IDF Animal Health Newsletter

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Preface

Dear Reader,

The Standing Committee on Animal Health and Welfare (SCAHW) has successfully completed a seventh edition of the yearly IDF Animal Health Newsletter. The Newsletter is available both electronically and as a paper copy. The Newsletter is produced with the primary aim of providing SCAHW members and others in the IDF community with knowledge of current activities in the field of animal health and welfare. It contains short descriptions of recent research, including summaries of PhD and Master theses, current activities in SCAHW, different projects and campaigns from member countries and more. The contributions are from members of the IDF SCAHW and their collaborators, from all over the world. In this edition we can present papers from Europe, Israel, Japan, North America, New Zealand and Africa. This issue of the Animal Health Newsletter represents the broad nature of SCAHW very well, with contributions ranging from antibiotic reduction campaigns and Schmallenberg virus to animal welfare and mastitis. I hope that you will find it both interesting and inspiring.

If you want to contribute to the Newsletter by providing us with the results of research of interest to the dairy community, as well as information on recent or forthcoming meetings, do not hesitate to contact us.

Ylva Persson (Sweden) Editor
E-mail: ylva.persson@sva.se

The International Dairy Federation

70/B, Boulevard Auguste Reyers
1030 Brussels – Belgium
info@fil-idf.org
http://www.fil-idf.org

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From the Chair of IDF Standing Committee on Animal Health (SCAH)

Dear All

As the first editor of this newsletter, I now have the privilege to be writing the introduction to the newsletter as the Chair of the Standing Committee on Animal Health and Welfare.

One of the aims of this newsletter is to present some of the areas that our representatives work in or have access to. It is also to give an opportunity for those just starting in the area of animal health and welfare to showcase some of their findings or research.

I want to thank Ylva Persson again for the work she has put in editing this issue of the Animal Health Newsletter, supported by Marylène Tucci from IDF headquarters.

I would like to use this opportunity to thank Henk Hogeveen for all his work and commitment to the committee when he was Chair and hope that he continues to play an active role in committee life. Henk was keen to get the fun back into the committee and I do think he achieved this and held an excellent meeting in Amersfoort last year with a focus on the role sensors currently play in farming and their future potential. We then visited a variety of dairy farms local to the area, each focusing on a different aspect.

Update on the Standing Committee activities

Animal health and welfare impact in many ways, not just on individual dairy farm economics. To highlight just two potential areas: there are increasing concerns over antimicrobial resistance, the sustainability of the dairy industry and its impact on greenhouse gas emissions. These topics are also discussed within other Standing Committees but are equally important within the SCAH.

One item of work just finished is a 'Guide for the use and interpretation of bovine somatic cell counts'. Many countries and individuals were actively involved in this work item and it should be of use in the wider dairy industry.

Another study is looking at dairy data for individual countries so that we can share information about our individual dairy situations. In the committee restructure, this work was lost and has now been resurrected due to interest from others.

There is also an annual review of peer-reviewed literature with regards changes in antimicrobial resistance and patterns for mastitis pathogens. The latest review again showed no change in these resistance patterns, irrespective of antimicrobial use.

On the welfare aspect, a literature review on the impact of mastitis with regards welfare is being carried out and we are also coordinating with OIE and ISO on welfare standards.

Several members of our committee were invited to an ad hoc working group with OIE on a welfare guide for dairy cows, following on from their work on welfare in beef cattle. The aim is to continue this piece of work following comments to OIE.

As a committee, we represent a very diverse dairy industry and welcome all the contributions to both the committee meetings and behind the scenes. Everyone works very hard and I want to thank all for their contributions, many of which are done in their own time.

I also wish to thank Olav Osteras from Norway for his help as Vice Chair.

Dr Elizabeth Berry
Chair of the IDF Standing Committee on Animal Health
E-mail: Elizabeth.Berry@dairyco.ahdb.org.uk

PhD Summaries

Energy status related to production and reproduction in dairy cows. Prevention of decreased fertility and detection of cows at risk

Decreased fertility in dairy cows is widespread and economically undesirable. Current management strategies to prevent decreased fertility exploit the close relationship between negative energy balance in transition cows and subsequent decreased fertility. However, there is a continuous need for more information regarding the effects of different strategies on fertility. This thesis evaluates the effect of supplemental feeding with glycerol or propylene glycol, the usefulness of measuring metabolic indicators in blood samples to predict decreased fertility and investigates potential risk factors.

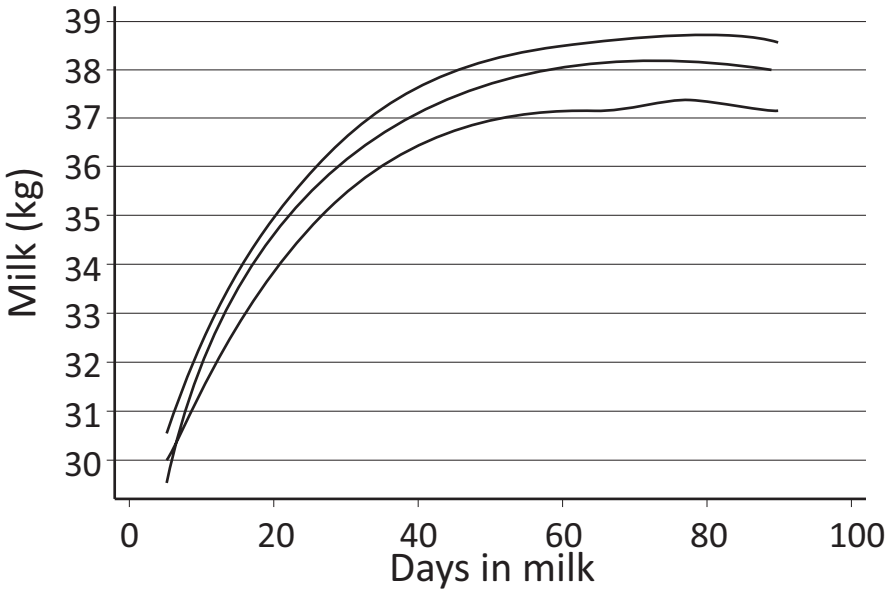

Figure 1: Milk yield at monthly test days during the first 90 days in milk for 673 cows receiving supplemental feeding with glycerol (solid line), propylene glycol (dashed line) or control (dotted line) during their first 21 days in milk

In papers I and II, the metabolic status, milk yield, health and fertility of cows in 17 commercial herds, fed either a glycerol or propylene glycol supplement or no supplement (control) were evaluated in a field study. The supplemented cows received 450 g of glycerol or 300 g of propylene glycol 0–21 days post-partum. Plasma samples for measurement of glucose, insulin, non-esterified fatty (NEFA) acid and beta-hydroxy butyrate (BHBA) were taken every third week during the first 9 weeks of lactation. Cows fed glycerol produced, significantly, 1 kg more milk during the first 90 days in milk and cows fed propylene glycol tended to produce more milk without a subsequent decrease in metabolic status or fertility (Figure 1). No differences in post-partal health across the different groups were seen.

In paper III, the accuracy (i.e. sensitivity and specificity) of metabolic indicators used to predict decreased fertility was evaluated. The results were based on a single blood sample taken during the first 3 weeks of lactation, and different test cut-off values of NEFA and BHBA were applied. The usefulness of the metabolic indicators was in general low and was influenced by cow parity, cow breed and the prevalence of decreased fertility in the population studied.

Finally, potential risk factors for decreased fertility related to housing, feeding and the cow herself were evaluated in approximately 750 Swedish herds and 63,000 cows (paper IV). Data from the Swedish official milk recording program was combined with questionnaire data on the feeding system. Cows with severe claw lesions and cows displaying a rise in somatic cell counts had a lower probability of pregnancy at first insemination. In addition, cows experiencing a change in system (e.g. in housing or milking system or a change from conventional to organic production) had lower fertility than cows not experiencing such a change.

In conclusion, supplemental feeding with glycerol or propylene glycol, as a general strategy in a herd, does not seem to influence fertility or energy status but could increase milk yield. Measures to prevent a decrease in fertility (i.e. supplemental feeding) could be more effective if applied to cows in physiological imbalance, rather than to all cows in a herd. However, the use of metabolic indicators in a single blood sample may not be optimal for detecting individual cows at risk. Finally, the identified risk factors for decreased fertility could be used when devising preventive strategies. It was also found that new techniques and management per se are not associated with decreased fertility, but that decreased fertility could be seen during the period of change between systems. Extra resources in the management of the fertility of cows should therefore be provided during such a period.

A digital version of the thesis can be found at: http://pub.epsilon.slu.se/9048/

Hanna Lomander,
DVM, PhDDepartment of Animal Environment and Health,
Swedish University of Agricultural Sciences,
Skara, Sweden
E-mail: Hanna.Lomander@slu.se

Four PhD students evaluate the Nordic health recordings

The four Nordic countries Denmark (DK), Finland (FI), Norway (NO) and Sweden (SE) all have national disease recording systems for dairy cows where data is stored in centrally managed databases. The data in these central databases are used for several purposes, for example herd health and production management, by breeding companies for bull selection, for genetic and epidemiologic research and for the production of national and regional statistics to monitor trends in disease and production. These recording systems are unique in their large coverage of the populations. Collaborative research and comparison of disease occurrence across country borders can contribute to even greater knowledge of the epidemiology of production-related diseases in particular.

Objectives for the Norwegian thesis were: (1) to quantify the disease data quality in the Norwegian central database, focusing on data loss in the transfer of registered disease on farm to the central database; (2) to quantify and compare the central database completeness of metabolic diagnostic events in DK, FI, NO and SE with reference to farmer-observed events and veterinary-attended events, separately; and (3) to study in more detail the influence that human decision thresholds, namely the farmers' intent to contact a veterinary surgeon and the veterinary surgeons' intent to start medical treatment, have on the amount of observed disease that is centrally recorded. The latter studies of behaviour were done with mild clinical mastitis (MCM) as a disease example.

For the quality of metabolic diagnostic events in DK, FI, NO and SE, farmers, over two periods of two months in 2008, gave details of all observed events of illness in their herds on a recording sheet identical in all four countries and separate from the ordinary recording process. Human threshold behaviours that are likely to influence the amount of disease recorded in central databases were studied with a questionnaire based on a method from social psychology – the Theory of Planned Behaviour (TPB).

