Milk Quality Academy

1ST MILK QUALITY ACADEMY

Graduates in udder health

The 1st Milk Quality Academy, organised by Boehringer Ingelheim Animal Health, gathered more than 40 dairy cattle specialists in Utrecht (Netherlands) during the first week of November. Practitioners from different European countries as well as Egypt, Morocco, China and New Zealand enjoyed an attractive workshop format, which favoured close interaction between the participants and with the experts in mastitis leading the event.

The aim of this three-day programme was to provide valuable information about mastitis. To this end, two small work groups were formed and invited to attend both theoretical sessions focused on cutting-edge topics and practical sessions at Utrecht University.

This extensive academic programme covered most mastitis- and milk-quality-related topics, from epidemiology to marketing in mastitis-related services, and also included team-building activities, and two real-life case studies that were solved through discussion and thanks to the participants' contributions.

Getting to know the enemy

Ynte Schukken (GD Animal Health, The Netherlands) started his didactic presentation about the epidemiology of mastitis by highlighting the need to look for different tools to reduce antibiotic use. In this context, the main challenge is to reduce infections in the dry period.

Schukken explained how some intramammary infections (IMIs) are difficult to detect. He also stressed that healthy udders have their own bacterial flora and some infections are therefore not caused by an external entrance of pathogens, but rather by imbalances in the flora and the proliferation of specific pathogens.

Among the different diagnostic tools available, Dr. Schukken described some parameters (SCC, CMT, CFU in milk), which show different patterns depending on the type of pathogen involved in the IMI, and explained how DNA electrophoresis may be useful to know if a case of mastitis is of environmental or contagious origin.

For example, in the case of an *Escherichia coli* infection, the SCC increases significantly and rapidly after challenge and then decreases rapidly. *Staphylococcus aureus*, however, requires more time to proliferate and SCC peaks are lower due to its anti-inflammatory action. Finally, *Streptococcus uberis* also makes the SCC increase and reach a very high peak, which corresponds to the sudden appearance of the clinical signs. Schukken also highlighted the following points: a new IMI is a bacteria-specific event and treatment protocols should therefore also be bacteria-specific; there are important differences between

pathogens in terms of duration and type of infection (contagious vs. environmental); and persistent infections may occur in all bacterial species.

After presenting different case studies, Schukken concluded that strain variation within a species is sufficient to cause any transmission pattern and highlighted that the mammary health status of a herd is determined by the risk of a new IMI, the duration of the IMI and the risk of transmission.

How cows are protected against mastitis?

In his talk about the immunology of mastitis, Ynte Schukken stressed that the innate immune response in the udder is quite bacteria-specific, thanks to receptors in macrophages and neutrophils. These cells recognise the different pathogens and trigger a specific immune response.

For *E. coli*, the immune system is already working 4-6 hours after challenge, and an inflammatory response appears just a few hours later.

In case of an *S. aureus* infection, the bacteria limit the release of cytokines and chemokines, so the immune response is limited and delayed. In some cases, the infection does not completely resolve; some bacteria remain into the cells and are later released, thus maintaining the infection.

Streptococcus uberis can impair neutrophil activation, thereby limiting the memory of previous infections. Bacteria may proliferate in a few hours, with a strong immune response, including sepsis and congestion.

Few clinical cases of mastitis are observed in the dry period; however, most IMIs appear during the dry period: the risk of IMI is higher just after dry-off and in the late dry period. Clinical mastitis may appear throughout the whole lactation period, but the first two weeks after calving typically correspond to the higher risk period.

Schukken stressed that even if there is an infection at the end of the dry period, bacterial growth is limited and there is no pro-inflammatory response or clinical disease in the final stage of gestation. It may, in some way, be a measure to protect the calf from the effect of disease (fever, etc.). After calving, pro-inflammatory cells increase and the clinical disease appears.

Reducing clinical mastitis in lactation requires limiting new IMIs in the dry period and it may be achieved by enhancing the immune response, both innate (by improving teat-end quality, preventing negative energy balance and modulating the immune system) and acquired (by mean of vaccination).

In some countries, artificial pro-inflammatory cytokines are available – they are supposed to reduce the duration and incidence of clinical mastitis, not its severity.

Vaccines against mastitis are also available. *E. coli* bacterins reduce the severity of the infections and associated losses, while *S. aureus* bacterins decrease the transmission rate, which is important for farm epidemiology.

