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Management Advice for Parent Stock Production with Minimal Antibiotic Use

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Introduction

In recent years, there has been a growing consumer perception that the use of antibiotics in food-producing animals has contributed to antibiotic resistance in humans. Because of the general concern about the potential transfer of antimicrobial resistance from food producing animals to humans, many countries are being asked to reduce or eliminate the use of antibiotics in poultry.

This document presents advice for producers who aim to minimize antibiotic use in parent stock production and is based on the experience and expertise of those with practical knowledge of this situation. It is intended to provide information that allows parent stock to be grown without the preventive use of antibiotics, as well as deliver good quality chicks to broiler farms that have as little microbial challenge as possible.

Aviagen fully supports the rights of a licensed veterinarian to treat a sick animal or flock with an approved antibiotic to control disease and prevent pain and suffering as stated by the AAAP (American Association of Avian Pathologists) and referred to in the BVPA (British Veterinary Poultry Association) Antimicrobial Guidelines.

Rearing Parent Stock with Minimal Antibiotic Use

Information from the British Poultry Council (UK), USDA-FSIS and National Chicken Council (US), Official Journal of the European Union and European Food Safety Authority (EU), and Health Action International Asia Pacific (Asia) provide detailed guidelines on the use of antibiotics/antibacterials in different regions of the world. For specific details on antibiotics permitted for use, always check the local or national legislation.

The current **Parent Stock Handbook** describes management techniques for best practice production, however the following key factors are important to remember when rearing parent stock with minimal antibiotics.

Farm preparation

Although thorough cleaning and disinfection of the house is best practice for all poultry, take special care with houses that will be used to grow parent stock with minimal antibiotics. Pay attention to the floor of the house, using hot water to remove any grease that may be present. It is good practice to check the floors for Total Viable Count (TVC), Salmonella, and E.coli to test the efficacy of cleaning and disinfection. Recommended levels of TVC should be less than 10 colony forming units per centimeters squared (cfu/cm^2) and E.coli and Salmonella levels should be undetectable.

Clean water systems with products to remove biofilms. Check the water system for TVC, E.coli, enterobacteriaceae, mold and yeast levels using swab and water samples. The recommended level for TVC in the water system is less than 10 colony forming units per millilitter (cfu/ml) and E.coli, enterobacteriaceae, mold and yeast levels should be undetectable. After 7 days, obtain a water sample at the end of the water line and test it for TVC, E.coli, enterobacteriaceae, mold and yeast. Counts should still be <10 cfu/ml for TVC and undetectable for all others. Chlorinating the water and controlling water pH will help to control bacterial growth. Flush drinking lines weekly from placement through the end of production to ensure that water does not become stale and to remove any build-up of biofilms from the lines.

Only litter material that has been tested or is certified to have a TVC of less than 10 colony forming units per gram (cfu/g) should be used for minimal antibiotic housing. Although not ideal, some regions use earth floor houses covered with a layer of bedding material instead of concrete floors. House flooring of this type is not recommended for production because it is very difficult to clean and disinfect. However, if no other options are available, earth floors should, at a minimum, be treated with one of the following before spreading litter material:

- Iodine and acid with salt on top of the floor.
- A combination of salt and lime on top of the floor.
- An organic acid and iodine on top of the floor.

Brooding and rearing

Optimum chick growth during the first 10 days of life is fundamental to the development of the gastrointestinal tract (GIT) and helps to put chicks on the right path for good health. By monitoring crop fill (aiming to achieve 100% by 24 hours) (**Figure 1**) and reaching 7-day body-weight targets, chicks will be better prepared to face the challenge of coccidiosis in areas that do not allow coccidiostats in the feed or respond to the reaction to coccidial vaccines.

Figure 1. Assessing crop fill of chicks with a full, rounded crop (left) and an empty crop (right).

As birds age, keep feeding and drinking space, light intensity and other environmental conditions to the recommended specifications so that birds are comfortable and free from situations that impact comfort, health and wellbeing. Unnecessary bird pressure can cause potential intestinal challenges, that can be more difficult to correct in production situations where minimal antibiotics are used. Always take special care when a procedure such as vaccination, or others that involve bird handling, are performed.

The use of slats and perches is recommended during rearing as a training tool for both females and males. Introducing slats and perches at an early age will help to decrease floor eggs during production and help males find the drinkers after transfer. Floor eggs are potentially contaminated with harmful bacteria that can find their way into the hatchery. Decreasing floor eggs helps to ensure that only clean eggs are delivered to the hatchery, decreasing hatchery contamination and helping to prevent poor quality chicks that could require antibiotic treatment.

Minimizing Antibiotics in Parent Stock Production

Transfer

When birds are transferred from the rear to the lay facility, it is important to make this transition as smooth as possible. Changes in housing environment such as temperature, feeding systems, drinking systems and lighting schedules may potentially cause disruptions for the birds that could lead to decreased gut health. If gut health is compromised, minimizing antibiotic use during production becomes more difficult because treatment of illnesses may be needed. Ensuring that the conditions are as similar as possible from rear to lay will help to keep good gut integrity. Maintaining a good biosecurity program and assessing crop fill (on the day of transfer, 30 minutes after first feeding and again 24 hours later) will help to ensure that bird health is sustained.

