

## - PARASITOLOGY

### 5 - *Cryptosporidium parvum* animal model in neonatal calves

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A *Cryptosporidium parvum* model was set up for in future efficacy studies of veterinary products. Nine calves were included from which six were inoculated and three were negative controls. The calves were orally inoculated with  $10^6$  (one animal  $10^7$ ) commercially available viable oocysts at day of enrollment. Health parameters were scored twice a day, and feces was sampled once a day (mixed). Calves were weighted once a week. Health parameters included: overall clinical appearance, body temperature, feed (milk) intake, and signs of dehydration. In daily feces, consistency was scored on a 3 point scale, and fecal volume, fecal dry matter content and fecal oocyst count was determined.

All calves from the inoculated group shed *C. parvum* oocysts and no control calves shed *C. parvum* oocysts. When estimated with PCR, shedding started 3 to 5 days after inoculation and stopped between 14 and 17 days after inoculation. All calves showed signs of diarrhea, both clinically and estimated by dry matter content. Based on dry matter content, the duration of diarrhea differed between the calves from 1 to 10 days. When a score of 2.5 per day was regarded as diarrhea, all inoculated calves but no control calves experienced diarrhea for more than three days. All inoculated calves showed some signs of general clinical illness, ranging from mild in some calves to more severe in others.

With this model, generating shedding of *C. parvum* and diarrhea in all calves while evoking only moderate symptoms of general illness, we have a model that is suitable for testing Investigational Veterinary Products.

## - INFECTIOUS DISEASES

### 6 - Identification of *Mycoplasma bovis* directly from bronchoalveolar lavage fluid with MALDI-TOF MS

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*Mycoplasma bovis* is a leading cause of pneumonia in modern calf rearing. Fast identification is essential to ensure appropriate antimicrobial therapy, and to timely initiate control and prevention measures at farm level. Current diagnostic methods show issues, as they are either not able to differentiate between *Mycoplasma* spp., too time-consuming or expensive. Therefore, the objective of this study was to develop a rapid culture-based protocol to identify *M. bovis* directly from bronchoalveolar lavage fluid (BALF) with MALDI-TOF MS and to compare this method with other diagnostic tools.

BALF was obtained from 67 calves (8 farms). Presence of *M. bovis* was determined using three culture-based methods: (1) standard culture and lipase activity; (2) direct transfer method with MALDI-TOF MS from modified pleuropneumonia-like organisms agar and (3) direct MALDI-TOF MS detection after an enrichment procedure of BALF. After 24, 48 and 72 hours of incubation, protein extraction was performed and analyzed by MALDI-TOF MS. Also, a triplex real-time PCR for *M. bovis*, *M. bovirhinis* and *M. dispar* was performed. Results were analyzed with a Bayesian latent class model.

The model estimated the prevalence of *M. bovis* in the dataset at 10.9% (95% credibility interval (CI): 4.5-21.3). Method 1 and 2 showed detection of *M. bovis* in 8% and 15% of the samples after 5-10 days of incubation, respectively. For method 3, 1%, 19% and 22% of the samples were positive for *M. bovis* after 24, 48 and 72h of incubation, respectively. Sensitivity and specificity were 87% (CI: 49-100) and 97% (90-100) for method 1, 73% (36-97) and 99% (94-100) for method 2 and 88% (54-99) and 90% (80-96) for method 3. The results of statistical comparison of these methods compared to PCR, will be presented at the EBC.

In conclusion, direct identification of *M. bovis* from BALF is a promising rapid identification method with potential to massively improve timely initiation of effective therapy, control and prevention.

## - FOOT HEALTH

### 8 - Development and validation of an ELISA for detection of *Treponema* antibodies in bulk milk.

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Infections with several *Treponema* species have been associated with Digital Dermatitis (DD) in cattle. DD is a frequently reported cause of lameness in dairy cattle worldwide. In order to monitor DD prevalence in dairy herds, we have developed an indirect antibody ELISA based on antigens from four different *Treponema* species. This ELISA was validated on individual milk samples in a longitudinal study in seven dairy herds. During a one year period, individual milk samples were collected and clinical scores of in total 253 cows were obtained thrice. Results of the *Treponema* antibody ELISA in individual milk samples were correlated with the clinical scores. Antibody responses were positively correlated with age. Then the ELISA was validated in a large study including 110 dairy

herds from which bulk milk samples and clinical DD scores were obtained. Bulk milk was sampled five times during one year, and claw lesions were scored once during regular preventive claw trimming. Using the semi-quantitative results of the Treponema ELISA in bulk milk, herds with a low proportion of cattle with DD lesions could be distinguished from herds with a high proportion of cattle with DD lesions. Cows with acute (and the most severe) lesions had the largest contribution to the ELISA result. The newly developed Treponema antibody ELISA in bulk milk is a promising new low cost tool for implementation of control strategies for DD in dairy herds.

- YOUNGSTOCK

### **10 - BALf cytology and (quantitative) bacteriology in calves with respiratory infection**

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Respiratory infections are the main indication for antimicrobial use in calves. A shift from antimicrobial group treatments to individual treatment is needed to rationalize and reduce antimicrobial use. Using on-farm thoracic ultrasonography (TUS) and a clinical score card allows definition of four categories: healthy animals, upper respiratory tract infections (URTIs), subclinical and clinical pneumonia. Whether this practical categorisation coincides with (quantitative) bacterial culture results and cytological findings in broncho-alveolar lavage fluid (BALf) is currently unknown. Therefore, we compared BALf cytological and (quantitative) culture results between healthy calves, URTIs, subclinical and clinical pneumonia as diagnosed by clinical and TUS findings.

#### Materials and methods

Case-control study, 305 indoor group-housed calves from 62 farms without recent epidemic respiratory disease. Clinical examination and TUS were performed. Cytological and bacteriological analysis on non-endoscopic BALf was carried out.

#### Results

Bacterial isolation rates and quantitative BALf culture results did not differ between the diagnostic groups. In animals with clinical pneumonia, a positive culture result and presence of neutrophil phagocytosis a significantly higher BALf neutrophil percentage (59.0%) was observed compared to healthy calves (37.7%;  $P = 0.03$ ) and URTIs (35.4%;  $P = 0.015$ ). Inversely, lymphocyte percentage was lower in these calves (1.8% vs. 5.3% in healthy calves,  $P = 0.003$ ). Within the clinical pneumonia group, neutrophil percentage was significantly higher in the phagocytosis group (59.0%) compared to the no-phagocytosis group (36.5%;  $P = 0.021$ ).

#### Conclusions

Care should be taken not to overinterpret isolation of opportunistic pathogens in calves with various respiratory signs and ultrasonographic lesions. Phagocytosis by neutrophils in BALf potentially is an interesting diagnostic criterion for active respiratory bacterial infection in calves.

- ECBHM RESIDENT SESSION

### **11 - Lung ultrasonography to reduce antimicrobial therapy length in an outbreak of *Mycoplasma bovis***

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#### Objective

*Mycoplasma bovis* is a frequent indication for metaphylaxis. Current recommendations for antimicrobial treatment length are 7 days, but are not supported by substantial evidence. By thoracic ultrasound the healing process can be followed, offering possibilities to reduce therapy length without hampering animal welfare. The objective of this study was to determine cure rate and required therapy length for florfenicol and oxytetracycline in an outbreak of *M. bovis* by lung ultrasonography.

#### Materials and methods

Randomized clinical trial on 163 indoor – housed beef calves on a farm facing an outbreak of *M. bovis*. At the first visit thoracic ultrasonography was done in all animals. Animals with lung consolidation  $\geq 1$  cm were treated with either florfenicol (20 mg/kg IM) or oxytetracycline (10 mg/kg IM). Animals were scanned every two days and when re-aeration of the consolidation occurred, therapy was discontinued.

#### Results

*M. bovis* and *Pasteurellaceae* species were isolated from non-endoscopic broncho-alveolar lavage samples. Of the 163 animals present, 63.2% had a lung consolidation at the first examination. After one single injection 71.4% and 44.9% ( $P = 0.02$ ) was healed in the florfenicol and oxytetracycline group, respectively. After 4 days this was 94.3% and 85.7%, respectively. In the florfenicol group, all animals cured with a maximum treatment length of 8 days. With oxytetracycline after 14 days a final cure rate of 98.0% was reached. The average healing time was significantly shorter for the florfenicol group ( $3.6 \pm 1.8$  days vs.  $5.1 \pm 4.3$ ;  $P = 0.03$ ). Compared to a metaphylactic treatment of 7 daily dosages pro animal, a reduction of 63% and 61% was achieved in the florfenicol and oxytetracycline group, respectively.

## Conclusion

Florfenicol resulted in a significantly faster healing compared to oxytetracycline, reducing therapy length. Thoracic ultrasound is a promising field tool to assure cure and reduce treatment length in outbreaks of *M. bovis* pneumonia.

## - PARASITOLOGY

### **12 - Targeted Selective Treatment for control of gastrointestinal nematodes in an organic beef herd**

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Parasitic gastroenteritis (PGE) in grazing ruminants affects animal welfare and limits performance. To control PGE, commonly all animals in a group are treated with anthelmintic to reduce impact and limit transmission. However, group treatments can exert strong selection pressure for anthelmintic resistance and are discouraged in organic farming. Targeted selective treatment (TST) can reduce anthelmintic use, whilst minimising the impact of PGE. Breeding cows, calves and yearling cattle in a spring-calving, organic beef suckler herd were monitored from April to November over three years. Within each age group, a random sample of 15 animals was sampled monthly: faecal samples for nematode egg counts (FEC), liver fluke egg counts and coproantigen (*Fasciola hepatica*); yearling blood samples for plasma pepsinogen (PP) estimation. Calves and yearlings were weighed regularly. Yearlings were treated individually (fenbendazole) when monthly average daily live weight gain (ADLW) was <0.75kg per day. The median proportion of yearlings treated each month per year 2016-18 was 44%, 45%, 37% respectively (range 0-100% per month); ADLW was maintained at the target of 0.75 kg/day. Preliminary analyses show no significant associations between FEC and ADLW, but low ADLW coincided with elevated PP. Though TST requires a weigh scale, regular monitoring and additional handling, farmer acceptance of the system was excellent, with TST approved by the organic certification body. Currently, TST has only been demonstrated successfully in PGE; control of liver fluke and lungworm requires additional measures. This study demonstrates that TST can provide good control of PGE and growth performance, with reduced usage of anthelmintics, commensurate with responsible use and lowered selection pressure for resistance. Whilst TST has previously been shown to be effective in weaned first grazing season calves, this is the first report of the successful adoption of TST in yearling cattle.

## - FOOT HEALTH

### **13 - Monitoring concentrations of biotin, zinc and manganese in bulk milk of Dutch dairy farms**

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Biotin and zinc play a key role in the formation of good quality claw horn and manganese is essential for growth and function of cartilage and bone. Monitoring and optimization of the supply of these elements could fit in preventive strategies to improve claw health at dairy farms. In 2018, GD-AHS launched a voluntary program for dairy farmers, in which bulk milk samples are analyzed for biotin, zinc and manganese four times a year. Cut-off values to indicate possible dietary deficiencies are <30 µg/L for biotin, < 3400 µg/L for zinc, and < 20 µg/L for manganese concentrations. The objective of this research was to evaluate the results from this bulk-milk monitoring program in the first three seasons. These results may not be representative for the Dutch dairy population, as only a small proportion of farms participate in the program. The number of participating farms was 245 in March, 269 in June, and 289 in September 2018. Bulk milk samples were analysed for biotin using a commercial ELISA and zinc and manganese using inductively coupled plasma mass spectrometry.

Biotin concentrations in bulk milk of dairy farms (mean ± SD) were 37.7 ± 27.9, 38.7 ± 28.2 and 48.1 ± 33.0 µg/L in March, June, and September, respectively. For manganese and zinc the concentrations were 24.2 ± 4.5, 21.8 ± 3.8 and 24.0 ± 4.5 µg/L and 4433 ± 387, 4123 ± 301 and 4318 ± 330 µg/L for in the same seasons, respectively. The proportion of farms with a biotin concentration below the cut-off value was 53.5%, 51.7% and 38.4% in same seasons, respectively. For manganese, these proportions were 15.1%, 32.5%, and 18.0% in the three seasons. The increase in low manganese in bulk milk in summer is also seen for other trace elements (copper, selenium etc.). Farms with low zinc concentrations in bulk milk were rare. To the knowledge of the authors, this is the first bulk milk program monitoring of supply in dairy herds to guide feeding strategies for improvement of claw health at dairy farms.

## - INFECTIOUS DISEASES

### **16 - BRD vaccination reduces strongly the use of antibiotics in Dutch dairy calves**

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A substantial portion of antibiotics applied in the dairy sector are used for controlling respiratory diseases (BRD) in young stock. Vaccination against BRD pathogens may be a strategy to reduce antibiotics, and therefore an optimization for long-term performance of dairy cattle. In this field observational study, the antibiotic use in young stock on several Dutch dairy farms was measured depending on the used BRD vaccination program. 250 Dutch dairy farms were involved. In 159 farms calves were treated against BRD and/or vaccinated against BRD. These 159 'BRD' farms were divided in 3 groups depending on the BRD vaccination protocol. Group A did not vaccinate, group B vaccinated only in autumn with Bovilis® Bovipast RSP and group C vaccinated all year round with Bovilis Bovipast RSP. The antibiotic treatment percentage (TP) was calculated as the number of calves of 60kg bodyweight that could theoretically be treated with the amount of antibiotics actually used in 2017 to treat BRD in young animals divided by the number of calves born in 2017. Groups were compared for the number of farms that had an antibiotic treatment percentage higher than 20 (TP>20). Only 63 (40%) of the 159 'BRD' farms had a BRD vaccination program. Group A, B, and C had respectively 96, 36 and 27 farms. The TP>20 was respectively 84%, 47% and 26% for group A, B and C (p<0.001). The TP>20 was significantly different between group A and B (p<0.001) and between group A and C (p<0.001), but not between group B and C (p=0.14). The odds to have TP>20 is 83% lower in group B compared to group A, and 94% lower in group C compared to group A (p<0.001). This study clearly demonstrates the potential of Bovilis Bovipast RSP to reduce the antibiotic use in dairy young stock. In this study, a strong reduction was seen in the antibiotic treatment percentage of farms using Bovilis Bovipast RSP, with the strongest reduction on farms vaccinating all year round.

## - PRECISION DAIRY FARMING

### 18 - Evaluation of lameness detection using radar sensing in cattle

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Lameness is a major health, welfare and production-limiting condition for the livestock industries. The current "gold-standard" method of assessing lameness by visual locomotion scoring is subjective and time-consuming, whereas recent technical advancements have enabled the development of alternative and more objective methods for its detection. This study evaluated a novel lameness detection method using micro-Doppler radar signatures to categorize animals as lame or non-lame.

54 Holstein Friesian dairy cows from a farm in Central Scotland were assessed. The cows were individually mobility scored by an experienced veterinary surgeon on a numerical scale (0-3) using the UK industry accepted system described by Whay and others. The radar recordings were collected simultaneously. The measurements were performed with a commercial off-the-shelf radar sensor and two antennas, placed on tripods and directed towards the areas where the animals were moving. The data collected by the radar were processed to extract spectrograms (velocity-time representations), which display the velocity of the animal (body) and moving parts (i.e. limbs, head) at different instants in time in a continuum. These features were then used as samples in a supervised learning framework to train a classification algorithm able to automatically distinguish between the signatures of healthy and lame animals.

