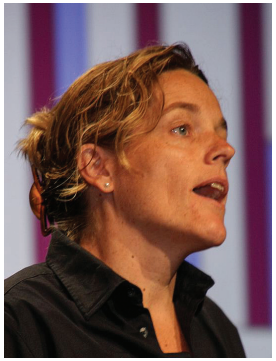

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INFECTIOUS DISEASE CONTROL IN DAIRY COWS: PROVISION OF PRACTICAL GUIDANCE ON VACCINATION AND BIOSECURITY

Introduction

The current trend towards reduced use of antimicrobials in cattle makes preventive measures, such as vaccination, a key topic for cattle vets. However, there has been limited research describing the uptake and use of cattle vaccines. Diseases commonly vaccinated against in worldwide are Bovine Viral Diarrhoea, Leptospirosis and Infectious Bovine Rhinotracheitis; these diseases however remain endemic in Europe; this begs the question if vaccination, as a strategy, is effective in its current format or if a more holistic approach is required.

Vaccination is a widely used strategy for disease control in cattle. In order for disease control to be effectively achieved via vaccination, correct usage is required, which includes administering vaccines via the correct route, at the appropriate time and to a specified target group of animals. Incorrect administration may lead to breakthrough disease, rendering vaccination a wasteful, rather than beneficial exercise.

To get the most out of your vaccination program, most programs should be accompanied by strategic management practices depending on the disease you are vaccinating against. Management practices may include grazing strategies, nutrition management, animal husbandry procedures and biosecurity practices. For example, the control of BVD depends on understanding the farm's BVD status, identification and removal of PIs, biosecurity and ongoing monitoring as well as vaccination. Several countries managed to eradicate BVD without using vaccination; however in countries with a high prevalence vaccination can be an important step to reduce infection pressure while also implementing other biosecurity management practices.

Vaccines are a growing market, in particular in the farm animal industry where the pressure to reduce antimicrobial use is ever increasing. According a market research report in 2016 the global veterinary vaccines market accounted for around USD 12 billion in 2015 and is expected to reach approximately USD 20 billion by 2021.

Lecture 1

Potential weak areas in the vaccination protocol

In order to investigate vaccination uptake and usage, a questionnaire was distributed to UK cattle farmers which highlighted 4 key areas for vets to focus on when aiming to improve vaccination usage on farm (Cresswell et al., 2014).

1. Timing of vaccination

Datasheets provide information on the appropriate timing of vaccines in order to gain the best possible immunological response and subsequently, better disease control within a herd. Whilst 86% of respondents administered the first vaccine within the correct timeframe (as specified on the datasheet), the second dose in a primary course was administered at the recommended time by only 48% of respondents. Fourteen percent of respondents stated that they administered the first vaccine at an age younger than the recommended age; dependent on the vaccine and the time frame, this could compromise the development of effective immunity in those animals.

2. Selecting animals for vaccination

Datasheets for most vaccines recommend that unhealthy animals should be excluded from vaccination, as vaccinating immunocompromised animals may lead to ineffective disease protection. In our survey, 33% of farmers were excluding certain animals, including sick and injured cattle. Farmers may be unaware of the risks of using certain vaccines in immunocompromised animals. Other reasons for not excluding animals could be that a whole herd approach is being taken for management purposes, and all animals are being vaccinated, to 'protect' the herd at herd level. This can be sufficient when aiming for population control, as vaccination can reduce infection pressure on farm, however when aiming for individual protection one needs to consider revaccinating immunocompromised animals.

3. Route/site of administration

Seventy three percent of farmers were using the correct route of administration for vaccines (intramuscular, subcutaneous, intranasal or oral routes). The most frequently mentioned incorrect routes were subcutaneous where intramuscular was indicated (17%, n = 11/64) and vice versa (13%, n = 10/75). A study in human

patients demonstrated that the same vaccine is immunogenic regardless of whether it is injected subcutaneously or intramuscularly, but there is no data to support this finding in the veterinary literature. Anecdotally some vaccines which are intended to be administered subcutaneously can cause severe lesions if administered intramuscularly. The risk of injection site lesions due to vaccination can be raised as a cause of concern not only in terms of financial loss due to carcase waste, but also for animal welfare reasons, and because of the implications to human health regarding the possibility of lesions entering the food chain. A study by Cresswell et al. (2016) however suggested that vaccines are not important contributors to injection site lesions, due to the site and route of administration of vaccines being different to the predominant pattern of injection site lesions found at abattoirs. Conversely, the study raised important issues of inappropriate needle usage when injecting animals and suggested that there are practical measures that could be implemented to reduce the risk of injection site lesions occurring in food producing species. The majority of intramuscular injections were administered in the rump, whereas the majority of subcutaneous injections were administered in the neck. Out of 69 respondents, 6% of respondents were using a new needle between each animal. For those vaccines where an injection site was recommended on the datasheet, 69% of respondents used the recommended site. Of those respondents not injecting at the recommended site, 46% were injecting in the gluteal region where the neck was recommended, and 42% were injecting elsewhere on the animal. The remainder of incorrect answers (12%) indicated more than one injection site. Injection in the gluteal region is often easier for operators when moving animals through handling systems. However, vaccination in this region can have consequences for meat quality as the more expensive cuts of meat are found in the rump region of the animal and injection site lesions which have to be trimmed from the carcase will cause proportionally higher losses. In response to the study findings, a video was produced to encourage effective vaccination in cattle: 'Vaccinating cattle safely and effectively' (AHDB, 2014).

