



Farm Animal Vaccination

Summary

Vaccination protects the welfare of farm animals by preventing or reducing disease, which in turn reduces the pain and suffering often associated with illness. Healthy animals are also the cornerstone of healthy food and so vaccination can help safeguard our food produced from animals. The animal medicine sector works to provide farmers with the range of vaccines they need to protect the health and welfare of their animals. These vaccines are licensed and produced under strict regulatory conditions ensuring their safety, efficacy and quality.

Introduction

Farm animals, just like people, are susceptible to different diseases caused by bacteria, viruses, fungi and parasites. It makes sense to protect animals from these threats wherever possible. Reducing the burden of disease and the associated suffering means animals can enjoy better health and welfare and consumers have a supply of safe and affordable food. It also means that vaccination has an important role to play in the responsible use of antibiotics on farm.

We have a legal and moral responsibility for animals under our care (1, 2). In many cases, we know the main disease risks on a farm, which is based on history, local and veterinary knowledge. This means herd and flock health plans can be put in place to address the disease risk on an individual farm basis. A specific approach means animals can receive a tailored vaccination program.

On the farm, vaccines must be stored at the correct temperature and used according to directions provided to ensure they perform optimally. Vaccines work by stimulating the animal's own immune system to respond and 'remember' should a real disease threat occur in the future. The vaccination of animals therefore does not present a risk to the food we eat from those animals.

All vaccines that are licensed for use in the UK must meet strict regulatory requirements, which includes how they are manufactured and who can supply them. Oversight of all veterinary medicines, including vaccines, is provided by the independent regulator – the Veterinary Medicines Directorate (VMD) in the UK and the European Medicines Agency (EMA) in the EU.

Dairy, Beef Cattle and Sheep Vaccination

Animals that produce our beef, lamb and dairy products can be protected from a range of common endemic (i.e. regularly found in the UK) and sometimes exotic disease threats.

Serious risks are posed by infection with e.g. a range of *Clostridial* diseases (caused by ubiquitous soil dwelling bacteria), which present a constant background threat to livestock. Reassuringly, vaccines are available that address a range of these bacterial diseases. These vaccines are commonly used by farmers to protect their livestock from these frequently fatal diseases.

On farm, animals may also succumb to respiratory diseases like pneumonia. These are painful conditions that make breathing difficult, damage lungs and even if successfully treated can mean animals do not grow as well as expected. Preventing outbreaks of respiratory disease through vaccination has major welfare benefits for animals and also helps farmers to produce affordable and safe food.

The animal health community in the UK is also actively working together to control some of the endemic diseases on a national level. Good examples are the campaigns to eliminate Bovine Viral Diarrhoea or BVD, which causes significant reproduction and production losses (3, 4). The success of these programmes is often dependent on the availability and appropriate use of vaccines to protect animals.

Innovative *marker* or 'DIVA' (Differentiating Infected from Vaccinated Animals) vaccines have been developed for farm animals. These vaccines allow us to differentiate between animals which have been

infected with the disease and those which have been vaccinated. An example of a marker vaccine in use on UK farms is the vaccine against a virus called Bovine Herpes Virus 1 (BoHV-1), which causes Infectious Bovine Rhinotracheitis (IBR) and various problems in cattle including respiratory disease and milk drop. These new vaccine technologies are not only helping to control disease on individual farms, but are necessary for national disease eradication plans and can allow us to trade more freely with countries that have specific disease-free status.

In terms of exotic diseases, outbreaks of Schmallenberg and Bluetongue in the UK pose a risk to British livestock farmers. Both of these viral diseases are spread through infected biting midges, which can reach the UK under certain conditions. The 2016 threat of Bluetongue has resulted in co-ordinated efforts by animal medicine companies, farming organisations and the UK government, to make vaccines available to UK farmers before the peak risk period (5). This example illustrates how quickly new disease threats can arise, but also how co-ordinated efforts in the UK can respond and provide solutions for farmers over a relatively short timeframe.

Pig Vaccination

The UK pig farming sector is comprised of a variety of different production systems with 40% of the national herd outdoors (6). Farmers and their pigs are therefore faced with an equally diverse range of disease challenges. Logically, farm specific solutions for disease prevention and control are employed to meet each particular circumstance. These are built around good biosecurity, husbandry, nutrition and the herd health plan, to prevent and control disease. Central to the health plan is a vaccination strategy to protect breeding pigs, piglets and growing pigs from important pig diseases found in the UK.

