Implementing an effective vaccination schedule

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Designing and implementing an effective vaccination schedule requires a thorough knowledge of the disease risk situation in a specific area, an understanding about the interaction between chicken and vaccine and thorough planning.

The number of vaccines and the spectrum of diseases included in a vaccination schedule should not be used as the primary parameter to judge the completeness of a schedule.

On the contrary, schedules containing a vaccine for every known poultry disease are an admission of poor biosecurity and management. Vaccines are not the panacea for all ailments; they are only one element of a disease control strategy which starts with good biosecurity and sanitation management.

Breeder vaccination in particular deserves additional attention. The valuable breeder hen is expected to produce a maximum number of hatching eggs; this requires a strategy that minimises the negative impact of disease on egg production.

The broiler chicken relies on the breeder hen for so called maternal derived antibody (MDA), the immune system starter pack protecting the chick for the first few weeks of life.

In addition, as an industry supplying protein to the human food chain all reasonable action must be taken to keep poultry flocks free of potential food borne pathogens such as salmonella.

Which vaccines should be included to achieve a balanced breeder vaccination schedule?

Live and inactivated vaccines

Vaccines are divided into two large groups based on whether the antigen (virus or bacteria) is live or inactivated.

Live vaccines are viruses or bacteria that have been weakened under controlled laboratory conditions into a 'safe' virus/bacteria strain that can infect the chicken, stimulating immunity, but without causing severe disease. In most cases live vaccines can be administered by mass application techniques such as drinking water, spray or aerosol.

Intramuscular vaccination in the breast muscle of a pullet.

Live vaccines stimulate the complete immune system; inducing local, cellular and humoral immunity.

Protection following vaccination is relatively rapid, within a few days to a week depending on the properties of the particular virus/bacteria. Unfortunately for most live vaccines the protection does not last for a full breeder cycle, thus regular revaccination is required.

As many of the live vaccines used target the chicken's respiratory system care must be taken to leave sufficient time between consecutive vaccinations to avoid potential interference.

Inactivated vaccines are viruses or bacteria that have been chemically inactivated and added to a suitable adjuvant.

The adjuvant causes a mild reaction at the injection site attracting cells, such as the macrophages, which start the immune response.

In addition, the adjuvant acts as a slow release formulation stimulating the immune system for an extended period of time.

Inactivated vaccines must be administered by injection to each individual bird at the prescribed dose rate, an extremely labour intensive procedure.

Unlike live vaccines, inactivated vaccines do not stimulate the complete immune system. They induce no local immunity and only limited cellular immunity, but there is generally a very strong humoral response (circulating antibodies), however it takes up to six weeks for this protection to develop.

For many viral diseases the breeder is primed with a live vaccine followed by an inactivated booster vaccination four to six weeks later. This provides protection for a full production cycle.

Vaccination using a double barrelled syringe. Two vaccines are administered simultaneously into the breast muscle on either side of the keel bone of a pullet.

Protecting the breeder

The bulk of breeder vaccinations are administered in the first 18 weeks, the rearing phase. Ideally a breeder hen's protection should be at a peak level when the first hatching eggs are collected and should persist through to the end of the egg production cycle.

To avoid unnecessary stress to the breeder bird vaccination during lay is kept to an absolute minimum; generally limited to the mass administration of certain live vaccines such as Newcastle disease (ND) and infectious

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Checking the calibration of a semi-automatic vaccinator. It is good practice to check equipment is delivering the correct volume at the start of each vaccination session.

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bronchitis (IB). The most important starting point to any breeder vaccination schedule is without a doubt Marek's disease (MD).

Vaccination at day old (or earlier: in ovo) with a suitable MD vaccine is essential to curb the otherwise inevitable losses associated with this disease.

The sensitive nature of the vaccine used; cell-associated and stored in liquid nitrogen; however requires specific attention to vaccine handling and administration procedures.

Vaccination in the hatchery is preferable and should be tightly controlled with regular auditing of the procedure. Even so, the best MD vaccination does not equate to guaranteed freedom from this scourge. Biosecurity measures to prevent early exposure of chicks to virulent field strains prior to vaccine take are paramount. Chicks must never be placed in close proximity to adult chickens or into a poultry shed that has not been adequately sanitised and rested.

