tion, the individual cow is still the heart of the dairy economic model. No matter the size, farm level profitability is the direct result of the cow being influenced by four primary factors: 1) Genetics 2) Nutrition 3) People 4) Environment. When all four of these factors are aligned, a healthy cow results in a healthy herd, resulting in profitable farms.

To date, the dairy industry has largely relied on lagging metrics as indicators of performance. Percentage of heifers returned to the lactating herd, 21-day pregnancy risk, and 30- and 60-day cull rates, are only three of many of examples of common lagging metrics used to evaluate performance. Arguably, no singular portion of a cow's lifecycle has been as extensively documented as the transition period. The goal of this presentation is to describe the clinical aspects of managing herd health throughout the transition period. We will do this by focusing on well-defined and common disease conditions, managing those conditions extraordinarily well, and consistently utilizing the information to look ahead and see where the dairy is headed. We propose that by maintaining the cow as the center of system and implementing leading metrics (focused on the four primary factors above during the transition period) cow productivity and farm profitability can be reliably predicted.

Infectious Diseases

K55

Tools for the diagnosis and control of bovine paratuberculosis

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Paratuberculosis (PTB) is an infectious enteropathy with worldwide distribution that mainly affects domestic and wild ruminants and is caused by *Mycobacterium avium* subsp. p*aratuberculosis* (Map) and triggers a regional chronic enteritis. Map infection significantly reduces the cost-effectiveness of cattle farms due to reduced milk production and early replacement of infected animals. Furthermore, Map has been associated with Crohn's disease, so it is considered by some authors as a zoonotic pathogen. The herd-level prevalence of MAP infection is over 50% in most countries with a developed substantial dairy industry. However, it should be considered that this percentage is limited by the small number of large epidemiological studies carried out in the different countries and by the difficulty in the laboratory detection of animals in subclinical stages.

Combining pathological lesions with clinical signs, two forms of infection, latent and patent, can be distinguished. Latent forms are those present in infected animals with focal lesions, very low bacterial load, low antibody titres and absence of clinical signs. On the other hand, patent forms are those presented by animals with multifocal and diffuse lesions, associated with a higher bacterial load and the presence of more or less evident clinical signs. Detection of infected animals before they present clinical signs of the disease is one of the challenges in laboratory diagnosis. So far, the combination of microbiological (culture and rt-PCR) and serological (ELISA) techniques with complementary sensitivity is the most effective alternative. However recent studies indicate that other techniques such as digital PCR could cover the shortcomings of current protocols.

Currently, the main disease-control strategy within dairy herds involves the combination of appropriate hygienic-sanitary measures and test and cull programs. Since test and cull programs are time-consuming, expensive, and eventually not as efficient as expected in part due to the lack of sensitivity of diagnostic tests, new approaches are needed. In this context, vaccination should be an alternative. It has been demonstrated its effect in the reduction of Map isolation in feces and tissues of infected animals and in the increasing of milk production and cow productive lifespan in infected farms. However, the possible interference of the vaccine with the tests used in the eradication control programs restrict its use. Another approach that is gaining relevance is the identification of genetic markers of resistance or susceptibility to the disease that can be considered in breeding programs.

In this talk all these aspects will be reviewed.

K56

What is new on IBR? Epidemiology and control at the farm level

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Infectious bovine rhinotracheitis (IBR) is a highly infectious disease caused by the bovine herpesvirus type 1 (BoHV-1). BoHV-1, one of eight herpesviruses known to infect cattle, is an alphaherpesvirus and can also cause infectious pustular vulvovaginitis (IPV) and infectious pustular balanoposthitis (IBP). IBR has worldwide distribution and in addition to the impact on health and productivity also affects the trade of animals, semen and embryos.

In order to be able to apply successful strategies for the control of IBR at the farm level it is necessary to have a good understanding of the epidemiology of this disease.

BoHV-1 is mainly spread directly by close contact between animals. It can also be shed from the reproductive tract, including semen, resulting in venereal transmission. Aerosol transmission typically occurs over short distances but it may also occur over distances of up to 5m. The virus is moderately resistant to environmental factors so indirect transmission within or between herds can also occur indirectly through movement or sharing of contaminated facilities, equipment or personnel.