Using veterinary scoring as a standard method of lameness detection, the classification as "lame" or "non-lame" by radar signature provided 85% sensitivity and 81% specificity for cattle. This radar sensing method shows promise for the development of a highly functional, rapid, and reliable recognition tool of lame animals, which could be integrated into automatic, on farm systems with no requirement for additional on-animal sensors, and its sensors are suitable for outdoor, farm environments.

## - UDDER HEALTH

### 19 - New bio-markers for selective dry cow therapy

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Selective dry cow therapy (SDCT) is a treatment strategy designed to reduce antimicrobial usage, with selection largely based on somatic cell count (SCC) or clinical mastitis history, which are used as proxies for current infection status. There have been limited attempts to evaluate whether measuring inflammatory biomarkers in milk results in more accurate selection of infected cows for DCT. Haptoglobin (Hp) and  $\alpha$ -lactalbumin (LA), positive and negative biomarkers for inflammation respectively, were assessed for their diagnostic accuracy in identifying quarters sub-clinically infected with major mastitis pathogens (MMP). SCC (based on milk recording), bacteriology (culture) and

Hp and LA concentrations were determined in 340 quarter milk samples collected aseptically at dry-off from 103 cows. In quarters infected with a MMP (n=17), Hp and SCC were significantly higher ( $p < 0.0001$  for both) than in those that were not (n=323) but LA did not differ significantly ( $p=0.1082$ ). From a generalised linear regression (GLR) model applied to the data we found no significant interaction between Hp and LA in identifying quarters with MMP. A treatment decision rule based on both Hp and LA was found to have greater in-sample sensitivity than SCC  $\geq 200,000$  (1.00 vs 0.94). The biomarker-based decision rule has reduced specificity compared to SCC (0.43 vs 0.61), and a worse misclassification rate (0.54 vs 0.37, McNemar test  $p$ -value  $< 0.0001$ ). A boosted regression tree (BRT) model fitted to the data had a significantly smaller misclassification rate (0.04) using both Hp and LA than the common treatment decision rule of SCC  $\geq 200,000$  ( $p < 0.0001$ ). However, sensitivity of the BRT model was poorer (0.59, compared to 0.94 for SCC). Further investigations will show whether additional inflammatory biomarkers, used independently or in conjunction with other data such as SCC, could refine decision making at dry-off.

## - ANIMAL WELFARE

### 20 - Cattle welfare self-assessment and benchmarking tool via mobile application

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Monitoring animal welfare is valuable for farmers to detect points requiring attention and to evaluate effects of management adaptations. Therefore, a mobile application has been developed to allow farmers to self-assess welfare of their animals with instant feedback (including potential risk factors, past scanning results and benchmarking). Veterinarians could be the farmers' ideal advisors in interpreting the results and coordinating a tailor-made action plan with proper follow-up.

The tool primarily includes animal-based indicators (e.g. related to body condition, injuries, behaviour). Indicators were carefully selected to ensure that the main welfare issues are covered and to allow straightforward scoring of a limited but instructive number of animals in a time-span of 1.5 hours. Additionally, key questions on management, housing and production parameters are included for suitable benchmarking.

Self-scans, allowing offline data recording, have been developed for beef and dairy cattle. Within each animal category, separate scans are provided based on production group and type of housing, to allow for appropriate data collection. After online submission of a completed scan, a report is automatically generated calculating scores (0-100 scale) for key indicators. Moreover, scores are graphically depicted over time and benchmarked anonymously.

To assess whether the tool was comprehensible, inviting and feasible to include in routine management, 8 groups of farmers tested the app on different farms. As a result the number of animals to be individually scored was reduced and some questions were rephrased for clarity.

By scanning welfare periodically, farmers are encouraged, in consultation with their veterinarian, to address points of attention and are able to monitor effects of measures taken over time. Effects of implementing the tool on the welfare status on farm, as well as the comparability of data both within and between farms still need to be assessed.

## - FERTILITY

### 21 - Relationship between ovarian activity and metabolites in dairy cows with short dry period lengths

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The aim of this study is to investigate the effect of dry period length (DP), dietary energy level, dietary energy source and interactions among these factors on fertility (resumption of ovarian cyclicity and days open), energy balance and metabolic status of dairy cows postpartum.

**Materials and Methods** Holstein-Friesian dairy cows (N=128) were blocked for expected calving date, milk yield in the previous lactation and parity. Within each block of 6 cows, 4 cows were randomly assigned to no dry period (0DP) and 2 cows to a short dry period of 30 days (30DP). Cows with 0DP were randomly assigned to either low dietary energy level (LOW) or standard dietary energy level (STD). Standard dietary energy level was based on the energy requirement for expected milk yield in 30DP cows. All 30DP cows were fed STD. Low dietary energy level was based on the energy requirement for expected milk yield in 0DP cows. All cows were fed either glucogenic (GLU) or lipogenic (LIPO) ration in week 8-44.

**Results** Cows in 0D(LOW) group had less days postpartum to onset of luteal activity compared with cows in 30D(STD) (19.43 vs 27.33 days) ( $P < 0.01$ ). Cows in 0D(LOW) group had less days open compared with cows in 0D(STD) group (96 vs 129) ( $P < 0.01$ ). Cows with less days postpartum ( $< 21$ d) to onset of luteal activity had higher concentration of insulin in plasma (15.85 vs 11.47) ( $P < 0.01$ ) and a lower NEB (-17.84 vs -170.01) ( $P < 0.01$ ) compared with cows with more days postpartum ( $> 30$ d) to onset of luteal activity.

**Conclusions** Omitting the DP (0D) reduced the interval from calving to onset of luteal activity compared with a 30D DP in dairy cows. Within 0D groups, cows with low energy level (0D-LOW) had less days open compared with cows with standard energy level (0D-STD) group. A low number of days open ( $< 80$ d) was associated with less severe NEB and better metabolic status, as reflected by increased insulin and decreased NEFA concentrations in plasma during weeks 1 to 7 weeks postcalving.

## - INFECTIOUS DISEASES

### **22 - Low prevalence of paratuberculosis in Bavaria: relax or react?**

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Paratuberculosis in cattle has recently received growing attention since it has been suggested that the causative organism (*Mycobacterium avium* subsp. *paratuberculosis*; MAP) may be associated with Crohn's disease in humans.

So far it was assumed that the prevalence of paratuberculosis is low in Bavarian dairy herds due to the small structures in the dairy sector and the use of German Fleckvieh as the main dairy breed. However, reliable data were not available.

Between February 2017 and December 2018 the Bavarian Animal Health Service sampled 294 dairy farms of which 225 belonged to regular customers (convenience sample; CS) and 69 were a subsample of randomly selected farms from a different project (RS). The median cow number in CS herds was 65, in RS 47. Samples comprised boot swabs, slurry samples and environmental samples as appropriate. Samples were analysed by culture and real-time PCR. Independent samples Mann-Whitney U test was used for comparison of groups (IBM SPSS Statistics 24.0.0.2).

On 13 dairies (4.4%) MAP was detected with any method in any sample. MAP was only detected by real-time PCR or culture on 7 and 2 farms, respectively. On 4 farms both methods came back with positive results. The apparent prevalence was 4.9% for CS herds and 2.9% for RS herds. Cow numbers in positive herds were significantly ( $p \leq 0.05$ ) higher than in negative herds (90 vs. 60 lactating cows). The percentage of German Fleckvieh or German Braunvieh only herds was significantly lower in positive herds than in negative herds (42% vs. 81%).

Even though the included herds of this study were not completely randomized the results are the most reliable available for the prevalence of paratuberculosis in Bavaria so far. In general it can be concluded that the prevalence of paratuberculosis in Bavaria is still low but could increase rapidly with current structural changes taking place. This means that the Bavarian dairy industry should take systematic action on paratuberculosis now.

## - INFECTIOUS DISEASES

### **24 - BVD virus prevalence in dairy cattle herds in Greece**

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Bovine Viral Diarrhea (BVD) virus type 1 (BVDV-1) is the most prevalent type in Europe, whereas type 2 (BVDV-2) has been recently diagnosed in several European countries. The aim of the study was to investigate BVDV-1 and BVDV-2 prevalence in dairy cattle herds in Greece. A total of 63 farms (vaccinated or unvaccinated against BVD) were enrolled. From 53/63 farms, bulk tank milk and blood samples from 15 heifers >8 months and 15 dry cows were obtained. Bulk tank milk only was collected from the rest 10/63 farms. Two blood pools were created for each farm: 1 for heifers and 1 for dry cows. All samples were examined for BVDV presence with a specific real-time RT-PCR. Samples from positive farms were further analyzed for BVDV species typing by two different PCR assays, specific for BVDV-1 and -2. To determine genotypic variations in the BVDV-1 strains, positive samples were also analyzed by RT-PCR amplification and sequencing of the 5'-UTR genomic region spanning three variable virus genomic regions, V1, V2 and V3. Genotype classification of the BVDV strains was performed by palindromic nucleotide substitution (PNS) analysis. Plasma samples from negative unvaccinated farms were analyzed for the presence of specific Ab against BVDV, with ELISA. Vaccinated against BVD were 36 (57.5%) herds. BVDV was present in blood or/and milk samples in 26/63 (41%) herds. Of those 26 herds, 17 (65.4) were vaccinated and 9 (34.6%) unvaccinated against BVD. All isolated strains were BVDV-1. 5'-UTR sequences were obtained from 8 samples with high virus titers and genotype classification revealed the presence of 4 BVDV-1 genotypes: BVDV-1b2 (n=2), BVDV-1.3 (n=2), BVDV-1.16 (n=1) and a new uncharacterized genotype (n=3). Moreover, from the 16 BVDV-negative and unvaccinated herds, 9 (56%) were positive to specific Ab and 7 (44%) negative. Herd-level BVD virus prevalence in Greece is high, despite the application of vaccination protocols. Only BVDV-1 genotypes were detected in all cases.

## - UDDER HEALTH

### **25 - Selective dry cow treatment at quarter level; the next step in antibiotic reduction?**

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The objective was to compare quarter level to cow level selective dry cow treatment because a quarter level approach may reduce antibiotics and improve dry period outcomes. Cows of 6 low BMSCC UK dairy farms, were stratified 'infected' or 'uninfected' based on CSCC (200k c/ml) and CM history before randomly allocation to 1 of 3 treatment groups; Cow Level Treatment (CLT), Quarter Level Treatment (QLT0 and QLT1), based on a CMT test score threshold of > 0 or > 1 respectively. At DO and < 1 week post-calving all quarters are sampled for bacteriology and SCC analysis and tested by CMT post-calving. All quarters of all cows are treated with teat-sealant (Cephallock®) and if 'infected', received also antibiotic treatment (Cefa-safe®) at cow or quarter level. Within QLT0 and QLT1 groups, quarters were allocated to treatments based on CMT score >0; versus CMT score >1, respectively. Successful dry period outcome was determined using bacteriology, SCC (<200k), and CM incidence in 1<sup>st</sup> 100 DIM. 807 cows, 401 'infected' and 406 'uninfected' at DO were enrolled. Data are available from 2,952 quarters from 765 cows and 10.1% and 50.0% of quarters are infected at DO with a major and minor pathogen, respectively. QLT1 treatment in 'infected' cows at DO greatly decreased antibiotic use but significantly increased (minor) pathogen incidence after calving compared to CLT (56.8% vs 64.9%; p<0.05), no difference was found with either group in the QLT0 group (p>0.05). QLT0 treatment in 'uninfected' cows at DO slightly increased antibiotic use but significantly decreased (minor) pathogen incidence post calving compared to CLT (60.3% vs 51.5%, p<0.05), no difference with either group was seen with the QLT1 (p>0.05). Based on these preliminary data, to be interpreted with care, it seems safe to not treat CMT score 0 quarters in 'infected' cows at DO with antibiotics, and addition of an antibiotic in quarters of 'uninfected' cows at DO is probably not justified.

#### - EMERGING AND INFECTIOUS DISEASES

### 62 - Early activation of the innate immune response after vaccination with a new intranasal BRD vaccine

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Bovilis® INtranasal RSP Live has been shown to protect young calves against shedding and clinical symptoms due to PI3 and BRSV. Immunity and complete protection against nasal shedding is achieved within 5 to 7 days, suggesting a strong activation of the innate immune response.

The objective of this study was to investigate the innate and adaptive immune response in vaccinated animals compared to animals that are challenged with field PI3 but not vaccinated.

At several time points the 2 groups of calves were sampled at the naso-pharyngeal mucosae, the site of vaccination or challenge. Multiple cytokines, chemokines and their receptor's activity were measured by quantifying their mRNA levels by QIAGEN GmbH using a RT<sup>2</sup> Profiler™ PCR Array 'Cow Innate and adaptive immunity'. Ct values were analysed by comparing fold-changes in gene targets between paired samples from individual animals at different time points. Vaccination induced mainly a Th1 immune response with clear involvement of CD8+ cytotoxic T-cells starting 5 days post vaccination, while only limited upregulation in both Th1 and Th2 response was seen within 5 days after challenge. Vaccination upregulated the anti-viral state pathway (induction of TLR7 and DDX58), resulting in the transcription of general anti-viral cytokines (IFNβ), enzymes (MX1) and signalling molecules that enhanced local immunity. Challenge upregulated transcription of the same genes within the anti-viral state pathway, but also showed increased transcription of the NLRP3 cell damage receptor and cytokines related to fever and inflammation like TNFα, IL1β, and IL6.

In conclusion, vaccination with Bovilis INtranasal RSP Live induced a clear and strong innate anti-viral state and Th1 response, while general disease markers remained low compared to challenge.

#### - ANTIMICROBIALS

### 30 - ESBL producing E. coli in dairy cattle

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Antimicrobial resistance is an important issue, with extended-spectrum β-lactamase (ESBL)-producing bacteria as a serious threat to human and animal health. ESBL's are capable to inactivate β-lactam antimicrobials including 3<sup>rd</sup> and 4<sup>th</sup> generation cephalosporins, and ESBL-encoding genes can transmit within and between bacterial species. Recent studies compared human, animal, food and environmental ESBL-producing *Escherichia coli* (ESBL-EC), but could not find an association between ESBL's in animals and humans. Nevertheless, from a precautionary perspective for human health, as well as the potential risk of ESBL's for animals, the subject remains of utmost importance.

Studies were done to determine the prevalence of ESBL-EC in dairy herds, in which the relation between antimicrobial usage and resistance in animals was evaluated. No relation between the prevalence of ESBL-EC and the total usage of antimicrobials was found, while a significant association with the usage of antimicrobials critically important for human health was found. Calves up to 21 days were found to have a higher individual animal

prevalence as well as a higher level of shedding ESBL-EC than young stock and cows. The prevalence in young calves was found to be not associated with possible residues of cloxacillin in colostrum that had been used for dry cow treatment.

In 2012, the antimicrobial policy in the Netherlands changed and a ban on the use of critically important antimicrobials such as 3<sup>rd</sup> and 4<sup>th</sup> generation cephalosporins was implemented. Comparing faecal samples from floor samples from randomly selected conventional dairy herds between 2011 and 2013 learned that the ESBL-EC herd level prevalence had decreased in that period from 32.7% to 18.0%. Although ESBL's were found in many dairy herds, as in any other animal species and in the environment in general, the herd prevalence declined significantly between 2011 and 2013, which may be related to the changed policy towards antimicrobial use.

