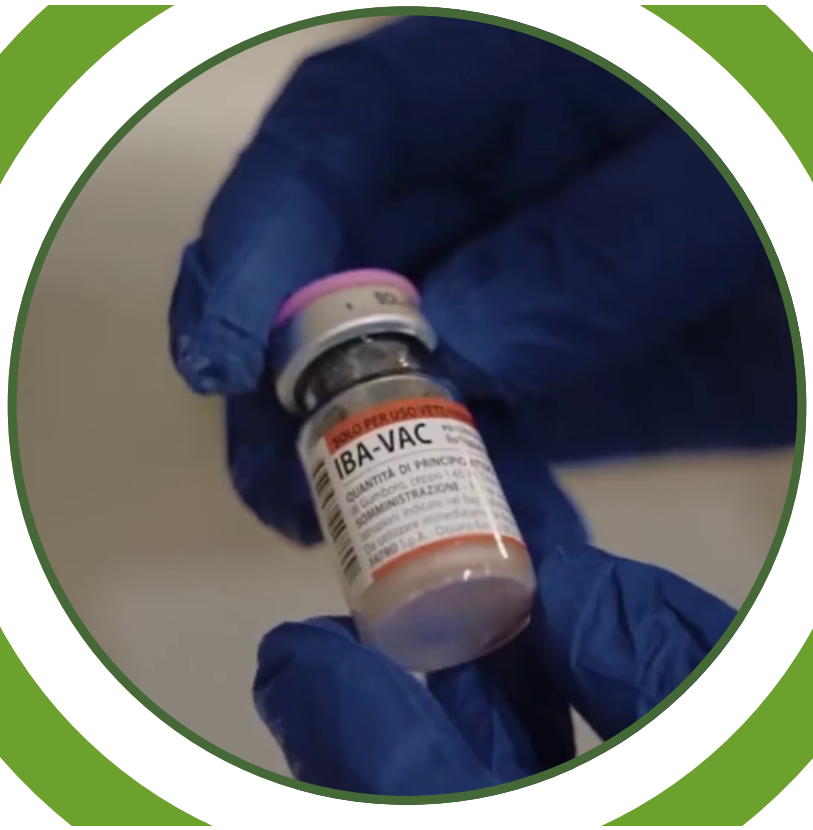
disarm

Disseminating Innovative Solutions for Antiobiotic Resistance Management

Best Practice Guides

Vaccination Protocols



PROLOGUE


CATTLE


PIGS


POULTRY


SHEEP

This guide is written as part of the DISARM project 'Disseminating Innovative Solutions for Antibiotic Resistance Management', funded by the European Union's Horizon 2020 research and innovation programme under grant agreement 817591.

The DISARM project aims to reduce antibiotic resistance through a focus on disease prevention and animal health, thereby reducing the need for antibiotic use. DISARM has a wide range of resources available via our website and YouTube channel. We also have a vibrant and knowledgeable community within our Facebook discussion group (we welcome you to join, simply click this link and answer some short questions to gain access), and wider social media channels: Twitter, Facebook, LinkedIn.

DISARM also promotes the multi-actor approach – different people (farmers, veterinarians, nutritionists and other advisors) working together towards improved animal health and farm performance. If you want to find out more about this, check out our toolbox to get started!

This guide was based on the information that was gathered during the DISARM project; it should not be considered as a complete reference book. It gives a useful overview with links to practical videos, abstracts, articles, testimonies etc., to facilitate good practices. Not all recommendations will be applicable or suitable for your farm and any interventions should be discussed with your farm advisor(s).

This guide is one of the 10 Best Practice guides made during the DISARM project. The 10 guides all have the goal to inform you about a specific topic in order to reduce the antimicrobial use in the livestock industry.

The other DISARM Best Practice guides can be found here.

Find us on **Facebook**

Follow us on **Twitter**

Watch us on **YouTube**

Follow us on **LinkedIn**

Visit our **Website**

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement no. 817591. The contents of this publication are the sole responsibility of the DISARM project and do not necessarily reflect the opinion of the European Union.

Coordinated by

ILVO Flanders research institute for agriculture, fisheries and food

Partners

INNOVATION for AGRICULTURE
ifip
nutrition sciences
ZLTO
ΓΕΩΠΟΝΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ AGRICULTURAL UNIVERSITY OF ATHENS
FIL IDF International Dairy Federation
SEGES
USAMV
ANPROGAPOR
ITAVI
copa cogeca
GHENT UNIVERSITY
angst
acta
INSTITUT DE L'ELEVAGE idele
WAGENINGEN UNIVERSITY & RESEARCH
Latvia University of Life Sciences and Technologies

INTRODUCTION

Vaccines are a very valuable and well-known tool to keep animals healthy. These tools are preventive measures which avoid future outbreaks of many diseases, acting for the benefit of the animals, the farmer and consumers. Vaccines have made a huge contribution to improving the health, welfare and productivity of cattle, sheep, pigs and poultry. They are a vital component of prevention for a range of diseases and are complementary to good hygiene and animal nutrition.