4. Reviewing instructions and storage

Whilst the majority of respondents obtained vaccines from their veterinary surgeons, 8% obtained the vaccine from an agricultural merchant. On the majority of farms, vaccines were administered by workers. There is an opportunity here for veterinary surgeons to provide training to operators who administer vaccines, thereby becoming more involved in ensuring appropriate vaccination strategies are implemented on farms. Instructions on vaccine usage may change periodically, but 23% of respondents did not read instructions as 'they did what they had done previously and did not need instructions'.

Vaccines are often stored on farm in a fridge prior to being administered. The Summary of Product Characteristics (SPC) for an animal vaccine stipulates the storage temperature requirements, such as between 2 and 8oC, and that the vaccine should not be frozen. Failure to maintain the correct storage temperature has been shown to compromise vaccine efficacy and indirectly, animal health. Live vaccines are more sensitive to potency loss at elevated temperatures whereas inactivated vaccines are typically more stable to moderate heat exposure, but more sensitive to freezing. A recent study by Williams and Paixao (2016) monitored the temperature of 17 farm fridges used to store both live and inactivated animal vaccines. All fridges in this study failed to maintain the temperature range required to store vaccines correctly. In a significant number of fridges, the temperature was outside the required storage range for a long enough period of time to produce a loss of vaccine potency. There is a need to increase awareness amongst farmers of correct vaccine storage temperatures. This awareness is raised in the farmer-facing video 'Vaccinating cattle safely and effectively' (AHDB, 2014) and could be achieved with on-going monitoring to ensure this is complied with.

Lecture 2

The role of the veterinary surgeon

As well as the veterinary surgeon being the main vaccine supplier, vets were also the preferred source of information about vaccination for most respondents. Face-to-face communication was the preferred route by which to receive information about vaccination, however, only 66% of farmers had discussions about vaccination with their veterinary surgeon. In addition, 'cost' was the most frequently mentioned discussion topic (46%), rather than topics about how to get the most from vaccinating their cattle effectively.

A recent study (Richens et al., 2016) shed more light on why vets are not frequently opening the discussion around vaccination: vets felt they needed more evidence into the field efficacy of vaccines to aid decision making and cost–benefit analyses; this could be pursued via field trials and simulation modelling. There was variation between vets with regards to vaccination advice; however, the risk-averse attitude often resulted in vaccination being advised 'just in case'. For the credibility of the profession it is deemed important to have broad agreement over such preventive medicine strategies. The on-farm variation observed with respect to following recommended vaccination protocols may be explained by a lack of vet-farmer discussion on the use of vaccines. Previous research described that vets' perceptions of farmer vaccination compliance ranged widely, and vets perceived they generally had a good understanding of the low level of compliance of clients regarding vaccine usage on farm (Cresswell et al., 2013). The vets participating in the study listed many reasons for non-compliance which could be addressed by on-farm discussions.

Farm clients may not be aware of the potential benefit of vaccination and would expect their vet to bring this 'animal health topic' to their attention when needed (Richens et al., 2015). Exploring different forms of communication tailored to the individual farmer may help improve uptake and compliance of vaccine usage, e.g. discussions on routine farm visits, discussion groups, newsletters, herd health visits with written reports and the use of technology for 'booster reminders' (Cresswell et al., 2013). Tailored advice during herd health visits provides an opportunity to discuss vaccination protocols with a client and offer further training to farm staff. Alternative labour sources, such as paraprofessionals, for delivering vaccination on farm or the development of multi-disease vaccines could help to increase compliance, reduce the perceived effort involved in vaccinating cattle and reduce 'vaccination fatigue' for both vets and farmers. These suggested approaches could improve adherence to recommended vaccination protocols, reduce vaccine failure on farms and raise awareness of the potential benefits among those who are not vaccinating. There are online resources for farmers and vets to support this discussion such as a video & quiz and a webinar provided by AHDB-Dairy.

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