Feeding in production

Preventing birds from coming into lay too early and becoming overweight at any time will limit the risk of egg peritonitis and E.coli infections, and reduce the need for antibiotics. From transfer until 5% hen-day production (POL), feed levels should be determined by the body-weight profile. From 5% hen-day production to peak feed level (normally reached between 65%-75% hen-day production), increase feed levels in accordance with production increases in small increments at a time. Adjust feed levels to maintain small weekly increases of 10-20 g (0.02-0.04 lb) per week in body weight after peak production is reached.

Egg collection and nest cleaning

Dirty eggs from the production house (**Figure 2**) pose a greater risk of bacterial contamination to the hatchery, which is a critical control point for birds reared with minimal antibiotics. To help prevent birds from laying eggs on the floor where they can easily become contaminated, walk the house several times per day from POL through 32 weeks (224 days) of production.

Figure 2: Dirty egg/floor egg from the production house.

To avoid contamination, keep egg collection times adjusted so that eggs are removed from the nest soon after they are laid. Some things to remember are:

- Collect eggs from manual nests at least four times per day (**Figure 3**). The first collection is most commonly the largest collection of the day. Collecting less frequently than this will increase the risk of cracked or dirty eggs.
- Run automatic egg belts at least three times per day and monitor flock production to ensure the last belt run is done after the last eggs have been laid (**Figure 3**).
- Collect floor eggs separately and as often as possible (more often than nest eggs). Keep them separate from nest eggs and wash hands to prevent cross contamination.
- Do not leave eggs in the nests overnight.

Figure 3: Manual egg collection (left) and automatic egg collection (right).

Keep nest boxes clean by removing any dirty nesting material and feces daily (**Figure 4)**, and periodically clean and change automatic nest box pads to avoid dirty nest eggs. Clean and sanitize egg collection belts at least once per week. Clean and sanitize packing and grading equipment daily. Monitor reports from the hatchery regarding contaminated eggs and rots and review farm hygiene and egg storage and transfer procedures, adjusting the cleaning schedule as needed.

Figure 4: Example of dirty (left) and clean (right) nesting material.

As a rule, floor eggs and second grade (cull) eggs should never be used by the hatchery. If used, they can be a source of hatchery contamination.

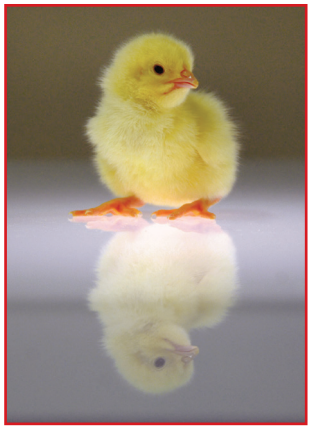
Egg disinfection

Fumigation with formaldehyde remains the most effective method for disinfecting hatching eggs. When done correctly, it provides an excellent kill rate of microorganisms on shell surfaces and does not damage the cuticle or the embryo. However, some countries have prohibited the use of formaldehyde due to the potential risk to human health if not handled safely. If an alternative to formaldehyde must be used, it must be capable of killing 99% of shell surface bacteria, viruses and molds and give no increase in egg content bacterial counts. This alternative must also cause little to no cuticle damage and provide the same or better hatchability than formaldehyde. Disinfect hatching eggs immediately (within 30 minutes) after each collection on the farm and again upon arrival to the hatchery. This method of double disinfection helps to eliminate contaminants from reaching the hatchery.

Management in the Hatchery

The main requirement for a good-quality chick is to use clean eggs. There is no substitute for clean eggs to produce healthy chicks (**Figure 5**) and this is even more relevant when dealing with eggs produced from flocks with minimal antibiotic treatment. Avoid taking-in or setting washed eggs as there is a risk for contamination inside the egg. When hatching chicks from minimal antibiotic-use flocks, it is crucial to maintian hatchery cleanliness and biosecurity throughout the intake of eggs, storage, setting, hatching and chick handling processes. Correctly set the eggs and maintain the optimum incubation conditions.

Figure 5: Clean eggs at the hatchery provide good quality chicks.



Tracking the number of contaminated eggs per flock at egg transfer is useful information that can be given back to the farm or egg supplier as an indication of farm egg hygiene. An effective disinfection method in the hatchers shortly after transfer and during pipping is recommended for reducing bacterial levels or keeping them to a minimum. When health and safety issues are addressed, formaldehyde is a very effective sanitizer for the hatcher environment. However, adhere to local legislation at all times.