For all diagnostic events as a group, data transfer from the cow health cards (CHC) to the central database was done with minimal error, quantified in an excellent correctness of 97%. A proportion of diagnostic events registered on the CHC were not reported to the central database, resulting in a completeness of 87%, but this can still be characterized as good. The completeness of farmer-observed diagnostic events, regardless of veterinary involvement, indicated that varying amount of 'real' disease occurrence on farm is captured in each of the four databases. For DK, FI, NO and SE, the farmer-observed completeness for milk fever was 77, 67, 79 and 79%; for ketosis 77, 55, 70 and 46%; and for 'other metabolic diseases' 76, 33, 81 and 49%, respectively. The completeness of veterinary treated or attended diagnostic events gave combined information about how well veterinary surgeons register diagnostic events and their transfer to the central database. Ideally, this should have been 100% in all four registration systems. For veterinary treated or attended diagnostic events, the completeness for milk fever was 88, 71, 80 and 82%; for ketosis 84, 75, 79 and 56%; and for 'other metabolic diseases' 79, 49, 87 and 65% in DK, FI, NO and SE, respectively. There were significant differences between all four countries, except DK and NO, for farmers to contact a veterinary surgeon when a case of MCM is detected. Danish and Norwegian farmers had the highest intention (0.50). When diagnosing a case of MCM, the intention of veterinary surgeons to initiate medical treatment also varied between countries, and this intention was statistically significant different between all countries except NO and SE. The mean intention score for veterinary surgeons was 0.71, 0.42, 0.58 and 0.50 in DK, FI, NO and SE, respectively.

For a mild disease like MCM, the largest contribution to varying completeness figures may be due to different country-level thresholds of farmers to contact a veterinary surgeon. For more severe diseases, like milk fever, this situation is possibly different. Veterinary surgeons are likely to have an influence on farmer behaviour, and farmers on veterinary behaviour. The work serves as an example of how to study and describe data quality in a central database for dairy cattle, including making sense of the influence that specific human decision processes may have. It may give ideas for improvements or be of interest to those wanting to set up similar recording systems in other countries.

The titles of the PhD theses are:

M.K.N. Espetvedt: Quality of production-related disease data in four Nordic databases for dairy cattle. The influence of the data transfer process and the decision thresholds of farmers and veterinary surgeons. Norwegian School of Veterinary Science, Oslo, Norway. 2013.

A-K. Lind: Validation of the Nordic disease recording systems for dairy cattle. With special reference to locomotion disorders and mastitis. Dept. of Large Animal Science, University of Copenhagen, Denmark. 2013.

C. Wolff: Validation of the Nordic disease recording systems for dairy cattle. With special reference to clinical mastitis. SLU, Dept. of Clinical Sciences, Uppsala, Sweden. 2012.

The fourth thesis is coming soon, with special reference to reproduction diseases, from the University of Helsinki, Finland.

Olav Østerås[1] and Dr. Scient[2]
[1]Section Manager,
TINE Adisory Service, Section Dairy Health and Welfare, Norway
[2]Professor II, Preventive Medicine and Health Management, Norwegian School of Veterinary Science
E-mail: olav.osteras@tine.no

Other research

Clinical and subclinical mastitis in dairy cattle in Kampala, Uganda

Background

Intensive dairy farming has been adopted as an important strategic as well as economic activity in the neighbourhoods of Kampala city in Uganda, providing a source of regular income, food security and employment for a rapidly growing urban population. Mastitis is one of the most important diseases limiting milk productivity in dairy cows and reducing profitability of dairy farming.

In two studies, one for clinical (CM) and one for subclinical (SCM) mastitis, the aim was to investigate the bacteriological panorama and the antimicrobial susceptibility in milk samples from dairy cows with CM or SCM. Another aim was to see if some environmental factors and animal properties influenced the frequency of mastitis.

Materials and methods

For CM, farmers made contact with the members of this study after recognizing an animal with CM. Cows were clinically examined, all quarters were examined by California Mastitis Test (CMT) and milk samples for bacteriological culturing were collected from all quarters positive for CM. A total of 24 milk samples from were collected from 18 animals.

The SCM study was conducted in 18 small-scale dairy farms. All cows at the farms were examined, and cows with signs of CM were excluded. Cows (*n*=195) were tested with CMT and udder quarters with a CMT score ≥3 were milk-sampled for bacteriological analysis.

Bacteriological analyses were done locally at Makerere University, Kampala, Uganda and at the Swedish Veterinary Institute (SVA), Uppsala, Sweden. Antimicrobial susceptibility was tested in staphylococci and streptococci. Chi-squared test and multivariable analysis were used to determine what factors influenced the frequency of CM and SCM.

Results

Of the animals with CM, 22% were affected in >1 udder quarter. Concurrent SCM in ≥1 quarter was found in 83% of the animals. At quarter level, 33.5% of quarters were positive for CM and 47% of quarters had SCM. The most common pathogen found in CM was coagulase-negative staphylococci (CNS) (29%), followed by *Escherichia coli* (12.5%). Of the *Staphylococcus (S.) aureus* and CNS isolates from CM, 100% were positive for β-lactamase production. A higher frequency of CM cases was seen in smaller herds, in open grazing systems and in ani-

Interveiw with a female milk farmer during a field visit. Photo Sandra Björk

Milk sampling from a cow with clinical mastitis. Photo Sandra Björk

mals with a parity >1. Zero-grazing systems were correlated with animals in poor hygienic conditions and were more common in smaller herds.

Results indicate that 86.2% (*n*=168) of the tested cows had SCM in one or more quarters. The most common bacteriological outcome was infection with CNS (54.7%), followed by negative growth (24.9%) and streptococci (16.2%). All susceptibility-tested streptococci (*n*=34) were sensitive to penicillin. Of the tested staphylococci, six out of nine CNS and four out of eight *S. aureus* were positive for penicillinase production. Factors with significant impact on the prevalence of SCM at cow level included stage of lactation, where the prevalence increased with lactation days; parity, where multiparous cows had higher prevalence than primiparous cows; and production type, where zero grazing cows had increased prevalence compared with grazing cows.

Discussion and conclusion

The results suggest that the prevalence of SCM in Uganda might be substantially higher than reported in previous studies and in comparable developing countries. The most common agent found in both CM and SCM was CNS. The majority of staphylococci were positive for β-lactamase production. Parity, stage of lactation, grazing system and herd size were factors that influenced the frequency of mastitis. The milking hygiene procedures among studied farms were generally poor and probably a contributing factor to the poor udder health. Also, the easy access of pharmaceuticals constitutes a risk in the development of antimicrobial resistance among bacteria.

Ylva Persson[1], Markus Abrahmsén[2], Sandra Björk[2], Benon Kanyima[3] and Renée Båge[2]
[1]National Veterinary Institute (SVA), Sweden/ Växa Sverige
[2]Division of Reproduction, Department of Clinical Sciences, Faculty of Veterinary Medicine and Animal Science, Swedish University of Agricultural Sciences (SLU)
[3]College of Veterinary Sciences, Animal Resources and Biosecurity, Makerere University, Kampala, Uganda
E-mail: ylva.persson@sva.se

Diagnostics of intra-mammary bacterial infections – comparison between a PCR assay and culturing

PCR analysis of milk samples is a new fast method for finding cows with intra-mammary infections and has the potential to be used routinely for test-milk samples or in-line systems. However, the results from PCR analysis are not easy to interpret and before the technique can be used routinely it needs to be validated. The present research project compares bacterial findings in whole udder milk samples analyzed using PCR with quarter milk samples analyzed using bacteriological culturing.

The golden standard for diagnostics of bacterial intra-mammary infection (IMI) is culturing. However, culturing takes time, can be subjective and may be falsely negative if the bacterial count is low. In recent years, PCR (polymerase chain reaction) assays have been developed to identify the most common pathogens in milk in a more objective and quicker way. One issue with the PCR assays is that it identifies DNA from both living and dead bacteria in the sample, i.e. also measures bacteria that have already been killed by the cows' immune system, which can be interpret as an ongoing infection when it not. Moreover, if these assays are used on non-aseptically collected whole udder samples (e.g. milk samples taken at test-milking), where the risk of contamination is high, the results could be difficult to interpret because it is impossible to distinguish between bacteria from the udder and from the skin of the cow or the environment. Although a lot of research has been conducted to validate PCR assays, the interpretation of their results is still not clear and needs further investigation. The aim of this study was to determine the diagnostic properties of a multiplex real-time PCR assay, comparing analysis of whole udder samples with culturing of quarter milk samples, and to investigate associations between bacterial findings and somatic cell counts (SCC), lactate dehydrogenase (LDH), *N*-acetyl-β-D-glucoseaminidase (NAGase) and alkaline phospatase (AP) in milk from the test-milking that hopefully could help with the interpretation of the PCR assay results.

Whole udder test-day milk samples were taken according to normal test-milking procedures and analyzed using PathoProof™ Mastitis Complete 12-kit (Thermo Fisher Scientific Inc.). Quarter milk samples were collected aseptically from the foremilk at the same test-milking. The quarter milk samples were analyzed using routine bacteriological culturing at the National Veterinary Institute. Milk samples from 955 cows were analyzed. To estimate the diagnostic

properties of the two diagnostic tests, latent class analysis was used in absence of a perfect reference test. The herds were divided into two sub-populations depending on SCC (less than or greater than 100 000 cells/ml milk) and the Hui-Walter two-test two-population model was applied to estimate the sensitivity and specificity for the two tests. Logistic regression analyses were used to investigate associations between bacterial findings and the udder-health indicators SCC, LDH, NAGase and AP.

In 867 of 985 whole udder samples, bacteria were found using the PCR assay whereas 261 cows had one or more udder quarter with bacterial findings according to the bacteriological culturing (mixed flora included). With the PCR assay, 0–6 bacteria were found whereas 0–3 bacteria (including mixed flora) were found in one or more udder quarter samples. The most common finding with either method was coagulase-negative staphylococci (CNS).

The results showed that the sensitivity of the PCR assay, varying between 44 and 96% depending on investigated bacteria (*Staphylococcus aureus* (Sa), *Streptococcus dysgalactiae* (Srd), *Streptococcus uberis* (Sru), *Streptococcus agalactiae* (Sra), *Escherichia coli* (Ec), *Klebsiella sp.*, *Enterococcus sp.* and CNS), was higher than the sensitivity of culturing (varying between 1 and 73%). The specificity of culturing varied between 87 and 100%, and was generally higher than the specificity of the PCR assay (varying between 66 and 99%). The correlations between the two methods were generally low (varying between −0.01 and 0.59). Findings of Sa, Srd, Sru and CNS, using either diagnostic test, were significantly associated with higher SCC, LDH and NAGase, and associated with lower AP for cows with findings of Sru and CNS as compared with cows with no findings of the respective bacteria. However, more findings with bacteriological culturing than with the PCR assay came from cows with SCC ≥ 100 000 cells/ml (Table 1), indicating that more of the PCR findings could be a result of contamination at sampling.