#### - TRANSITION COW MANAGEMENT

### **33 -Macromineral concentrations in serum of dry cows and associations with postpartum diseases**

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Macromineral nutrition in the dry period influences cow health around parturition. Attempts have been made to predict risks for postpartum disorders such as milk fever and ketosis using serum macromineral concentrations. The objective of this research was to investigate macromineral concentrations in the dry period and assess associations with postpartum disorders in dairy cows. Between September 2014 and April 2015, serum samples and complete data records from 528 dry cows from 40 Dutch dairy herds were collected. Postpartum disorders between parturition and 100 DIM were registered. The samples were analysed for calcium, phosphorus and magnesium using commercial test kits on a multi-analyzer. The average calcium concentration in cows was 2,30 mmol/L (5<sup>th</sup> - 95<sup>th</sup> percentile: 2,07 – 2,52 mmol/L). Phosphorus and magnesium concentrations averaged 1,94 mmol/L (5<sup>th</sup> - 95<sup>th</sup> percentile: 1,41 – 2,47 mmol/L) and 0,90 mmol/L (5<sup>th</sup> - 95<sup>th</sup> percentile: 0,72 – 1,07 mmol/L), respectively. Serum calcium and phosphorus concentrations were lower in cows with fewer days to parturition ( $P < 0.05$ ); this association was not observed for magnesium. For the total dry period, 12% of cows had calcium concentrations below the cut-off value of 2,15 mmol/L and 13% of cows had magnesium concentrations below the cut-off value of 0,78 mmol/L. For the subset of cows between 21 and 0 days before parturition, this proportions increased to 14% and 16% for calcium and magnesium, respectively. Low serum phosphorus concentrations ( $< 1,1$  mmol/L) were rare (1% of cows). No associations between serum calcium and phosphorus concentrations before parturition and postpartum diseases were observed. Cows with low magnesium concentrations ( $< 0,78$  mmol/L) between 21 and 0 days had a higher odds of developing clinical ketosis. These results indicate that monitoring magnesium concentrations in dry cows may have more potential than calcium or phosphorus concentrations in preventive strategies for postpartum diseases.

#### - FOOT HEALTH

### **34 - The cow pedogram - Do we need to know about this new tool?**

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The cow pedogram describes the acceleration characteristics of the gait cycle of the distal limb of the cow over time at walking. For recording of the cow pedogram, a high frequency accelerometer (400 Hz), attached to the distal limb is used. The gait cycle variables that may be extracted from the respective pedogram and that allow to characterize the gait cycle include temporal events (kinematic outcome = gait cycle, stance phase, and swing phase duration) and several peaks (kinetic outcome = foot load, toe-off). The goals of this review are to describe the various clinical applications of the cow pedogram by presenting the results of the own research in that field.

The normal gait cycle duration of a clinically healthy cow at walking is 1.22 sec; the stance phase makes up 64% and the swing phase 36% of the whole cycle. The deceleration at foot load is 19g and the acceleration at toe-off is 4.5g.

In case that the difference of the stance phase durations between paired hind limbs exceeds 2.09%, cows with versus cows without orthopedic pathologies can be differentiated with a sensitivity and specificity of both 100%. The pedogram, however, does not allow to differentiating between proximally and distally located pathologies with a sufficient accuracy.

The cow pedogram represents a valuable tool for the objective evaluation of the effect of NSAIDs on the gait of clinically lame cows and on the gait during the recovery period of cows after foot surgery. The latter is an important indicator for accurate evaluation of the prognosis.

It may be concluded that the cow pedogram represents an important tool for objective description of the cow gait. The cow pedogram may be applied for various clinical indications as described above. It is a *must* for each cattle veterinarian to be able to work with this novel tool in the near future.

## - ANTIMICROBIALS

### **36 - The concept 'outdoor veal calf' decreases antimicrobial use and mortality and improves calf health**

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High antimicrobial use favoring the selection of resistant bacteria is a concern in the veal industry. Previous studies have identified calf purchase and management features such as no physical examination or quarantine upon arrival, no vaccination, shared air space, large group size as strongly associated with increased antimicrobial use and mortality in Swiss veal calf operations. A novel concept was developed to reduce antimicrobial use by minimizing the impact of risk factors without compromising calf health and welfare.

The "outdoor veal calf" system, including direct purchase and short transports, vaccination against BRD and 3 weeks in quarantine in individual hutches, followed by fattening in small groups of 10 calves in group hutches with a straw-bedded, roofed outside pen providing shelter against direct sunlight and adverse weather, was implemented in 19 farms (intervention farms, IF) which were followed during a period of one year. Antimicrobial treatment incidence (in defined daily doses, TI<sub>DDD</sub> in daily doses per animal year, dd/ay), mortality, average daily gain (ADG), animal health and welfare (assessed monthly in live animals and after slaughter) were compared with those obtained in 19 conventional control veal farms (CF).

A total of 1905 calves was enrolled in the study. Mean TI<sub>DDD</sub> was highly significantly reduced in IF compared to CF (5.9±6.5 vs. 31.5±27.4 dd/ay; p<0.001). Mortality was twice lower in IF than in CF (3.1%±2.3 vs. 6.3%±4.9; p=0.032), ADG did not differ between groups (1.29±0.17 kg/day in IF vs. 1.35±0.16 kg/day in CF; p=0.244). Lung lesions suggestive of pneumonia were observed less often in calves from IF than CF (26% vs. 46%, p<0.001).

A drastic reduction in antimicrobial use and mortality was achieved in the "outdoor veal calf" system without compromising animal health and welfare. These principles of risk reduction can be used to improve management and animal health, and decrease the need for antimicrobial treatments.

## - YOUNGSTOCK

### **37 - Incidence and cause of calf death from 2000 Scottish beef cows over two seasons**

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Calves weaned per 100 cows bred is a Key Performance Indicator in beef herds. Calf losses by abortion, stillbirth, neonatal or older calf death cause significant financial loss and can negatively impact animal welfare. The incidence and causes of such losses are poorly recorded in the veterinary literature. We aimed to describe the incidence and cause of calf losses from ~2000 Scottish beef cows over two years.

Beef farmers were recruited on a 'first-come, first served' basis following awareness raising. Participating farmers recorded animals bred from April – August, and a pregnancy result, in each year (breeding 2017 and 2018). Every calf death (abortion, stillbirth, first week or prior to weaning) was submitted to SRUC Vet Services, Aberdeen for post-mortem investigation.

The same fourteen herds participated in both years, with 1822 animals bred in year 1, and 1845 in year two. Full results were available for year 1 only at abstract submission. Of 1679 calves conceived in 1610 pregnant cows: 16 (1%) died when the cow died pre-calving; 55 (3.3%) aborted; 52 (3.1%) were stillborn; 29 (1.7%) died in the first week of life and 25 (1.5%) older calves died pre-weaning. There was marked herd variation in rates of calf death and calves weaned per 100 cows bred (range 45% -101%). A diagnosis was reached in 87% of calves submitted. The major causes were feed-borne / environmental pathogens (abortion), anoxia during stage 2 labour (stillbirths), failure of passive transfer and infection (neonatal) and pneumonia (older losses).

Post-fertility losses were equal to fertility losses in year 1. There was marked herd variation in the incidence and causes of calf death, highlighting the importance of individual health planning. Potential focus areas for improvement were identified. Comparison of year 1 and year 2 results (herd and study level) will be available at the conference. The project was supported by Livestock Health Scotland and the Scottish Government.

## - ECONOMY OF BOVINE DISEASES

### **38- Economic comparison between abrupt drying off with cabergoline and gradual cessation of lactation**

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An abrupt dry-off method has disadvantages and is considered inappropriate for current dairy cows due to a high and constantly increasing milk production, related welfare issues and attributable risks for intramammary infections (IMI) linked to the risk of milk leakage. A gradual lowering of the milk production has been advocated in order to prevent these undesirable effects. Recently, an alternative approach has surfaced where milking is stopped abruptly while using cabergoline (CAB). The aim of the current study was to compare the attributable net costs of three different methods of drying off cows (gradual reduction in feed, gradual reduction in milking frequency, and abrupt cessation of milking with CAB).

A simulation model was developed to calculate the net costs of applying the different dry-off strategies. The attributable net costs were determined by only including costs and benefits which varied between the three methods. Each cow in the model was simulated from 7 days before the day of drying off until the end of the next lactation. The risk of acquiring an IMI during the dry period was determined, based on the fact that the probability of getting an IMI was higher for cows leaking milk than for cows not leaking milk. Subsequently, if an IMI did not cure during the dry period, the cow had an IMI at calving. In addition, milk production and feed costs were modelled, as well as labor for applying the drying off method. For all methods, the net costs were calculated as the sum of costs for feed during the gradual feed reduction period, costs for applying drying off, and the IMI costs during the dry period and lactation, minus the milk revenues during the transition from lactation to dry period.

The percentage of cows having an IMI at calving was 20.5, 23.2, and 22.0% for abrupt-CAB, gradual-milking, and gradual-feeding, respectively. In conclusion, abrupt-CAB saved €49.5 and €21.9/cow on average compared with gradual-feeding and gradual-milking.

## - INFECTIOUS DISEASES

### **39 - A retrospective study of caudal vena cava thrombosis in 17 cows.**

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Vena cava thrombosis (VCT) in cattle is a sporadic condition that is difficult to diagnose during the animal's lifetime. A retrospective study was carried at the National Veterinary School in Alfort to assess the prevalence of CVT, its clinical picture and the value of complementary tests in a diagnostic approach. The certainty diagnosis of VCT was established by necropsy examination in 17 cattle.

The annual prevalence of VCT between 2010 and 2018 was about 1 %. Only one cow was referred for caudal vena cava thrombosis (CdVCT), the others for various reasons such as chronic respiratory disorders, traumatic reticulo-peritonitis, heart disease, chronic weight loss or poor general condition. After admission to Alfort, a clinical suspicion of CdVCT was made in almost half of the affected animals before complementary tests are carried out. Liver ultrasound (realized in 9 to 17 cattle) revealed dilation of the caudal vena cava in 100 % of cases, venous congestion in 55 %, hepatomegaly in 33 %, a thrombus visible in the vena lumen in 33 % and liver abscesses in 22 %. Heart ultrasound examination (made in 10 to 17) showed no anomalies in 6 cattle, a tricuspid valve endocarditis in 2, a mass in the right ear in one and a slight fibrinous pericarditis in another one. Lung ultrasound examination (performed in 5 of the 17) showed diffuse moderate pleuritis in 100 % of cases and lesions of pulmonary consolidation in 80 %. More than half of the animals had hyperproteinemia and neutrophilic leukocytosis. Origin of VCT was hepatic abscesses in 53 % of cases and other miscellaneous conditions (mastitis, traumatic reticulo-peritonitis, tenosynovitis, subacute rumen acidosis) in 18 %. No origin of thrombosis could be established in 29 % of cattle.

Even if VCT is an uncommon disease, it should be suspected in any adult cattle unsuccessfully treated for respiratory disease. Liver ultrasound is the preferred test for the diagnosis of CdVCT during the animal's lifetime.

## - PRECISION DAIRY FARMING

### **40 - Reducing bimodality by optimizing treatment time in an automatic milking system**

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The milking process in an automatic milking system (AMS) aims to improve efficiency and to maintain udder health. Milking efficiency can be quantified as milk yield given during the time spent in an AMS. Milk letdown is provoked by brushing the teats, a tactile stimulus to trigger oxytocin release. Attaching teat cups too soon may cause bimodality. We hypothesize that bimodality can be reduced by optimizing brushing time.

Milk data from 26 AMS-farms (80 consecutive days; 832,260 milkings; 4,809 cows) was examined at quarter level for the occurrence of bimodality using semi-supervised classification. Aggregation of the bimodality classification

resulted in bimodal cow having at least 10% bimodality a week. Data was selected for 1) a spectral clustering analysis. To exclude the impact of natural variation over time, two-week data of a subset of 857 bimodal cows was used for 2) the adjustment of brush time with 8 extra seconds. The effects of prolonged brush time (n=53) are compared to not changed brushing by Fisher's exact test. 3) On one farm, the hyperkeratosis scoring was compared with the occurrence of bimodality.

The prevalence of bimodal cows per herd varied from 1% to 46%. Farm level clustering showed different brushing time between the clusters of bimodality. Multiparous and late lactation cows were more bimodal than primiparous and early lactating. Further, a longer milking interval reduced bimodality. Prolonged brush times resulted in a significant reduction of bimodal cows (odds ratio = 13.2). Moreover, increased milking efficiency was observed due to an increased milk speed (odds ratio = 2.8) and growth in yield per box time (odds ratio = 3.2). Rough teat ends were related to a higher percentage of bimodality and longer milking times.

Prolonged brush times result in reduced occurrence of bimodality, an efficient milking and might improve udder health. Ideally, the interaction between udder health and efficiency requires cow specific brush time.

## - HOUSING AND FOOT HEALTH

### **42 - Hock lesions are a common problem in dairy cows in northern Germany**

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Hock lesions in dairy cows are a commonly used animal-based welfare indicator. Swellings or wounds indicate a suboptimal cow comfort.

In Germany, a cross-sectional study was conducted to investigate common diseases and injuries in dairy cows and young stock as well as risk factors promoting these ([www.praeri.de](http://www.praeri.de)). Within this study, the hocks of up to now 20,743 cows in 206 dairy farms in northern Germany were scored with respect to hock lesions by trained study veterinarians. Farms were selected randomly considering a representative distribution of the sizes of the farms. Preliminary results: Only 5962 cows (28.7%) had no hair loss, wound or swelling at any of their hocks. Hair loss without a swelling or wound was observed in 11,087 cows (53.4%) at least at one hock. Severe lesions (swellings and/ or wounds) were observed at least at one hock of 2539 cows (12.2%). One thousand fifty five cows (5.6%) had soiled hocks, so that no assessment was possible. Thirty-two farms were excluded from the further analyses, as more than 10% of the cows of these farms could not be assessed. The prevalence of cows with bald areas, wounds and/ or swellings within the farms varied enormously (mean=67.8%, CV=39.7, min=0%, max=100%). Farms that kept their cows predominantly in straw yards (n = 7) or on pastures (n = 6) had fewer cows with severe hock lesions than farms that kept their cows predominantly in pens with cubicles (n = 149), tied (n = 6) or in other systems (n = 6). The more time the cows spent on pastures the less severe hock lesions were observed.

The results indicate that hock lesions are a common problem in dairy cows in northern Germany. Moreover, the study indicates that also hygiene is improvable in some dairy operations. The percentage of cows with severe hock lesions can be reduced by housing and access to pasture.

## - UDDER HEALTH

### **44 - Current status of dry cow therapy in northern Germany**

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Selective dry cow treatment (SDCT) can be one strategy to significantly decrease the use of antibiotics on dairy farms. It is already widely implemented in some countries (e. g. Finland (Vilar *et al.* 2018)) and preventive antibiotic treatment is forbidden in others (e. g. The Netherlands (Scherpenzeel *et al.* 2016)). A study published in 2015 for northern Germany found that none of the 95 farmers asked mentioned the application of SDCT, while 79.6 % of them applied blanket dry cow treatment (Bertulat *et al.* 2015).

Between December 2016 and February 2019, 196 northern German dairy farms were visited. Based on the number of cows, the farms were separated in three groups: small (1 - 64, n = 58), medium sized (65 – 113, n = 68) and large ( $\geq 114$ , n = 70). The smallest farm visited kept 12 cows while the largest had 991. The average herd size in small, medium and large farms was 44, 87 and 180 cows, respectively. Cows were mainly kept in free stall barns (n = 165), tie-stalls (n = 9), straw pens (n = 6), on pasture (n = 6) or in other ways (n = 10). On each farm a structured interview was conducted, including questions on drying off practices.

