple logistic and linear regression models, adjusting for breed, sex and herd. Altogether 561 calves were studied, 191 kept at the lower group size and 370 kept at the higher group size. Calves in pens for 14-18 calves had a higher incidence of respiratory disease (OR: 2.0; P=0.0016). They also grew less than calves housed in groups of 6-9 (P=0.0002); the difference in least square means was 0.026 cm/day equivalent to approximately 50 g/day. No significant difference was detected in risk of diarrhea. It was concluded that housing calves in groups of less than ten calves is preferable from a health and growth perspective.

Funding: Swedish Farmers' Foundation for Agricultural Research

085 (2814)

**EFFECTS OF SEROPOSITIVITY FOR BOVINE LEUKEMIA VIRUS, MYCOBACTERIUM AVIUM SUBSPECIES PARATUBERCULOSIS, AND NEOSPORA CANINUM ON MILK PRODUCTION ON 152 CANADIAN DAIRY FARMS**

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The purpose of this research was to determine the effect of seropositivity for exposure to bovine leukemia virus (BLV), Mycobacterium avium subspecies paratuberculosis (MAP) and Neospora caninum (NC) on milk production in Canadian dairy cattle.

One hundred and fifty-two dairy herds on monthly milk recording were selected from five provinces in Canada: New Brunswick (NB), Nova Scotia (NS), Ontario (ONT), and Prince Edward Island (PEI) in 1998, and Saskatchewan (SASK) in 2001. Within each herd, a serum sample was obtained from 23-40 randomly selected lactating cows and tested for antibodies against BLV, MAP and NC using commercially available ELISA test kits. For each lactation of each tested animal, 305day milk production and culling data were gathered electronically from a central milk-recording database for the period of May 1998 to February 2002. Linear mixed models were used to determine the individual and interactive effects of seropositivity for BLV, MAP and NC on 305 day milk production, after adjusting for herd effects and controlling for lactation number, province, and seropositivity to the other two microorganisms. Also, variability in milk production was quantified at the lactation, cow and herd levels. Overall, 26.2, 2.3 and 13.5% of cattle were test-positive for exposure to BLV, MAP and NC, respectively. The average 305 day milk production for all lactations in seronegative cows for all three infections across all provinces was 8839 kgs. MAP seropositive cows were associated with a decrease of 276.3 (S.E. 271.1), 429.7 (S.E. 283.9), and 556.1 (S.E. 316.1) kgs of 305day milk in second, third and fourth lactations, respectively, compared to MAP seronegative cows. NC seropositive cows were associated with a decrease of 38.6 (S.E. 62.9) kg of 305 day milk as compared to NC seronegative cows. BLV seropositivity was not associated with decreased milk production. When no fixed effects were included in the model, the proportion of variance explained at the herd, cow and lactation levels were 43.92%, 21.41% and 34.67%, respectively. Addition of the three disease effects accounted for 16 % of the total variation.

Funding: PEI Agri. Res. Invest. fund

086 (1771)