In recent years coccidiosis vaccines have become a routine addition to most breeder vaccination schedules.

Administered correctly these vaccines induce a predictable immunity to the selected Eimeria strains, an improvement on the previous unpredictable practice of natural field exposure moderated by various coccidiostat treatment regimes.

Protecting egg production

Achieving maximum hatching egg production demands a healthy hen. Extensive lists of viral and bacterial agents have known potential to cause suboptimal egg production in poultry.

The consideration to vaccinate or not against these pathogens should be based on a risk analysis taking into account disease occurrence, population density of poultry and the level of biosecurity in a region.

The infectivity of the concerned disease agent also needs consideration. Viral diseases are generally far more contagious, spreading more rapidly than bacterial diseases which often remain localised to a site. Thus, vaccines against certain viral diseases are considered routine.

IB is such a highly contagious viral agent with a presence in most poultry producing regions, thus the risk for infection is relatively high.

Although IB is generally not a major cause of death in breeders it may result in severe economic losses due to poor egg production and changes to egg quality with a direct impact on hatchability.

A basic IB vaccination schedule includes two live vaccinations with an IB Massachusetts type strain followed by an inactivated IB oil emulsion vaccine prior to the onset of lay. Despite vaccination continuous disease monitoring is advised as new variant IB strains do emerge which may require changes to the schedule, such as the inclusion of an additional IB variant type vaccine.

The intensity of a ND vaccination schedule is largely dependent on the prevailing infectious pressure.

In high risk areas early vaccination with live ND vaccine strains, complemented by one or more inactivated vaccines induce a high level of immunity preventing death and egg production losses.

To the other extreme in regions considered free of ND there may be a policy of no vaccination or a light schedule with a live priming vaccination and a possible inactivated booster vaccination.

The decision to vaccinate against poul-

try pathogens such as avian pneumovirus, egg drop syndrome, infectious laryngotracheitis, fowl pox, coryza, fowl cholera, and mycoplasma should be taken based on their occurrence in a region and the risk posed to the concerned flock.

A healthy broiler

Vaccination of the broiler breeder does not end at protecting the hen and egg production. The breeder's immunity has a direct impact on the immunity of the broiler at hatch.

Nature has developed a system to transfer a basic package of protection to offspring based on that of the parent, in the case of the chicken this is transferred via the yolk, so called maternal derived antibody (MDA).

There is a high likelihood that a chick hatched into an environment will face the same disease challenges the hen faced in the past, thus the chick is thrown a life line while its own immune system starts to mature.

We, however, have disturbed this balance by keeping the hen in one environment, hatching eggs in a hatchery and raising the broiler chicks in a different environment away from the breeder

Using vaccination we attempt to emulate nature by exposing breeders to infectious pathogens the broilers are likely to encounter.

Infectious bursal disease (IBD) is probably the best example of a vaccination in breeders primarily for the benefit of the broiler. IBD specific MDA protects the broiler from infection during the first two to three weeks, after which live IBD vaccines are administered. In North America where the variant forms of IBD predominate there is total reliance on breeder vaccination to control the disease in broilers.

Reovirus has long been associated with poor growth in broilers. There is sufficient information to confirm a positive correlation exists between the level of reovirus protection in the breeder and broiler performance.

Vaccination of the breeder prevents transmission of reovirus via the egg and transfers protective levels of reo specific MDA to the broiler chick.

Avian encephalomyelitis (AE) and chicken anaemia virus (CAV) are both viral pathogens transferred from breeder to broiler via the egg. Vaccination of the breeder during rearing effectively prevents viral transmission via the egg and the transfer of antibodies protects the broiler from early infection from the environment.

Subcutaneous vaccination in a day old chick.

Food safety

Broilers must be free of food borne pathogens such as salmonella. Breeder vaccination is one of the tools successfully used in salmonella control strategies. The vaccinated breeder is less susceptible to salmonella infection and there is a reduced risk of salmonella transmission via the egg. The protective levels of MDA transferred from the breeder to the broiler protect against infection during the first weeks post hatch, when the broiler is most susceptible to infection.

Summary

Vaccination, like an insurance policy, is about risk management; the higher the risk associated with a disease, the wiser the decision to vaccinate.

However, when planning a breeder vaccination schedule additional consideration must be made for those diseases affecting the broiler progeny. ■