When animals are exposed to and recover from infections, they develop immunity to further attacks by the same infectious pathogen. Their immune system, in exchange, remembers the bacteria or virus and launches a quicker, more effective response to remove it if they get exposed again. Vaccination mimics infection, but in a dosage and pathogenic degree low enough to allow the animal to develop immunity without succumbing to the disease. This means that after vaccination, the animals are more resilient against future infections, showing minor or no symptoms of illness, thus requiring fewer treatments or none. Therefore, it is important to remember that vaccines do not prevent infection per se, but they rather prime the immune system to provide a rapid and effective response following an infection, avoiding the development of the disease in the process. In many cases, vaccination results in decreased transmission of the pathogen to other animals.

To find out more about the responsible use of vaccines in farm animal production you can check the recording of the DISARM Webinar on vaccination. This webinar was organized in cooperation with EPRUMA, the European Platform for the Responsible Using of Medicines in Animals, and it focused on experiences of farmers (Copa-Cogeca), vets (FVE) and manufacturers of animal medicines (AnimalHealthEurope) on responsible use of vaccines as a successful strategy to avoid the need for antibiotic treatment. The webinar is 1h and 30 minutes long and besides short presentation about the DISARM project, it includes three presentations highlighting different perspectives of stakeholders.

WHY VACCINATE?

There are in general four main reasons to vaccinate livestock:

- To increase immunity.
- To reduce the spread of diseases and ultimately eradicate them. Veterinary vaccines against zoonotic diseases can control infections in animals, thereby also reducing their transmission to people.
- To help to reduce the use of antimicrobials and consequently the appearance of antimicrobial resistance.
- To enhance productivity.

Vaccinations can reduce production losses associated with disease and therefore lead to more cost-effective animal production. For example, this article 'Time to Vaccinate: the importance of preventive health and vaccination programmes in ruminant production' developed by MSD Animal Health gives examples of how vaccines can generate a return on investment, minimize environmental impacts, and achieve other productivity goals. Vaccination is an essential tool for all farmers to optimize the herd/flock's capability to resist infection. This paper, however, is not intended to cover every single disease and vaccination program, but to use some good examples of the value of vaccination in ruminant production systems.

There are also a number of more practical examples which highlight the benefits of vaccination. Calf scour (Neonatal calf diarrhoea) is the most common cause of disease and death in calves during the pre-weaning period[1]. Scour can be due to both infectious (e.g., viruses and bacteria) or non-infectious causes (such as poor nutrition). Symptoms are most often diarrhoea that might be green, yellow or grey in colour, weakness, and dehydration (especially when very young) causing sunken eyes, etc. Calves are most at risk from infectious scour in the first 3-4 weeks of life and need a continuous source of protection. In collaboration with their veterinarian, farmers can vaccinate in-calf cows against calf diarrhoea few weeks before calving, while increasing the quantities of colostrum given to the calves at birth. After doing this, cases of diarrhoea in the calves should usually drop as it was the experience of the French farmer shown in the DISARM best practice video.

▲ *DISARM project best practice video*

In addition to vaccination, as shown in the video, it is useful to segregate calves by age to prevent passing infectious agents from older calves to younger more vulnerable ones and to maintain clean, dry housing with good ventilation, ideas for improving calf housing are shown in this video.

Another example is linked to *Salmonella* spp. in pigs. Salmonellosis is an important zoonosis - despite current control measures, it remains a major public health concern.

However, the results of the study[2] published in Veterinary Journal suggest that vaccination and supplementation of the feed with coated calcium-butyrate limited *Salmonella* transmission in pigs and thus might be considered useful control measures.

WHEN TO VACCINATE?

The decision of 'if' and 'when' to vaccinate and against what pathogen should always be done after consultation with the farm veterinarian. The veterinarian can determine the need for vaccination and the ability for vaccines to reduce the current health challenges on a farm.

This includes a good knowledge of the animal/herd/flock health history, diagnostic sampling of animals, the disease challenges in the area, evaluation of specific risk factors and other management routines that might impact animal health e.g. colostrum management[3].

This decision also depends on the animal species and what kind of vaccines are available. According to the review[4] *Vaccination schedules in small ruminant farms* there are no 'blueprint' approaches in the health management of small ruminants.

This review presents guidelines which should be modified accordingly on a farm-by-farm basis to address health issues according to locally prevailing production types, management systems and health problems. Based on this review, one can adapt details for correct application of vaccines; the exact vaccination program and schedule to be applied in any farm should be decided on farm-by-farm basis by the attending veterinarian.