Conclusions

The correlation between whole udder samples analyzed by PCR assay and udder quarter samples were low. More positive samples were found with the PCR assay but many of these findings seem to be due to contamination. We found significant associations between some of the bacterial findings and the udder-health indicators, but how this can be used in the interpretation of the results from the PCR assay needs to be investigated further. Neither the PCR assay nor culturing are perfect tests for identification of IMI.

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Ann-Kristin Nyman[1], Ulf Emanuelson[2] and Karin Persson Waller[1,2]
[1]Department of Animal Health and Antimicrobial Strategies, National Veterinary Institute (SVA),
Uppsala, Sweden
[2]Department of Clinical Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden
E-mail: ann.nyman@sva.se

Table 1: Distribution of the proportion (%) of cows with a somatic cell count (SCC) of less or more than 100 000 cells/ml milk where bacteria in milk samples were identified by either a PCR assay or bacteriological culturing

Bacteria	Bacteriological culturing			PCR assay		
	SCC < 100 000 cells/ml	SCC ≥ 100 000 cells/ml	Total number of positive samples	SCC < 100 000 cells/ml	SCC ≥ 100 000 cells/ml	Total number of positive samples
Enterococcus sp.	17	83	12	55	45	429
E. coli	20	80	5	52	48	78
Klebsiella sp.	0	100 %	1	47 %	53 %	81
CNS	30	70	119	49	51	718
Str. agalactiae	0	100	3	54	46	11
S. aureus	12	88	74	17	83	101
Str. dysgalactiae	0	100	35	29	71	127
Str. uberis	15	85	33	18	82	55

Associations between cow factors, intra-mammary infections and udder-health indicators

A recently finished research project at the National Veterinary Institute in Sweden shows that cow factors, e.g. parity, breed and days in milk, are significantly associated with several udder-health indicators and that the somatic cell count (SCC) is more affected by intra-mammary infections (IMI) than the other udder-health indicators investigated. The SCC was the best udder-health indicator in predicting whether a cow had an IMI or not.

Correct identification of cows with infectious subclinical mastitis, in a fast and cost-effective way, is highly desirable in order to reduce the risk of spread of udder pathogens in a herd. Measuring the milk somatic cell count (SCC) is the most common tool for achieving this, but analyses of other udder-health indicators, such as lactate dehydrogenase (LDH), *N*-acetyl-β-D-glucoseaminidase (NAGase) and alkaline phospatase (AP), are also used. It is important to continuously assess the ability of

the inflammatory indicators to find cows with IMI. It is well established that cow factors and IMI contribute to the variation in SCC within and between cows, but how these factors are associated with LDH, NAGase and AP is not as well investigated. The first aim of this study was to investigate if and how different cow factors and IMI are associated with SCC, NAGase, LDH and AP. The second aim was to investigate the ability of the inflammatory indicators to predict whether a cow has IMI or not.

A prospective cohort study was designed, and a total of 25 dairy herds were enrolled in the study and visited twice during the study period. At each visit, quarter milk samples were taken from 20 cows on three consecutive days (the day before the monthly test-milking, the day of the monthly test-milking and the day after the monthly test-milking) for bacteriological culturing. Whole-udder test-day milk samples were taken according to normal routines and analyzed for SCC, LDH, NAGase and AP. A cow was considered IMI-negative if all 12 udder quarter samples were bacteriologically negative, and IMI-positive if one or more udder quarter samples were bacteriologically positive with the same bacteria twice. Associations between the dependent variables (SCC, LDH, NAGase and AP) and the independent variables (parity, breed, days in milk, milk yield, percentage of milk-fat and milk-protein, milk-urea) were investigated in a multilevel mixed-effect linear regression model where only IMI-negative cows were included. A second model, including all cows, was built to investigate the association between the udder-health indicators and IMI (including the cow factors). Milk samples from 976 cows were analyzed, and 522 of those cows were considered IMI-negative.

The results showed that all cow factors investigated were significantly associated with one or more of the udder-health indicators, explaining 21–58% of the variation in the udder-health indicators. Parity was the only factor associated with all indicators; breed was associated with SCC and AP; days in milk was associated with LDH, NAGase and AP, milk yield was associated with SCC and NAGase; percentage of protein was associated with LDH and AP; percentage of fat in milk was associated with SCC; urea concentration in milk was associated with SCC, LDH and NAGase; and season was associated with LDH and NAGase. Moreover, all inflammatory indicators except AP were significantly associated with IMI status. The cow factors explained approximately 21% of the differences in SCC between cows and adjusting the SCC for these factors improved the ability to predict whether a cow had an IMI or not. The SCC had better ability than the other udder-health indicators to predict whether a cow had an IMI or not.

The conclusions from this study are that cow factors are associated with all udder-health indicators investigated, but that the SCC is least affected and that IMI status affects SCC more than the other indicators. SCC also had the best ability to predict whether a cow had an IMI or not. Thus, the SCC still seems to be the most useful tool for finding cows with IMI.

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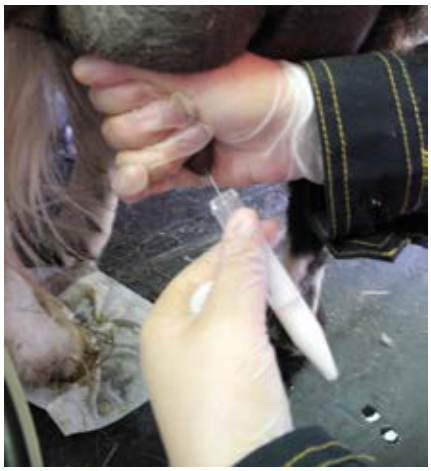
Ann-Kristin Nyman[1], Karin Persson Waller[1,2], Ulf Emanuelson[21]Department of Animal Health and Antimicrobial Strategies, National Veterinary Institute (SVA),
Uppsala, Sweden
[2]Department of Clinical Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden
E-mail: ann.nyman@sva.se

Somatic cell count and bulk milk PCR as tools for finding udder infections of *Staphylococcus aureus* in dairy goats

Background

In cheese-producing goat farms, the pathogenic bacteria *Staphylococcus (S.) aureus* is often isolated from curd samples. The bacteria can enter the curd as a contamination from the surroundings or through infected milk from the does. Thus, it is important to find the source of contamination in order to prevent further spreading of the bacteria to dairy products.



Milk sampling - Photo by Ylva Persson

Aim

The aim of this study was to investigate whether somatic cell count (SCC) and PCR analysis of *S. aureus* in bulk tank milk could be helpful tools for cheese-producing goat farms to identify herds where does have intramammary infections (IMI) with *S. aureus*. Another aim was to investigate whether the SCC measured by the California Mastitis Test (CMT) or the DeLaval Cell Counter (DCC) could be used to identify udder halves infected by *S. aureus* within the herd.

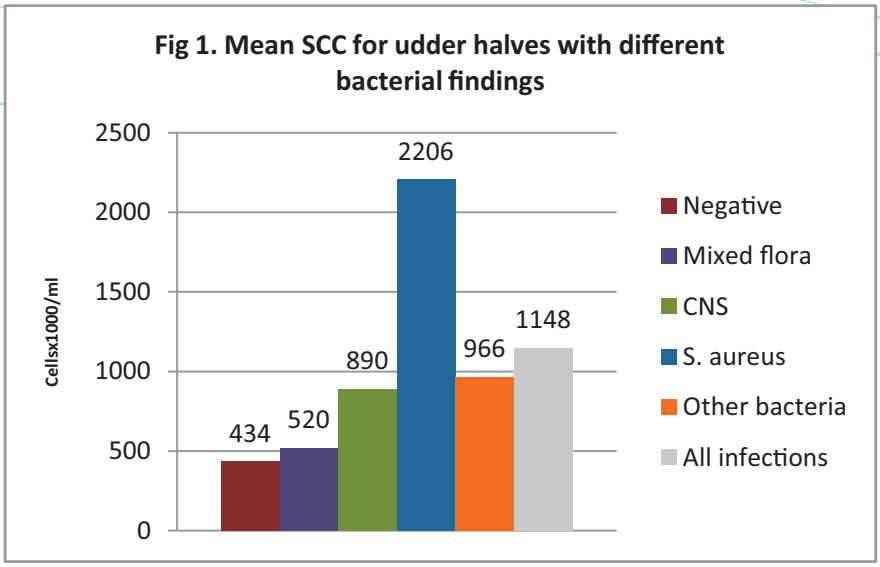
Material and methods

In the study, 1051 milk samples from both udder halves of 530 clinically healthy goats in mid to late lactation were collected from 17 herds. From the same herds, 29 bulk tank milk samples were also collected. Milk samples from individual udder halves were cultured on blood agar plates and the SCC was measured by CMT and DCC (DCC-SCC). Bulk tank milk samples were analyzed with PCR for the presence of *S. aureus*, and the SCC was measured by DCC.

Results and discussion

Coagulase-negative staphylococci (CNS) were the most frequently isolated udder pathogen, and were found in 12% of the udder half samples. Only 13 samples (1.2%) were culture-positive for *S. aureus*.

Fig 1. Mean SCC for udder halves with different bacterial findings



The results indicate that udder infection with *S. aureus* causes a greater increase in milk DCC-SCC than infection with other udder pathogens. The SCC for udder halves infected with *S. aureus* was significantly higher than for culture-negative udder halves and halves infected with CNS or other (neither *S. aureus* nor CNS) bacteria (see Figure 1).

Furthermore, the differences in SCC between udder halves within does were also significantly higher for does infected with *S. aureus* than for culture-negative does and does with CNS or other bacteria in at least one udder half. This indicates that measurement of SCC can be a helpful tool for the dairy farmer to identify does carrying *S. aureus* in their udders. However, it was not possible to find a cut-off value for SCC that could differentiate between udders infected or not infected with *S. aureus.*

Similarly, the CMT was significantly higher for udder halves infected with *S. aureus* than for culture-negative udder halves, halves infected with CNS and halves infected with other bacteria. Again, no cut-off value separating the groups could be found. When analyzing the differences in CMT between udder halves within does, the only significant differences were found between uninfected and infected udder halves, but not between different types of bacteria.