Blanket dry-off treatment was applied on 65.8 % of the farms (60.1 % on small, 61.7 % on medium sized and 74.3 % on large farms). SDCT was conducted on 29.6 % of the farms. On 9 farms, the cows did not receive any antibiotic dry cow treatment. Teat sealers were used on 35.2 % of the farms for all cows, on 18.7 % selectively and not at all

on 46.4 % of the farms. On 7 small farms, neither antibiotic dry-off treatment nor teat sealers were used, while 21.9 % of all farms used both. Microbiological testing before drying-off was carried out on 26.5 % of all farms only and in 84.6 % of these farms for less than 50 % of all cows.

Compared to the study from 2015, the use of SDCT became more common in northern Germany. Anyhow, field veterinarians and farmers should further work together on a wide implementation of structured SDCT programs.

## - FOOT HEALTH

### **46 - Treatment of non-healing white line disease with a topical spray containing chelated copper and zinc**

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#### **Introduction**

Standard treatment of white line disease (WLD) consists of proper hoof trimming + application of a block, but for non-healing WLD (nhWLD) this approach appears to be insufficient. A non-antibiotic gel and aerosol spray containing chelated copper and zinc are available for digital dermatitis treatment. The goal of this practical field study was to evaluate the potential curative effects of this spray on cases of nhWLD.

#### **Materials and Methods**

Animals with a recent history of WLD were scored as 0 (closed), 1 (small), 2 (moderate), and 3 (severe) and randomly divided in standard trimming + block (standard treatment, n=9), or standard treatment + spray (Intra Epidine, IE) and a bandage (IE spray treatment, n=9). Hoofs were re-inspected on day 3, 7, and 28, lesion severity was scored, and, if necessary, spray was applied again. Score improvement was compared using a t-test.

#### **Results**

At 28 days, the average score after standard treatment had improved 1.0 point, while the score after spray treatment had improved 2.0 points (Table 1). This difference in improvement was statistically significant (p=0.016).

**Table 1.** Average nhWLD score on the days of inspection.

After spray treatment all scores improved; two of the five severe lesions (score 3) even changed into completely healed horn (score 0), one already within 7 days. This was not observed after standard treatment, where three of the five severe lesions again had a score 3 on day 28 and none moved from score 3 to 0.

#### **Conclusion**

Treatment of nhWLD with a spray containing chelated copper to eliminate pathogenic bacteria, and chelated zinc to stimulate corium healing resulted in a significant improvement in lesion score.

#### **Acknowledgements**

Thanks to the dairy farm family for their assistance and hospitality.

## - ANTIMICROBIALS

### **47 - Farmers judgement used for evaluation prudent treatment of grade 1 and 2 clinical mastitis**

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Prudent use of antimicrobials consists of targeted treatment of the pathogen involved in the disease. To change treatment routines evidence-based information on treatment efficacy is needed to let rigid routines go. The change to treat mild (grade 1 and grade 2) clinical mastitis (CM) with first choice, narrow spectrum treatment instead of the routinely used broad spectrum treatment needs to be explained and substantiated to farmers. Therefore a field trial was carried out to motivate and engage Dutch farmers in changing their treatment habits. The objectives were to study the prevalence of causative pathogens of grade 1 and 2 CM and to evaluate the clinical cure rate after treatment with a benzylpenicillin injector (Ubropen<sup>®</sup>, Boehringer Ingelheim).

Eighty two dairy farmers within "Kernpraktijken Rundvee" were selected. Milk samples from all CM were collected and farmers were asked to indicate the severity of mastitis and to record duration of treatment and day of clinical cure, defined as the first day of normal appearance of milk and/or quarter judged by the farmer. Treatment recommendation for grade 1 and 2 CM existed of 1 benzylpenicillin injector per day for 3 to 5 consecutive days. Bacteriology results and CM severity were available for 253 milk samples; 224 (88%) grade 1 and 2 CM. In only 14% of grade 1 and 2 CM a Gram negative pathogen was cultured. Mean treatment duration for 171 cows was 3.4 and 3.5 days for grade 1 and 2 respectively. Clinical cure was recorded after 3.7 and 4 days of treatment for grade 1 (n=52) and 2 (n=79) respectively, resulting in a clinical cure rate of 81% for both grades.

Conclusion: in 86% of grade 1 and 2 CM there is no need to use broad spectrum injectors. The use of a narrow spectrum injector was justified, also reflected in the clinical cure rate of 81%. These outcomes might convince other farmers to use a narrow spectrum penicillin injector as effective treatment of mild CM and may help change their treatment habits.

## - NUTRITION AND METABOLIC DISEASES

### **8 - Concentrations of copper and molybdenum in bovine liver**

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The absorption of copper in the gut is affected by molybdenum and sulfur, which can form insoluble thiomolybdate complexes with copper. It was hypothesized that molybdenum may also form complexes with copper in the liver tissue, thereby reducing the amount of stored copper that is available for the cow in case of insufficient copper supply from the diet. The objective of this study was to assess concentrations of copper and molybdenum in bovine liver tissue samples to investigate whether molybdenum levels could possibly influence the amount of available copper in storage. Results from 919 liver samples collected after post mortem examination of GD Animal Health between 2014 and 2018 for analysis of trace elements were used for the data analysis. Copper concentrations in liver samples were 387 mg/kg dm (SD: 291 mg/kg dm) and molybdenum concentrations were 2.47 mg/kg dm (SD: 1.05 mg/kg dm). Results were divided in four copper level categories (< 600; 600 – 800; 800 – 1000 and > 1000 mg/kg dm) and copper to molybdenum ratios were calculated for each copper level category for the total group and for specific age categories separately (< 2 month, 2 – 6 month, 7 – 12 month, 1 – 2 year and > 2 year). Copper concentrations were, on average, 188 times higher than molybdenum concentrations and the ratio increased with increasing copper level category. This association was observed for liver samples of all ages of cattle. As copper concentrations in liver samples were much higher than molybdenum concentration, it is unlikely that thiomolybdate complex formation between copper and molybdenum will substantially affect the copper status of the animal.

## - INFECTIOUS DISEASES

### **49 - Mannheimia haemolytica infections as an emerging cause of mortality in dairy cows in The Netherlands**

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In this presentation clinical, pathological and epidemiological characteristics of acute bovine pleuro-pneumonia caused by *M. haemolytica* infections in dairy cows in the Netherlands will be addressed. *M. haemolytica* is part of the commensal flora of the upper respiratory tract in ruminants. However, this bacteria may cause respiratory disease and polyserositis in calves. During the recent years, *M. haemolytica* has also been identified as an emerging cause of acute fibrinous pleuro-pneumonia in adult dairy cows. Until clinical disease symptoms appear, these animals are highly productive and in good bodily condition. Once disease symptoms start there is a rapid onset of severe respiratory symptoms and high fever. Unless a tentative clinical diagnosis of *Mannheimia haemolytica* infection is made and immediate adequate antimicrobial and anti-inflammatory therapy is started, these animals often succumb within 24 hours. Alarmingly, we\* encounter an increasing number of farm-associated, severe outbreaks of this condition in dairy cows, resulting in several, sometimes a dozen fatal losses per outbreak. Recent statistical analysis on pathology data, including 31.000 examined Dutch cattle, substantiated this phenomenon. In the past 15 years, there is a significant increase in *M. haemolytica* infections as cause of death in cattle, with in particular *M. haemolytica* polyserositis infections in veal calves (OR=1.7 for every subsequent period of three years) and *M. haemolytica* pleuro-pneumonia infections in adult dairy cows (older than one year) (OR=1.5 for every subsequent period of three years). Remarkably, in dairy calves (below one year), no differences have been found over time.

\* GD Animal Health monitoring system is based on a combination of signals from three sources: a free telephone helpdesk for questions and reports of veterinary practitioners, our veterinary pathology, our laboratory and regularly data-analysis of a team of veterinary epidemiologists.

## - ECBHM RESIDENT SESSION

### **51 - Reference intervals for thrombocytes and leukocytes in Dutch calves aged 0-2 months in two studies.**

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#### **Background**

In thrombocytes and leukocytes reference intervals (RIs) age differences are present in cattle and therefore it is necessary to establish RIs for young dairy calves. Only small experiments were performed in several breeds and under more controlled environments. This abstract describes a cross-sectional field study with a larger group of animals and a longitudinal study in an experimental setting.

#### **Methods**

In a large field study 497 healthy dairy calves were blood sampled and thrombocyte and leukocyte counts were determined. The RIs of thrombocytes and leukocytes of calves were derived by two methods: calculating the 2.5-97.5% range of values (method 1) and calculating the mean +/- 1.96\*standard deviation (method 2).

In a longitudinal study in under experimental conditions, 19 dairy calves were blood sampled 16 times in the first 14 days of their lives and thrombocyte counts were determined. The RIs were derived by making error bars.

### **Results**

Thrombocytes reference intervals for calves aged 0-60 days are 283-1362\*10<sup>9</sup>/litre (method 1) or 261-1315\*10<sup>9</sup>/litre (method 2). Leukocytes reference intervals for calves aged 0-60 days are 4,0-18,2\*10<sup>9</sup>/litre (method 1) and 6,5-12,1\*10<sup>9</sup>/litre (method 2).

The amount of thrombocytes slightly decreases in the first 24 hours after birth, from mean thrombocytes of 423\*10<sup>9</sup>/litre at birth to mean thrombocytes of 367\*10<sup>9</sup>/litre on 24 hours post-partum. After 24 hours post-partum the amount of thrombocytes starts to increase until it settles around 7 days of age at 760\*10<sup>9</sup>/litre.

### **Conclusion**

The RIs for leukocytes and thrombocytes are set under field conditions and in an experimental setting for dairy calves up to 60 days of age and can be used in hematology diagnostics in bovine medicine and in animal experiments. In very young animals up to 7 days of age, the mean amount of thrombocytes is lower than calves older than 7 days. After 7 days the thrombocyte count is comparable with thrombocyte counts of adult cattle.

- ECBHM RESIDENT SESSION

## **52 - Cocoa byproducts as a possible cause of acute illness and death in intensively fed cattle**

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A farm fattening around 1000 bovines a year contacted the Ruminant clinic (University of Liège) in January 2019 due to a significantly higher loss (20-30 animals) from Sept. 2018 on. Affected animals were bulls between 300-500 kg, housed in boxes of 10. Food was dispersed four times a day and consisted of approximately 1.5 kg of concentrate / 100 kg bodyweight, supplemented with various roughage.

Symptoms consisted of stiffness, muscle tremors, depression, decubitus and tachycardia. Death was usually observed within 48 hours. Antibiotic and other medical treatment seemed without effect, necropsy did not yield a clear diagnosis. In October, selenium (Se) values had been determined on the suspicion of white muscle disease (WMD). Se values were low (32-45 µg/l, ref: 80-110 µg/l). Since then, the (organic) Se level in the feed was adjusted without effect.

Three symptomatic animals were examined, after two had already been culled due to similar symptoms the day before. Blood was taken to determine LDH, CPK and Troponine I values. WMD was seen as the primary suspect. However, troponine I was not elevated, reducing the possibility of cardiac myopathy. CPK was elevated, but not as high as one would expect in a WMD case and was probably due to prolonged recumbency. LDH values were normal.

Analysis of the feed showed the addition of 8.9% cocoa shell pellets till 17/10/2018 and 5% onwards. Serum of two symptomatic animals was tested for theobromine, one tested highly positive. Analysis of the theobromine content in the feed amounted to 546 and 307 mg/kg feed, just above the EFSA guideline of 300 mg/kg (EFSA, 2008). Symptomatology also matched that of other case reports of theobromine intoxication (Curtis and Griffiths, 1972).

Disease and death could be related to a cumulative effect (T<sub>1/2</sub> of theobromine is 15.5-21 hours), the intensive feeding schedule and the high palatability of cocoa products, leading to increased selection by the animals.

- ECBHM RESIDENT SESSION

## **53 - Iron deficiency anaemia in whole milk fed calves**

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Anaemia caused by iron deficiency has long been reported in dairy calves. The low levels of iron in whole milk, coupled with poor absorption from the gut, leads to poor transfer of minerals from whole milk diets alone, resulting in pre-weaned calves developing iron deficiency anaemia. This study primarily investigated if there was iron deficiency anaemia on UK dairy farms feeding whole milk and the effect of iron supplementation on the Daily live weight gain (DLWG) and Haemoglobin (Hb) levels of these calves.

272 calves were enrolled across 8 farms. Calves were blood sampled for Hb, total protein and weighed at 1-10 days old, blood sampled for Hb and weighed at 6 weeks old and weighed only at 12 weeks old. Calves were randomly selected to receive Iron Dextrane at the first weighing, resulting in a control group (CON, 133 calves) and treatment group (INJ, 139 calves) on each farm. The injection contained 200mg of Iron Dextrane per ml, each calf was given 1000mg, equating to 5mls via intramuscular injection.

Iron had a statistically significant effect (p<0.001) on DLWG from 1-6 weeks with an average 55g/d DLWG difference between the INJ and CON group. There was no significant DLWG difference between groups from 6-12 weeks or 1-12 weeks. Iron also had a statistically significant effect on Hb at 6 weeks and the difference between Hb at week 1 and week 6, with calves in the INJ group having a higher average Hb than the CON group (110.8 vs 97.1g/l) and calves in the CON group reduce by 10.1g/l on average. At the second Hb measurement 49 calves (21%) were under 90g/l the threshold used, but there was a large variability observed between farms (3.2-63.2%). Calves with a higher

growth rate from 1-6 weeks were significantly more likely to be under 90g/l at 6 weeks ( $p=0.035$ ), which was mitigated by iron injection ( $p<0.001$ ). With current recommendations to feed higher volumes of milk for longer, there may be a place for iron supplementation in whole milk fed calves.

- ECBHM RESIDENT SESSION

#### **54 - Prevention of Infectious Bovine Keratoconjunctivitis in two Cypermethrin-based preparations**

J.E. Allan, S. van Winden

RVC, LONDON, United Kingdom

Infectious Bovine Keratoconjunctivitis (IBK) is an infection of the cornea caused by *Moraxella bovis*, often causing painful ulceration and conjunctivitis. Transmission is by the face fly, carrying the bacteria on its legs. Mortality is low, but the morbidity is high with a common complaint being reduced growth rates over the grazing season. Fly control is preferred for prevention and topical insecticide is most widely used, however, there are some variations in application. The objectives of this study were to investigate the difference in incidence rate of IBK cases between two groups of animals treated with Cypermethrin, one a pour on preparation and one with impregnated ear tags. Daily Live Weight Gain (DLWG) was also evaluated between cases and between fly control products.

197 cattle were included, cattle were split randomly into two groups; tags ((TAG), Electron Tag, containing 935mg Cypermethrin) and pour-on ((PON), Dysect Cattle 15 g/l Pour-on Solution, containing alphacypermethrin). Ages ranged from 3-20 months old and included 3 breeds.

Overall, there were 56 IBK cases recorded out of 197 cattle. No difference ( $P=0.378$ ) was found between the TAG group ( $n=26$ , 46.4%) and the PON group ( $n=30$ , 53.6%). Gender did not seem to affect the IBK rates either ( $P=0.684$ ). There were, however, more cases in the Herefords (57.4%,  $P=0.004$ , odds ratio = 2.2) and animals under 12 months old (76.8%,  $P<0.001$ , odds ratio = 3.5). DLWG in the PON ( $n=95$ ) group was 0.531 kg/d and TAG ( $n=97$ ) group 0.554kg/d. Controlling for age, there was no significant difference between treatment groups ( $P=0.389$ ). Average DLWG did not differ between animals that had a case ( $n=55$ ) 0.533kg/d and not ( $n=137$ ) was 0.547kg/d ( $P=0.906$ ). There was no difference between Cypermethrin pour-on or tag preparations in the prevention of IBK. IBK in this study did not significantly affect DLWG but younger or white-faced breeds were significantly more likely to have a case of IBK.