For example, as shown in this video, Enterotoxaemia is a frequently severe disease of small ruminants of all ages. It is caused by two strains of bacteria called *Clostridium perfringens*, type C and D.

Type C principally produces β-toxin, which most commonly kills lambs less than 2 weeks of age. Type D principally produces the ε-toxin which affects lambs older than 2 weeks of age, particularly those eating diets high in starch. Lambs exposed to high doses of ε-toxin also die very quickly.

Fatalities occur particularly in non-vaccinated animals or in newborn lambs whose mother was not vaccinated. Vaccination of ewes 3-4 weeks before lambing improves passive protection in lambs up to 12 weeks of age, whereas there is no benefit of vaccinating lambs before 6 weeks of age. Prevention of enterotoxaemia is far more likely to be successful than trying to treat the disease.

Similarly, the risk of mortality and morbidity in calves is higher during the first few weeks of life. The main causes of mortality change during the pre-weaning period: septicaemia is most likely to occur in neonatal calves (up to 28 days of age); diarrhoea in calves less than 30 days old, and bovine respiratory disease in dairy calves more than 30 days old[5]. During this critical period, many farmers could consider vaccination and other preventive interventions to minimise the risk of diseases.

VACCINATION PROTOCOLS

Besides the general advice that vaccination should be used under veterinary supervision and according to the product specifications, there are additional sources of guidance. Checklists and basic vaccination protocols are produced by different manufacturers, farmers and vet organisations, networks, national advisory services, and other bodies.

For example, through its best practice framework, EPRUMA, a European multi-stakeholder platform, wish to raise awareness on the benefits of vaccination, and recommend best practices for vaccine use to ensure optimal animal health. The brochure aims to complement existing guidelines on vaccination, which are available in many European countries [France, UK (RUMA), Vetresponsable (Spain), AMCRA (Belgium), etc.]. It highlights the benefits of and provides recommendations for proper animal vaccination.

Different vaccine manufacturers are also producing additional guides on how to correctly administer vaccines or on different vaccination programmes that are available on the market.

Another example are tools developed by national farming associations and their advisory services, such as the SEGES Guide (in Danish) for vaccinations against E. coli mastitis in dairy. This checklist is a quick guide to vaccinate dairy cows against *E. coli* mastitis. The guide covers all details from the important diagnostic, planning, how to handle the vaccine, how to do the practical part, when to vaccinate and possible side effects.

Vaccines are biological medicinal products, therefore they need to be used with great care and under veterinary supervision. There are different types of vaccines (Live or attenuated vaccines, Inactivated vaccines, Recombinant live virus vaccines, DNA/RNA vaccines, Auto-vaccines), as well as different types of application (Air spray, Eye drop, Intranasal, Oral via Water or Baits, Parenteral, Needle-free Parenteral, and In-Ovo).

Therefore, it is crucial to ensure, through a dialog with the veterinarian, a proper vaccination programme that responds to the animal's needs. The veterinarian will diagnose the health status of the animal(s) or herd/flock before vaccination and prescribe the right product for each species, disease or condition. They can advise on proper administration and which booster doses are needed to reach an adequate level of immunity, based also on the instructions provided in the medical product specifications. These instructions on handling the product before, during and after use must be followed thoroughly.

Although concrete vaccination protocols will be developed in consultation with veterinarian and will depend on the animal species, disease, type of vaccine and medical product specifications, some general guidance and approach can be established and applied:

1. Diagnostics

As vaccines rely on the animal developing an adequate immune response, it is important that prior to vaccination a veterinary assessment of the health of the animal/ herd/ flock is done to ensure that only healthy animals are vaccinated. In addition, this assessment will ensure that medicine specifications are also respected since certain vaccines are not intended for young or pregnant animals, animals in lactation etc.

2. Storage and equipment

It is important to avoid any contamination or inactivation of the veterinary medicinal product. Therefore, proper equipment and vaccine storage must be ensured. This entails that:

- Vaccine containers are properly sealed and are within the limits of the expiration date.
- Vaccines are properly stored, since they are often light and temperature sensitive and should therefore be stored according to the medical product specifications (generally this entails unlit conditions and a temperature of 2 to 8°C).
- Any equipment needed should be clean (e.g., sterile needles), in sufficient quantities and calibrated to deliver the correct dose.

3. Vaccination

As mentioned previously, since there are many different types of vaccines and administration routes or possible injection sites, the vaccination must be done in accordance with the medical product specifications.

To ensure proper administration of the vaccines, appropriate handling of animals during the process is very important to minimise the stress and ensure the success of the vaccination. It is important that all animals in the group are vaccinated and marked properly to avoid an accidental duplication of vaccination, or an omission of some animals in the group.

