



# Vaccination for Animal Health: An Overview

## Summary

Vaccination has long been an effective way to reduce disease burden in pets and farm animals, and is a key tool in maintaining animal health and welfare. Vaccines continue to play an increasingly vital role in preventative health and disease control programmes in animals. Innovative research and the development of safe, effective and quality vaccines means that our pets and farm animals continue to benefit from vital medicines that prevent or alleviate clinical signs of disease.

## Introduction

All those who care for animals, including pet owners and farmers have a duty to protect the health and welfare of animals under their care (1, 2). However, animals, like people, are susceptible to a wide range of diseases caused by viruses, bacteria, fungi and parasites. Vaccines are available for many of these diseases, making them preventable or mitigating the losses or long term consequences of disease. This is particularly important for those diseases which have complex, limited or no treatment options available. Therefore, we should prioritise preventing disease or minimising the clinical signs of disease in the first instance to protect the health and welfare of animals: the old adage of ‘prevention is better than cure’.

Reassuringly, effective vaccines are available for many important animal diseases. Some of these diseases are endemic, meaning they are normally found in the UK e.g. Canine Parvovirus in dogs, or they may be exotic, meaning that they are not normally found in the UK. However they may still pose a risk for entry to the UK e.g. Bluetongue in sheep and cattle or Rabies from travelling pets. For many years, the animal medicines sector has continued to invest in the research and development of veterinary vaccines to tackle these endemic and exotic diseases. One of the greatest achievements in veterinary medicine in modern times has been the global eradication of a devastating disease of livestock – Rinderpest in 2011, for which vaccination played a central role (3).

Even though many diseases are successfully controlled with vaccination, despite best efforts, effective vaccines can sometimes prove technically very difficult to develop. This is due to the complex nature of vaccine development and the inherent characteristics of some pathogens. Ongoing investment in research and development aims to tackle these challenges and make available more vaccines to maintain animal health and welfare. Indeed, vaccines are often updated to include and protect against new strains as diseases evolve. The challenge in developing new vaccines reminds us that vaccines are part of a wider range of animal medicines – that together protect and treat our companion and farm animals.

## Regulation and Veterinary Vaccines

All authorised veterinary medicines, including vaccines available in the UK, must undergo a strict regulatory approval process, before they gain a Marketing Authorisation (MA) (commonly called a product licence) for sale and supply. Stringent evaluation, by independent regulatory authorities, the Veterinary Medicines Directorate (VMD) in the UK and the European Medicines Agency (EMA) in the EU, ensure that each authorised vaccine meets the required high standards of safety, efficacy and quality.

In the UK, animal vaccines can be classified based on their authorised supply route, and are either POM-V (prescription only medicines – through a veterinary surgeon) or, in the case of some farm animal vaccines, POM-VPS (Prescription Only Medicine – Veterinary Surgeon, Pharmacist, Suitably Qualified Person (SQP)).

After vaccines are licensed and used in animals, their continued efficacy and safety is monitored through a [surveillance system](#) whereby any adverse events can be reported to Market Authorisation Holder (MAH) of the vaccine or to the VMD (4). This ensures that there is an opportunity for continual monitoring and, if necessary, further improvement in the safety of these medicines.

## Key Concepts: Vaccines and Vaccination

Vaccines have a long and successful history of preventing and controlling disease. The veterinary vaccines available today represent years of innovative research and meet many of the disease threats faced by pets and farm animals in the UK today.

Vaccines work by stimulating an immune response in an animal without causing the disease itself. When healthy animals are vaccinated, their own immune system responds to the vaccine and can remember the infectious agent to which the animal is vaccinated. This means, if appropriately vaccinated animals are then exposed to the pathogen against which they have been vaccinated, they can expect a level of protection from disease.

The main types of vaccines available can be categorised as modified-live (attenuated), inactivated and recombinant.

- **Modified-live (attenuated):** a vaccine that contains an intact but weakened pathogen which stimulates an immune response but does not cause clinical disease.
- **Inactivated (killed):** a vaccine that contains a completely inactivated pathogen, which is no longer infectious. These vaccines often contain an adjuvant, which is a compound added to help improve the protective immune response.
- **Recombinant:** a vaccine that is produced using genetic engineering technology and using specific genetic material from a pathogen to produce proteins which will stimulate an immune response when the animal is vaccinated.
- **Toxoid:** a vaccine that is based on inactivated toxins produced by pathogens. These vaccines stimulate immunity and protect the animal against these toxins.

Research and innovation has also resulted in the development of novel and more sophisticated technologies such as marker vaccines. Typically, when animals are vaccinated they produce an immune response that resembles that of a natural infection. It can then be difficult when testing animals to determine if they have been naturally infected or if they have been vaccinated. An example is the farm animal marker vaccine for Infectious Bovine Rhinotracheitis (IBR) – a highly contagious respiratory disease in cattle.