**ANTIMICROBIAL RESISTANCE IN WISCONSIN ORGANIC AND CONVENTIONAL DAIRY HERDS**

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Antimicrobial resistance was compared between 30 Wisconsin organic dairy farms and 30 matched conventional dairy herds in 2000-2001. The organic dairy herds did not use antibiotics for their cows and rarely used antibiotics for their calves. Our study objective was to determine if cessation of antibiotic usage (minimum = 3 years, mean = 8 years) on the organic farms was associated with reduced rates of antimicrobial resistance for indicator fecal bacterial species. Fecal specimens from ten cows and ten calves from each farm (two visits per farm) yielded 1,120 *E. coli* isolates and 7 isolates of *Salmonella* spp which were tested for resistance to 17 antimicrobials using a micro-broth dilution test. A total of 332 *Campylobacter* spp. isolates were tested to four antibiotics and a total of 2,049 *Enterococcus* spp were tested to 3 antimicrobials (Quinupristin / dalfopristin, gentamicin, and vancomycin) using the agar dilution test. A randomized block sample of 562 *Enterococcus* spp isolates was tested for resistance to 10 antimicrobials using a micro-broth dilution test. Our study showed significantly lower prevalence rates of *E. coli* antimicrobial resistance for seven antimicrobials (ampicillin, streptomycin, kanamycin, gentamicin, chloramphenicol, tetracycline, and sulphamethoxazole) in organic dairy herds, as compared to conventional herds. However, the odds ratios were relatively small (OR=1.5 - 4.3). Two *Campylobacter* isolates from conventional dairy farms were resistant to ciprofloxacin and none of the isolates were resistant to gentamicin or erythromycin. Tetracycline-resistance in *Campylobacter* was 41.5% (66/159) for organic and 47.4% (82/173) for conventional herds. *Enterococcus faecium* isolates (9 organic and 16 conventional) were resistant to quinupristin / dalfopristin and 9 *Enterococcus* spp (1 *E. faecium* and 8 *E. faecalis*) were resistant to gentamicin (2 from organic and 7 from conventional farms). None of the *Enterococcus* spp were resistant to vancomycin. Organic dairies had a significantly lower prevalence of antimicrobial resistance in *Enterococcus* spp for four antimicrobials (erythromycin, kanamycin, streptomycin, and tetracycline) as compared with conventional farms. Although the organic farms had converted to organic farming methods at least 3 years before our study (mean = 8.0 years), antimicrobial resistance clearly persisted long after antimicrobial selective pressure had been withdrawn. Funding: US government: CDC, FDA

087 (5005)

#### ELECTRONIC VETERINARY PRACTICE SURVEILLANCE NETWORK FOR ALBERTA'S CATTLE POPULATION

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The Food Safety Division of Alberta Agriculture Food and Rural Development (AAFRD) is developing an electronic surveillance network to collect cattle health information from practicing veterinarians in Alberta. The network will provide cattle health information specific to the surveillance needs of the provincial cattle industry including rapid detection of emerging and foreign animal diseases, demonstrating the presence of a well trained, effective veterinary service and establishing freedom from diseases of importance to trade. A second goal is to provide livestock health information of value to veterinarians like the importance of endemic diseases, their geo-spatial temporal fluctuations and value of control programs. The guiding principle for data collection is to collect sufficient data to meet AAFRD surveillance needs and the information needs of veterinarians while minimizing the burden placed on practitioners. Data collection and information reporting for veterinarians will be designed specifically to meet information needs identified by veterinarians

To estimate geo-spatial temporal fluctuations in endemic disease incidence, time, location and severity of outbreak data will be collected. For rapid real time identification of disease outbreaks that may represent emerging/foreign diseases and endemic diseases of importance, veterinarians will report their classification of the clinical syndrome and their clinical diagnosis for each outbreak. Since syndrome/clinical diagnoses classifications made during initial farm visits may be uncertain, identification of outbreak syndromes/clinical diagnoses that may represent diseases of importance will trigger further investigation. The validity of syndrome/clinical diagnosis classifications will be estimated using laboratory diagnoses. Farm numbers and numbers of cattle on farms will be collected for both health and non-health related farm visits

Data collection and transmission will be electronic. The initial phase of data collection; designed to allow a small group of veterinarians to test and modify the logical flow of data entry, will be through data entry forms available on a restricted access web site. Once efficient data entry forms have been developed they will be incorporated into practice management software that is used by veterinarians to manage their daily billing and record keeping. Data collection using chute side devices like Palm Pilots® is also being explored.

088 (5021)

#### A CLINICAL FIELD TRIAL IN A CALF RANCH EVALUATING THE INFLUENCE OF PROPHYLACTIC AND THERAPEUTIC ANTIBIOTIC USE ON ANTIBIOTIC RESISTANCE IN FECAL ESCHERICHIA COLI AND CALF HEALTH.