Understanding milking machines

Ian Ohnstad (The Dairy Group, UK) focused his presentation on how milking machines can affect mastitis in three ways: by changing number of bacteria on the teat or at the teat orifice, by changing the resistance of the teat canal to bacterial invasion and by providing forces to overcome the resistance of the teat canal.

Reducing the number of bacteria in the teat requires improving general farm hygiene and implementing appropriate cleaning protocols for the milking equipment. Ohnstad provided some tips for optimal cleaning of the equipment and stressed the importance of liner maintenance and changing.

Regarding teat condition, Ohnstad described the teat canal as the primary barrier to prevent the entrance of pathogens into the udder and stressed the importance of it being tightly closed between milkings. The teat canal is naturally lined by keratin, which traps bacteria and allows their elimination during the milking process. When appropriate compression is applied by the teat-cup liner, it does not interfere with this process; however, if over-pressure is applied, teat-end hyperkeratosis may appear, which prevents the efficient removal of the pathogens adhered to the keratin lining.

Oedema and congestion may also result from over-pressure. It is therefore recommended that the vacuum levels of the milking machine be reviewed and adjusted when these signs are observed. In addition, liners should be adapted to the average teat size of the cows and changed when necessary.

Finally, several factors may impair the resistance of the teat canal, such as liner slip caused by incompatibility between teat and liner, low vacuum level, worn liners and poor cluster positioning.

Scoring for improving

In his second presentation about teat condition, Ian Ohnstad insisted on the importance of explaining to clients the benefits of teat scoring to detect milking and mastitis problems. He presented some documents to support the relationship between teat condition and mastitis and explained how the Teat Club International standardised the teat scoring system.

For Ohnstad, the keys to accurate teat scoring are timing (recommended after milking, routinely every six/twelve months and always after a change in parlour and staff), selecting which cows to be scored (at least 80 cows or 20 % of the herd, across all stages of lactation and all parity groups) and how scoring is carried out (look and touch, correct equipment and devices for recording audio, pictures and data).

The teat-end classification system to be used in the field includes four categories of teats: no ring (small, even orifice), smooth (slightly rough ring), rough ring (1-3 mm from the orifice) and very rough ring (>4 mm from the orifice). Smooth teats are desirable, whereas the others are indicative of a risk of mastitis.

Teat scoring also involves colour evaluation and observation of haemorrhage and oedema/congestion. If alterations are observed, this may indicate incorrect settings of the milking machine. Infectious lesions must also be controlled.

It is important to obtain information using a hygiene scoring system, as it will allow comparisons to be made on the farm and between farms. Farmers are more easily convinced if they are shown the proven relationship between hygiene and mastitis. Both in teat and hygiene scoring, practice ensures

consistency, thus participants enjoyed a practical session at the parlour of the Utrecht University Farm Animal Practice (ULP).

Automated milking systems also need vet supervision

Friederike Reinecke (Regierungspräsidium Giessen, Germany) explained the characteristics of automated milking systems regarding udder health. Firstly, she gave some tips about how to plan individual SCCs, and recommended that analyses of quarter foremilk samples be carried out when infection rates increase from one SCC to another.

Reinecke reviewed the risk assessment methods for each type of IMI: due to contagious pathogens (*S. aureus*, *S. agalactiae*), due to environmental pathogens (*S. uberis*, *E. coli*, *Klebsiella* spp.) and due to skin flora opportunists (coagulase-negative staphylococci). In the case of contagious pathogens, the risk assessment should include verification of the teat-preparation module, making sure the equipment is in good shape (brushes, etc.) and disinfection systems are working fine (back flush, etc.), and maintenance of the teat cups (change of liners, check for efficient disinfection) and equipment surfaces (visible and not visible). Other elements to be assessed are the technical state of the milking robot, the dipping process, teat-condition scoring results and treatments. Teat scoring on automated farms is more complicated given that teats are less accessible and cows are not used to manual contact.

For environmental pathogens, the risk factors to focus on are: cleanliness of the udder and teat-preparation module, drinking water quality, udder hair, general hygiene, feeding management and therapy.

Finally, for skin flora opportunists, it is crucial to assess teat condition, the dipping equipment, teat cleaning and the milking frequency.