Irrespective of the type of vaccine used, an animal should be in good health at the time of vaccination – as a properly functioning immune system is needed to stimulate a good immune response and develop an effective level of protection. Initially a primary vaccination course should be completed and depending on the vaccine type and the species of animal, it may be necessary to follow up with booster vaccinations at intervals based on veterinary advice

and the characteristics of the vaccine, to maintain protective immunity throughout the animals' lifetime.

There is no 'one size fits all' when vaccinating animals and vaccination protocols should be tailored, based on veterinary consultation, for individual pets or groups of farm animals. This is because animals are exposed to a range of different risk factors related to their age, lifestyle, prevailing disease threats and travel/movement. These factors should be discussed with the vet to decide on the most appropriate choice of vaccine and vaccination protocol. For some farm animal vaccines, appropriate advice can also be sought from an SQP.

Another important concept in vaccination is that of 'herd immunity'. Herd immunity is the protection offered to a wider community of animals, pets or farm animals, when a sufficiently high proportion of individual animals are vaccinated, reducing the prevalence of disease and numbers of susceptible individuals in an area. An unfortunate example of what can happen when herd immunity diminishes were the outbreaks of measles in the UK in recent years, which are thought to be due to reduced numbers of children being vaccinated (5).

Public health can also be protected through vaccination and a good example of this is the requirement for cats, dogs and ferrets to have a valid rabies vaccination before entering or returning to the UK from abroad (6). Vaccination plays a key role in protecting animals and people in the UK from the threat of rabies, which is still one of the most deadly zoonoses (meaning diseases which can be passed from animals to humans) (7).

Vaccination can also help support the responsible use of antibiotics by preventing disease or reducing clinical signs so that fewer veterinary medicine treatments are needed. Although antibiotics are only useful for bacterial infections, there are many cases where farm animals and pets succumb to viral disease in the first instance, which then leads to a subsequent secondary bacterial infection that may need treatment with antibiotics. So vaccinating for both bacterial and viral disease can help to preserve the future effectiveness of antibiotics.

## Companion Animal Vaccination

The mainstay of protecting our pets from a wide range of diseases, many of which are very difficult or impossible to treat, is through vaccination. Our pets enjoy the protection from disease despite the risks they face every day from the environment, from travelling and from direct and indirect contact with unvaccinated or diseased animals. As every pet is faced with different risk factors, it is very important to discuss these with the vet, so the most appropriate vaccinations are provided. The information about the different vaccines is publically available, provided in the Summary of Product Characteristics (SPC)

associated with each individual UK authorised vaccine (8). As recommended by the VMD, the vet should take the SPC and specific risk factors associated with each animal into account when they are developing a suitable vaccination schedule (9).

### Feline Vaccination

Many of the most important diseases in cats can be prevented, controlled or alleviated through effective vaccination. These include:

- Feline Panleukopenia/Infectious Enteritis (Feline Panleukopenia or Parvovirus, FPV)
- Feline Rhinotracheitis (Feline Herpesvirus, FHV)
- Feline Calicivirus (FCV)
- Feline Leukaemia Virus (FeLV)
- *Chlamydomphila felis*
- Feline Rabies

In 2015, the European Advisory Board on Cat Diseases (ABCD) produced updated best practice vaccination guidelines for indoor and outdoor cats, rescue shelter cats and breeding catteries (10). These guidelines recommend that 'core' vaccines should be administered to all cats (FPV, FHV, FCV) and 'non-core' are recommended only for cats at risk of specific infection. Additionally, 'circumstantial' vaccines are needed in specific circumstances such as Rabies vaccination for cats travelling in and out of the UK - often referred to as the PETS travel scheme. The ABCD also provide recommendations on vaccination schedules for the primary vaccination course and subsequent boosters, which take into consideration the type of vaccine product and vaccination history. More information on cat vaccines can be found in the NOAH briefing document 'Cat Vaccination'.

### Canine Vaccination

The UK veterinary medicines regulator, the VMD, have published a position paper on authorised vaccination schedules for dogs including core and non-core vaccines (9). The important canine diseases, for which vaccines are available, include:

- Canine Distemper Virus (CDV)
- Canine Parvovirus (CPV)
- Canine Adenovirus (CAV)
- Canine Leptospira
- Canine parainfluenza virus (CPI)
- *Bordetella bronchiseptica*
- Canine Rabies

The core canine UK vaccines include CDV, CAV and CPV – these protect dogs from severe life threatening viruses, whilst canine leptospira, CPI and *Bordetella bronchiseptica* for animals who are at risk due to their geographical location, local environment or lifestyle and are considered non-core (9). Other UK vaccines authorised for use in dogs in Canine Herpes and Canine Coronavirus (Canine Enteric Coronavirus, CECOV). More information on dog vaccines can be found in the NOAH briefing document 'Dog Vaccination'.