On pig farms, vaccinating groups of animals also offers the protection of 'herd immunity' where the overall disease challenge can be lowered. Vaccines are given to animals at different life stages, depending on the particular risks at that time. Some vaccines are given to pregnant pigs, which can also offer protection either to the unborn piglets or to the newborn piglets through their mothers' milk. An example of a disease that is particularly important for pregnant pigs is Porcine Parvovirus (PPV), which can cause a range of reproductive problems including death of piglets before they are born. Vaccination, as the cornerstone to controlling PPV, has proven to be highly effective making this disease no longer common (7).

A common infectious disease that can also be controlled by vaccination is Erysipelas – seen not only in small holdings, but also on larger farms (8). Erysipelas, a bacterial disease, can cause a variety of clinical signs including skin lesions, arthritis and blood poisoning with sudden death. Effective vaccination programmes have proven key to controlling this

disease, which can readily be picked up from a variety of sources including the surrounding environment.

Immunosuppressive disease in pigs can increase the complexity of diseases seen on farms by predisposing pigs to mixed infections when their immune response is suppressed. An example is Porcine Reproductive and Respiratory syndrome (PRRS), which can be controlled using vaccines as part of a wider control strategy.

Poultry Vaccination

In the UK, almost half of the meat we consume is from poultry (9). We also eat over 12 billion eggs per year (10). Taken together, the poultry sector plays a major role in providing us with safe and affordable food. To meet this demand and considering the naturally higher numbers of individual birds on farms, compared to cattle/sheep production systems, refined strict biosecurity and management systems have been developed over many years. The prevention of illness and avoiding outbreaks of disease is a key priority where the health and welfare of naturally larger flocks of birds must be safeguarded. Vaccination is therefore a core part of poultry flock health planning, which has not only benefitted poultry health and welfare directly, but can also safeguard us, the consumer too. An example is the successful control of *Salmonella* in eggs with vaccination. In particular, the British Lion Code quality assurance scheme for eggs developed a suite of measures to address the risk of *Salmonella* including vaccination programmes (11). Most recently this has resulted in the Advisory Committee on Microbiological Safety of Food (ACMSF) recognising further major reductions in risk from Salmonella in UK eggs produced under such assurance schemes (12), highlighting the key role that vaccination on farm has played in protecting consumer health.

Whilst bacterial and viral diseases are very important in poultry production, coccidiosis is one of the most significant diseases worldwide. Coccidiosis is caused by intra-cellular parasites that in some cases cause considerable inflammation of the gut and is a constant threat to poultry. To meet this disease challenge, there are anti-coccidial treatment options that can be provided in poultry feed. Additionally, vaccines have also successfully been developed and used to induce an immune response and control this endemic disease. Treatments or vaccinations form part of a wider spectrum of prevention, control and management options including strict hygiene measures.

Many of the advancements in poultry vaccination have only been possible through investment in research on vaccines, the avian immune response to disease and development of vaccine delivery technologies. Innovation has also reduced stress for birds and today flocks can be vaccinated using a wide range of methods including e.g. inhaling droplets or in the drinking water.

Aquaculture and Fish Vaccination

The production of food from fish as a growing sector has simultaneously seen the development and innovation of fish medicine products to support their health needs. Improved understanding of significant fish diseases and the corresponding development of vaccines means that vaccination plays an important part in safeguarding fish health and welfare in aquaculture today. Indeed, vaccines against e.g. furunculosis have made a major difference to the management and control of this disease in farmed fish in the UK (13).

Vaccines and other health products have been developed for farmed fish species including Atlantic salmon and Rainbow trout. In particular, a range of important bacterial and viral diseases including Furunculosis, Pancreatic Disease (PD), Vibriosis, Infectious Pancreatic Necrosis (IPN) and Enteric Redmouth Disease (ERM) can now be targeted with fish vaccines.

Conclusions

- Vaccination for the important bacterial, viral, fungal and parasitic diseases is key to safeguarding the health and welfare of food producing animals.
- All vaccines on the UK market meet rigorous safety, efficacy and quality standards.
- Innovations in vaccinology continue to benefit farmed animals and fish, and contribute to the production of safe and affordable food.

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What is NOAH? The National Office of Animal Health Ltd represents the UK animal medicine industry: its aim is to promote the benefits of safe, effective, quality medicines for the health and welfare of all animals. For further information, including more briefing documents on animal medicines topics see www.noah.co.uk and follow @UKNOAH on Twitter.

(For more information on veterinary vaccines and the regulation and safety of veterinary medicines see NOAH briefing documents on Vaccines and Vaccination: an overview, Cat Vaccination, Dog Vaccination, Rabbit Vaccination, Equine Vaccination, Pharmacovigilance and Controls on Veterinary Medicines).

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