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Best Practice Management in the Absence of Antibiotics at the Hatchery

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Introduction

In light of increased antibiotic resistance, and as consumer pressure to reduce antibiotic use in animals continues to increase, minimal or no routine use of antibiotics in the hatchery is the ideal. In the absence of antibiotics, strategies that decrease the bacterial challenges in the hatchery need to be put in place and aseptic application of vaccines must occur. Decreasing the bacterial challenges can be achieved by following agreed and proven best practices on the grandparent and parent stock farm, during the storage and transport of eggs, and in the hatchery. After good-quality clean eggs have been produced on the farm, freedom from contamination must be maintained throughout the whole hatchery process for viable, healthy chicks to be hatched and first-week livability to be maximized.

Antibiotics in the Hatchery

Traditionally, antibiotics have been used in the hatchery to overcome health issues that might arise in chicks as a result of contamination from the eggs as well as contamination from vaccination.

The two main antibiotics given to chicks in the hatchery are:

- **Ceftiofur** - an antibiotic with activity against Gram-negative and Gram-positive bacteria as well as E coli.
- **Gentamycin** - an antibiotic used for the treatment of a range of bacterial infections and used extensively in human medicine.

Ceftiofur has been banned for use *in-ovo* in the USA since 2005. In many European countries, bacteria which produce enzymes that exhibit resistance to antibiotics (ESBL - extended-spectrum beta- lactamase and AmpC - ampC beta-lactamases) are being monitored more widely, including their incidence in poultry. Partly because of this resistance, Ceftiofur has either been banned from use (e.g. Netherlands) or withdrawn voluntarily (e.g. UK). In 2016, sampling broilers for ESBLs became mandatory in all EU member states, so the ban on Ceftiofur will become more widespread.

As the routine use of any antibiotic within the animal sector, particularly those used extensively within human medicine, comes under increasing scrutiny, the pressure not to use any antibiotics in the hatchery will also increase.

Management on the Breeder Farm

Management to optimize egg production
In the absence of antibiotics, the number of good-quality clean eggs entering the hatchery must be maximized. The use of second-quality (soiled or dirty) eggs significantly increases the risk of contamination to clean eggs and to chicks and may lead to problems with chick livability. More detailed information on best-practice management on the breeder farm to optimize the production of good-quality clean eggs can be found in the **Parent Stock Handbook** and the **Grandparent Management Supplement**. However, there are some key points that should be noted:

- Follow guidelines for body-weight and nutrition specifications in order to achieve recommended body weight and body condition by 20 weeks of age to ensure females are in the best condition possible for maximizing egg production. Ideally, grade the flock two or even three times during rear to optimize flock uniformity and flock management.
- Follow body-weight targets throughout production to help achieve target egg weights thus optimizing egg shell quality. Poor egg shell quality increases the risk of contamination of the egg.
- Move birds to the laying facilities at around 21 weeks of age. However, actual age of transfer will depend on the maturity and condition of the birds. If birds are immature, moving them to the laying facilities may need to be delayed by 7-14 days.
- Reach peak feed at 65-70% production. It is important to feed ahead of production to maintain peak production and persistency.
- Feed withdrawal after peak should be approximately 6-7%. The actual amount of feed withdrawn should be determined by egg production, body-weight progression and egg weight but feed withdrawal should not exceed 10%.

Other management points that should be noted include:

- Introducing perches during rear, at around 28 days of age, to encourage birds to use nests in the laying facilities. This will help to reduce the number of floor (dirty) eggs.
- Familiarizing birds with the nesting system in advance of the onset of lay to encourage birds to lay eggs in the nests and not on the floor.
- Having a regular nest box hygiene program in place to maintain egg cleanliness and reduce bacterial contamination.

Management to optimize egg quality and cleanliness
Keep the inside of nests and any collection belts free from litter and droppings. At a minimum, brush clean the nests and collection belts at least once a week and check them daily for dead birds.

Collect nest eggs at least four times a day. Egg collections should be timed to account for the fact that most eggs will be laid in the morning. Clear nests and collection belts at the end of the working day to minimize the number of eggs left overnight.

Ideally, floor eggs or soiled eggs should never be incubated. **A high level of floor eggs (above 4%) is probably the single biggest cause of poor chick quality and first-week mortality when antibiotics are not used at the hatchery.** Monitor the number of floor eggs and use appropriate management factors to limit the numbers laid. The key to reducing floor eggs is proper training of the birds to use nests. For further information on how to minimize floor eggs, see **Best Practice in the Breeder House - *Preventing Floor Eggs***.