- FOOT HEALTH

#### **55 - Survival of Digital Dermatitis Treponemes on Hoof Knives and Disinfection to Prevent Transmission**

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It is well known that good hygiene in housing, regular footbathing and prompt treatment of new cases underpin effective control of bovine digital dermatitis (BDD) by reducing infection pressure. Despite increased attention to detail in these areas, BDD continues to be a common cause of lameness in dairy cattle. Although a variety of bacteria have been associated with BDD lesions, treponemes are most commonly identified and are located deep within lesions, suggesting a major role in aetiopathogenesis.

An existing body of research identifies lack of hygiene during foot trimming as a potential risk for transmitting BDD. BDD treponemes have been detected on hoof knives used to trim both symptomatic and asymptomatic feet, and isolated from a hoof knife used to trim a symptomatic foot. Epidemiological studies have reported an increased prevalence of BDD within herds attributed to use of external foot trimmers and not cleaning foot trimming equipment. The risk of transmission occurring will depend on many factors, including how long BDD treponemes survive on hoof knives.

The current study examines survival times of two strains of BDD-causing treponemes on hoof knife blades, and shows they are culturable for up to two hours post-inoculation under aerobic laboratory conditions. This study also tests a range of common disinfectants for use on hoof knives, showing that 2% Virkon®, 2% sodium hypochlorite and 1:100 FAM® used with a twenty second contact time prevented visible growth of treponemes as measured using phase contrast microscopy. In addition, 1:100 FAM30® prevented any growth in culture as measured using nested PCR.

These findings confirm contamination of hoof knives with treponemes during foot trimming as a potential risk for transmission of BDD. We conclude that our findings support the importance of good hygiene during foot trimming as part of a holistic approach to BDD control on farm. Three disinfectants have been identified as suitable for this purpose.

## - INFECTIOUS DISEASES

### **56 - Dynamics of an acute mycoplasma Bovis outbreak in Dutch dairy farms**

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A longitudinal study was performed in 20 Dutch dairy farms with an acute clinical *Mycoplasma (M.) bovis* outbreak, i.e. having cows with clinical signs of *M. bovis*-associated mastitis and/or arthritis within a 2-wk period. The farms were visited 5 times, at 3-wk intervals. Samples were collected from clinically diseased dairy cows (max 5) and randomly selected healthy animals in three age groups: 10 calves (1-6 mo), 13 young stock (6-24 mo) and 13 dairy cows. The presence of *M. bovis* was examined by culture on individual and bulk tank milk samples and by PCR on eye fluid and environmental swabs. The presence of antibodies against *M. bovis* was tested by an indirect ELISA on serum samples. At the first visit (V1), 66% of the randomly selected cows, 34% of the young stock and 57% of the calves had PCR-positive eye fluid and these percentages decreased rapidly during the second and third visits. Mycoplasma antibodies were shown at V1 in 48% of the cows, 26% of the young stock and 24% of the calves. The percentages serologically positive young stock and dairy cows decreased over time in contrast to calves where an increase was observed. *M. bovis* was detected in 2.2% of the milk samples from randomly selected dairy cows and in 6.5% of those from *M. bovis* suspected cows. At V1, 80% of the farms had *M. bovis* contaminated environmental samples (water troughs, calf feeding buckets and bedding material), whereas only 45% of the farms tested positive three months later. The dairy cows showed a relatively high prevalence of *M. bovis*, whereas in the younger age groups more varying patterns were observed. Not only *M. bovis* suspected animals were test positive, also randomly selected non-clinical animals. At the end of the 3-mo study period none of the farms were free of *M. bovis*. In conclusion, *M. bovis* i) spreads quickly among age groups, ii) is able to infect animals without causing clinical signs, ii) is in the environment, and iii) is present at outbreak farms after 3 mo.

## - HOUSING AND FOOT HEALTH

### **58 - Use of panel discussions to transform risk factors into practical claw health advices for farmers**

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Claw health and lameness is an important issue on dairy farms worldwide. In literature, a lot of risk factors associated with infectious claw disorders are described. However, risk factors need to be transformed into practical advices to facilitate dairy farmers in implementing measures to improve claw health. This study aimed to translate risk factors associated with infectious claw disorders, described in a literature review and estimated in two recent field studies in the Netherlands, into practical advices for farmers. The risk factors were transformed into concept advices for dairy farmers by the researchers during a brainstorm session. Thereafter, the concept advices were evaluated in a panel discussion with six scientists (of which three specialized in claw health), two veterinarians, two farmers and two hoof trimmers. All concept advices were presented using posters and panel members were asked to give their opinion on every advice individually regarding advantages, disadvantages and preconditions for the farmer and the dairy industry, respectively. Thereafter, each panel member was asked to choose the advice he wanted to pay special attention to and the panel was asked to give their opinion on this advice. The panel members were also asked if practical advices were missing. After the panel discussion, the researchers scored each advice with a feasibility-score between 0 and 5, based on the pros and cons, and it was assessed if the advice was likely to be implemented on dairy farms in a short-term or mid- to long-term period. These feasibility-scores could support farmers and their advisors to determine which advices are most suitable for implementation at the farm. In conclusion, this methodology was successful in translating scientific knowledge into practical advices for farmers.

## - FOOT HEALTH

### **59 - Efficacy of a non-antibiotic enzyme alginogel on digital dermatitis in dairy cattle**

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**AIMS:** Alginogel (AG) is an effective, non-antibiotic treatment for udder cleft dermatitis (van Werven et al. 2018). Alginates stimulate cytokines proliferation and activate immune cells in the wound. The calcium ions in alginates facilitate haemostasis and the formed gel does not stick to the wound (Kammerlander and Eberlein 2003). We hypothesise that this AG is effective in the treatment of digital dermatitis (DD) lesions. The aim was to investigate the efficacy of AG on M1 and M2 lesions of DD, compared with a gel containing copper and zinc chelates (CZG).

**METHODS:** Lactating cows from 7 dairy farms were hoof trimmed and examined for the presence of DD using the M-score (Berry et al. 2012). Feet with M1 or M2 lesions were photographed and alternating treated with AG or CZG under bandage on D0 and D3. On D7, feet were photographed and those with M1 or M2 lesions received a third treatment and bandage. All feet were photographed again on D10. Clinical improvement was assessed based on M-stage transition and wound healing aspects.

**PRELIMINARY RESULTS:** M-score improvement rate was 0.29 for AG and 0.93 for CZG. An association between treatment product and M-score improvement rate was observed,  $\chi^2(1) = 88.39$ ,  $p < 0.001$ . M1-lesions treated with AG mainly remain an M1-lesion (31,8%) or transfer to an M2, M3 or M4.1. M2-lesions treated with AG mostly remain an M2-lesion (75,6%). The lesions treated with CZG, are likely to transfer to an M3-lesion (72,9%), or in case of an M1-lesion on day 0, transferring to M0 (17,4%) or M4 (21,7%). Wound healing evaluation is in progress and will be presented during the congress.

**CONCLUSIONS:** Treatment of M1 and M2 lesions with AG results in a marked lower M-score improvement rate than treatment with CZG. Only 5 lesions transitioned into M0, all of them were treated with CZG.

**ACKNOWLEDGEMENTS:** We thank the farmers and students that helped with data collection.

**KEY WORDS:** Digital dermatitis, alginogel, treatment, wound healing

## - COMMUNICATION FOR BOVINE PRACTITIONERS

### 60 - Nordic transdisciplinary training of future dairy advisors

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The future cattle advisor must master complex issues on larger farms. The key to success is high professionalism combined with the ability to work both inter- and transdisciplinary.

Since 2017 an innovative joint continuing education program for dairy consultants and dairy veterinarians has been ongoing in Denmark with participants from Denmark, Sweden and Finland. The program is part of a unique educational matrix, where different educational courses and professional groups are integrated. The field of participants and other involved stakeholders consist of:

Cattle consultants and veterinarians

Dairy herds invited to participate in the program by their bank. Teams of consultants and veterinarians from the program work in these herds in close collaboration with herd owners and employees.

Several large banks interested in putting their mark on the future cattle advice

Universities, Dairy processors, Insemination companies and Slaughter houses.

The continuing education program consists of an integrated course for dairy consultants and dairy veterinarians including topics rarely included in the classic veterinary curriculum (feeding, herd and health management, herd level analysis and economics). In parallel a separate line of activities in the participating herds with focus on development of long-term strategy and reproduction are going on. Participants experience an innovative integrated transdisciplinary learning environment that challenge them with a focus on economics, motivational structures and practice-related professional advice.

The transdisciplinary approach chosen for this program and the involvement of several contributory industry stakeholders is new and innovative, as is the focus only on dairy. For participating consultants and veterinarians, it conveys an improved understanding of the areas of work on either side and for herds and other stakeholders involved an integrated approach to herd health and production advisory services.

## - TRANSITION COW MANAGEMENT

### 62 - Efficacy of a salicylic-acid bedding conditioner in dry cow housing on new intra mammary infections

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Bedding conditioners are an important management tool to reduce bacteria counts in bedding material, thereby decreasing the exposure to environmental mastitis pathogens. The direct effect of a bedding conditioner on dry cow udder health, reflected in a decrease of new intra mammary infections (IMI) has never been studied. Our study investigates the use of salicylic-acid based bedding conditioner on new IMI rate during the dry period.

Ten herds were selected with a new IMI rate during the dry period of at least 20%. On each farm 2 separate areas

were created in the dry cow housing and conditioner was added daily to the bedding in one area. Animals were randomly allocated to control or treatment area and stayed there till calving. Farms were visited monthly to check protocol follow-up and collect individual cow data. SCC-data was collected on cow-level from the DHI records pre- and post-dry period and standard definitions for new IMI during the dry period were based on SCC only. A total of 688 animals were enrolled. Animals that stayed the dry period in the treatment area had a new IMI rate of 19%, animals that stayed in the control area 11%.

At 7 farms the new IMI rate was numerically higher in the treatment group than in the control group. The results of a multivariable mixed effect logistic regression analysis showed an Odds Ratio of 2 (95% CI 1.1-3.7) for new IMI in the treatment group compared to the control group, taking into account cow and herd level variables, such as parity, dry cow therapy and kg of milk in the last 24 hours before dry-off. Despite previous evidence on the drying and disinfectant characteristics of the bedding conditioner, this study did not show a reduction of new IMI during the dry period. Further research is needed to unravel the mechanism of the salicylic-acid which might cause an imbalance in the natural flora of the teat end leading to less protection against environmental pathogens or might affect the integrity of the keratin plug.

- ECBHM RESIDENT SESSION

### **63 - Understanding diagnostic practices to improve decision-making: a study of UK diagnostic test usage**

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Prompt diagnosis can inform therapeutic and management decisions. An understanding of diagnostic testing practices is essential for sustainable agriculture and responsible medicine use. On-farm sampling and testing is routinely carried out by first opinion farm vets to support and inform diagnostic practices but the prevalence of different test types has not been investigated.

The study analysed all testing carried out a farm practice in South West England in 2017. The aims were to investigate testing behaviours, seasonal variations, demographics and the congruence of results with national disease incidence. All tests were classified as 'diagnostic' or 'monitoring' based on a Diagnostic Innovation and Livestock focus group.

*Predominant testing behaviours:* The most used laboratories (and tests) were the in-house lab (worm egg count), APHA (*Neospora* antibody) and SAC (Johne's ELISA). On farm tests accounted for only 0.4% of recorded tests.

*Most common tests:* Diagnostic - albumin,  $\beta$ -hydroxybutyrate, coccidial count; monitoring - BVD antibody, IBR gB ELISA, Johne's ELISA.

*Farm factors:* Large farms carried out more tests than small and medium units. The ratios of diagnostic:monitoring tests were: large 1:2, medium 1:3, small 1:2. Dairies carried out one third of the monitoring tests of beef farms but there was little difference in diagnostic testing.

*Veterinary demographics:* Differences in testing habits were related to personal interest but not to demographics (age, gender).

*Congruence of testing with national disease incidence:* 1/241 (0.4%) BVD antigen tests was positive which agrees with UK figures. 83/1201 of Johne's ELISAs were positive, correlating with a national UK prevalence of 6%.

The results offer insight into diagnostic testing practices of first opinion farm vets. Data are likely influenced by a variety of factors that affect testing protocols but offer meaningful insights that will be reviewed in relation to the future of effective diagnostic practice.

- FOOT HEALTH

### **66 - The best treatment for sole ulcers - should we bandage or not?**

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**Objectives** This randomized clinical trial will evaluate the effect of bandaging on healing uncomplicated Sole ulcers (SU).

**Materials and methods** This study included Holstein Friesian dairy cows (n=52), diagnosed with uncomplicated SU (n=56) upon the first examination (week 0). All hoofs were cleaned and trimmed by a professional hoof trimmer or a veterinarian. Afterwards a wooden block was applied on the sound claw. 15 g of an iodine ointment was applied on each SU. Cows were then randomly assigned into either a non-bandaged (n=32, Group 1) or bandaged group (n=24, Group 2). The bandaging process was standardized and applied by the same veterinarian for all groups. The process of wound healing was scored weekly (weeks 0, 1, 2, 3, 4) according to a visual inspection scheme. Photographs of lesions were taken and a special software package (Jalomed®), was used to track changes in lesion size across observations. The healthy formed corium was judged as full recovery. Locomotion was also evaluated and scored weekly (Sprecher et al., 1997). If an ulcer was not considered healed, the whole procedure was repeated until the end of week 4.

**Results** In total 19 of 32 sole ulcers (59.4%) in the non-bandaged group were healed at week 4 compared to 7 of 24 ulcers (29.2%) in the bandaged group. The log-rank test indicated that healing was significantly higher for non-bandaged than bandaged SU's ( $p = 0.024$ ). A Wilcoxon Rank Sums Test indicated that bandaging had no effect on locomotion ( $p = 0.9$ ). However, cows with a healthier locomotion (Sprecher 1+2) had significantly smaller lesion sizes (median lesion size,  $0.5 \text{ cm}^2$ , IQR= $0.21\text{-}0.92 \text{ cm}^2$ ) than animals with locomotion score 3-5 (median lesion size,  $0.9 \text{ cm}^2$ , IQR= $0.42\text{-}1.81 \text{ cm}^2$ ;  $P < 0.001$ ).

**Conclusions** Results suggest that bandaging has a negative effect on the healing process of SU's. Healing of sole ulcers might only require hoof trimming and a wooden block.

## - FOOT HEALTH

### 67 - The use of risk assessments in lameness herd health management

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Lameness has major negative economic and welfare consequences for the dairy industry, in Europe and worldwide. In addition to individual-animal treatments, consultants try to mitigate lameness through herd-level preventive programs. Risk assessment (RA) identifies farm-specific critical control points (CCP) to support herd-level approaches to address a problem.

We developed a lameness-specific RA, based on identifying CCP for infectious and non-infectious causes of lameness. Between March and October 2018, 65 dairy farms participated in a study to validate the RA as a farm-specific approach to reduce lameness. One researcher evaluated 7 areas on each farm. These areas include general farm information, biosecurity practices, animal-based measures, and facilities and management practices for pregnant heifers, dry cows and lactating cows. Videos of 3,759 lactating cattle exiting the milking parlor were evaluated for lameness (scale of 1-5). In addition, hoof lesion data from certified hooftrimmers recorded using Hoof Supervisor®, were collected for cows trimmed in the previous 12 months.