Given that a cow on a robotic farm may be milked several times a day, it is important to set a minimum and a maximum inter-milking interval. Both very short and very long intervals can increase the SCC, and so can incomplete milkings. If the inter-milking interval lasts less than 6 hours, the muscles surrounding the teat end become fatigued as the teat end is pulled open repeatedly, and pathogens can thus go up more easily. If, on the other hand, the inter-milking interval is longer than 14 hours, the udder is filled with milk and milk may even leak from the teats.

Reinecke explained how automated milking systems may improve milk yields by 7 % and give farmers more flexibility to do their job.

The dry period: crucial for udder health

Using research data, Andrew Bradley (QMMS, UK) confirmed that a high percentage of cases of clinical mastitis appearing during lactation are originated in the dry period (DP). Bradley explained the background of mastitis in European dairy herds, with a complex aetiology and high variation of risk factors between herds. He also described how the use of many antibiotic dry-cow therapy results in a better control of Gram-positive bacteria, , than Gram-negative bacteria. Especially the early dry period is optimum to eliminate intramammary infections. However, there is a high risk of a new IMI throughout the whole dry period, which may have a great impact on clinical mastitis in the subsequent lactation.

Bradley also reviewed the main factors influencing the dry period outcome in terms of mastitis, such as specific cow factors, bacterial interactions, what occurred in the previous lactation, environment and management (herd factors).

A multi-centre European study on intramammary infections in the dry period was carried out to better understand the dynamics of IMIs, the variation between herds and the impact of infections acquired during the DP and to determine the importance of some key risk factors associated with an increased risk of intramammary infection during the this period.

Results showed that a large number of quarters become infected during the dry period, despite dry-cow therapy, although there is a huge variation between herds in terms of rate of infection and aetiology. As a consequence, in the subsequent lactation, udder health results are affected by the IMIs acquired mainly in the late dry period and most frequently as a result of Gram-negative bacteria.

Bradley advised practitioners to base their approach on the prevalence of mastitis and its aetiology on each farm, and on farm- and cow-specific risk factors, as those factors may have a greater impact than previously thought. He also recommended that veterinary practitioners keep in mind that when clinical mastitis appears, dry-cow management must also be checked.

Does type of bedding matter?

Regarding the relationship between bedding materials and mastitis, Bradley explained that links have been established but are not always clear and consistent. Two research studies have been carried out in the UK: an epidemiological survey of 125 farms and a controlled study of different bedding materials (sand, sawdust and recycled manure solids-RMS) and depths.

The number of pathogens in bulk milk and milk quality were not significantly affected by the bedding material used, which indicates that appropriate teat preparation can compensate high bacterial counts in the bedding. In general, no association was found between the type of bedding material and a new quarter IMI, but it was observed that some bedding materials may be linked to a higher risk of certain types of environmental clinical mastitis.

Beginners in the lab

In an interesting session at the Utrecht Faculty of Veterinary Medicine, Andrew Biggs (VALE Veterinary Group, UK) showed the whole microbiology lab process: from sampling on the farm to bacterial identification, sensitivity tests and interpretation of lab results.

First of all, Biggs explained that the identification of mastitis-causing bacteria is useful to understand when the infection has been originated and select the appropriate antibiotic for treatment and dry cow therapy. Knowing the causal agent helps to understand the infection pattern and to modify management to reduce the likelihood of a new IMI caused by that specific pathogen.

Biggs then gave some tips on sampling and on the interpretation of lab results. Several identification tests were explained in detail, as well as the importance of sensitivity testing to provide appropriate

treatment advice. He discussed the importance of using veterinary instead of human sensitivity thresholds.

The participants then had the opportunity to use the lab to put the topics discussed in the training session in practice. They were able to try different tests for bacterial identification, e.g. observation of Gram-stained bacteria and their shape under a microscope, cultures using selective media, catalase test, colony identification and coagulase tests. This activity was very useful and the perfect complement to the theoretical presentation.

Is it possible to reduce antibiotic use in mastitis?

In her presentation, Tine van Werven (Faculty of Veterinary Medicine Utrecht and University Farm Animal Practice – ULP, The Netherlands) reflected on the treatment of mastitis and how antibiotics are and should be used in dairy practice.

She stressed the difficulty of defining a "golden therapy" for mastitis, as this condition and its outcome may vary depending both on the pathogen involved and on the cow's response. In general, all drugs for the treatment of mastitis work; the issue is how they should be used.