SCC and PCR analyses of bulk tank milk were not reliable in detecting *S. aureus*-infected herds because significant associations between bulk tank milk SCC, *S. aureus*-positive bulk tank milk and *S. aureus* cultured from udder halves within the herd were not found. However, 6 out of 8 herds in which *S. aureus* was cultured from udder halves were also PCR-positive for *S. aureus* in bulk tank milk on at least one occasion. Repeated bulk tank milk sampling and analyses of *S. aureus* might therefore give an indication of whether or not the does have IMI with *S. aureus*.

To conclude, the results indicate that SCC is a useful tool for detecting *S. aureus*-infected does in a herd, but not at the bulk tank milk level.

The study is available at
http://stud.epsilon.slu.se/5304/

Åsa Järnberg[1], **Karin Persson Waller[2] and Ylva Persson[3]**
[1]**Department of Clinical Sciences, Swedish University of Agricultural Sciences (SLU)**
[2]**Department of Animal Health and Antimicrobial Strategies, National Veterinary Institute, Sweden/Department of Clinical Sciences, Swedish University of Agricultural Sciences (SLU)**
[3]**Department of Animal Health and Antimicrobial Strategies, National Veterinary Institute Sweden/Växa Sverige**
E-mail: ylva.persson@sva.se

Swedish landrace goats - Photo by Ylva Persson

Using bio-sensors to measure activity and milk compositional changes during Streptococcus uberis-induced mastitis

The introduction of automated bio-sensors has allowed the continuous testing of cows in dairy herds to assess their productivity, behavior and health. Monitoring these traits allows managers and veterinarians to identify deviations in individual cows due to both normal physiological cycles and metabolic or infectious diseases. Mastitis is an infectious disease that negatively affects the quantity and compositional quality of milk produced. The value of daily testing of milk composition and activity patterns for individual cows for managing mastitis continues to be evaluated in both naturally occurring and experimentally induced intramammary infections.

An experiment was conducted to determine the effects of experimentally induced *Streptococcus uberis* mastitis on milk quality and physical activity measured by a commercial system. Twelve late lactation Holsteins were placed into six pairs based upon parity and milk production. One cow in each pair was experimentally infected into the right front mammary gland with *S. uberis*. The remaining cow in each pair was the uninfected control. Cows were housed in the same free-stall pen and milked twice daily as a single group. The automated biosensor system provided real-time analysis of milk fat, protein and lactose at each milking. Pedometers were placed on the left front leg of all cows. Pedometers measured activity as number of steps taken, bouts of rest and amount of time resting. Milk compositional data were analyzed as weighted daily averages and activity data were daily totals.

Intramammary infections with *S. uberis* reduced milk yield in experimental cows by approximately 1.6 kg/day compared with control cows the first week after challenge. Likewise, the lactose percentage in milk was reduced in infected cows compared with controls. This decrease was significant by day three of infection and persisted for the next three days (Figure 1). Percentages of fat and protein in milk did not differ between infected and uninfected cows the week after infections were induced.

Total steps per day were reduced (Figure 2) and minutes resting per day were increased (Figure 3) in infected cows compared with control cows the week after experimental challenge. The number of resting bouts did not differ between infected and uninfected cows. These data indicated that the decreased activity in cows with mastitis was due to longer bouts of rest during the first week of infection, but the number of times the cows rested was comparable between infected and uninfected cows.

The use of automated bio-sensors for real-time measurement of changes in milk composition and daily totals of physical activity in cows with mastitis has positive potential for diagnosing mammary diseases in dairy cows and formulating management strategies for enhancing milk quality.

Hannah Kester and Joe Hogan
The Ohio State University, Wooster, OH, USA
E-mail: hogan.4@osu.edu

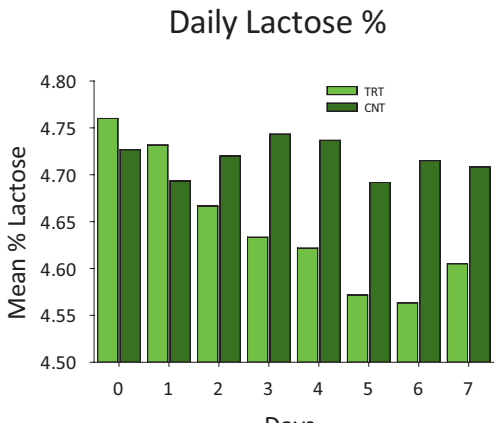


Figure 1: Daily mean lactose percentage in milk from cows experimentally infected with *Streptococcus uberis* (TRT) on day 0 and from uninfected control cows (CNT)

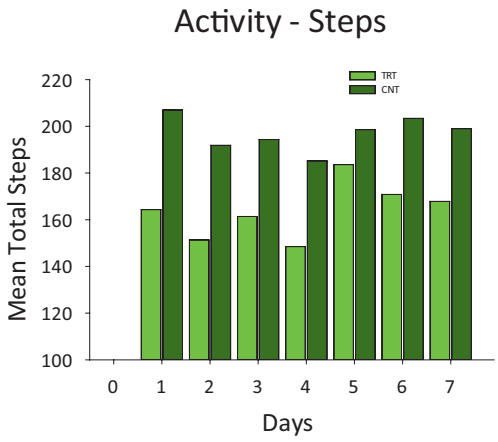


Figure 2: Daily mean number of steps taken in cows experimentally infected with *Streptococcus uberis* (TRT) on day 0 and uninfected control cows (CNT)

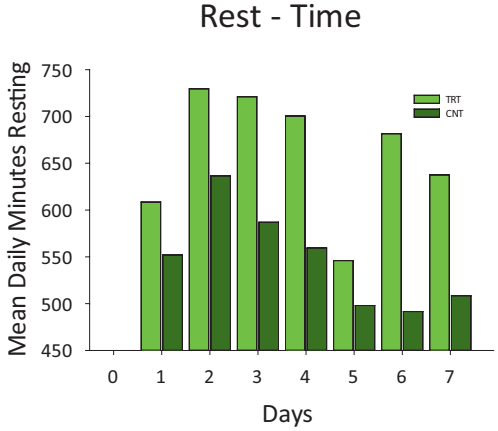


Figure 3: Daily mean number of minutes at rest for cows experimentally infected with *Streptococcus uberis* (TRT) on day 0 and uninfected control cows (CNT)

Klebsiella species counts in bedding of recycled manure solids

Controlling the incidence of bovine mastitis is based upon reducing the exposure of cows to mastitis pathogens in the environment. Bedding in stalls is very closely tied to the bacterial exposure of the cows due to the fact that cows spend 8–16 h daily lying down with their udders in direct contact with the stall surface material. Complicating the assessment of disease risk attributed to bedding is the fact that bedding costs are one of the greatest variable expenses on the farm. Manure is a readily available by-product of dairy cows. Bedding stalls with recycled manure solids allows the use of the waste and promotes profitability of anaerobic digestion that produces manure solids as a by-product of the process. However, managing the use of recycled manure solids as bedding is a tenuous balance between economics, disease risk and cow comfort.

Two management strategies are commonly employed to use recycled manure solids in free stalls: deep packs and daily replacement. Deep bedding packs are reported to minimize labor costs due decreased time spent filling stalls. Daily replacement of bedding in the back one-third of stalls has increased labor costs associated with grooming stalls, but enhanced cow cleanliness compared with deep packs has been attributed to daily replacement of bedding. The disease risks associate with the two management strategies have not been compared. Therefore, a six-week study was conducted to directly compare *Klebsiella* species counts in deep-packed manure bedding with those in bedding replaced daily.

Eighteen Holsteins cows were housed in one pen with unlimited access to 18 stalls. One row of nine stalls was covered with vinyl-surfaced mattresses. All bedding was removed each week, approximately 30 kg of fresh recycled manure bedding added to the brisket area of stalls, and the back one-third of stalls covered in 25 mm recycled manure solids. For the next six days, all bedding was completely removed daily from the back one-third of mattresses and bedding from the brisket area of stalls was pulled to the back one-third of stalls to maintain a bedding depth of 25 mm. The remaining row of nine stalls was bedded with 100–150 mm of deep-packed, recycled manure solids. Minimal bedding was added to deep pack stalls only to replenish bedding removed due to fecal contamination. *Klebsiella* species counts were enumerated four times each week. Bedding in the back one-third of stalls was sampled immediately after fresh bedding was added to daily replacement stalls (day 0) and immediately prior to daily removal of bedding on days 1, 2 and 6 of each week. The surface 25 mm of bedding in deep packs was sampled each time samples were collected from daily replacement stalls.

Klebsiella species counts in recycled manure bedding were reduced by daily replacement of bedding compared with bedding that remained in deep packs (Figure 1). This difference was an approximately tenfold reduction in total *Klebsiella* in bedding on each sample day. Previous trials in our laboratory have shown positive correlations between bacterial counts in bedding and bacterial counts on teat ends and clinical mastitis. Daily replacement of recycled manure bedding from the back one-third of stalls appears to be an effective management approach to reducing exposure to *Klebsiella* and reducing the risk of clinical mastitis.

Dana Sorter and Joe Hogan
The Ohio State University, Wooster, OH, USA
E-mail: hogan.4@osu.edu

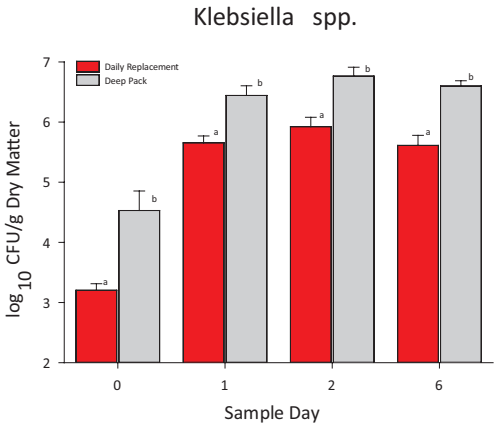


Figure 1: Mean $\log_{10}$ *Klebsiella* counts in recycled manure bedding either replaced daily or maintained as deep packs in free-stalls. Sample days are related to days of the week and the trial was replicated for 6 weeks. Means within day with differing letters (*a*, *b*) differ significantly ($P<0.05$)

Figure 1: Bedding stall with recycled manure solids

Figure 2: Klebsiella in recycled manure bedding were reduced by daily replacement of bedding

A review of the literature on treatment and preventive measures for bovine lameness between 2000 and 2010

Figure 1: One foot lesion picture

The aim of this study was to collate and review the peer and non-peer reviewed English language literature on the treatment and prevention of foot lameness in cattle published between 2000 and 2011. Then, using these papers, to identify deficits in knowledge and areas of disparity between what is recommended in the field by veterinarians, foot trimmers and advisors and what has been substantiated experimentally.