Within-herd lameness prevalence ranged from 2 to 56% (median of 20%). There were positive associations between: lameness prevalence and total RA score ( $r=0.26$ ,  $P=0.04$ ); RA score for non-infectious causes of lameness ( $r=0.26$ ,  $P=0.04$ ); and RA score for infectious causes of lameness ( $r=0.17$ ,  $P=0.17$ ). These positive associations validated the RA as accurate RA results in higher scores correlated with higher lameness prevalence. Reports created for producers, presenting various hoof lesions and linking lameness prevalence to RA-scores per area on farm are available. This information provides producers and consultants with guidance in prioritizing CCPs in an attempt to reduce lameness.

## - PARASITOLOGY

### 68 - Quantitative detection of *C. parvum* oocysts compared to diarrhea in experimentally infected calves.

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Cryptosporidiosis is a worldwide disease affecting young calves causing diarrhea. Most of the times, for diagnosing cryptosporidiosis a qualitative estimation of the presence of *C. parvum* is sufficient. However, to be able to determine the efficacy of therapeutic treatments or practicing measures, a quantitative determination of oocyst production is valuable. Therefore 4 different techniques to quantitative estimate the *C. parvum* shedding were evaluated in experimentally infected calves. 6 calves were inoculated at day 0 with  $10^6$  oocysts and feces volume and dry matter content were determined. Oocyst shedding was quantitatively determined using a commercially available RT-PCR assay and microscopic counting using 3 different staining techniques: naïve counting (NC), Ziehl-Neelsen staining (ZNS) and Immuno fluorescent staining (IFS). For PCR, a dilution series with known oocyst count served as calculation curve. For microscopy, a standardized volume was suspended over a standardized surface size after which a standardized number of fields was counted microscopically.

All calves shed *C. parvum* oocysts which was shown by all staining techniques. The shedding pattern was comparable for all techniques, however, while with PCR, shedding could be shown for 11 or 12 days which started at 3 to 5 days after inoculation, the number of days that oocysts were found with microscopy was substantially lower. This is caused by the higher cut-off level of light microscopy, missing low shedding at start and end of the experimental period. This cut-off level was higher in naïve counting ( $4.4 \text{ log oocysts/ml}$ ), compared to IFS ( $3.3 \text{ log oocysts/ml}$ ). Ziehl Neelsen colouring randomly seemed lacking staining clearly positive samples. Compared to the most sensitive method (PCR), microscopic evaluation with naïve counting, Ziehl Neelsen staining and Immunofluorescent staining had sensitivities of 52, 42 and 75%.

## - UDDER HEALTH

### **70 - Can differential somatic cell count at dry-off help to predict postpartum mastitis prevalence?**

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The aim was to investigate the relationship among large dairy herd improvement programs (DHI) information related with dry period available -especially differential somatic cell count (dSCC)- and mastitis prevalence (somatic cell count (SCC)  $\geq$  200.000 cell/mL; IDF, 2003) at first postpartum milk test (FstT). DHI data of 16.572 multiparous cows were recovered. Information from previous lactation last test (LstT) and FstT were evaluated retrospectively for each cow (farm name, cow id, calving number, calving date, milk yield (kg), fat (%), protein (%), betahydroxybutyrate (BHB, mmol/L, only in FstT), SCC (cell/mL) and dSCC (%)), as well as number of days dry (DaysDry), days in milk (DIM) at dryoff (DIMDry), 305-day milk yield (pl305Kg, kg) in previous lactation. Milk values were determined individually in LIGAL (A Coruña - Spain) with a FOSSOMATIC / DC. With these information, the following variables were calculated and multinomial logistic regression model was run ( $r^2=0.40$ ,  $p<0,0001$ , JMP v.13): Parity (2 vs 3 or more), DIM at FstT, ketosis (cutoff value = 0,1 mmol/L, 1(yes) vs 0 (no)), prepartum mastitis (based on LstT SCC; 1 vs 0), postpartum mastitis (based on FstT SCC; 1 vs 0), prepartum active infection (based on LstT dSCC; cutoff point for active infection: dSCC  $\geq$  70%, Schwarz et al, 2018; 1 vs 0), postpartum active infection (based on FstT dSCC; 1 vs 0), pl305Kg quartile (Q1, Q2, Q3 and Q4) and ECM\_FscT (Energy correcter milk (kg) at FstT; IFCN 2018). Except Prepartum active infection (1 vs 0; OR= 0,97, CI=0.85-1.11), all the variables included on the model showed an impact on Postpartum mastitis prevalence: Parity (2 vs 3, OR= 0.78, CI= 0.69-0.87), DIM at FstT (0.94, CI=0.93-0.95), ketosis (1 vs 0, OR=1.53, CI=1.361-1.73), Prepartum mastitis (1 vs 0, OR= 1.66, CI=1.46-1.88), Postpartum active infection (1 vs 0, OR=40.26, CI=39.97-45.07), pl305kG Quartile, DaysDry (OR= 0.99, IC95%=0.99-0.99), DIMDry (OR=1.00, IC=1.00-1.01) and ECM\_1st test (OR=0.97, IC=0.97-0.98).

## - NUTRITION AND METABOLIC DISEASES

### **72 - Liver function and composition in states of phosphorus deficiency in transition dairy cows**

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Phosphorus (P) deficiency in early lactating dairy cows is receiving increased attention because of incentives aiming at reducing the P content of ruminant diets to curtail environmental pollution with P. In order to determine potentially deleterious effects of P deprivation in late gestation and early lactation a clinical study was conducted transition dairy cows diets with either adequate (0.28% in DM ante-partum, 0.44% in DM post-partum) or low P content (0.15% in DM ante-partum, 0.18% in DM post-partum) from 4 weeks before to 4 weeks after calving. Throughout the study cow health and productivity was monitored closely and liver tissue and blood samples were obtained repeatedly. Liver tissue was assayed for its triacylglycerol-, mineral and water content as well as for the relative abundance of mRNA of enzymes of the carbohydrate-, fat- and protein metabolism. While cows on P deficient cows developed pronounced and sustained hypophosphatemia, the most prominent clinical finding associated with P deprivation was marked feed intake depression developing after the first week of lactation. Accordingly cows on low P diets had lower milk production and showed more pronounced and sustained increases in liver triacylglycerol in early lactation. Although the liver P content decreased over time in P deprived cows neither a negative effect on enzyme transcription rates nor effects on blood parameters suggestive of impaired liver metabolic activity or liver injury were identified. These results indicate the P deprivation only indirectly affects liver function through exacerbation of the negative energy balance occurring as P deficient cows become anorectic.

## - UDDER HEALTH

### **74 - The impact of the first lactation days on udder health in German dairy heifers**

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Heifer mastitis is a great concern in many German dairy farms. Intramammary infections (IMI) prior to calving and during early lactation may interfere with the development of the mammary glands, the future milk production, udder health and related culling hazard. Up to now, the exact time of infection has not been identified but would be of major importance in order to reduce the rate of new infections by deliberately switching off risk factors. The aim of this study was to evaluate the exact moment of IMI in dairy heifers during early lactation and to point out the most important risk factors. In total, 279 Holstein Frisian heifers were included reared on 3 German dairy farms. The farms

had an average herd size of 160 to 784 lactating cows. The average bulk milk SCC during the test period was 150,000, 180,000 and 260,000 cells/ml, respectively. From September 2017 until March 2018 quarter milk samples were collected twice from all four quarters for cyto-microbiological diagnosis. The samples were obtained 3 and 17± 3 days after calving in order to define the postpartum IMI status. The farmers observed the heifers during the first 100 days of lactation and documented signs of clinical mastitis. The percentage of quarters with no detectable pathogen was 80.2% (n = 725) three days and 85.8% (n = 776) 17 days after calving. Hence, on day 17 after calving in 129 udder quarters an IMI could be detected. As IMI was not detected on day 3 after calving it could be stated that 83.0% (n = 107) of the affected quarters suffered from a new IMI. A latent infection could be detected in 17% (n = 22) of these udder quarters. The risk of IMI was influenced by the age at calving, milk yield at calving, presence of udder edema and problems during the milking process. This study shows that, in addition to the period before calving and calving itself, the period between the 3rd and 17th day of lactation plays an extremely important role for the udder health of dairy heifers.

## - INFECTIOUS DISEASES

### **75 - Mannheimia haemolytica in adult dairy cows - a case report from Germany**

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*Mannheimia haemolytica* (*Mh*) is one of the most important pathogens in bovine respiratory disease. *Mh* occurs mostly in young animals, but there are also few reports in adult dairy cows.

In March 2018, the mortality and morbidity on a German farm with 500 lactating cows was very high. When the vet was consulted, 5 animals already died and about 15 others were lying down with fever and increased respiratory rate. Cows of all ages and stages of lactation were affected.

There was a suspicion for Clostridial disease as a different silage was administered a few days earlier. Several samples were taken for further diagnosis and 1 cow was sent to the State Laboratory for necropsy. Despite symptomatic treatment, 36 animals died within 8 days.

Results from the samples and the necropsy showed no evidence of Clostridial disease. A severe acute fibrinous bronchopneumonia was found. The bacteriological examination revealed the presence of *Mh* (serotype A1) in the lungs and other organs.

Due to the dramatic events in the herd and the results from the necropsy, animals without clinical signs were vaccinated with an inactivated multivalent BRD vaccine (Bovilis® Bovipast RSP). Clinically affected animals were first treated with an antibiotic and vaccinated at a later point in time. A few days after first vaccination and treatment of the affected animals, the general health in the herd was improving. After the booster injection 4 weeks later, no further diseases or deaths linked to *Mh* were observed.

Similar case reports, where *Mh* has been identified as a cause of acute pleuropneumonia in adult dairy cows, are available from UK and Dutch farms. The animals die after a short period of fever, respiratory symptoms and a decline in milk yield. But often sudden death is the only symptom.

This case report shows that *M. haemolytica* must be considered as differential diagnosis in the case of sudden deaths in cows.

## - INFECTIOUS DISEASES

### **76 - A new phase in the control of BoHV1 in the Netherlands - an update on the progress**

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In the Netherlands eradication of Bovine herpesvirus-1 (BoHV1) started in 1997, with at the time an estimated herdprevalence of 84%. In 1999 the national programme was abruptly suspended when a BVDV2-contaminated batch of IBR-vaccine was used. The IBR-certification programmes were then continued voluntary for almost two decades. This resulted in 43% participation of dairy farms in the beginning of 2015, when discussion on a new national push towards eradication started. The herdprevalence had decreased to 16% by that time.

In April 2018 a compulsory IBR control scheme for dairy herds was introduced by the dairy industry. Farms have to participate in one of the three major routes:

**IBR-free certification** starts with individual serum gE-antibodies screening of the herd, subsequent monitoring of the free status is performed by monthly bulk milk IBRgE testing. Purchased cows from non-free herds require mandatory testing. 49% of dairy farms are certified IBR-free in this route.

**IBR-unsuspected certification** starts with a negative bulk milk gE-antibodies screening, subsequent monitoring of the unsuspected status is performed by monthly bulk milk IBRgE testing. Purchased cows from non-free herds require mandatory testing. 30% of dairy farms are certified IBR-unsuspected in this route. There is an opportunity to qualify for IBR-free in a simplified manner after at least two years.

**IBR-vaccination certification** is granted after the first whole herd vaccination with gE-deleted markervaccine (all

animals >3 months of age) and is prolonged when the herd is vaccinated every six months thereafter. 20% of dairy farms have chosen for this route of IBR control, mostly because the herd is infected. After a year of new IBR regulation, the amount of (sub)clinical outbreaks has decreased. National implementation of IBR-eradication for all bovine herds by the Ministry of Agriculture is scheduled for 2019 and after that a request for article-9 within EU-legislation will be prepared.

#### - FERTILITY

##### **77 - The effect of prepartal vitamin D3 on puerperal uterine contractility and blood Ca<sup>2+</sup> in dairy cows**

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Declined myometrial activity due to hypocalcaemia may contribute to a delayed involution in puerperal cows. Our aim was to measure the effect of a single prepartal vitamin D<sub>3</sub> treatment on early postpartum uterine contractility and blood Ca<sup>2+</sup> concentrations in dairy cows. Myometrial contractions of normocalcaemic (n<sub>NC</sub>=8; blood Ca<sup>2+</sup>>1.06 mmol/l) and hypocalcaemic Holstein-Friesian cows (n<sub>HC</sub>=12; blood Ca<sup>2+</sup><1.06 mmol/l) at a large-scale Hungarian farm were measured early postpartum, using an open tip catheter system for acquiring digital intrauterine pressure (IUP) recordings. Seven days prior to expected calving date, additional cows were intramuscularly treated with 10 million I.U. vitamin D<sub>3</sub> (n<sub>D</sub>=9). Only cows without placenta retention were included. The initial 4-h IUP recordings had been started 14-17 h after calving and were followed by three further recordings in 12-h intervals, each of these lasting for 60 min. Pressure data were collected from the previously pregnant uterine horn, and were analysed for mean contraction frequency (FREQ), amplitude (AMP), duration (DUR), mean and total area under the pressure curves (AUC and TAUC), using LabVIEW® 5.0. Coccygeal blood withdrawal for on site Ca<sup>2+</sup>-analyses were linked to IUP sessions. Data were analyzed using repeated measures ANOVA. Significant group differences occurred in TAUC with higher values in Group D (p=0.0131). Despite the highest FREQ, AMP and AUC means in this group, no further significant group differences were found. All IUP parameters declined significantly by time (p<0.001). Mean blood Ca<sup>2+</sup>-concentrations in Group D did not decline below 1.04 mmol/l. Group HC had lower blood Ca<sup>2+</sup>-means than Group D (p=0.0034) or Group NC (p=0.0029). In conclusion, prepartal treatment with vitamin D<sub>3</sub> effectively prevented major fall of blood Ca<sup>2+</sup> during the first two days after calving in dairy cows and acted beneficially on myometrial contractility. However, further evaluations are needed to clarify this effect.

#### - ECBHM RESIDENT SESSION

##### **79 - Outbreak of post-parturient hemoglobinuria associated with hypophosphatemia in a dairy herd.**

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Post-parturient hemoglobinuria is a disease described with a relatively low incidence in dairy herds around the world. We herein describe a fatal post-parturient hemoglobinuria outbreak in a Belgian dairy herd of two hundred Holstein cows.

Four cows in early lactation were referred at the Clinic for Ruminant of the Veterinary Teaching Hospital of the University of Liège for depression, decubitus, decreased feed consumption and milk production associated with anemia and hematuria. Blood analysis revealed severe regenerative anemia with hemolysis and neutrophilia. Investigation for bacterial infection and blood parasite gave negative results. Blood copper values were in the normal range. However, electrolytes concentration in blood plasma indicated hypophosphatemia. A suspicion of post-parturient hemoglobinuria was made, hospitalized animals received blood transfusion and supportive intravenous fluids, and organic phosphorus (P) provided intravenously. Two cows died despite treatment.

A herd visit was performed to investigate the cause of hypophosphatemia. It appeared that P needs for dry cows were barely covered, while its daily intake for lactating cows was half the minimum recommended, especially in the lactation peak for highly productive cows. This could be explained by a ration almost composed of pressed beet pulps, straw and protein concentrate without adequate mineralization. In order to correct this deficiency, it was recommended to add two kilos of bran to the daily ration of the cows, as well as 150g of dicalcium phosphate, and no additional case has been reported since then.

Post-parturient hemoglobinuria affects high-lactating cows during the first month after calving. This herd outbreak was original because of the high number of clinical and subclinical cases (cows with pale mucous membranes), and because of the ration content that permitted to reach a very high production of milk even though the P mineralization was totally inadequate.