The veterinarian should have the necessary knowledge regarding the correct administration and timing of the vaccinations and the use of various vaccines in relation to one another. All booster vaccinations recommended in the medical product specifications should be administered and any co-administration with other medical products should be done only when authorised by these specifications.

Detailed records of vaccination should be kept for each individual animal (cattle, sheep, pigs, horses) or for each cage/batch (swine, poultry), as recommended by the national authority.

4. Post vaccination

Once the vaccination process is done it is important to dispose unused or expired vaccines and empty containers as it is recommended in the medical product specifications or national legislation.

All vaccinated animals must be monitored closely after vaccination. If any side-effects are observed, they should be reported to the authorities as appropriate. For food-producing animals, any applicable withdrawal periods for milk, meat or eggs as mentioned on the medical product specifications must be respected.

Check out **this video** showing how the vaccination protocol is implemented on a poultry farm in Latvia (via drinking water and spray application). The video highlights some of the main steps of handling the vaccines, correct dosage and application that minimizes the stress of animals.

Example: Support the calf to obtain better vaccination results

Farms specialized in bull calf rearing from a very young age often experience high frequencies of respiratory diseases, especially during the first month of life. Calves are often exposed to radical changes and challenges in this period.

Vaccination could be a useful tool to enhance immunity. Whenever vaccinating, farmers try to create the best possible conditions for the calf and minimize factors negatively affecting their immunity:

- Provide shorter transport times (max. 1-2 hours) to limit dehydration, hypothermia and exhaustion
- Avoid mixing calves from different farms on the same truck
- Insert calves in a clean box
- Keep calves in small groups – preferably in pairs – at least for the first 6 weeks
- Avoid mixing calves of different origins in the same box
- Segregate groups of calves by solid walls or panels
- Make sure all calves have easy access to fresh water – preferably lukewarm water from a bucket or trough
- Feed sufficient amounts (minimum 6-7 litres/day) of a good quality milk replacer
- Start milk-feeding on the day of arrival
- Secure good air quality and avoid draughts
- Avoid moving, mixing, feeding changes and other negative factors 3-4 days before and after vaccination

Intra-nasal vaccines can be applied at the day of arrival. Let other vaccinations wait until the calves are in a positive energy balance (e.g. from 2 weeks after arrival).

CONCLUSIONS

Vaccination has been an essential tool over the years for preventing, controlling and eradicating infectious diseases, for improving animal health and welfare and reducing the need for treatment, as well as contributing to food safety and public health.

However, it is important to note that a vaccination scheme alone is not an animal/herd/flock health programme. It is part of the holistic animal/herd/flock health programme which also includes among others:

- good hygiene and biosecurity;
- good nutrition;
- improved animal husbandry;
- herd health planning and etc.

The above is also highlighted in **the best practice video** on “The prevention and control of mastitis in sheep”. Although the vaccination program is recommended to be included in the control of mastitis, the implementation of biosecurity measures play an important role. Good husbandry and milking practice with regular maintenance

of the milking machine alongside the use of post-milking teat disinfection can prevent the introduction and transmission of mastitis in dairy ruminants, and consequently, reduce antibiotic usage.

Cited references & further reading

1 Tewari, Anita. (2012). Neonatal Calf Diarrhoea.

2 De Ridder L, Maes D, Dewulf J, Pasmans F, Boyen F, Haesebrouck F, Méroc E, Butaye P, Van der Stede Y. Evaluation of three intervention strategies to reduce the transmission of Salmonella Typhimurium in pigs. Vet J. 2013 Sep;197(3):613-8. doi: 10.1016/j.tvjl.2013.03.026. Epub 2013 May 13. PMID: 23680264.

3 https://www.farmantibiotics.org/tool_links/the-importance-of-preventive-health-and-vaccination-programmes-in-ruminant-production/

https://disarmproject.eu/resources/vaccination-of-calves-as-a-disease-prevention/

4 Lacasta, Delia & Ferrer-Mayayo, Luis-Miguel & Ramos, J & Gonzalez, Jose & Ortín, Aurora & Fthenakis, G. (2015). Vaccination schedules in small ruminant farms. Veterinary microbiology. 181. 10.1016/j.vetmic.2015.07.018.

5 Sherwin, Virginia & Down, Peter. (2018). Calf immunology and the role of vaccinations in dairy calves. In Practice. 40. 10.1136/inp.k952.

Disseminating Innovative Solutions for Antiobiotic Resistance Management

Visit our **Website** Find us on **Facebook**

Follow us on **Twitter** Watch us on **YouTube** Follow us on **LinkedIn**

Design: Henry Burridge / henryburridge.com