The peer reviewed database contained 591 papers, of which 286 contained information on treatment or prevention. The vast majority of papers (258) concerned prevention; only a small number covered treatment (31) and of these only three contained information on the treatment of sole ulcers or white line disease. The number of intervention studies and trials was low; most papers on prevention were observational. There were 46 sources for non-peer reviewed material; these varied significantly in regard to the treatments advocated, with some texts directly contradicting each other.

Controlling lameness is thus currently one of the greatest challenges facing the dairy industry. The levels of lameness in cattle, particularly dairy cows, in the UK and worldwide, are unacceptably high (Archer et al., 2010a; Tadich et al., 2010; Espejo et al., 2006). Most lameness is caused by four different diseases of the foot, namely, sole haemorrhage and ulceration (SU), white line disease (WLD), digital dermatitis (DD) and interdigital necrobacillosis, although other causes exist (Cramer et al., 2008).

Early identification and prompt and effective treatment of clinical cases is essential in order to reduce the duration of time over which animals are lame and, secondly, the implementation of effective farm-specific prevention strategies is needed to decrease the rate at which new cases develop. These approaches require clear evidence, for which on-farm control strategies and treatment protocols provide the most appropriate and cost-effective options.

Lameness is a presenting clinical sign rather than a disease in its own right. The predominant cause of lameness varies between different farms, regions and countries (see, for example, Manske et al., 2002; Chesterton et al., 2008; Cramer et al., 2008; Tadich et al., 2010). The diseases associated with clinical lameness have different aetiologies (particularly between the claw horn lesions and infectious causes) and, consequently, a wide range of different risk factors have been identified between conditions (e.g. Somers et al., 2005; Barker et al., 2009; Cramer et al., 2009). If the cause(s) of the lameness is not identified and described in research studies it is very difficult to translate the findings into control and prevention strategies for individual farms (as veterinarians and advisors must do). Many studies do not clearly identify the cause of the lameness.

The number of intervention studies and clinical trials, particularly in the area of lameness prevention, was relatively low.

Further carefully constructed experimental work is needed in this area to ensure that farmers are given the best advice in what is an expensive area to make management and husbandry changes. Although high quality intervention studies are more diffi-

cult to design and much more expensive to run, without them we will remain unsure of the relative merits of the different preventative and control strategies currently being delivered around the world. The most striking shortfall identified in this dataset was the lack of well-controlled papers on the treatment of the claw horn lesions (WLD and SU); there is an almost complete absence of work in this area.

This piece of work highlights the need for well-designed intervention studies to address the deficits highlighted in this review.

Figure 2: One foot lesion picture

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Dr Elizabeth Berry
DairyCo, Agriculture & Horticulture Development Board, UK
E-mail: elizabeth.berry@dairyco.ahdb. org.uk

Effect of manure treatment methods in cowsheds on udder health and milk quality

One of the major conditions for maintaining udder health in pack barns is keeping the pack as dry as possible. Use of bedding materials is both costly and requires constant manure removal from the barn (environmental protection).

Purpose of the study: To evaluate and compare two pack treatment methods and their effect on udder health.

Course of the study: The observation was conducted over the course of one year in a commercial dairy farm located in the Shefelah region [Judean lowlands], where the cows are milked three times a day with an average production of 39 litres/cow/day.

Treatments: In one barn, the pack was treated by harrowing the surface to a depth of up to 5 cm; in the second barn, deep cultivation of 30–50 cm was applied (Figure 1). Neither method involved the addition of bedding material throughout the observation period.

Cows were designated to two similar groups (73–76 cows in each group) from the second calving and up according to milk yields, somatic cell count and days from calving. Both groups were kept in barns of a similar structure and area per

Figure 1: Harrowing the surface (0–5 cm) and deep cultivation (30–50 cm)

Figure 2: Deep cultivation creates drier cattle pen conditions

cow (22 m^2/cow). Both packs were treated daily throughout the months of the observation.

The effect of the various treatment methods were monitored by culturing of the pack for pathogens, dry matter content and the incidence of udder infections. Six fixed sampling points were determined and marked, from which the manure (100 g) was sampled once a month. The samples (n=144) were taken proximate to the monthly DHI check, and were transported in a refrigerated vehicle to the Udder Health Lab in Caesarea for performance of the following tests: total cell count, differential cell count (*E. coli* and *Streptococci*) and the pH level of the soil sample. At the same time, soil temperature was measured (at a depth of 10–15 cm) as well as air temperature and relative humidity on the testing day. The percentages of dry matter in the manure samples were tested at the Vulcani Institute laboratory. The cleanliness of the cows was monitored in both groups on a form for evaluating cleanliness. Ten standing cows in each group were inspected once a month for cleanliness of udder, legs, tail and body sides. Values ranged from 1–4, with 1 being very clean and 4 being very dirty (the evaluations were according to a cleanliness/dirtiness ratio in each area of the cow's body inspected). Also tested was the incidence of clinical and sub-clinical udder infections (according to the somatic cell count at the time of the monthly DHI), pathogens and the severity of the clinical udder infections.

Results

Microbiological composition of the manure:144 manure tests were taken for total bacteria and differential bacteria counts from all determined sampling points in the barn during all the trial months. A decrease was found in the total count (P<0.04), *Coliform* counts (P<0.004) and *Streptococcus* (P<0.0001) in the "deep cultivation group" as opposed to the "harrowing group".

Soil temperature and pH level: Internal manure temperature was tested when taking the monthly manure sample. It was found that the mean temperature in the deep cultivation group was higher throughout the sampling months (32.9°C versus 26.2°C in the harrowing group). The temperature never reached 60°C – the right temperature for creating proper compost. It was found that the deep cultivation process raises the temperature as compared with the harrowing group. The air temperature under the barn roof, sunlight or relative humidity were not found to have any effect on the manure temperature. Acidity (pH) in the deep cultivation group was found to be more basic than in the harrowing group at 9.265 versus 9.089 (P>0.016).

Percentage of dry matter in soil: The test was conducted to compare the dry matter content at the different sampling points within each barn and between the two barns. Despite the large variance between the sampling points in the same cowshed, significantly higher levels were found in the sampling points in the deep cultivation barn and in the total amount of dry matter (59.8% versus 47%) throughout the year (P<0.001) (see Table 1). The percentage of dry matter in the two groups at the beginning of the trial started from a level of 47–48%. A steady increase of up to over 60% was found in the content of dry matter in the deep cultivation group. At the same time, the dry matter in the control group did not change throughout the months, remaining at 40–47%.

Table 1: Dry matter of cattle manure (%) in experimental plots

Month	Culture	Non-culture	S.D. culture	S.D. non-culture
0	46.8	48.9	±4.28	±2.37
1	64.4	48.4	±10.46	±2.43
2	58.9	48.7	±11.4	±1.13
3	60.3	48.3	±10.43	±3.76
4	63.4	48.7	±6.68	±7.09
5	63.8	47.9	±14.02	±3.26
6	59.4	43.8	±4.57	±2.55
7	53.8	42.3	±3.44	±3.11
Average	58.8	47.1		

S.D. Standard deviation

Cleanliness of the cows: The cows in the cultivation group were found to be cleaner than those in the harrowing group in the different areas inspected on the cow's body and, on average, in the general cleanliness index of both groups (1.66 versus 2.24, respectively).

Somatic cell counts – sub-clinical udder infections: DHI somatic cell count was tested in both groups to quantify the results into one common denominator. The percentage of cows found without udder infections was recorded based on their somatic cell count level (percentage of cows with results below 200,000 SCC/ml in both groups). It was found that, on average, the percentage of udder-healthy cows in the cultivation group was higher in most of the months compared with the harrowing group (70.6% versus 65.4%).

Clinical udder infections: Borderline significant differences were found (P>0.067) in the incidence of clinical infections. It was found that the most common pathogen in both groups was *E. coli* (70%). Other pathogens were cultured in the harrowing group, such as

Streptococcus dysglacia and *Arcanobacterium pyogenes*. These factors impacted the severity of the infection and recoverability in the control group.

Summary

This study found for the first time, in a controlled manner and based on laboratory tests, that the deep cultivation method creates drier cattle pen conditions, higher cattle pen temperature and a basic environment, which together affect the concentration of bacteria in the cattle pen. The main effect on udder health was a decrease in the percentages of sub-clinical udder infections. It is noteworthy that applying this method requires suitable environmental conditions (more than 20 m^2/cow), equipment and technical capabilities (proper deep cultivation) and, above all, the environmental treatment must be carried out in a fixed daily routine in order to obtain the optimal effect, as described in this study.

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The Shmuel Friedman[1],Danna Menis[1], Adin Schwimmer[1], Zeev Feldheim[1] and Zvika Weinberg[2]
[1]Israel Dairy Board – National Service for Udder Health and Milk Quality
[2]Vulcani Institute – Laboratory for Preservation of Fodder and By-products
E-mail: shmulik@milk.org.il

News from member countries

How we use the PCR test PathoProof in Denmark

We have found that the PathoProof PCR test is much more sensitive than the traditional culture when we are looking for *Streptococcus agalaciae* both in our bulk tank milk (BTM) screening program and in individual cow samples. Meweu et al. (2012) found in BTM samples at a cut-off threshold cycle value (Ct)<40 that the sensitivity for PCR was 95.2 compared with 68.0 for culture. Mahmmod et al. (2013) found in individual cow samples that the sensitivity for PCR on DHI samples was 95.2 compared with 25.7 for culture on single quarter samples.