Nutritional Recommendations for Minimal Antibiotic Use Parent Stock

Gastrointestinal (GIT) health

The GIT of the chicken has three predominant stages: development, transition and maintenance. Understanding all of these stages is essential to ensuring optimal gut health. During the development stage (the first two weeks of the chick's life), failure of the GIT to develop properly will impact health and performance for the entire life of the bird. Optimal early GIT development is dependent on correct brooding conditions, the presence of food and clean water, and the introduction of beneficial bacteria into the intestinal tract. The transition stage refers to the time periods when there are fluctuations in the gut environment in response to impacting factors such as a feed change, vaccination, grading and transfer. These events can cause a change in the intestinal environment and increase the risk of conditions such as dysbacteriosis or Necrotic enteritis. The maintenance stage refers to the period when the gut has stopped developing and reached balance. There is still the risk of intestinal imbalance due to management or pathogen challenge, so it is important to maintain support of the GIT tissues.

Plant-based diets

One of the key factors that distinguishes diets of flocks grown with minimal antibiotic use is the move from animal byproducts to all-vegetable nutrition. Due to the increased possibility of Salmonella contamination and Necrotic enteritis when including animal byproducts in diets, plant-based diets are recommended for this type of production. Changes in the gut environment, either due to bacteria or feed ingredients, can cause an increase in viscosity in the mucus layer of the intestines. This change in the mucus environment can provide more favorable conditions for the growth of Clostridium perfringens, and in turn, lead to an outbreak of Necrotic enteritis that will require antibiotic use.

In some countries, diets are formulated with the addition of grains with higher levels of non-starch polysaccharides such as wheat and rye. The addition of these grains in different diets throughout the life of the bird can significantly affect the balance of the intestinal microflora and cause intestinal disruption leading to conditions such as Necrotic enteritis.

Other potentially beneficial feed additives

There are some feed additives that can possibly be beneficial when minimizing antibiotics. These products may have antibacterial properties and help to maintain gastrointestinal health. Feed additives to consider when rearing these flocks are:

- **Prebiotics** – provides a nutrient source to beneficial bacteria in the GIT.
- **Probiotics** – provides the GIT with beneficial bacteria.
- **Essential Oils** – have been known to have antibacterial properties, stimulate gut tissue development and have beneficial effects on the immune system.
- **Organic Acids** - stimulate GIT tissues and modify intestinal flora by favoring acidophilic bacteria.
- **Insoluble Fiber** - birds fed insoluble fiber have greater gut-fill, improved immunity and reduced salmonella, clostridium perfringens and enterobacteriaceae. Insoluble fiber is proven to increase gizzard development which is known to improve the function and health of the small intestine, reducing the risk of bacterial over-growth and dysbacteriosis (microbial imbalance).

Health and Vaccination of Minimal Antibiotic Use Parent Stock

When minimizing antibiotic use, it is essential that parent stock flocks are of good health status. To achieve this, there must be an appropriate vaccination program and a good biosecurity program in place. Parent stock should be free from vertically transmitted diseases such as Mycoplasma and Salmonella and be vaccinated/protected against appropriate vertically transmitted diseases, such as CAV (Chicken Anemia Virus), AE (Avian Encephalomyelitis), etc. In addition, an appropriate vaccination program should also prevent infection from diseases that are not vertically transmitted.

Parent flock vaccination will also help to provide maternal antibodies that help prevent horizontal infection (infection from the broiler farm environment) in chicks at an early age. This is the main function of some vaccines such as inactivated Gumboro disease.

All vaccinations must be given using a standard operating procedure that minimizes discomfort and optimizes the vaccine uptake. Always administer vaccines in accordance with the advice from the manufacturer. The exact vaccination program will vary, taking into account the background disease challenge of the parent stock farms and the broiler farms on which the progeny will be placed.

Conclusions

Although the current **Parent Stock Management Handbook** provides a wealth of information regarding best management practices for rearing parent stock, some key points to remember when limiting antibiotic use in poultry include:

- Closely monitor water quality. Keep TVC at <10 cfu/ml, and E.coli, enterobacteriaceae, yeast and mold at undetectable levels.
- Use only litter that has been tested or is certified to have a TVC of <10 cfu/g.
- If possible, do not use earth floor housing for antibiotic-free production.
- Monitor crop fill and 7-day body-weight targets to ensure chicks get off to a good start.
- Keep to recommendations of feeding/drinking space, light intensity and temperature/RH to keep birds calm.
- Make the transition from rear to lay as smooth as possible to avoid compromising GIT health.
- Limit the risk of egg peritonitis and E.coli infections by preventing birds from coming into lay too early and becoming overweight at any time.
- Do not use floor eggs and second-grade eggs at the hatchery.
- Use the double-disinfection method for hatching eggs to help eliminate contaminants from reaching the hatchery.
- There is no substitute for clean eggs to produce first-quality chicks.
- Plant-based diets are recommended.
- Use pre- and probiotics, essential oils, organic acids and insoluble fiber to benefit production as part of a strategic gut health program.
- Maintain a high health status with good biosecurity and vaccination programs.