Clinical signs of BoHV-1 infection most commonly involve the upper respiratory tract and include nasal discharge, hyperaemia of the muzzle (red nose), conjunctivitis, fever and inappetence and on occasions, death. This may be accompanied by decreased milk yields and a range of negative reproductive outcomes depending on the stage of the reproductive cycle at which exposure occurs (failure to conceive, early embryonic death and abortion). However, it is also recognised that in herds with endemic infection the course of infection can be sub-clinical but nevertheless still be associated with a reduction in milk yield and negative reproductive outcomes.

Recovery following initial infection is associated with the development of immunity, but this does not eliminate the virus. Instead, the virus establishes lifelong latent infection in the trigeminal ganglion or pharyngeal tonsils. During this period the latent carrier is not shedding virus. However, at times of stress such as transport, calving, mixing stock etc, the virus may be reactivated and can begin to multiply and be re-excreted. This leads to new infection in other susceptible cattle, which in turn will also become latent carriers. These latently infected animals play a central role in maintaining IBR in infected herds, where they act as a reservoir of infection, and in spreading infection between herds.

Vaccines are used widely for a range of scenarios including to reduce the clinical impact of an outbreak, as part of an IBR control programme and to protect free herds against infection. Both live and inactivated marker vaccines are available which can reduce the clinical signs and the amount of virus shed following infection. When given intra-nasally, live vaccines can give rapid protection in the face of a clinical outbreak. When used as part of a control strategy, the percentage of infected cattle in a herd should decrease over a period of time as older, positive cattle are displaced by younger, uninfected stock. Animals vaccinated with gE-deleted marker vaccines can be discriminated from field-virus infected animals by a negative serological reaction for gE.

Understanding the relevant risk factors for (re)introduction of the virus is key information both for the design of effective control programmes and for individual farmers aiming to maintain their herds free of infection. These risk factors should be then translated into biosecurity measures that farms can apply. The main risk for introduction of infection is the purchase of latently infected animals. Biosecurity options to address this risk include maintaining a closed herd, buying known-negative stock and post-purchase isolation and testing. Other risks, including contacts at boundary fences, shows and sales, and movement of people and equipment, should also be considered.

In summary, control of IBR at the farm level is possible but, especially in endemic areas, this must be accompanied with the implementation of biosecurity measures to protect the farm from (re)introduction of the virus.

K57

Animal tuberculosis. Looking for the eradication

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Animal tuberculosis (TB) is caused by infection with members of the *Mycobacterium tuberculosis* complex (MTC). *Mycobacterium bovis and Mycobacterium caprae* are the main etiological agents of animal TB a mycobacterial infectious disease with a worldwide distribution that affects cattle, other domestic hosts, wildlife and humans. The huge economic losses caused by bovine TB added to the impact of its zoonotic nature led to implement control strategies lasting for over a century in many countries. Although eradication of TB has been accomplished in some countries, the presence of *M. bovis* in herds continues to pose serious problems for animal and human health in developing countries. This discrepancy has been observed despite the similarity of the eradication programs used in the different countries. There are several reasons for the persistence of the disease in cattle, but it is usually attributed to the existence of wild reservoirs.

Different transmission pathways do exist. These include direct or indirect inhalation, oropharyngeal exposure and/or ingestion of the pathogen. Lesion distribution and progression seem to be shaped by the route of introduction of the bacterium. There is a general acceptance that the aerogenous transmission is the most frequent one in cattle and lesions are usually found in the respiratory system and associated lymph nodes (LN). Lesions can also reach these LN and other tissues or LN of the head region after oral exposure to the pathogen. However, ingestion of bacilli is usually associated with affected LN and tissues of the digestive system with or without visible lesions. Oral exposure to *M. bovis* could represent a more relevant route of infection than previously thought. In the wildlife-livestock interface inter-species transmission is of an indirect nature, for instance through shared water or food. In these cases, infection will most likely enter the host by the oral route.