Bulk tank test

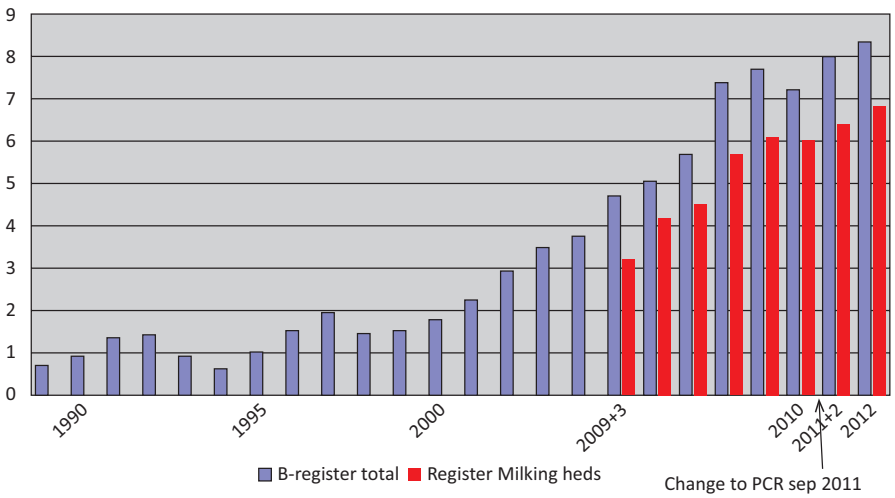
The high sensitivity is one of the main reasons for our interest in the PCR test for mastitis pathogens. In 2011, we changed the test we use in our yearly BTM surveillance program for *S. agalactiae* from culture to PCR and it is well accepted by the farmers and advisors. During the time using culture we often had a farm-positive result at one test and then negative at the next. With the PCR test, our results seem more stable and we are more convinced that a negative PCR test is related to a negative herd.

In 2012, we found 6.0% of our herds positive at the yearly screening and at 31 December 2012 we had 6.9% of our milking herds registered in the Danish *S. agalactiae* register.

In the autumn of 2010, a few herds in Denmark started to have problems with *Mycoplasma bovis*. This escalated in 2011 with many reports of a lot of problems, especially with mycoplasma arthritis, and in some herds many cows had to be euthanized due to animal welfare considerations after these outbreaks. So, in the yearly testing program we changed from the former 12-kit test to the new 16-kit test, which also gave us the possibility to screen all herds for *Mycoplasma bovis*. In 2011, we found 69 out of 3921 herds (1.8%) and in 2012 we found 74 out of 3770 herds (2.0%) positive at Ct<40. We followed some positive herds with monthly testing and it looks as if most of the herds with a positive BTM test for *M. bovis* become negative after 2–3 months (Katholm et al., 2012). Farmers and advisors like using the BTM testing for *M. bovis* if they start having clinical problems with suspicion of *M. bovis*. It is a fast test and seems to give a correct herd diagnosis if positive. Furthermore, if BTM samples are followed every 1–2 weeks the clinical cases in the herd normally also stop when the test gives a negative result. The test can be negative for many reasons even though a positive cow (e.g. with lung or arthritis problems) is in a herd. Therefore, the test is not good enough to be used to state that a herd is negative for *M. bovis* but we find it good enough to be used in diagnosing positive herds.

Farmers and advisors can see all the results from the 12- and 16-kit BTM testing in the Danish Cattle Database. The PCR results for the other pathogens is used in some herds to follow the development in the mastitis situation in the herd, for example, whether a *Staphylococcus aureus* problem is becoming under control or whether a *Streptococcus uberis* problem is increasing (Katholm et al 2012).

Prævalens of herds in B-register i Denmark 1988 - 2012



Individual cow test

Most testing at the cow level is on DHI samples. The last two years more than 50,000 samples were tested each year. The Danish regulation says that it is necessary to have a positive test for infection to be able to carry out dry cow therapy. This test has to be less than 35 days old at time of therapy.

Until 2009, all the test were made in the local veterinarian's laboratory by traditional culture. In 2010, we started to also test DHI samples using the PCR test. More than half of the tests before dry cow therapy are now made by PCR on DHI samples.

Also, in cases of attempts to eradicate infections with *S. agalactiae*, individual cow testing on DHI samples is a way to find infected cows in order to segregate, cull or treat them. Years ago this was also done on bacteriological samples but, due to the low sensitivity, the attempts to eradicate infection in the bigger Danish farms often failed.

Carry over and proper sampling

We have found carry over in the cases of BTM samples. In Denmark, these samples are taken from the trunk during loading of the milk through a VM Tarm valve. We have demonstrated that more than 10 tons of negative milk has to pass the valve after an infected farm before the sample taken by the valve becomes negative for *S. agalactiae*. So, in order to handle this situation, herds with a new positive sample are resampled directly in the tank if there is a risk of carry over.

Also, we have demonstrated carry over in cases of DHI samples. To reduce the risk of carry over it can be necessary to take samples by manual sampling directly from the cows. But, we have also found cases of carry over due to contamination during manual sampling.

If DHI samples are used it is important to take the samples as aseptically as possibly. Clean teats and quarter, milk out more strips from all four teats to remove bacteria in the teat canal, and finally swab with alcohol on the teat ends to have as few bacteria from the skin contaminating the milk. In all systems, reduce milk line lengths and residues of milk between cows and, especially in the AMS pump, the milk collector should be as empty as possible.

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Jorgen Katholm,
Ilka Klaas and
Torben Bennedsgaard
Knowledge Centre for Agriculture, Cattle, Denmark
E-mail: jka@vfl.dk

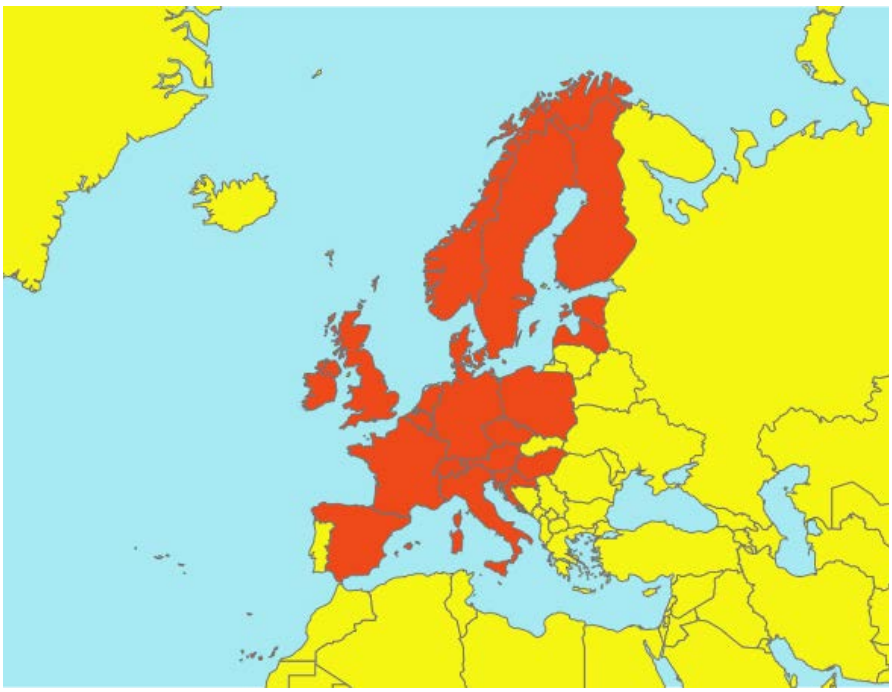
Schmallenberg virus

Schmallenberg virus (SBV) is a newly discovered virus infection in ruminants and was first found in Schmallenberg in Germany in late 2011.

The virus is classified as belonging to the Simbu sero-group within the virus family *Orthobunya*virus.

Spread of the disease

At present, 22 countries all in Europe (Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Germany, Ireland, Italy, Latvia, Luxembourg, Netherlands, Norway, Poland, Slovenia, Spain, Sweden, Switzerland, UK) have reported cases of SBV (Figure 1). Furthermore, antibodies against the infection have been found in Russia.



Transmission of the infection

The biology of SBV is not fully understood but it shares similarities with the other Simbu virus found in Australia, Asia and Africa.

Furthermore, the European Commission has donated 3 million euros to co-finance research projects in SBV biology and infection dynamics, from which there are some preliminary results.

The virus can infect a number of ruminant species including cattle, sheep, goats, buffalos, bison, llamas and deer. Infection in humans has not been seen and is highly unlikely.

The virus is spread between animals by means of vectors. The possible vectors are midges, which are biting insects. This method of transmission is shared with the bluetongue virus, which swept over Europe from 2006 to 2009, but this is the only significant similarity between the two. The virus seems not to spread directly between animals; however, vertical infection from a pregnant female to the offspring is possible. So far there is no evidence of vertical transmission in midges. This means that spread of infection only occurs when midges are present, i.e. in the north of Europe no transmission occurs from November to April. Thus, taking the very short viraemic period of the infected animal into account, the infection has to start over in spring with new introduction of infected midges from the south.

The virus has been detected by RT-PCR in semen from seropositive bulls. It is not known, however, if transmission can occur by artificial insemination

Symptoms

The incubation period is 1–4 days and the duration of the viraemic phase is 1–5 days. Symptoms can occur 3–5 days after infection. Most infections result in no or mild clinical signs.

These can include:

Adults (cattle)
Probably often unapparent, but some acute disease during the vector-active season:

- Fever (>40°C)
- Impaired general condition
- Anorexia
- Reduced milk yield
- Diarrhoea
- Recovery within a few days for the individuals, 2–3 weeks at the herd scale
- Abortion

Because the symptoms are non-specific, all possible causes of fever, diarrhoea, decreased milk production and abortion/malformations should be taken into consideration. The affections mentioned above in adults have only been seen in cattle. The afflictions of the foetus mentioned below can also occur in sheep and goats.

If a pregnant animal is infected during a certain period in pregnancy (for cattle presumably between 62 and 173 days, sheep between 28 and 56 days) the outcome can be abortion, stillbirth or malformation of the offspring.

Malformed animals and stillbirths (calves, lambs, kids)

- Arthrogryposis (bent limbs) / hydranencephaly (fluid in the brain)
- Brachygnathia inferior (short lower jaw)
- Ankylosis (fixed joints)
- Torticollis (fixed back bending and twist of the neck)
- Scoliosis (twisted spine)

The diagnosis can be confirmed by laboratory investigation (PCR) of relevant samples. An antibody-positive blood sample does not confirm the diagnosis.

Other related *Orthobunya* viruses stimulate a strong immune response, which protects infected animals from subsequent ill effects. This means that they do not usually give birth to further deformed offspring. It is expected that SBV will behave in a similar manner.

Control

There is no treatment for the infection other than symptomatic treatment of diseased animals. Furthermore, prevention is difficult because it is practically impossible to keep the vector from the animals.

A vaccine has been developed against SBV infection. However, given the impact of the disease and that the dynamics of the infection lead very quickly to natural immunity in a large proportion of the animals in infected herds, situations where vaccination is justified are limited.

Impact

The conclusions from the first years of the spread of the disease and preliminary results of the on-going research indicate minor impact of the infection at the herd level. The number of affected offspring is typically low. However, a small number of cattle farms have reported more significant impact among adults. In infected sheep flocks, the number of affected offspring can be high because of the seasonal lambing.