### Rabbit Vaccination

Vaccination of pet rabbits is an important part of a proactive approach to preventative healthcare and is widely recommended to protect rabbits from two very serious viral infectious diseases – myxomatosis and rabbit haemorrhagic disease. These diseases can result in rabbits needing prolonged intensive care treatment and in many cases the most serious viral diseases of rabbits are fatal. Vaccinating to protect rabbits against these two deadly diseases therefore makes good sense and the benefits are clearly evident in terms of reducing rabbit suffering and death and alleviating owner distress. More information on rabbit vaccines can be found in the NOAH briefing document 'Rabbit Vaccination'.

### Farm Animal Vaccination

Farm animals are represented by a variety of different species, from cattle, sheep, pigs and poultry to farmed fish. This means there is a correspondingly diverse range of potential disease threats and vaccines available to protect farm animals.

Disease outbreaks can occur when new stock are brought in to replenish the herd or flock, or when an animal becomes ill and disease may spread within susceptible animals housed or grouped together. Taken together, the challenges faced by farm animals means there is an ongoing requirement for effective, safe, quality vaccines – not only for the endemic diseases, but also during periods of exotic disease threat.

A good example of vaccines used on farm as part of an endemic disease control programme in the UK is that of Bovine Viral Diarrhoea (BVD) in cattle. An example of an exotic disease threat faced by cattle and sheep is Bluetongue, for which vaccination is the effective way to help prevent the spread of disease (11).

In aquaculture too the innovative development of vaccine products supports fish health and welfare and the productivity of an important and growing sector in the UK.

Farm animal vaccination strategies are developed as part of preventative farm health plans, which aim to vaccinate based on individual farm risk for particular diseases. Species-specific guidelines on responsible use of vaccines and vaccination are produced by RUMA

(Responsible Use of Medicines in Agriculture Alliance) (12).

The production of safe, affordable food from healthy animals is an increasing priority in a growing global population. Farmers are meeting this need by embracing animal medicine innovation to improve health and welfare and prevent losses where possible. The use of vaccines on farm is also becoming increasingly important at a time when farmers and vets are refining and improving their responsible use of antibiotics. More detailed information can be found in the NOAH briefing document 'Farm Animal Vaccination'.

### Equine Vaccination

Horses as companion animals, athletes and breeding stock are exposed to varied disease threats depending on their unique circumstances. Risk factors including travelling to other geographical regions and mixing with unvaccinated horses are also very important.

Important equine vaccines include Equine Influenza, Tetanus, Equine Herpes Virus 1 and 4 (EHV-1 and EHV-4). Other vaccines that are authorised for use in horses in the UK include those for equine viral arteritis, equine rotavirus, *Streptococcus equi equi* and West Nile Virus. Depending on the lifestyle and use of the horse specific vaccinations are recommended. Vaccination of all horses is recommended for equine tetanus, which can be fatal and equine influenza, which is a contagious viral respiratory disease (12). Many equestrian organisations and all racecourse premises require mandatory vaccination for equine influenza (12). Regular EHV vaccination is important for breeding stock, particularly in stud farms, to help reduce reproductive losses and respiratory disease (13). More detailed information can be found in the NOAH briefing document 'Equine Vaccination'.

### Future Outlook

The availability of veterinary vaccines across the EU and in the UK is a key priority for the European medicines regulator, the European Medicines Agency (EMA) (14). This view is mirrored by UK regulatory authorities. The EMA are implementing an action plan on the availability of veterinary vaccines in recognition of the vital role that vaccines play in preventing animal disease, protecting public health and supporting good animal health and welfare (14). Both the animal medicines sector, through innovative research and development, and the regulatory authorities, are committed to facilitating the availability of veterinary vaccines for animals under our care.

### Conclusions

- Vaccination is an effective way to prevent or reduce disease in pets, farm animals and fish
- Vaccines are available for a range of important bacterial, viral, fungal and parasitic diseases - many of which are difficult or impossible to treat.

- All vaccines on the UK market meet rigorous safety, efficacy and quality standards and are assessed by an independent veterinary medicines regulator before they are authorised for use.
- Preventative health measures, such as a robust vaccination strategy can reduce the need for veterinary treatments and improve responsible antibiotic use.
- There is no 'one size fits all' vaccination strategy and consultation with your vet to discuss specific disease risk factors is important to decide on the most appropriate vaccines for animals in your care.
- Although it is not always technically possible to develop an effective vaccine, the animal medicines sector continues to invest and innovate in vaccine technology to support endemic and exotic disease prevention and control. Vaccines are therefore part of a wider range of animal medicines available to prevent or treat disease.

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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](http://www.noah.co.uk) and follow @UKNOAH on Twitter.

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