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The prophylactic use of antibiotics in animal agriculture is of increasing concern due to emergence of antibiotic

resistance incommensal and pathogenic bacteria. The objective of our clinical trial was to raise pre-weaned calves on a calf ranch under different antibiotic regimes and evaluate the outcomes; antibiotic resistance of fecal *Escherichia coli* (*E. coli*) as well as calf health and productivity. Four groups of 30 day-old calves were enrolled and raised for one month. The control group received chlortetracycline and neomycin in the milk and individual antibiotic therapy when necessary. The other three groups did not receive any antibiotics in the milk. Group 2 calves were treated with antibiotics, predominantly ceftiofur, when clinically ill, while calves in groups 3-4 were treated with non-antibiotic alternatives such as bismuth salts, kaolin-pectin, vitamins, probiotics electrolytes and anti-inflammatory drugs. Group 4 calves were physically isolated from the other groups to determine the importance of the environmental flora on the emergence of resistance. Antibiotic resistance in fecal *E. coli* was determined using the disk diffusion method to 12 antibiotics. Cluster analysis was used to group the *E. coli* isolates into clusters with similar resistance patterns. Using multinomial logistic regression we determined the influence of in-feed antibiotics and individual antibiotic therapy on the odds of *E. coli* belonging to clusters with higher levels of resistance. In-feed antibiotics and individual antibiotic therapy were both correlated with increased antibiotic resistance. Survival analysis was used to assess the impact of group affiliation on mortality, controlling for colostrum status. Calves receiving in-feed antibiotics had lower incidence of disease while calves receiving insufficient colostrum were at increased risk for disease and high mortality. Treatment frequencies were increased in the groups not receiving antibiotics in the milk replacer. This study has shown that it is difficult to maintain calf health and productivity in the present calf ranch system used in California without in-feed antibiotics. The in-feed antibiotics as well as individual antibiotic therapy select for highly resistant fecal commensal *E. coli*. The individual antibiotic therapy results in a transitory shift to more resistant *E. coli*. The impact of the calf environment on antibiotic resistance patterns in *E. coli* is minimal compared to the direct antibiotic exposure effects. Alternative treatments as well as improved management are needed in order to minimize the present antibiotic use.

089 (2264)

#### NATIONAL CONTINGENCY PLANS, ERADICATION PROGRAMMES, CONTROL AND MONITORING OF BOVINE INFECTIOUS DISEASES IN THE SLOVAK REPUBLIC

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The Slovak Republic (SR) is an inland country in the Central Europe with an area of 49 012 square kilometers with approximately 5 000 000 inhabitants. The approximate numbers of bovine animals are totally 610 000 animals, out of these totally 250 000 dairy cows. SR is included by the Office International des Epizooties (OIE) in the list of FMD free countries where vaccination is not practiced according to the Chapter 2.1.1., Art.2.1.1.2. of the International Animal Health Code (the last occurrence of FMD was recorded on the territory of SR in the year 1973); rinderpest free country according to Chapter 2.1.4., Art. 2.1.4.2. of the International Animal Health Code (the last occurrence of rinderpest was recorded on the territory of SR in the year 1881); caprine and ovine brucellosis (*B.melitensis*) free country by the Commission Decision 97/232/EC. Out of other diseases transmissible to bovine animals listed on the list A OIE the occurrence of contagious bovine pleuropneumonia was recorded in the year 1902, other diseases of this list were not recorded. The national contingency plan for case of FMD occurrence has been worked out for SR; eradication program for enzootic bovine leukosis (EBL) - in SR totally 18 EBL positive animals were recorded in the year 2002. These animals originated from 6 holdings located in 4 districts); the control and monitoring is performed mainly in tuberculosis - based on nation-wide eradication programs the eradication of bovine tuberculosis was successfully completed. The last occurrence of *M.bovis* in animals was recorded in the year 1993; in brucellosis - the last occurrence of serologically positive animals was in the year 1977; in paratuberculosis - in the year 2002 the occurrence of 2 outbreaks was recorded; in infectious bovine rhinotracheitis - in the year 2002 the occurrence of 22 outbreaks was recorded; in some other diseases, e.g. Q-fever, leptospirosis, chlamydiosis, trichomoniasis, campylobacteriosis and BVD the occurrence was recorded, however without significant economical impact. SR after evaluation of disease position in connection with *M.bovis* and brucellosis, in the year 2001 submitted the EU Commission the application for recognition of brucellosis and bovine tuberculosis free country.