The impact on a national level likewise tends to be low although in high prevalence areas (e.g. Belgium) the herd seroprevalence can be as high as 100% in sheep and cattle and the within-herd prevalence around 85%.

However, a number of countries have imposed trade restrictions on import of live ruminants because of SBV infection. This is not justified according to the international trade regulations because SBV is not on the list of important diseases of the OIE. Russia has submitted a proposal to the OIE in order to get the disease listed.

Erik Rattenborg,
DVM, Ph.D.
Danish Cattle Federation
E-mail: ERA@vfl.dk

French plan for antimicrobial reduction

Antibiotics are medicinal products capable of achieving the destruction or cessation of multiplication of microorganisms. After its discovery in 1928 by Sir Alexander Fleming (penicillin G), and within less than a century, the use of antibiotics has developed in both human and veterinary medicine.

Antibiotics are widely used in both the curative and preventive treatment of human beings and animals.

Antimicrobial resistance is probably one of the major medical challenges of the 21st century. The transfer of resistance through the environment and the food chain, the potential for development of resistant bacteria and the appearance of therapeutic failures in human medicine, notably due to zoonotic bacteria, constitute major health issues for livestock farming sectors. Such resistance is a natural phenomenon given that certain bacteria are not naturally sensitive to certain antibiotics. However, any inappropriate use of antibiotics in human or veterinary medicine can encourage the selection of resistant bacteria.

Internationally, there has been a great deal of reflection in international organizations such as the FAO, WHO and OIE during the 1990s on how to combat antibiotic resistance.

In France, the authority responsible for human health has implemented, starting in 2001, a national plan to preserve the effectiveness of antibiotics. In the 10 years of the programme, consumption of antibiotics in human medicine has declined by about 16%.

In the area of animal health, several programmes have been initiated by the authorities for the monitoring of resistance (networks, surveillance programmes, monitoring of sales of antimicrobials and farm surveys).Based on those initiatives, the French Ministry of Agriculture set out to mobilise in a sustained and consistent manner all the professionals (farmers, vets, technicians, in industry) involved in the implementation of a national action plan for a reduction in the risk of antibiotic resistance in veterinary medicine.

The action plan has two objectives:

1. To reduce the contribution to bacterial resistance made by the antibiotics used in veterinary medicine and its consequences for public health
2. To preserve the therapeutic tools on a sustainable basis, especially given that the prospects for development of new antibiotics are limited in veterinary medicine

It aims to achieve a reduction of 25% in use over five years (2012–2017) by developing alternatives able to protect animal health while avoiding recourse to antibiotics. To achieve those objectives, the plan has been built on five priorities (through 40 measures):

1. Promotion of good practice and raising the awareness of agents to the risks arising from antibiotic resistance and the need to preserve the effectiveness of antibiotics
2. Develop alternatives to antimicrobials use
3. Reinforce the regulation of commercial practices and prescribing rules
4. Improve the monitoring of antibiotic use and resistance
5. Promote the same approach on European and international levels

Regarding cattle, the plan focuses on four points:

1. Development of vaccination strategies, especially for the allotment of veal calves and beef cattle
2. The use of a risk analysis approach to limit group treatment of fattening livestock and incoming cattle lots
3. Limitation of use of fluoroquinolones, these being widely used for the treatment of neonatal diarrhoea, by redefining good husbandry practices
4. Promotion of practices for selective and differentiated treatment relating to drying off (treating only infected cows or animals at particular risk).

Dr Fatah Bendali
Ministère de l'Agriculture de l'Agroalimentaire,
Paris, France
E-mail: fatah.bendali@agriculture.gouv.fr

Theileriosis in New Zealand

Theileriosis, an anaemia, in dairy cattle is a protozoal disease caused by *Theileria orientalis.* This disease has long been endemic in the most northern parts of New Zealand but with a low morbidity. Since August 2012, cases have been reported in approximately 40 herds with a mortality rate approaching 1% of cows in the herd and a prevalence of up to 50% infection in affected dairy herds. Affected cows have a drop in seasonal milk production of approximately 30% and poor reproductive performance, in addition to clinical anaemia usually presenting as lethargy. The disease appears to have spread south into the Waikato and Bay of Plenty, with the majority of new reports in early 2013 from these regions.

Theileria orientalis Ikeda has been isolated. This strain is apparently new to New Zealand, certainly not recognized in 400 samples tested since 2008. *Theileria* are known to be transmitted by *Haemaphysalis longicornis* (*Ixoda: Ixodidae*), the indigenous cattle tick, and tick specimens have been confirmed as having *Theileria orientalis.* The 2012–2013 summer was marked by a hot summer and a significant drought in the affected areas. This may have affected tick activity and abundance. Another risk factor may be high numbers of cattle movements, greater than usual in response to shortage of grazing in the dry summer.

The summer of 2013–2014 is awaited with interest.

J. Eric Hillerton
DairyNZ,
New Zealand
E-mail: eric.hillerton@dairynz.co.nz

Lumpy skin disease outbreak in Israel 2012

Figure 1: Systemic appearance in dairy cows yielding 40 kg one day prior and nil milk production at presentation; fever of 41°C, nodules, oedema

Introduction

Israel's location in the eastern part of the Mediterranean basin at the junction between continents poses the risk of exposure to infectious diseases considered to be endemic in neighbouring countries. Lumpy skin disease (LSD) outbreaks (1989, 2006, 2007) in Israel occurred in the summer months, in the southern dairy and beef farms, following outbreaks in Egypt and the Gaza Strip. Surveillance and prevention by annual cattle vaccination with sheep pox vaccine were carried out in the central and southern districts of the state. The index case in the 2012 outbreak was in July, in naïve beef cattle herds pasturing at an altitude of 2000 m in the northern district where the Syrian, Israeli and Lebanese borders meet. After implementing control measures such as vaccination, cattle movement restriction and culling, the current outbreak was mostly contained within 9 m from emergence.

Etiology and epidemiology

LSD is a severe infection in cattle caused by the LSD virus of the genus Capripoxvirus. The virus is transmitted mechanically by partially undefined blood-feeding insects. The incubation period lasts 2–4 weeks. The index case in the current outbreak occurred in a beef cattle herd, presenting "sit-fast" lesions, which generally appear 1 month post infection.

Clinical Signs

High fever due to generalized lymphadenopathy, dyspnea, profuse drooling, limb oedema and large numbers of flat-topped, coin-sized cutaneous lumps. Post-mortem examination reveals nodules on the kidneys, lungs, gut and testicles.

Table 1: Within-herd morbidity, within-herd case fatality and within-herd mortality rates in the 2012 LSD outbreak in Israel

Herd type	Exposed heads	Morbidity rate (%)	Case fatality rate (%)	Mortality rate (%)	Euthanized rate (%)
Beef cattle	25,147	1–95	0–25	0–25	0.06
Dairy cattle	22,219	1–90	0–0.05	0.2	1.5

Control

Vaccination of all susceptible cattle in the first months post-emergence in the northern districts of the country was performed with live attenuated sheep pox strain RM-64 (Jovac, Jordan), due to antigenic resemblance between lumpy skin disease virus and the other pox viruses. Because vaccinated cattle challenged by natural infection were found to be unprotected and presented disease symptoms, a safety trial for a sheep pox vaccine with tenfold the number of viruses per dose (Pox10, Jovac) and the Neethling strain vaccine (OBP, South Africa) was carried out. Upon approval, all of the country's susceptible cattle were revaccinated with these vaccines. Their efficacy will be evaluated under natural viral challenge by monitoring morbidity and mortality rates in 15 selected dairies that were not exposed to LSD at the time of vaccination. In the present outbreak, selective culling of all new cases was performed daily in infected dairy herds to limit the extent of morbidity. Daily control of insect burden was carried out by using fly repellents and fans operating nonstop at the dairies to repel blood-feeding insects. In extensive grazing beef herds, insecticides were used to supplement vaccination.

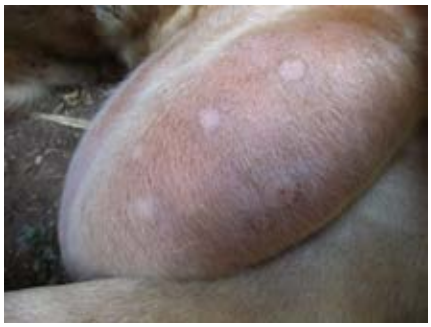


Figure 2: Nodular, flat, coin-shaped lesions on testicles and teat in dairy cattle

Discussion

The current and past LSD outbreaks in Israel pose a hazard for naive cattle that are at risk of contracting emerging diseases from endemic countries due to a lack of control and inspection in the international livestock trade and the well-documented involvement of short- and long-distance winds associated with infected insects. No differences in efficacy were monitored

between the two vaccines for 3 months after treatment. Better global proactive disease control should be considered in order to protect animal welfare and prevent the economic damage stemming from emerging and remerging diseases.

Benny Sharir, DVM
Hachaklait, Israel
E-mail: Sharir@hachaklait.co.il

Figure 3: Systemic appearance in dairy cows yielding 40 kg one day prior and nil milk production at presentation; fever of 41°C, nodules, oedema

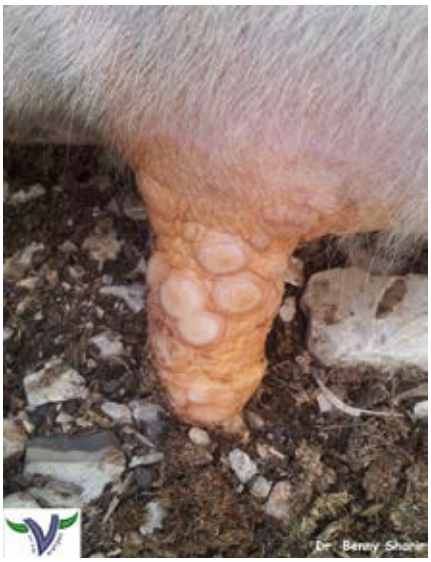


Figure 5: Nodular, flat, coin-shaped lesions on testicles and teat in dairy cattle

Figure 4: Charolais breeding bulls. Note sub-iliac lymph node enlargement and multiple lumps on the trunk

Bovine tuberculosis control in New Zealand

New Zealand's bovine TB control programme is recognized as world leading. A government–farming industry partnership, its achievements have been built around a three-pronged approach consisting of wild animal control, disease control and movement restrictions on the 70,000 registered cattle and deer herds.