It is important to bear a few elements in mind before starting the treatment. First, veterinary practitioners must understand that antibiotics give the cow's immunity some extra time to work. Then, they must ensure that the treatment is applied at the right time (the earlier the drug is administered, the better). They should also decide which cows are likely to benefit from the treatment, taking into account that individual factors, such as age, SCC, number of affected quarters, and the pathogen involved may help to predict the outcome. For instance, it is unlikely that a cow with a high SCC over a period of several months may be cured. Finally, their choice of treatment should be made with caution. Veterinary practitioners should select the drug to be used depending on the cause of the mastitis, and establish the appropriate dose, interval, route of administration and duration of the treatment. It is important to check the farmers' routines, such as using extended therapies.

Van Werven also described the Dutch approach to reduce the use of antibiotics in animal health. Antimicrobial resistance has become an urgent issue both in human and animal health, and the Dutch antibiotics policy has led to a drastic reduction of the use of antibiotics in animal health. However, a drop of 70 % in the use of antibiotics needs to be achieved between 2009 and 2015 – even though a great reduction has been obtained, this is a hardly attainable goal. The speaker highlighted that results are quite good in dairy cows, and there has been a consistent reduction of the use of antibiotics thanks to good veterinary practices and the involvement of farmers. The concern is that farmers may feel too much pressure and sometimes avoid using antibiotics even when necessary.

To end her presentation, van Werven cited the example of dry cow treatment. In the Netherlands, prophylactic treatment with antibiotics is prohibited, so selective dry cow therapy (DCT) guidelines have been proposed, with hopeful results. In this scenario, optimised management of the transition period is fundamental not just for udder health, but also for the general health status of the herd.

Marketing milk quality services

Bill May's presentation (Lambert Leonard and May, UK) was highly instructive about the use of marketing for dairy practitioners and milk-quality advisers. He stressed the importance of using economic data to motivate farmers in terms of mastitis control. As people are motivated by different factors, it is useful to know the different components of the economics of mastitis (direct and indirect costs). In the UK, mastitis costs millions of pounds every year, and the cost of a clinical mastitis case may vary between 200 and 800 euros in different countries (according to the participants' data). Practitioners must detect the elements that act as strong motivators for the different farm workers.

For May, marketing is anything a practitioner or milk quality adviser may do, and it is useful to take a step back and think about why we do marketing (to increase incomes, improve the service to dairy industry, etc.). We can then analyse our goals and define a marketing strategy for our business, decide what to market, which is our market niche and what marketing methods we want to use (brand image, communication, etc.). May stressed that enthusiasm is a powerful marketing tool… and it is contagious!

How do your clients make their choice?

Hylke ter Beest's (Kenneth Smit Training, The Netherlands) presentation was highly interactive and focused on the importance of knowing clients well to improve communication. It is essential to reduce disturbances in communication, by both avoiding elements that may distract the client and making sure that client and practitioner are talking about the same thing.

Ter Beest defined four types of purchasing motives, according to Jung's personality theory. Depending on their personality, clients may purchase based on: profit, certainty, convenience and prestige/status. The speaker took the participants through an amusing journey through the four types of clients and how to handle them, including which arguments to use to convince them. The key is to recognise which type of client we are dealing with and adapt our communication methods to it.

The point of view of the cheese industry

Finally, Mark Paauw (Cono Cheesemakers, The Netherlands) described the importance of milk quality in the cheese industry, and highlighted how, in his cooperative, problems are analysed in cooperation with the technicians who provide their services to the farm: vet, feed adviser, milking machine dealer.

More than a formal meeting

The first edition of the Milk Quality Academy stood out for its solid academic program, but also for a social approach that has turned out to be really interesting. The reduced number of attendants, all of them working in the dairy cattle industry, has facilitated rewarding connections from the very beginning of the meeting. Highly-motivated veterinarians willing to expand their knowledge and improve their practice came from around the world to participate in this event and enjoyed an invaluable networking experience.

The workshop format, with groups of less than 20 people, and the skills of the speakers allowed continuous interaction both in theory and practice sessions (and also outside them, during the breaks, meals, etc.). A close relationship between attendants could be established thanks to a very friendly atmosphere during the social activities. Plus, thanks to the collaborative tasks in the teambuilding activity, the participants had the opportunity to empathize and enjoy really funny moments together.

The practitioners who attended the 1st Milk Quality Academy greatly appreciated the format and contents as well as the networking experience, both with other colleagues and highly-qualified mastitis experts. As a result, they could obtain a useful knowledge that they will be able to apply straightaway in their daily work.