Collect floor eggs separately from nest eggs and kept them separate. If floor eggs must be used, they should be clearly labelled so that the hatchery can appropriately manage the contamination risk they present (incubate them separately).

Diseases that can affect egg quality, such as Infectious Bronchitis (IBV), Avian Pneumovirus (aMPV/ART), Egg Drop Syndrome (EDS) and Newcastle Disease (NDV) must be minimized through good biosecurity and an appropriate vaccination program. The presence of these diseases must be closely monitored through serological and bacteriological testing.

Optimizing egg shell quality through the control of egg size, good nutrition and careful handling of eggs will minimize damage (such as cracks) to the shell that can be a source of contamination. Providing the correct nutrition and feeding strategies post peak (based on actual egg production, body-weight development and egg weight) to maintain egg weight targets will optimize egg shell quality, reducing the chances of contamination.

Best practices for egg sanitation

- Manage nest boxes and collection intervals so that eggs are laid on a clean surface and their shells disinfected as soon as possible after they are laid. Ideally (where local legislation allows), this practice will be done using formalin fumigation, which is effective against a wide range of microorganisms (virus, bacteria, fungi) and is a dry gas.
- Keep soiled eggs separate from clean eggs. If washing is unavoidable, always follow clear protocols regarding water temperature, non-corrosive chemicals and frequent water changes.
- There will be microbes even on the shells of clean eggs. Effective disinfection is required before arrival at the hatchery to reduce the risk of contamination to embryo and negative effects on chick health. The most effective way to disinfect eggs, where it is permitted, is with formaldehyde. It is good practice to fumigate all eggs again upon arrival at the hatchery or before set. **Never fumigate eggs after the onset of incubation.**

Egg storage

Store eggs at temperatures below physiological zero (21°C/70°F) to pause embryonic growth. Place eggs in plastic trays as soon as possible after collection and allow them to cool down uniformly. Recommended egg storage conditions are 15°C (59°F) at a relative humidity (RH) of 75-80%. Do not allow eggs to become wet during storage and pay particular attention to water droplets from humidification systems falling onto the eggs.

Nutrition

It is important to provide high-quality nutrition (good-quality raw ingredients and correct feed form). Good nutrition will ensure birds receive the nutrients they need to optimize development and production and maintain body-weight targets as recommended. In addition, the correct nutrition will promote good shell and embryo quality and good litter quality, all of which will minimize contamination.

Litter quality

Good ventilation and drinker management are both important for maintaining a dry friable litter to reduce the incidence of soiled/dirty eggs and the contamination risk they pose. Manage drinking systems to limit any water spillage and make sure they are maintained and at the correct height for bird age. The environment within the house (temperature, relative humidity and ventilation) must be managed primarily for bird comfort but also to ensure the removal of any excess moisture to maintain litter quality.

Egg Transport

Transport conditions should allow eggs to continue cooling down without condensation forming on the shell surface. Condensation will increase the chances of internal contamination and may reduce embryo viability. Condensation formation will be minimized if the farm store is kept 2°C (4°F) warmer than the hatchery store, with the truck temperature intermediately between the two.

Egg trucks should ideally be equipped with a cooling or heating system, depending on the climate. Air suspension systems are preferred to minimize damage to the eggs during transportation.

Hatchery

Hatchery conditions
When there is a lot of pressure on a hatchery and the hatchery is working at, or close to, full capacity (i.e. very high utilization, no non-hatch days or very long hatch days), hygiene as well as chick quality can suffer. Maintaining good hatchery hygiene is a must in the absence of antibiotics. Correct hatchery design and control of movement between clean and dirty areas within the hatchery will greatly assist in keeping the hatchery clean and reducing contamination. Hatchery machinery must be in good working order and a well-structured preventative maintenance schedule in place to maintain a good air flow through the hatchery. These measures will ensure clean areas are kept clean and that there is no cross-contamination from dirty areas.

Eggs should be stored within the hatchery at a temperature of 15°C (59°F).

Hatchery sanitation
Hatchery cleaning and disinfection procedures are key to hygienic conditions and good-quality chicks. Apply standardized protocols every day in all areas of the hatchery. All procedures should be documented and easily evaluated. Only use appropriate and approved soap and disinfectants. Evaluate and monitor the hygiene status of a hatchery using routine laboratory tests and follow trends over time to make sure that contamination levels are not increasing, preferably decreasing.

