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SANITARY MANAGEMENT OF THE HATCHING EGGS

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INTRODUCTION

Unquestionably, the sanitary quality of the hatching eggs will affect the quality of the day-old chicks. The egg leaves the oviduct free of any microorganisms (except for vertically-transmitted pathologies), but even eggs which are laid « clean » present a wide diversity of bacteria on the shell. Furthermore, after being laid, the egg's temperature drops (from 41 to 21°C), which causes embryonic development to be suspended, but also egg contents to contract, thereby creating an aspiration effect of the germs present on the eggshell surface, an effect made even easier by the fact that the cuticle is still wet.

It is therefore very important to bear in mind that eggs are sanitarily fragile, thus special procedures have to be implemented, from the breeding farms up to the hatcheries, to ensure it.

A. SANITARY QUALITY OF EGGS ON THE FARM

In the hatchery, the first requirement consists in receiving clean eggs. Clean eggs are defined as eggs having an intact shell, free of any micro-cracks, with a regular surface and not any deformations, and bearing no visible external soiling (laid in the nests).

Producers must be well aware of the difference in the level of hygiene required between egg rearing on the one hand, and egg conditioning on the other hand. These are truly two different professions.

1. Egg Collection – Prevention of Dirty Eggs

While being collected, eggs will be distinguished into three categories and sorted to be stored depending on their status and future use:

- clean eggs (which can be directly incubated),
- slightly dirty eggs, which will be either culled, or decontaminated and incubated, as required by economic conditions,
- eggs to be culled. i.e., dirty, abnormal, out of standards, etc.. that are to be sent to the shelling plant or destroyed.

The traceability process must start as soon as egg collection takes place: the different egg qualities constitute different batches, whose identification will be maintained through the production process, from breeders up to the farm which receives the chicks stemming from these breeders.

Dirty eggs, and typically all floor eggs, are contaminated and constitute a potential hazard for the hatchery: they reduce chick hatchability and viability performances, and increase disinfection and personnel costs. Therefore, under no circumstances should floor eggs be replaced in nests, they will be stored separately.

Prevention of dirty eggs goes through a number of measures:

- ✔ Nests in sufficient numbers (4-5 hens per nest), attractive (well laid out), and cleaned regularly. As the greatest risk of contamination for eggs is during oviposition, it is particularly important that nests be very clean.
- ✔ Frequent collection schedule, depending on the internal temperature of the building. During hot days, egg collection frequency must be increased in order to prevent the beginning of embryonic development and early embryonic mortality. Thus, it is recommended to collect eggs 5 times a day above 30°C, particularly during the laying-peak period. Egg collection from automatic nests must be programmed to eliminate this risk of pre-incubation.
- ✔ Ensured food safety to avoid the appearance of non-specific enteritis.
- ✔ Regular cleaning of egg collecting belts and elimination of soiling.
- ✔ Cleaning of hands before/after each collection and before/after handling floor eggs. Clean eggs must be collected before floor eggs.
- ✔ Finally, it is useful to mention some farm management practices reported in some studies on the factors promoting floor laying:
 - a. A luminous intensity of at least 10 lux limits floor laying by promoting the horizontal mobility of hens to the detriment of vertical mobility,
 - b. The risk of having floor eggs is two- to threefold with rear pan feeders without perches than with chain feeders,
 - c. Nipple drinkers more largely contribute to floor laying than bell drinkers,
 - d. Feeding birds within 30 minutes of lighting turning on: nests should be opened 15 minutes before lighting turns on and closed one hour before it turns off.

2. Cleaning of Dirty Eggs on the Farm

This practice is generally not advisable because it leads to the introduction of risky eggs in the hatchery (a few dirty eggs can contaminate a whole incubator); however, cleaning dirty eggs can be necessary when they are in large numbers and their elimination is a threat to the hatchery's profitability. Therefore, egg cleaning is a compromise between economic and sanitary imperatives.

Cleaning must be applied to dirty eggs only: cleaning is not necessary and can be risky for clean eggs because it weakens the natural protection of the egg shell. Clean eggs are directly sent to the disinfection chamber of the farm.