The intradermal test and the interferon-gamma release assay (IGRA) are the in vivo diagnostic methods used in test and cull-based eradication campaigns. These tests have been deemed of poor specificity because the confirmatory tests (pathological examination and culture) fail to demonstrate the presence of lesions and the involvement of *M. bovis* quite frequently. However, disagreements between confirmatory tests and in vivo methods are expected because their best sensitivity and specificity values are achieved at different immunopathological stages of the infection. In addition, cross-reactions with other mycobacteria present in the environment must be considered. Despite their limitations, these procedures have successfully eradicated the disease in many countries.

An alternative for TB eradication strategies in some scenarios could be vaccination. Probably, as has been observed with other mycobacteriosis as paratuberculosis, the first objective would be to control the disease through the reduction of mycobacteria excretion, which minimizes the risk of transmission. Several studies have been carried out in cattle and wildlife, principally using BCG but also with inactivated *M. bovis* vaccines, showing promising results.

The best option for TB control and subsequent eradication could be a combination of strategies including biosecurity measures, diagnostic follow-up of animals and vaccination, depending on the country, the situation and the host species involved in the epidemiology of this disease.

In this talk all these aspects will be reviewed.

K58

BVD. Actual situation in Europe

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The concept of bovine viral diarrhoea (BVD) control has changed over the years. Initially, there was a focus to control the infection at herd level by prophylactic vaccination. Improved awareness of the economic impact that this endemic disease has on the cattle industry shifted the focus of control to a more systematic approach. Economic losses arise from infertility, reduced productivity and immunosuppression which, by increasing susceptibility to other pathogens, will result in increased veterinary and treatment costs as well an increased use of antibiotics on farm.

BVD is an excellent example of an infectious disease where a range of strategies have either succeeded or are currently advancing towards eradication. The main objective of this talk is to review the current status of the various control and eradication programmes for BVD across Europe and the strategies that these apply.

Two main approaches to BVD control and eradication exist and have been successfully applied by European countries. The first large scale systematic eradication programmes were initiated in the early 90s in Sweden, Denmark, Norway, Finland and the Shetland Islands. The approach taken is commonly referred to as the Scandinavian model and includes a strict non-vaccination policy. Herd-level tests are used to classify the herds into those likely to be non-infected and those with evidence of current or recent circulation of virus. Typically, these are based on antibody detection by antibody ELISA. Identification and removal of persistently infected (PI) animals from infected herds and continuous monitoring and certification of non-infected herds is also part of these programmes.

For other countries, where the seroprevalence at the animal and at herd level was considered to be too high to make the use of an initial antibody screen to classify herds suitable, the strategy focused on testing directly for PI animals. In Switzerland for example, the programme consisted of testing the whole cattle population for BVD antigen or RNA via ear notch testing in a short period of time, culling virus-positive animals, banning BVD vaccination and applying movement restrictions. This was followed by all newborn calves being sampled and tested with tissue sampling tags. In Ireland, ear notch tissue is collected from all new-born calves using modified official identity tags to test for BVD virus, supplemented by additional blood sampling in herds with positive results, including for testing of their dams. Culling of virus-positive animals and movement restrictions are also applied.

SOUND-control, a European Cooperation in Science and Technology (COST) Action, focuses on the topic of output-based surveillance for cattle diseases with either no or limited regulation under EU legislation. Limited regulation means that EU countries are not required to control the disease in their country. This COST Action provides an overview of national and regional control programmes for several cattle diseases. As highlighted by work done within SOUND control, in some countries there is a mixture of compulsory and voluntary BVD control plans depending on the region or cattle type e.g., mandatory for dairy and voluntary for non-dairy. Control plans are implemented at national or regional level and have different funding models.

A recent development in BVD control has been the inclusion of this disease as a Category C+D+E disease within the new Anima Health Law. This piece of legislation which has been in place since April 2021, includes, for the first time, an annex with requirements for programmes to be recognised at EU level and for member statues/zones to be declarer BVD-free. A number of countries/regions have had their BVD programmes approved or have had recognition of BVD-freedom.

In conclusion, a wide range of strategies for BVD control are currently applied around Europe, ranging from non-systematic control to EU-recognised freedom of disease.