- YOUNGSTOCK

### **80 - Impact of cleaning and disinfection of milking equipment on bacterial counts in first colostrum**

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IgG content and bacterial contamination of bovine colostrum influence colostrum quality and are, therefore, utmost important. Bacterial contamination of colostrum occurs during harvesting and feeding of colostrum. The objective was to study the effect of two cleaning protocols – A and B – for milking equipment on bacterial counts of colostrum samples. Protocol A is: rinse equipment with lukewarm water, disassembly equipment, rinse and scrub all exterior and interior surfaces with hot water with detergent, put parts together, rinse with hot water, allow equipment to drain and air dry in an area next to the calving pen. Protocol B is a like protocol A with additional disinfection: after rinsing with hot water, disassembly the equipment again, rinse and scrub all exterior and interior surfaces with hot water with acid sanitizer, put parts together, rinse with hot water, allow equipment to drain and air dry in the milking parlour's machine room. Directly after calving, colostrum samples were collected aseptically directly from the udder (U), milking bucket (M), and from feeding equipment (F). Cows were randomly assigned to protocols A (n=24) or B (n=25). Bacterial culture was performed on all U, M and F samples to determine total plate count (CFU/ml) after 48 h, which were log transformed. Results show that bacterial counts from U samples were low (mean 2.70 log cfu/ml, SD=1.00), and significantly lower than M and F samples (mean 3.52 log cfu/ml, SD=0.94 and mean 5.03 log cfu/ml, SD=1.38). Bacterial counts in M samples from milking equipment cleaned with protocol A contained bacterial counts (mean 3.80 log cfu/ml, SD=0.84) similar to protocol B samples (mean 3.26 log cfu/ml, SD=0.98). Bacterial counts from F samples were significantly higher than M samples: 5.02, SD=1.29 and 5.04, SD=1.50 for protocol A and B, respectively. It can be concluded that cleaning milking equipment thoroughly is only one of the critical points influencing bacterial contamination of colostrum.

- FOOT HEALTH

### **81 - The Prevalence of Lameness in UK Beef Cattle**

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**Objectives:** There is a lack of scientific determination of lameness prevalence in UK beef cattle. There is also very little information on lesions types and risk factors for beef cattle lameness, both in the UK and internationally. This study identified the prevalence of lameness on 30 farms (18 finishing units and 12 suckler herds), and identified foot lesions as well as risk factors for lameness.

**Materials and Methods:** A cross sectional observation study was carried out across England and Wales. 1685 housed finishing cattle and 1050 housed suckler cows (including in-calf heifers) underwent locomotion scoring by the same researcher. Claw and distal limb examinations were carried out on all high scoring (lame) cattle plus a sample of low scoring (non lame) control animals.

**Results:** Lameness prevalence was 13.4% for suckler cows (range 0 – 43%), and 7.8% for finishing cattle (range 2 – 21%). For finishing cattle, claw overgrowth and white line disease were the most common lesions to be significantly associated with increased lameness, with odds ratios of 1.95 (95% CI 1.12 – 3.40) and 20.22 (95% CI 9.50 - 43.08) respectively. Risk factors for lameness in finishing cattle included ration type and flooring type. Common finishing cattle breeds were Limousin or Limousin cross (38%) and British Blue and British Blue cross (20%).

**Conclusions:** The range of prevalence between farms suggests that individual farm factors are influential, and that the identification of such risk factors may help in reducing lameness in beef cattle. Furthermore, the identification of overgrown claws and white line disease as common conditions associated with increased lameness highlight that both prevention and appropriate treatment are likely to be important in the control of lameness in beef cattle.

We would like to thank The Animal Welfare Foundation (Norman Hayward Research Fund) for funding this research.

- UDDER HEALTH

### **83 - The effect of automatic cluster remover settings on milking performance and teat condition**

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#### Introduction

The objective of this study was to evaluate the effect of 2 different ACR settings on 1) milking performance, 2) udder health, and 3) teat tissue condition. We hypothesized that a higher cluster remover take-off milk flow threshold (i.e., 1.2 kg/min) increased milking efficiency and improved teat tissue condition without sacrificing milk yield or udder health compared to a lower threshold (0.8 kg/min).

### Materials and Methods

This randomized field trial was conducted on a commercial dairy farm in northern New York. Cows (n = 689) were assigned into 1 of 2 treatment groups: LOW and HIGH which corresponded to a cluster remover take-off milk flow threshold of 0.8 (LOW) and 1.2 kg/min (HIGH), respectively. Total milk yield (kg, TMY) and milking unit-on time (s, MUOT) were assessed at each milking. Composite milk samples were collected and analyzed for SCC (cells/mL). Machine milking induced short-term changes to the teat tissue condition were visually assessed. General linear mixed models were fitted to study the effect of treatment on TMY, MUOT, and linear somatic cell scores. To determine differences in machine milking induced short-term changes between treatment groups, a generalized linear mixed model was fitted.

### Results

Milking-unit on time was different ( $P < 0.0001$ ) between treatment groups with least squares means ( $\pm$  SE) of  $287 \pm 3$  s and  $260 \pm 3$  s in group LOW and HIGH, respectively. No differences in TMY ( $P = 0.73$ ) and LS ( $P = 0.32$ ) were detected. Total milk yield was  $11.31 \pm 0.24$  (LOW) and  $11.32 \pm 0.23$  kg (HIGH). Linear somatic cell scores were  $1.78 \pm 0.1$  in group LOW and  $1.79 \pm 0.1$  in group HIGH, respectively. Cows in group HIGH had decreased odds of short-term changes compared with cows in group LOW [odds ratio (95% CI) = 0.78 (0.64 – 0.97)].

### Conclusion

Increasing the cluster remover take-off milk flow threshold from 0.8 kg/min to 1.2 kg/min improved milking efficiency without affecting milk production or somatic cell count.

- ECBHM RESIDENT SESSION

### **84 - Management factors related to new IMI during the dry period**

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### **Introduction**

In the Netherlands in 2012 the preventive use of antibiotics was banned in animal husbandry. This ban interfered with blanket dry cow therapy, because cows with low SCC had to be dried off without antimicrobial dry cow therapy (ADCT). Three years after the introduction of selective dry cow therapy (SDCT) the national results did not show any detrimental effect on udder health, despite a decrease of ADCT of almost 50% (VanHoudt, 2018). However, reduction of antimicrobial usage was accompanied by changes in dry cow management. The aim of this study was to evaluate (1) the use of ADCT in relation to the percentage of new IMI over the dry period, and (2) to investigate the effect of different dry cow management factors on new IMI.

### **Materials and Methods**

A digital questionnaire was sent to 1942 farmers of 12 Kernpraktijken vet clinics. Additional data were collected per herd including new IMI and Defined Daily Dose per animal year (DDDA/Y).

### **Results**

The total use of ADCT varied considerably between the 12 vet clinics, with a range from 0,64 to 1,29 DDDA/Y. A weak correlation between ADCT and the percentage of new IMI over the dry period was found ( $r = -0.19$ ). A total of 690 farmers (36%) responded to the questionnaire. The 3 main criteria to successfully dry off cows without ADCT according to farmers were reduction of milk production before dry off, optimal hygiene during dry off and optimal hygiene during the dry period. The results of the multivariable analysis of the answers of the questionnaire on transition management and antibiotic usage will be available and presented in September.

### **Conclusion and Discussion**

In contrast with previous studies (Bradley, 2004) this study shows a weak correlation between the use of ADCT and the percentage of new IMI over the dry period. Awareness of risk factors for infection during the dry period seems to compensate the reduced use of ADCT. This information is of great importance for other countries starting SDCT.

- PRECISION DAIRY FARMING

### **87 - Dairy cow body-condition-related feature extraction using 3D vision**

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Body condition score (BCS) of a dairy cow is a reflection of its subcutaneous fat reserves. BCS is often considered an indicator at herd level that is used for feed advice. When trained assessors use predefined scoring protocols, it could serve as an individual health-status-indicator as well. Such protocols often include visual inspection and some require manual palpation. Manual scoring is labor-intensive and therefore costly. Nowadays, machine vision has the potential to assess BCS automatically. However, single view-camera systems often lack accuracy and precision.

Hence, we explored the feasibility to use multiple cameras to score the main body regions of cows. Eight body regions (i.e. the spinous and transverse processes, hook bones, pin bones, the transverse processes, the thurl area, the area between the spinous processes and hook bone, and the cavity between the tail head and pin bone) were examined by trained assessors and a balanced dataset of 44 lactating cows with BCS ranging from 1.5 to 4.5 was created. Images obtained with three 3D cameras (top-, right-, and rear-view) were automatically processed and the regions of interest were quantified to denote the same eight body-condition-related features as from the manual scoring.

For each body region, the correlation between manual and automatic BCS-feature was quantified by using Spearman's  $\rho$ . Among all body regions, the spinous processes had the highest  $\rho$  of 0.89 ( $P < 0.001$ ) with manual BCS and the thurl area had the lowest  $\rho$  of 0.69 ( $P < 0.001$ ). Moreover, the average correlation was 0.82 ( $SD = 0.07$ ). The high correlations of the features with manual BCS indicate great feasibility to automate dairy cow body condition scoring using 3D vision. However, best results are obtained when using side- and top-view images. This 3D vision-based scoring system allows continuously monitoring the fat reserves of cows, providing the metabolic state of dairy cows on a daily basis.

- ECBHM RESIDENT SESSION

### **89 - Quantification of locomotion scoring on sensor based behavioral parameters in dairy cattle**

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Lameness is, with a prevalence varying from 20% to over 80%, one of the most important diseases in the dairy industry. Lameness is related to other diseases occurring post-partum and has impact on dairy cow welfare, leading to changes in daily behavioral parameters of dairy cattle.

To quantify the effect of lameness on behavioral parameters in the transition period, 520 dairy cows of 8 well managed Dutch dairy farms were visually scored on their locomotion (score 1-5) 4 times: the early and late dry period, 4 and 8 weeks post-partum. Cows were equipped with 2 types of sensors: the Nedap Smarttag Neck sensor (eating time, number of eating bouts, duration per eating bout, ruminating time) and the Nedap Smarttag Leg sensor (lying time, number of lying bouts, duration per lying bout and number of steps) (Nedap, Groenlo, The Netherlands). Sensor data was used per behavioral parameter from 5 days before until 5 days after scoring, excluding the day of scoring. Locomotion scores 1 and 2 were grouped together as a non-lame group, scores 3, 4 and 5 were used separately. A linear mixed model was used for statistical analysis which was corrected for farm and repeated measurements.

A gradual increase in lameness per scoring moment was found. In the early dry period 30% of the cows (and in the late dry period 35%) were scored lame. At 4 weeks post-partum 47% scored lame and at 8 weeks post-partum this rose to 53%. As the locomotion score decreased, eating time, rumination time, number of eating bouts and duration per eating bout decreased. Decreased locomotion score also indicated more time spent lying down, with fewer lying bouts of longer duration. A decreased locomotion score also correlated with fewer steps overall. These results indicate a high prevalence of lameness on Dutch dairy farms with an increase of lameness during the transition period. Moreover, the effect of lameness on daily behavior of dairy cows in this study is quantified with 2 types of sensors.

- TRANSITION COW MANAGEMENT

### **1 - Correlation of Serum Haptoglobin Level of Fresh Dairy Cows to Clinical Health Parameters**

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In dairy cows, the transition period contains different risk factors for systemic inflammatory reactions. These factors trigger an Acute Phase Response of the innate immune system including the increased production of positive Acute Phase Proteins in the liver. In cattle, Haptoglobin (Hp) has shown to be a reliable marker of inflammation (Eckersall und Bell, 2010). It is known, that excessive inflammation can impair immunity and recovery in transition cows (Sordillo et al., 2009). It would be beneficial for both farmers and veterinarians to rely on a diagnostic marker for cows in a subclinical stage at risk for clinical puerperal diseases. This study was designed in order to determine if Hp was a suitable diagnostic marker for these cows.

Three East German farms were selected from a preliminary study based on > 33 % randomly sampled postpartum cows ( $n = 10$ , < 8 DIM) showing serum haptoglobin levels > 600 mg/L.

Clinical examinations and blood samples for Hp, TP, Albumin, NEFA and BHB analysis are performed at 24-36 h (d1) after calving and repeated at d3 and d5. Body temperature (BT) is measured for 7 days and repeated on d14. The quality of vaginal discharge is assessed using the Metrichheck device (d7, d14). Fertility and milk production are

monitored until the end of lactation. At abstract submission, 170 of the 400 cows have been enrolled. Significant ( $p < 0.05$ ) positive correlations were found between Hp and BT, NEFA, Metrichick and the Somatic Cell Count (SCC). Significant negative correlations were found between Hp and BHB, Albumin, Rumen Filling and Milk yield. These correlations were stronger and more significant than those of BT. Plus, Hp concentrations (d3, d5) had a high predictive value regarding milk yield and SCC. It can be concluded that Hp measurements in serum of Dairy Cows 3 to 5 days p.p. are suitable for detecting cows at risk of puerperal disorders and excessive inflammation and do have a higher predictive value than daily measurements of BT.

#### - EMERGING AND INFECTIOUS DISEASES

### **92 - A new phase in the control of BVDV in the Netherlands - an update on the progress**

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In April 2018 a compulsory BVDV control programme for dairy herds was introduced in the Netherlands. Within the programme there are four different routes that can ultimately lead to a herd with a BVDV-free status. Monitoring of BVDV-free herds is based on either bulk milk antibody testing, antibody testing in young stock, or ear tag testing. In the fourth quarter of 2018 almost 100% of dairy herds participated in one of the four routes.

In all four different routes in the programme, herds can obtain an unsuspected status or a BVDV-free status.

Of the BVDV-free herds, approximately 1% had an indication for reintroduction of the virus in the fourth quarter of 2018.

In the fourth quarter of 2018, 202 (0.7%) out of 27.807 ear tag tested animals were found to be persistently infected with BVDV (PI). The age at which the animals were removed from the farm was 20 days on average, six days after testing. The percentage of PI removed was 96.0%.

As part of the control programme, purchased cows and their calves were also tested for BVDV. In 2018 14,327 purchased cows were tested for antibodies. Of these cows, 4,068 cows tested antibody positive and 938 had given birth to a calf at the time of the analyses. Of these 938 calves a test result was available for 277 calves and 3.3% tested BVD-virus positive.

The new national BVDV control programme in the Netherlands had a promising start, and offers several opportunities for farmers to participate in a way that suits them best.

#### - FERTILITY

### **93 - Evaluating methods of measuring oestrus detection**

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#### **Introduction**

Efficient oestrus detection is essential to achieve good reproductive performance in dairy herds using artificial insemination. There are numerous metrics described to measure oestrus detection performance. Some of these metrics are based on an expected oestrous cycle length of 18-24 days. Recent research indicates that a longer interval between inseminations of 19-26 days might be more appropriate. The aim of this study was to compare the use of oestrus detection metrics that use the accepted expected 18-24 day cycle length to those using 19-26 days.

#### **Materials and methods**

Data from 167 UK dairy herds were analysed. The proportion of re-inseminations occurring 18-24 and 19-26 days after a previous insemination were compared across all calendar years of all herds. The relative ranking of each calendar year of each herd using both intervals was also compared. Multiple regression was used to identify herd level factors that may influence return oestrus detection performance.

#### **Results**

There was a significant difference in the apparent inter service interval performance of the herd calendar years when using the modified 19-26 day interval compared to the standard 18-24 day interval. There was a significant association between herd calendar year 305 day milk yield and the change in apparent performance when using the new metric. Higher yielding herds apparent performance improved more when using the 19-26 day interval than lower yielding herds.