For moderate cleaning, one should prefer wiping using a single-use towel (cloth) slightly moistened with a disinfecting solution. Avoid using abrasive or metal sponges: they promote egg contamination by causing damage to the cuticle while allowing microorganisms to survive.

For a more intensive cleaning, the best solution from a sanitary point of view, is spraying: eggs go through a tunnel where they are sprayed with a disinfecting solution and then water at a well-controlled temperature (40-42°C). This egg-washing practice is very efficient but can rapidly become a source of contamination. As a consequence, the disinfecting solution must absolutely be clean and also imperatively changed for each batch of eggs. After bathing in a detergent solution, eggs are bathed for 2-3 minutes in a disinfection bath (e. g., a 500 ppm chlorine solution) at approximately 42°C in order to act only on the surface of eggs.

3. Disinfection of Eggs on the Farm

The earlier disinfection takes place after laying, before too strong cooling of the egg, the more likely it is to be effective. Moreover, it is logical to carry it out as early as possible as the egg is not soiled.

Disinfection should take place in the storage room of each building, in an annex room or in a central storage room, which has a sufficient capacity to handle the totality of a morning collection. The trays must be clean and stored in a place secure from wild animals and pests.

Disinfection can be done using the spraying method: by spraying eggs with a solution when they are collected directly on cardboard Keyes trays, or with foam when collected on setter trays. However, this method is not advised by some people who consider that damage to the cuticle is more harmful and less beneficial than partial disinfection (a liquid never diffuses enough to reach the whole surface of the egg on a carton Keyes tray or a setter tray).

Another efficient method is disinfection in a water and air-tight chamber with formalin gas or by nebulization of disinfecting solutions. However, fumigation with formaldehyde has to respect five key points: concentration of the gas, time of exposure, temperature, humidity and circulation of the gas.

Disinfection with formaldehyde is very effective on setter flats and plastic Keyes trays (which offer large open surface areas), and even on cardboard Keyes trays. However, pulverization can only be performed on eggs already placed on setter flats.

In the event of a risk of Aspergillosis, it is recommended to use a specifically active product called enilconazole.

Disinfection control can only be carried out on agars that have been in contact with egg shells before and after disinfection, by testing for the total mesophilic flora, fecal streptococci and *Aspergillus fumigatus*.

4. Storage

During the storage period, it is crucial to prevent the recontamination of the hatching eggs. Temperature and relative humidity values must be applied to limit embryo dehydration but also to prevent condensation and the development of fungi, as well as the degradation of cardboard Keyes trays.

The storage room must have two accesses:

- ✓ one coming from the disinfection chamber for hatching eggs,
- ✓ the other, independent, to pick up hatching eggs with the hatchery's truck, thus forbidding access to the rearing area to the driver.

Note: downgraded eggs, intended for consumption or destruction, must not be stored in this room.

B. SANITARY QUALITY OF THE TRANSPORT OF HATCHING EGGS

Transport of eggs to the hatchery must preserve the integrity of the shells and their sanitary status as clean eggs. The quality of the transport vehicle is important as regards suspension, ventilation and air conditioning. Movements should preferably take place during cool hours.

Disinfection can possibly be carried out during transport if the truck is equipped for it. The temperature in the truck contributes to good hygiene; indeed, maintaining a stable temperature from the farm to the hatchery prevents condensation on shells (which is favorable to egg contamination).

Dedicated transport means, specifically used for hatching eggs, must be preferred. If the truck is to transport day-old chicks, these should never be mixed with eggs, and it is essential that a complete disinfection procedure be carried out between egg transport and chick transport.

Trucks will be disinfected after each trip, and disinfection will be evaluated periodically: on the walls, in the ventilation tank, on air extractors, on the moveable floor and in the driver's cabin. All equipment that can be reused for production is carefully disinfected before it returns to the farm (transport trolleys, egg flats, plastic Keyes trays).

The driver does not have access to the area where breeders are reared and should not enter the hatchery; his access to the storage area is different from that through which the hatchery personnel enter the room. Finally, he must change and wash his outfit at each round.