Hatchery incubation
Manage incubation conditions so that the embryo temperature is held at 37.8°C (100°F), the weight loss to 18 days is between 10.5-12.5 % and chick yield is 67-68%. The room's static pressure should be in accordance with manufacturer's specifications and should be checked monthly.

When the eggs pip, microorganisms from inside the shell are released in a microbial bloom. It is common practice to use formalin to control this bloom, ideally at a level of 20 ppm within the hatcher at pipping. To achieve this, initial levels added may be higher, but prolonged exposure to formaldehyde levels of >40 ppm can cause tracheal lesions in chicks. If use of formaldehyde is not permitted due to local regulations, an alternative disinfectant must be used. There are a number of other disinfectants available, but these are generally based on peracetic acids or hydrogen peroxide. Using these other disinfectants can also affect humidity in the hatcher; therefore such products need to be added with caution. If using an alternative to formaldehyde, it is important to verify and measure its effectiveness.

Vaccination
The correct and aseptic preparation of vaccines is a key component of chick quality in the absence of antibiotics. The application of vaccines via spray/gel cabinet and by injection or *in-ovo* is an important source of possible contamination of chicks if good hygiene practices are not in place. A separate air system, touchless faucet, paper towels and a clean water bath should be a priority in areas where vaccines are prepared.

Prepare the vaccine in a sterile environment and in a positively pressured room so that the vaccine will not be contaminated by dirty air from other areas of the hatchery. This room should be dedicated for vaccine preparation ONLY. Standard procedures need to be in place and vaccine preparation should be done by a trained technician.

Only use sterile water and an aseptically prepared vaccine. Spray, injectable and in-ovo vaccination equipment must be disinfected after each use using appropriate disinfectants and disinfection methods.

Processing
Handling and processing of the chicks should be kept to a minimum and be done by training personnel with due care and attention given.

The use of spray vaccination will have extra impact on the chicks as they will become wet and thus more dependent on good environmental conditions (temperature) so that they don't become chilled.

Chick holding conditions
Keep holding conditions (temperature and humidity) optimal to achieve and maintain chick vent temperatures between 39.4°C (103°F) and 40.5°C (105°F).

Chick Transport

Transport chicks from the hatchery to the farm as quickly as possible (within local legislation) and provide the correct environment for the chick to ensure that chicks arrive at the farm in the best possible condition and health status. During transport, control the temperature to achieve the desired vent temperature (39.4-40.5°C/ 103-105°F). Relative humidity should be between 50 and 65% and a minimum of 0.71 m^3/min (25 ft^3/min) of fresh air should be supplied per 1000 chicks. Ventilation rates will need to be increased if trucks are not air conditioned.

Brooding Conditions at Chick Placement

When antibiotics are not used at the hatchery, it is important that chicks are given the best possible start on the farm. Following recommended brooding practices as detailed in the **Parent Stock** and **Broiler Management Handbooks** will ensure that chicks have the best possible start with minimal need for antibiotic intervention.

- Start with a clean, disinfected, biosecure house. Ensure litter and feed have low or no bacterial contamination or Salmonella.
- Pre-heat the house at least 24 hours in advance of chick placement to achieve:
  - « An air temperature of 30°C (86°F).
  - « A litter temperature of 28-30°C (82-86°F).
  - « An RH of 60-70%.
- Ensure adequate provision of feed and water.
- Monitor crop fill and vent temperatures to ensure that the environment and the provision of feed and water are correct.

Summary

To be successful at producing good-quality chicks without the use of antibiotics at the hatchery, it is essential to reduce contamination in all areas of the process. In particular, consider the following:

- Use good-quality eggs with low levels of contaminant bacteria (ideally, dirty eggs and floor eggs should not be used).
- Maintain egg weight according to breed standards. High egg weights at an age will lead to reduced shell quality and an increased risk of contamination.
- Do not wash eggs.
- Maintain good storage conditions on the farm and at the hatchery, avoiding condensation and temperature fluctuations that may increase the risk of contamination.
- Maintain excellent hygiene standards in the hatchery to decrease the chances of egg contamination during incubation.
- Keep contamination levels under control by using formalin, or a good alternative, in the hatcher during hatch.
- Use the vaccine preparation room only for preparing vaccines and maintain excellent hygiene in the room.
- After hatch, keep the chicks in optimum condition by providing the correct temperature and humidity at the hatchery and during transport to the farm.
- Ensure the farm receiving the chicks is properly cleaned and disinfected. The correct brooding conditions and brooding set-up with clean equipment and easy and unlimited access to water and feed are fundamental for a good start. Litter material, feed and water must have low bacterial contamination and no Salmonella.

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