Funding: STATE VETERINARY AND FOOD ADMINISTRATION OF THE SLOVAK REPUBLIC

090 (2297)

#### NATIONAL PLAN OF CONTROL TSE IN RUMINANTS AT THE SLOVAK REPUBLIC

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The monitoring of TSE at the Slovak Republic (SR) has officially started in the year 1996 according to the decision of the State Veterinary and Food Administration of the SR. The risk groups of animals were investigated by histopathological method specified in OIE Manual of Standards for Diagnostics Tests and Vaccines. Since July of 2001 all investigations of bovine spongiform encephalopathy (BSE) in cattle, and since January of

2002 all investigations of Scrapie (TSE) in sheep and goats have carried out by rapid (screening) tests according to EC Regulation No. 999/2001 with amendments. The State Veterinary and Food Administration of the SR has adopted a series of measures based on this regulation, to protect human and animal health from the risk of TSE. Up to this time in monitoring of TSE has been investigated around 160 000 cows and 6 500 sheep in two specialized laboratories. 13 positive cases of BSE and 3 positive cases of scrapie have been confirmed to the time November 1, 2003.

In accordance with information from experimental studies having shown that BSE is transmissible to sheep following oral and parenteral challenge, and BSE may have been introduced into the small ruminants populations, and laboratory for TSE introduced modified method western blot for discrimination of BSE and Scrapie in small ruminants (developed by VLA, UK). It was important because the first case of Scrapie in the SR was geographically very closed to occurrence of BSE. PrP genotype of this case was ARQ/ARQ. Sheep with this genotype are very sensitive for experimental BSE infection.

Adopted preventive measures and implemented monitoring system are the important and effective parts of the National plan of control TSE in ruminants at the SR.

Funding: STATE VETERINARY AND FOOD ADMINISTRATION OF THE SLOVAK REPUBLIC

091 (2626)

#### QUATERNARY AMMONIUM COMPOUND RESISTANCE GENES IN STAPHYLOCOCCI OF BOVINE AND CAPRINE ORIGIN

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Quaternary ammonium compounds (QACc) are active components in various antiseptic preparations used in the dairy industry to prevent mastitis. Six staphylococcal QAC resistance genes have previously been characterized: *qacA*, *qacB*, *smr* (*qacC*), *qacG*, *qacH*, and *qacJ*. The genes *qacA/B* normally reside on large plasmids (> 20 kb); and the remaining QAC resistance genes are in general harbored by small plasmids (< 3 kb). The QAC resistance genes encode efflux proteins. The aim of the study was to examine milk from dairy cows and goats with regard to QAC-resistant staphylococci, including genetic characterization and epidemiological aspects. Bulk milk samples from 123 dairy cattle herds and 70 dairy goat herds were collected repeatedly during a 12-month period and screened with regard to QAC resistance, using selective media. Additional quarter milk samples were collected in two dairy cattle herds. Fifty-five QAC resistant isolates were selected for molecular genetic studies: Plasmid DNA analysis, hybridization and PCR analysis with gene specific probes/primers, species determination based on *sodA* sequences, and PFGE typing. QAC-resistant staphylococci were recovered in bulk milk from 22 cattle herds (17.9 %) and 6 goat herds (8.6 %). The gene *qacA/B* was found in 12 bovine isolates and *smr* was found in 33 bovine and 6 caprine isolates. One bovine *Staphylococcus haemolyticus* isolate contained both *qacA/B* and *smr*. *qacG* (in *S. haemolyticus* and *Staphylococcus warneri*) and *qacJ* (in *Staphylococcus intermedius* and *Staphylococcus epidermidis*) were found in two and three bovine isolates, respectively. One *smr*-containing bovine *Staphylococcus aureus* isolate was recovered. Certain PFGE-types of *S. warneri* and *S. haemolyticus*, both containing *smr*, were repeatedly recovered from bovine bulk milk samples during an 8-month period as well as from individual cows and quarters. The gene *smr* resided on large, intermediate (5-7 kb), or small plasmids. PFGE revealed that some coagulase-negative staphylococci (CoNS) recovered from bulk milk from different herds, or from individual cows within a herd, were identical. In conclusion, QAC-resistant CoNS are common in dairy herds in Norway, apparently more widespread in cattle herds than in goat herds. The results suggest persistence in herds and clonal spread within and between herds of QAC-resistant CoNS. Detection of the gene *smr* on plasmids of different sizes should lead to further investigation on the spread of QAC resistance.