C. SANITARY QUALITY OF EGGS IN THE HATCHERY

Beyond techniques, it is useful to remind that egg sanitary quality control is closely associated to a controlled circulation in the hatchery. It is possible to manage eggs from questionable pens by setting them apart on a treatment circuit completely distinct from that of clean eggs: questionable eggs are incubated separately and then transferred last to specific hatchers, and chicks can possibly be loaded without going through the common room.

1. Usual Procedure: Hygiene of Clean and Sound Eggs

After a first disinfection session at the farm, eggs are systematically disinfected as soon as they arrive in the hatchery, in a dedicated water and airtight chamber:

- ✓ by fumigation: traditionally used, formalin remains the most effective and the least expensive product. However, its use tends to be more and more limited due to its toxicity.
- ✓ by pulverization: hatching eggs will then have to dry off before any other handling. The increasing use of peroxides should be noted. However, be careful of their corrosive effect on non-stainless steels, or finally
- ✓ by spraying: application is quick (5 minutes) and the recommended contact period is one hour.

Note: glutaraldehydes, because of their smell, and quaternary ammonium compounds, because of the greasy film they leave on eggs, are not widely used.

After this contact period, the chamber is opened and ventilated; once dry, hatching eggs can be placed in the storage room.

If sanitary circumstances warrant it, additional disinfections can be carried out in the preheating room, in the incubator, or even in the hatcher. Attention should be paid to using products that are compatible with embryonic development, and contact periods should be limited. Be particularly careful during the 1st to 4th incubation days during which the embryo is very fragile, and during the hatching period itself because of the risks of respiratory toxicity for chicks.

2. Occasional Procedure: Dirty Egg Washing

As indicated previously, dirty egg cleaning, if carried out, is preferably done on the farm in order to prevent the introduction of dirty eggs in the hatchery.

However, it can also be performed in the hatchery itself in order to better control the reliability of the method. This washing process is then often carried out upon storage exit, just before eggs are set for preheating.

In all cases, washed eggs will be incubated separately from clean eggs.

3. Exceptional Procedure: Antibiotic Treatment of Eggs

This procedure can be implemented in a very particular context and obviously in accordance with the current sanitary regulations and charters:

- ☑ on valuable flocks deemed in danger on a sanitary basis,
- ☑ to eliminate a specific contaminant (mycoplasma),
- ☑ under strict veterinary control, with close follow-up of antibiotic resistances in chicks born from those eggs.

It can by no means be recommended as a routine on multiplication batches, because of the risk of appearance of multiple resistances.

The antibiotic treatment can be applied by egg dipping or by *in ovo* injection:

- ☑ egg dipping: eggs are placed in a water and airtight recipient containing the antibiotic solution. By creating a depression with a vacuum pump, the air contained in the pores of the egg shell is extracted, and when the depression ceases, it results in the penetration of the antibiotic solution through the egg shell.
- ☑ *in ovo* injection: the antibiotic injection, carried out at transfer, is performed into the amniotic cavity or directly into the embryo, through the air chamber. This option is far better to guarantee the uniformity of the dose. Egg candling is strongly recommended in order to avoid the serial explosion of very contaminated eggs during injection.

CONCLUSION

After following the hygiene rules, decontamination and checkout methods having been applied, the result must logically be seen on chicks, which are the first indicators of the sanitary level of the hatchery.

That is why it is interesting to follow up the performances of batches during the first week: a sanitary problem at the level of the hatchery is transmitted and multiplied at the level of the chick, a problem which will express at least by a poor early growth, possibly complicated by infectious and inflammatory processes.

Besides, this %downstream+follow-up must be completed by an %upstream+analysis: a flawless management of the hatchery cannot offset errors made at the production level. Consequently, it is essential that these measures be included in a strict sanitary policy applied on breeder flocks.

Keep in mind that it is possible to compromise the results of a good batch of chicks by a poor farm management, but it is impossible, even with the best management, to obtain good results with a poor batch of chicks.