Working with an annual budget of $80 million, unchanged since 2001, the TBfree New Zealand programme has driven infected cattle and deer herd numbers down from almost 1700 in 1994 to about 88 in May 2013. Of these, 54 are dairy herds. Although movements of dairy animals can bring additional risk, some 70% of all new herd infections can be traced, through DNA strain typing, to possums, an exotic animal the size of a big cat that lives in the wild with populations in the past reaching 70 million.

The target of reaching 0.2% infected herd period prevalence (the OIE standard for TB

freedom) was reached in December 2011, some 18 months before its target date of June 2013.

Progress in reducing infected herds has provided a platform for funders and other TB control strategy partners to embark on a process of eradicating the disease from wildlife in New Zealand. By 2026, the objective is to eradicate TB from wild animals, specifically possums, across at least 2.5 million hectares of identified TB risk area. The total risk area comprises 40% (or 10 million hectares) of New Zealand's land mass where the disease has been found in a range of wildlife.

The role of the introduced Australian brushtail possum in both spreading and maintaining TB within its own populations is scientifically proven. Effective control of an animal regarded as an introduced pest continues to be seen as pivotal to the eventual eradication of the disease from farmed cattle and livestock.

Using a range of techniques, including wild animal surveys and scientific modelling, more than 400,000 hectares of the 2.5 million hectares have already been declared free of TB in wildlife. The rate of progress towards eradication depends on a range of factors but the intensity of vector (wild animal) control is necessarily varied and split into distinct choices, given the limited finds available.

Improvements to possum control techniques, risk assessment, a greater use of technology and enhanced approaches to contract management of TB testing and possum control are informed by a comprehensive research programme, with the goal of increasing operational efficiency.

The national TB control strategy, including funding, is comprehensively reviewed every five years, although regular performance updates are provided to funding partners and stakeholders more frequently, including progress towards objectives.

The fall in infected herd numbers has presented a range of challenges. These include ensuring that farmers do not believe the job is done and that they continue to comply with the scheme and its requirements.

There is also a continuing need to ensure that the next generation of farmers, many of whom have never experienced TB, understand the historical investment and the significant effort in achieving the current position of contemplating eradication of the disease from wildlife – which if successful it is believed would be a world first.

Willy Leferink
Chair Federated Farmers Dairy
Federated Farmers of New Zealand,
Wellington, New Zealand
E-mails: leferinks@gmail.com; wleferink@fedfarm.org.nz

Future meetings and reports of past meetings

Cow longevity – a scientific conference on cow comfort and best practices to increase life time productivity

The controlled replacement of old cows with newly calved 1st calvers is the heart and motor of the milk production of a dairy herd. Ideally, each dairy cow leaves the herd healthy at a pre-planned time point, preferably at the end of lactation after having served her master well and rendering full payment for the value of meat. At the same time, a more profitable newly calved cow raised on the farm stands ready to replace her predecessor.

However, this ideal situation is often not achieved and the high turnover rate of cows in intensive milk production is increasingly attracting more attention. In many places all over the world the average productive life length of a dairy cow stays at 2.5 lactations, reflecting that 35–40% of the cows are replaced on a yearly basis. Of these, 70–80% are culled due to health or fertility problems, 20–30% are 1st calvers, 15–25% leave before 2 months of lactation and up to 25% die or are euthanized.

The three main reasons for culling are failure in getting cows pregnant, mastitis and lameness. In combination with extended calving intervals and losses in calf and young stock, many herds run into problems retaining herd size and are forced to purchase replacement heifers, thereby taking biosecurity risks. Apart from the negative effects of these disturbances on welfare and use of veterinary medicines, they influence farm profitability and sustainability due to considerable economical losses.

The company vision of DeLaval is to make sustainable food production possible and this is why we have decided to take the lead in raising awareness of the importance of longevity and lifetime productivity. As a first step, we have arranged a scientific conference "Cow longevity – a scientific conference on cow comfort and best practices to increase life time productivity" at our research farm in August 2013. At the conference, world-leading scientists will present their views on optimal cow-friendly barn design, prevention of mastitis, lameness and infertility and how to care for vulnerable calves and cows from a profitability and sustainability perspective.

Our ambition is not only to raise awareness but also to share the latest knowledge on cow comfort and best practices, with a focus on the longevity of cows in intensive milk production in different climate zones over the globe. Attendance at this conference is by invitation only but local events will be organized during 2014. More information can be found at http://www.delaval.com/Longevityconference

Charlotte Hallén Sandgren, PhD
Dairy Development Director
Business Area After Market & Services,
DeLaval International AB, Sweden
E-mail: Charlotte.HallenSandgren@delaval.com

Guelph hosts Dairy Cattle Welfare Symposium

The inaugural Dairy Cattle Welfare Symposium was held on October 24–26, 2012 in Guelph, Ontario, Canada, hosted by the University of Guelph and its Campbell Centre for the Study of Animal Welfare. This was an international three-day Symposium dedicated to all aspects of the welfare of dairy cattle. The dynamic program featured nationally and internationally renowned keynote speakers, multiple brief presentations of research reports, hands-on workshops, poster sessions, exhibit area, networking reception and a Gala Banquet. The symposium attracted 292 registrants from 18 countries across the globe. The Symposium registrants included a diverse mix of individuals including veterinarians, dairy cattle producers, support industry representatives, researchers, graduate students and undergraduate students. Although most attended in person, a small number participated via webcast.

Attendees had the opportunity to experience three dynamic days of interaction with outstanding speakers and exhibitors and to discuss recent research findings and recommendations. The interactive forums promoted networking with colleagues involved and interested in the welfare of dairy cattle, workshops to help identify welfare issues on dairy farms, and dialogue around potential solutions to current welfare issues.

The Symposium provided a venue for the presentation of 25 oral research presentations and 65 posters, while featuring keynote presentations from some of the world's leading experts in the field. These included the following topics and speakers:

- What is animal welfare? – David Fraser, University of British Columbia, Canada
- Public awareness of dairy cattle welfare. – Dan Weary, University of British Columbia, Canada
- Assessment and guidelines for dairy cattle welfare. – Jeffrey Rushen, Agriculture and Agrifood Canada Research Centre in British Columbia, Canada
- Welfare related to feeding, housing and health of dairy calves. – Margit Bak Jensen, Aarhus University, Denmark
- Welfare implications of dairy cattle housing management. – Marina (Nina) Von Keyserlingk, University of British Columbia, Canada
- Welfare implications of dairy cattle feeding management. – Trevor DeVries, University of Guelph, Canada
- Management of lameness and other health problems for dairy cattle welfare. – Becky Whay, Bristol University, UK
- Detection and management of pain in dairy cattle. – Hans Coetzee, Iowa State University, USA

Further details are available on the Symposium website at http://www.dairycattlewelfaresymposium.ca/default.htm

Dr David Kelton
Research Program Director for Emergency Management
Professor of Epidemiology and Graduate Coordinator Department of Population Medicine, University of Guelph, Canada
E-mail: dkelton@uoguelph.ca

SCAHW field visit

The IDF SCAHW meeting took place on 17 and 18th June in Paris. It was an good opportunity for the team to visit AgroParisTech.

Recognized as the leading French Graduate School in Agronomy, Environment, Life Science and Food Technology, AgroParisTech has a tradition of more than 150 years.

AgroParisTech missions are:

- To train Master of Engineering, Master of Science and Doctoral students, through state-of-the art research and partnerships with agro-industrial companies
- To contribute to the advancement of scientific knowledge, in close association with public or private research centres, be it through fundamental or applied research
- To develop our international relations to enhance the career prospects of our graduates worldwide, and participate in the constitution of a global community of research

During the visit to the experimental farm of Grignon, the focus was dairy cattle management and the "Grignon Energie Positive" programme, whose objective is to test and evaluate innovative technical options in order to reduce the energy consumption and greenhouse gas emissions of the farm.

This trip was both technically and socially interesting (...and the sun was out!).Many thanks to the organisers!

For more details:

http://www.agroparistech.fr/energiepositive/
http://www.agroparistech.fr/energiepositive/IMG/pdf/Grignon_Energie_Positive_trois_ans_deja_compresse.pdf
http://www.agroparistech.fr/IMG/pdf/AgroParisTech_brochure_ENGLISH.pdf

Dr Fatah Bendali
Ministère de l'Agriculture de l'Agroalimentaire,
Paris, France
E-mail: fatah.bendali@agriculture.gouv.fr

Animal Health and Welfare Conference at WDS 2013

The IDF World dairy Summit 2013 will be held in Yokohama, Japan from 28 October to 1 November. The theme for the Summit is "Rediscovering Milk" and new industrial technology as well as basic research will be discussed in Conferences in relation to solving the challenges facing the global dairy sector.

Two Sessions are scheduled in Animal Health and Welfare Conference on 31 October. The first Session will focus on animal infectious diseases of importance to the dairy industry. The keynote speaker, Elisabeth Erlacher-Vindel, well-known to IDF members, will give a highly anticipated talk on infectious animal diseases of importance to the dairy sector according to recent OIE activities. Elizabeth Berry from the United Kingdom, will update us on zoonotic diseases from dairy cattle with wildlife connections. The third speaker is Tomohito Hayashi, and he will speak about causative bacterial species of contagious mastitis and introduce recent Japanese studies, which include the development of diagnosis using DNA derived from bacteria, treatment method with intra-mammary infusion of cytokine, and so on. Then, a presentation on arthropod-borne viral diseases in Japanese cattle will be presented by Makoto Yamakawa. Han-sang Yoo will introduce case study on the control of foot-and-mouth diseases in Korea. Finally, Yasuyuki Mori will discuss strategies for controlling Johne's disease in Japan.

The second session will focus on recent progress in animal welfare. In the keynote speech, Tomoko Ishibashi, OIE Asia-Pacific, will introduce the development of OIE animal welfare standards. Then, Seiji Kondo will speak about the current situation and recent developments related to animal welfare in Japan. Sira Abdul Rahman from India, will present animal welfare issues under the five broad systems of rearing. Finally, the relationship between animal welfare and farm economics/food safety will be discussed by Frank Berthe from Italy.

This exciting programme focuses on attracting experts from many countries and we hope you do not miss it. Yokohama is old city opened its port over 150 years ago, where Japan's modernization started and you can get all the details on the website www.wds2013.com.

Prof. Hisao Itabashi
Nippon Veterinary and Life Science University, Japan
e-mail.: wds2013-p@ics-inc.co.jp