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092 (934)

#### EXPERIENCES OF A VETERINARY PRACTICE DURING RESTOCKING OF FARMS IN CUMBRIA, UK AFTER THE FOOT AND MOUTH DISEASE OUTBREAK OF 2001

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This paper describes the author's experiences of rebuilding a 14 vet, 3 centre veterinary practice which was devastated by the foot and mouth disease outbreak in the UK of 2001, losing 95% of the farm animals previously cared for. It discusses briefly the role the practice played and some of the disease challenges (many novel and unpredictable) faced by the practice's clients as well as the difficulties in re-establishing disease equilibrium on these farms. Topics will include infectious diseases, micro- and macro-nutritional problems and management related issues. The paper also considers the dramatically altered demographics of Cumbrian agriculture, as well as the social and psychological impact on the local communities.

This paper will be presented in conjunction with a paper by Andrew Holliman of the Veterinary Laboratories Agency diagnostic laboratory in Cumbria and these presentations will follow on from a joint presentation given at the the 22nd World Buiatrics Congress in Hanover 2002 detailing our involvement during the foot and mouth outbreak in 2001.

093 (2462)

#### CONTROL OF SALMONELLA GOLD COAST INFECTION IN FIVE DAIRY HERDS IN THE SOUTH WEST OF ENGLAND.

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I am the attending veterinary practitioner to five dairies, all part of a single enterprise, with a history of disease and deaths in the cows due to Salmonella gold coast infection.

The majority of Salmonella infections in cattle in Great Britain are associated with Salmonella typhinurium and Salmonella dublin. At the time of this study the Veterinary Laboratories Agency only incriminated Salmonella gold coast in 4% of the Salmonella outbreaks. The epidemiology of Salmonella gold coast infection in dairy cows has not been studied in detail, and it was the lack of information available to the author, which has provided the stimulus to submit this paper.

In view of the unusually high incidence of clinical disease due to Salmonella gold coast, extensive environmental sampling was carried out on all of the farms demonstrating a high degree of environmental contamination and subclinical infection. All farm staff were advised of the need for strict hygiene, and told not to drink untreated milk, but as all the milk from the dairies was pasteurised and then used for cheese manufacture, there was considered to be minimal zoonotic risk to the general public.

All this changed when an outbreak of Salmonella gold coast infection in humans was traced back to locally manufactured cheese and attributed to a pasteurisation failure. A rigorous program to reduce the level of Salmonella gold coast infection and contamination on the farm was undertaken. In addition to attention to farm management and husbandry measures, all cattle were vaccinated with an emergency vaccine containing formalin inactivated Salmonella gold coast. Boosters were administered annually for a further five years. Clinical disease was successfully prevented and environmental contamination greatly reduced following the introduction of the control measures.

This case highlights the potential for Salmonella gold coast to cause significant animal health problems and pose a risk to human health. It highlights the extent to which farms can become contaminated with Salmonella and the role which subclinical infection, in environmental contamination and infection of wildlife may play in maintaining the infection on a farm situation.