#### **Discussion and conclusion**

This study shows that apparent herd calendar year return oestrus detection improves when using a 19-26 day inter oestrus interval in the calculations rather than 18-24 days, this is especially true for higher yielding herds. This supports earlier work that these longer intervals may be more common and suggests that this longer interval is a more appropriate estimation of the expected time to return oestrus in previously inseminated cattle.

- ECBHM RESIDENT SESSION

**96 - Chronic oak poisoning (*Quercus suber*) in beef cattle: 21 cases (2014-2018)**

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The ingestion of acorns, leaves and young trees of diverse species of *Quercus* has been reported as the source of high concentrations of tannins, which are pointed as the toxic principles responsible by oak poisoning in grazing cattle. Outbreaks of acute oak poisoning are well described in the literature. By contrast, chronic poisoning is not so well characterized. It has been considered to occur in cattle that survive to an acute outbreak, which develop uncompensated renal function. The aim of this study was to describe chronic oak poisoning in a beef herd without history of previous acute oak poisoning outbreaks.

The study was conducted in a beef herd of 1000 animals (600 adult pure Mertolengo and cross-bred Mertolengo with three other continental breeds), between November 2014 and 2018. At the fields there are *Quercus suber* and *Pinus pinela* trees, allowing access to acorns from September to January, and young trees and leaves all year round. Twenty-one cows were included in this study. Blood samples were collected from coccygeal vein from live animals for creatinine, albumin, urea and potassium measurements. Necropsies were performed as soon as possible after cows' death. Kidney, liver and large intestine fragments were collected for histopathologic examination.

Only the cross-bred cows were affected, with 60% dying while they had plentiful access to acorns, but little grass, and 40% when there was an abundance of grass available. The most common clinical signs observed were weight loss and submandibular oedema. Cows were usually dull, although a few showed aggressiveness. Blood work showed BUN and CK well above the reference ranges for cattle. Renal gross and histopathological alterations were present in all cows. Other necropsy findings were presented in half the animals. *In vivo* diagnosis is difficult, thus prevention including management measures that limit the access to acorns and oak leaves should be considered.

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- ECONOMY OF BOVINE DISEASES

**97 - Vaccination against Bovine Respiratory Disease lowers the total rearing costs of dairy young stock**

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Rearing young stock provides the future cows for a dairy farm but it entails a large proportion (5-10 %) of the cost price of milk. One of the uncertainties associated with rearing young stock includes the occurrence of Bovine Respiratory Diseases (BRD). Vaccination is a possible management strategy against BRD. It has been shown to reduce the number of cases in dairy herds but it is unknown whether this is cost-effective. The aim of this study was to assess the cost-effectiveness of vaccination against BRD.

An existing calf level bio-economic simulation model was adapted to estimate the distribution of the rearing costs in the Netherlands from two weeks of age until first calving. It simulates growth stochastically using a two phase growth function and incorporates the temporal uncertainties of BRD with the associated effects on morbidity and mortality. The model was further adapted to model the effect of BRD vaccination with a multivalent inactivated vaccine (Bovilis<sup>®</sup> Bovipast RSP, MSD Animal Health). All model input was based on scientific literature and, if not available, expert knowledge. The output of the model consisted of non-economic output such as BRD incidence, birth weight, first calving age and weight. In addition, the economic output consisted of healthcare costs (vaccination costs, prevention costs and treatment costs), feed costs, barn costs, breeding costs and labour costs. Total rearing costs were estimated using 10,000 simulations. Model runs were performed for herds with a high and low incidence risk for BRD.

In herds with a high BRD incidence, the simulated average incidence was 0.30 and 0.23 in non-vaccinated and vaccinated herds. Despite the additional cost of vaccination, the average total rearing costs per calf were €56 lower. In herds with a low BRD incidence, total costs were €35 per calf lower. The preliminary results from this study shows that vaccination is an economically interesting option to lower the rearing costs of young stock.

## - COMMUNICATION FOR BOVINE PRACTITIONERS

### **98 - Veterinary advice and intervention during extreme weather events and disasters.**

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The past decade has seen some extreme weather events affecting farms and livestock in Europe and it is thought that these occurrences will become more prevalent. But apart from natural disasters, human related disasters can also have devastating consequences to livestock, farms and farm personnel. Disasters can vary from flooding to severe winter weather and from hazardous material spills to fires on farm. Getting prepared for future potential events should be on the "to-do" list of every cattle veterinary advisor.

Most livestock producers and veterinarians instinctively know what to do in emergencies and with the help from local communities and government, problems will be solved and solutions will be found. However, most approaches to dealing with disasters affecting livestock and farms are time consuming and based on impulsive improvisation and connecting multiple pieces of knowledge, experience and resources. As most disasters occur suddenly and outside the scope of normal farm operations, prompt and thoughtful coordination of resources is required to maintain health, safety and welfare of animals and people involved to minimize the effect on farm operations. The veterinary advisor is very much suited to play a pivotal role in the coordination of disaster risk management of cattle farms. As the time to prepare for disasters is long before they occur, the information provided will help the veterinary advisor to plan for disaster management of cattle farms by determining the type of disaster and the risks involved, followed by planning for actions that can be made in advance and what actions would be needed during a disaster. This planning will not only benefit humans and animals involved in disasters, it will also mitigate the risk of contamination of both feeds used on the farm and food produce leaving the farm.

## - NUTRITION AND METABOLIC DISEASES

### **99 - Effects of glycerol-esters on immune, health and growth variables in veal calves**

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#### **Objectives**

In current production systems, Holstein bull calves experience many different stressors and excessive pathogen exposure, necessitating antimicrobial use for welfare and production reasons. The aim of this randomized clinical trial was to explore the effects of esterified fatty acids used as feed supplement on health, production and immune variables in veal calves.

#### **Materials & methods**

One hundred sixty eight calves were randomly assigned to 6 treatment groups; short chain fatty acid-based glycerol-mono- and tributurate, medium chain fatty acid-based glycerol- monocaprylate/monocaprinate in low and high dose, glycerol-monolaurate in low and high dose and a control group (CON).

Average daily gain, bodyweight at 14 weeks on feed and carcass weight were determined. Health monitoring consisted of clinical signs and repeated thoracic ultrasonography. After 4, 8 and 12 weeks on feed, the function of neutrophils, monocytes and peripheral blood mononuclear cells (PBMC) was evaluated *ex vivo* by measuring reactive oxygen species (ROS) production by neutrophils and monocytes and by proliferation and cytokine release by PBMC.

#### **Results**

No significant effects on health and growth variables could be evidenced. Supplementation with glycerol-esters resulted in immune modulation, depending on the ester, dose and duration of treatment. Main findings were increased secretion of the cytokines IL-17A, IL-6 and chemokine IL-8 by PBMCs after 4 weeks of supplementation in the high monocaprylate/monocaprinate, low monolaurate and monobutyrate calves, combined with decreased ROS production by neutrophils and monocytes.

#### **Conclusion**

High dosed monocaprylate/monocaprinate and low dosed monolaurate have the potential to promote an early pro-inflammatory immune response with limited tissue damage by ROS, which might be beneficial in the clearance of pathogens in young calves subjected to periods of stress and high pathogen exposure.

### **100 - Do Point of Care Tests for Bovine Mastitis can Reduce Antimicrobial Use Without Animal Welfare loss?**

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Information about clinical mastitis (CM) causing pathogen is important to support farmers to adopt targeted treatment decisions and ensure prudent use of antimicrobials. While there are available multiple point of Care Tests for identification of the pathogen, farmers are more interested in a simplified diagnostic test that allows treatment advice. This study aimed to evaluate the performance of two test kits, a simplified slide test kit (ST) and a commercially available plate-based test (VetoRapid, Vetoquinol) (VR), as tools for differentiation of gram-positive (GP) mastitis from other forms of mastitis and support farmers' treatment decisions in cases of non-severe CM. The performance of the test kits was evaluated against a reference test (RT) consisting of bacteriological culture and matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-ToF). We used 156 milk samples from CM, contaminated samples and samples with non-identifiable isolates based in the RT were excluded. Accuracies for GP bacteria were 79% in the ST and 72% for VR. As treatment decision support tools, samples of non-severe CM were excluded, and both test kits showed moderate to high predictive values. ST had positive predictive value (PPV) and negative predictive value (NPV) of 80% and 82%, respectively; and VR had PPV and NPV of 70% and 82%, respectively. These values demonstrate that both tests are suitable to inform selective treatment decisions in non-severe CM. However, there will be a potential negative impact of reduced antimicrobial use on cow welfare (false negative for GP) and sub-optimal reduction of antimicrobial usage (false positive for GP). Today, the balance of societal pressure is shifting away from a focus on animal welfare to a focus on reduced use of antimicrobials. Both tests can help to achieve this goal, though ST is more user-friendly and more likely to be applicable on-farm.

### **102 - Associations between cortisol, gamma-globulin and body weight upon arrival in veal calves**

C.K. Masmeijer, B. Devriendt, K. Van Leenen, L. De Cremer, P. Deprez, B. Pardon

Ghent University, MERELBEKE, Belgium

#### **Objective**

Male dairy calves are exposed to a series of stressors before arriving at the veal facilities. An insufficient amount of maternal immunoglobulin and low body weight upon arrival have been identified as risk factors for morbidity and mortality. Measuring cortisol concentration at arrival might offer additional information to classify the disease risk. The objective of this prospective cohort study was to determine the association between cortisol,  $\gamma$ -globulin concentration and body weight in Holstein calves at arrival on the veal farm.

#### **Materials & methods**

A total of 105 calves were randomly selected from two consecutive production cohorts on the same veal farm. Animals were weighed upon arrival, serum cortisol concentration, total protein (TP), and protein fractions were determined. A mixed model with cohort as random effect was built.

#### **Results**

At arrival, cortisol levels were significantly higher in the second cohort (299 nM  $\pm$  standard deviation (SD) 158 vs. 243  $\pm$  111), and ranged from 138 to 875 nM. Average arrival weight was 48.0 kg  $\pm$  3.1 (Range=39.5-56.8) and average  $\gamma$ -globulin concentration was 10.3 g/L  $\pm$  4.6 (1.4-22.2), with no significant differences between both cohorts. Of the calves, 32.3% had  $\gamma$ -globulin levels lower than the previously documented 7.5 g/L threshold for increased disease risk. Increasing cortisol levels were associated with reduced  $\beta$ -globulin concentrations ( $P<0.001$ ), but not with arrival weight ( $P=0.13$ ). Arrival weight was significantly associated with TP ( $P=0.05$ ) and  $\beta$ -globulins ( $P=0.02$ ). Moreover, albumin concentration at arrival was positively associated with slaughter weight ( $P<0.001$ ).

#### **Conclusion**

Arrival weight,  $\gamma$ -globulins and cortisol offer distinct information upon arrival. Further exploring the serum  $\beta$ -globulin fraction will be interesting for its positive association with body weight at arrival and negative association with the serum cortisol concentration.

## - HOUSING AND FOOT HEALTH

### **104 - Evaluation of natural phytogetic additive to limit the impact of lameness due to digital dermatitis.**

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Digital dermatitis (DD) is a major disease that causes lameness in cattle. DD is an important problem for the dairy industry in many countries, causing reduced animal welfare and economic loss. Evidence show that risk factors favoring digital dermatitis outbreaks include hygiene, biosecurity, hoof care and unbalanced nutrition.

We here in describe the evaluation of a natural phytogetic food additive (Pietix®) on the impact of digital dermatitis in dairy cattle.

Three dairy farms located in Wallonia were selected for this assay based on the DD frequency (> 15 %), appropriate diet to exclude ruminal acidosis or alkalosis, minimum three scrapings of the walking area per day and regular hoof care, hygiene and trimming. Food additive was included in the mix diet (10 g per day per cow) during 6 months between november 2016 to april 2017. A lameness 5-points scoring and a DD M stage scoring were performed at the beginning (T0), at three months (T3) and at 6 months (T6) of the supplementation. Only cows receiving 6 months of food additive were included in this study (n = 500).

In the three farms, we have a significant improvement of the overall lameness score between T3 and T6. Moreover, there is a significant decrease of the M1 and M2 lesions and a significant increase of the M0 and M3 lesions in two out of the three farms between T3 and T6. Between T0 and T3, there is a slight increase of the overall lameness score and of the M1 and M2 stages in the three farms. In the third farm, without improvement of the DD prevalence, a change of the diet was observed leading to a subacute ruminal acidosis during the study.

In conclusion, natural phytogetic food additive, Pietix®, could be use in conventional or organic farming (without residues and withdrawal period) to prevent and to manage digital dermatitis in well managed dairy herd with a high DD prevalence. Moreover, it is easy to use adding directly in the diet.

## - EMERGING AND INFECTIOUS DISEASES

### **112 - Reducing the incidence of BRSV and BCoV by 50% in Norwegian cattle herds**

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The Norwegian cattle health service started a 3-year control program for Bovine respiratory syncytial virus (BRSV) and Bovine Coronavirus (BCoV) in 2016. The annual new-infection herd rate was estimated to nearly 50% for one or both viruses. The aim of the program is to reduce new-infection rate to 10%. The estimated annual cost with no program is NOK 100 million (approx. 10 million €). Norway has about 13000 cattle herds.

Bovine viral diarrhea was eradicated in 2007. Now, BRSV and BCoV are the two most important virus diseases in cattle, and these viruses will die out in an isolated herd. Hence, the aim of the program is to avoid new introduction. Monitoring has been done in two stages, starting with a screening of bulk tank milk from all dairy herds, where 69% of tested positive for BCoV and 49% tested positive of BRSV. The second stage is voluntary testing where the analysis is free. Herds are recommended to test yearly. Antibodies are either tested in serum from four animals more than six months of age or mixed milk samples from four young cows. Herds are categorized into red (infected) or green (not infected). Herds without analysis for the last 365 days are red.

Biosecurity measures are the most important part of the program. Animal transport, buying animals and people going from one herd to another are the most common routes of contagion. Both farmers and farm services are intensively working with biosecurity measures. Animal trade is only done between farms belonging to the same category and suspected disease outbreaks are reported to an organized contingency system resulting in an alert of local veterinarians, traders and other relevant personnel.

Until now the program has been very successful. Results from serum analysis the previous 12 month shows a reduction from 41,5% positive herds in July 2017 to 17,3% in December 2018. Reported suspected outbreaks to our organized contingency system are reduced by more than 50% in the same period.

## - COMMUNICATION FOR BOVINE PRACTITIONERS

### **114 - Blended learning as a tool for feedback in local practices**

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Veterinarians in practice are not used to give feedback to extramural students or to (young) colleagues. Teaching skills of extramural supervisors are suboptimal. However, in the workplace specific skills for supervising veterinarians are needed to diminish the risk of drop outs amongst young veterinarians. Supervision of these young health care professionals should be sufficient, both technical and professional. In a collaborative project between the Faculties of family medicine, pharmacy and veterinary medicine of Utrecht University, a teacher feedback training for extra-mural clerkships has been developed. Tools which were available for training teaching skills through E-learning were explored. The supervisors had difficulty giving critical feedback and increasing motivation of the students. Therefore, a blended learning on feedback skills was developed. The theory and practice (with a virtual student game; Communicate, Utrecht, the Netherlands) is taught in an E-learning module. The virtual student game provides the feedback on the level of proficiency of supervisors in the game. The face-to-face part with role plays and video reviews enables the teachers to practice and discuss feedback procedures with trainers and colleagues. This course is also available to use in practice to supervise young professionals.

## - ECONOMY OF BOVINE DISEASES

### **115 - Economic evaluation of mastitis vaccination based on Simherd modeling: a case study in three dairy herds**

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