094 (3294)

#### EVALUATION OF ANTIBIOTIC RESIDUE RISK IN UNTREATED QUARTERS ADJACENT TO QUARTERS TREATED FOR MASTITIS BY INTRAMAMMARY ROUTE

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Inadequate use of antibiotics in milk animals produces a selective pressure on microorganisms, leading to the development of multi-resistant pathogens that may spread very quickly in human and animal populations. The presence of antibiotic residues in milk lead to economic losses to the dairy industry. The objective of the present study was to evaluate the occurrence of residues in untreated quarters adjacent to quarters treated for mastitis by intramammary route. The influence of the following factors were evaluated in 397 quarters from 139 Holstein cows in five Brazilian herds: presence of detectable residues from different antimicrobial compounds commercially available for lactating cows; the interference of anti-inflammatory compounds associated with the antibiotics used; the influence of production level, stage of lactation, number of lactations and the number of treated quarters per animal. In relation to the intensity of the inflammatory process, the influence of treatment of clinical and subclinical cases, and the influence of the microorganism causing mastitis in the treated quarter were evaluated. The influence of the inflammatory process in untreated quarters, their anatomic disposition in relation to treated quarters and the period after treatment influence were also evaluated. Samples from the 397 quarters were analyzed using Delvotest®. Positive results beyond the withdrawal period recommended by the manufacturers were observed in treated and untreated adjacent quarters. Positive residue rates in the present study were 37.4% for treated quarters and 14.3% in untreated quarters, no matter the group of antimicrobial compound. Statistically significant differences ( $P < 0.05$ , Fisher's test) were detected between samples analyzed 24 hours after the end of the treatment and samples evaluated 24 hours after the first administration. Statistical differences were also observed in the comparison of results from the samples evaluated 24 hours after the end of the treatment and those evaluated at the end of the recommended withdrawal period. In order to prevent false

positive results due to natural inhibitors present in milk, all samples from treated and untreated quarters were inactivated by means of heating at 80°C for five minutes. It was concluded that there was a risk associated with the use of milk from treated quarters as well the untreated adjacent quarters, for they may present antibiotic residues beyond the withdrawal recommended period.

095 (2555)

#### ANALYSIS OF ASSOCIATIONS BETWEEN THE PRION PROTEIN GENOTYPE AND PRODUCTION TRAITS IN GERMAN SHEEP BREEDS

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The objective of this study was to analyse possible effects between scrapie susceptibility associated ovine prion protein (PrP) genotypes and production traits in sheep. Performance traits included scores for muscle mass, wool quality and type, the reproduction traits age at first lambing, first lambing interval, second lambing interval, total number of lambs born, the milk performance traits milk, fat and protein yield, fat and protein content and somatic cell score. Linear animal models were employed for the analysis of the PrP-genotype-effect. The genotyped sheep showed significantly superior performance in score for muscle mass, type, wool quality and fat yield in comparison to the non-genotyped animals. This indicates a pre-selection of animals for genotyping. No significant association was found between the prion protein genotypes and the performance traits investigated.

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096 (5100)

#### ANIMAL DISEASE SURVEILLANCE IN QUEBEC

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Among the mandates of the Institut national de santé animale (INSA) of the Centre québécois d'inspection des aliments et de santé animale (CQIASA) is that of ongoing surveillance, prevention and control of animal and zoonotic disease. It does this through a team of specialists and a laboratory network that work closely with their partners in animal health, as well as with public health authorities. This partnership is the backbone of RAIZO, Québec's animal disease surveillance and information network.

A number of approaches and tools are used in epidemiological surveillance or investigation, including species-specific surveillance networks, to which veterinary practitioners contribute; laboratory diagnostics; farm information systems coupled with a geopositioning system; farm producer federations; and of course, for bovines, the central permanent identification bank that records the movement of Québec cattle.

Examples of the activities that have been carried out to better target animal disease and protect public health will be presented to illustrate how these partnerships work.

097 (2971)

#### ANTIMICROBIAL RESISTANCE IN WESTERN CANADIAN COW-CALF HERDS

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The study objective was to describe antimicrobial resistance (AMR) patterns in calves from commercial Western Canadian cow-calf herds in the spring and the fall of 2002 using *E. coli* as an indicator organism. In the spring (at calving) a total of 1677 isolates (n=559 calves from 92 herds) and in the fall (at weaning) 1186 isolates (n=396 calves from 44 herds) were harvested from fresh fecal samples. The antimicrobial susceptibility of a minimum of a three *E. coli* isolates per sample was tested using microbroth dilution (Sensititre®, TREK Diagnostic Systems Inc., Cleveland, Ohio) and the 2002 National Antimicrobial Monitoring System (NARMS) panel. Data on health, treatment history, fecal consistency, calf age and sex were collected. Among the spring isolates, 4.7% were resistant to amoxicillin/ clavulanic acid, 25.3% to ampicillin, 1.5% to ceftiofur, 7.2% to cephalothin, 17.7% to chloramphenicol, 0.5% gentamicin, 22.8% to kanamycin, 0.2% to nalidixic acid, 47.0% to sulfamethoxazole, 49.8% to tetracycline and 19.8% to trimethoprim-sulfamethoxazole. Among the fall isolates, 1.6% were resistant to ampicillin, 0.6% to cephalothin, 0.6% to chloramphenicol, 1.1% to kanamycin, 2.8% to streptomycin, 4.0% to sulfamethoxazole, 5.1% to tetracycline and 0.3% to trimethoprim-sulfamethoxazole. In total, 49.5% of the spring isolates and 5.0% of the fall isolates had resistance to at least two antimicrobials. Further investigation into potential epidemiological associations between herd and individual animal level antimicrobial usage and the occurrence of AMR among fecal *E. coli* isolates from the spring and fall calves will be completed using multi-level models. Initial analysis indicates that more resistance was detected in the spring isolates; therefore, seasonality, possibly related to antimicrobial usage patterns, must be accounted for in studying AMR in western Canadian beef calves.

Funding: ABP, AAFRD, Health Canada

098 (3440)

#### HI HEALTH: COMBINING VETERINARY PRACTICE BASED HEALTH PLANS WITH QUALITY ASSURANCE, SURVEILLANCE AND DECISION SUPPORT

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Most Scottish farms are already involved with basic farm quality assurance that excludes significant veterinary involvement or health components. As a group of veterinary surgeons involved in food animal production we believe that eventually health and welfare quality assurance will be a prerequisite for the sale of bovine derived produce in Europe. Our perception is that many of the immediate needs of the industry can be met through the health plan/quality assurance concept that preserves the essential farmer/veterinarian unit; subject to third party scrutiny. The health plan can also provide surveillance data to parameterise decision support systems for farmer and veterinary feedback/education. Therefore over the last decade we have helped develop a farmer lead business, HI Health, with the objective of creating a local pool of high health status herds. At the basic level of this programme provides a record of the annual veterinary inspection with derived health plan using a standardised system and results held on a centralised database. At higher level farmers are encouraged to eradicate and/or become accredited for freedom from diseases such as BVD, IBR, leptospirosis and reduce Johne's prevalence. The cross-sectional surveys resulting are exploited as a data source. As many components as are practicable are electronic and full use is made of the Internet.

HI Health has been developed primarily for cow-calf herds with fewer dairy herds. Approximately 10% of the Scottish herd is involved. Overall farm records were scored, as "good" for 84% but the health record component scored "good to moderate" for only 43% of herds. Calf enteritis was recorded for 42% of participant cow-calf herds, then calf pneumonia (35%), navel ill (23%) and joint ill (11%). Reproductive loss was a problem for 48% of adult herds with lameness in 33%, summer mastitis in 14% and Johne's disease in only 2%. Although in this large survey the sample is biased in favour of better farms but these are our target population and in several districts/islands most farms are involved. The economic losses associated with the skewed distributions of mortality and morbidity is explored for target diseases and the results are used to re-parameterise decision support models. This presentation will describe the development of this feedback/education component as a tool for population medicine. Now, with the help of Quality Meat Scotland, the programme is set to expand throughout the country.

Funding: Scottish Executive Environment Rural Affairs Department

099 (5080)

#### MEASUREMENT OF ANTIMICROBIAL RESISTANCE OF ESCHERICHIA COLI DERIVED FROM CATTLE POPULATIONS

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This presentation describes the results for a series of studies to establish basic information about the prevalence of antimicrobial resistance in *E. coli* populations derived from cattle faeces. Our initial investigation (A) reviewed passive surveillance data from a Regional Veterinary Laboratory during routine diagnostic screening of 407 unrelated faeces samples from enteric calves (aged < 42 days). The disc-diffusion method remained constant over the period. The results demonstrated the proportion of resistant bacteria varied significantly by antibiotic, year and veterinary practice. For tetracycline 88% of samples contained resistant isolates but only 5% were resistant to apramycin. Case-control study (B) tested how results from diagnostic samples related to antimicrobial resistance in the non-enteric calf population. The method used measured growth on agar plates infused with antibiotic. This eliminated arbitrary bias introduced by operator selection with disc-diffusion. There was a significant difference in the proportion of resistant bacteria between healthy and diarrhoeic calves ( $p=0.04$ ). Then a survey (C) of 105 randomly selected farms to monitor antimicrobial resistance of *E. coli* recovered from cattle of various ages demonstrated a significantly higher proportion of resistant samples in calves compared to fattening and adult cattle. This survey used the same method as study B. For ampicillin 88% calf faeces were resistant compared with 49% fattening cattle (apramycin - 13% for calves but 2% for fattening; nalidixic acid - 7% for calves but 2% for fattening) ( $p<0.05$ ). Results indicated that resistance may be associated with total bacterial counts and therefore we re-evaluated our definition of antimicrobial resistance. Combining newly acquired technology with a novel quantitative method for describing the resistance of large numbers of bacteria and using a spiral-plater we re-examined the issue. Our method enumerates the number of bacteria that grow at different concentrations of antibiotic and using non-linear regression fits a cumulative density function of the normal curve

to these data. It quantifies the total bacterial density, the mean population minimum inhibitory concentration, the phenotypic variation of those bacteria and the proportion of bacteria for each phenotype. We can now demonstrate very subtle differences and changes in antibiotic resistance, paving the way for experimental and survey work with greater statistical power.

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#### DISEASES IN RESTOCKED HERDS FOLLOWING FOOT AND MOUTH DISEASE IN 2001

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Following the disaster of foot and mouth disease in the UK in 2001, many hundreds of farms throughout the country were forced to restock from a variety of sources and start again. A national survey, sponsored by the Department of Environment, Food and Rural Affairs, was carried out by the Veterinary Laboratories Agency to investigate diseases occurring on restocked farms. The results of this survey are presented in this paper. Many farms restocked from Western Europe and the possibility of the introduction of novel diseases was a constant worry and required a heightened level of surveillance. Fortunately no new diseases have been uncovered. The spread of bovine tuberculosis following the movement of cattle throughout the country has been a particular concern. Infectious bovine rhinotracheitis, bovine virus diarrhoea and Johne's disease have all had a significant impact on restocked farms. The role of inadequate biosecurity in many of these disease outbreaks will be discussed, with particular reference to the use of specific serological tests, the use of quarantine etc.

This paper will be presented in conjunction with a paper by David Black (a local veterinary surgeon) and these presentations will follow on from a joint presentation given at the World Buiatrics Congress in Hanover 2002 detailing our involvement in the foot and mouth outbreak in 2001.

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