

Food Safety Program /2nd Level 2nd
Course: Animal Production 3 (Poultry)

Title of lecture : Maintaining Hatching Egg Quality

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Maintaining Hatching Egg Quality

There are a number of biological, physical, and environmental factors which can influence the quality of hatching eggs.

Maintaining egg quality in the breeder house

1. Nesting Material

Use enough clean, dry, and mold-free nesting material to avoid cracked and dirty eggs. Nesting material provides a cushion for the eggs and when it is insufficient, many eggs can be broken by the hens.

Wet litter will also reduce air quality and increase respiratory disease. A good practice is to replace or add nesting material as needed during egg collection and to remove wet litter from the floor.

nesting material include low in dust, high in porosity, cushioning qualities, and to be inexpensive. Common nesting materials include: woods having ,dried sugar cane pulp, peat moss, rice hulls, chopped corn cobs, straw or hay excelsior pads, peanut hulls, carpet remnants, sawdust ,artificial grass pads and shredded paper

2. Training Birds to Use Nests

Early training of hens to lay in the nests, whether conventional or mechanical, is essential to prevent contamination and to reduce the incidence of cracked eggs. Open the nests one week prior to the expected first egg and make sure that there is sufficient padding or nesting material in the nests.

remove floor eggs, and encourage hens to move toward and recognize the nests.

- These materials should be removed when egg production reaches 25 to 35%. Other training tips include:

- A.** Locate the lowest perch no more than 27 inches (69 cm) above the litter.

- B.** Place the nests in the house before the time pullets are housed at the breeder farm.

- C.** Hens may refuse nests that are soiled, dusty, or dirty

D. Make certain the nesting material is adequate to provide sufficient cushioning to entice the hens.

E. Provide a well-ventilated breeder house environment so that the nesting material and floor litter remain dry.

F. Provide one nest for every four hens with conventional nests and one nest for every five to seven hens with mechanical nests.

G. Pick up the floor eggs six to eight times per day when the birds first start to lay.

H. Nest boxes should be checked for stray electrical voltage, especially if they are mechanical nests.

3. Hatching Egg Collection

The frequency of hatching egg collection is very important to maintaining quality. This is especially true in extreme weather (hot or cold) conditions. Most published reports suggest that hatching eggs should be collected a minimum of four times per day with conventional nests.

It is imperative that people wash and sanitize their hands before collecting eggs from the nests or egg belts. The flats that eggs are placed on must also be sanitized and free of organic material.

- **4. Hatching Egg Containers**

Plastic flats are the best hatching egg container for at least two reasons. First, the eggs must be cooled to proper storage temperatures, in the range of 55° to 67°F (13° to 19°C), as soon as possible after collection. In plastic flats the eggs are exposed to the circulating air in the storage room and will cool faster than eggs in fiber flats. Second, because eggs have more exposed surface area with plastic flats, they can be sanitized more easily than with other types of flats. Plastic flats are ideal for fumigation, mechanical hatching egg washing, and spray sanitizing.

Paper and fiber flats are readily available in the poultry industry but have weakness as hatching egg containers. These flats cannot be sanitized and therefore are a potential source of contamination or recontamination.

Wire baskets have been and are still being used for collecting hatching eggs. However, their use is not recommended as cracks occur when eggs are piled on top of each other in a rigid wire container.

HATCHING EGG SELECTION

In general, hatching eggs with poor shell condition do not hatch as well as those with good quality shells. Eggs with moderate to severe shell defects.

Excessively long, thin, or completely round eggs do not hatch well. Other defects including wrinkles, hair-line cracks, toe-punches, pointed ends, dark tops, calcium deposits , etc.

Table 38-1 shows the results of incubating various classifications of cull-hatching eggs. Most cull eggs are also more easily penetrated by microorganisms than normal hatching eggs.

There are many types of defective eggs that should be culled during hatching egg collection at the breeder farm.

Table 38-1. Hatchability of Abnormal Broiler Breeder Eggs

| Description of Abnormality | Reduction from Normal % |
|--|-------------------------------|
| Misshape (slight deviations due to ridges) | 8.9 |
| Slightly round | 10.7 |
| Small (<50 g; <21 oz/doz) | 11.5 |
| White (no pigment) | 24.6 |
| Obviously round | 26.1 |
| Pimpled (rough shell) | 55.1 |
| Wrinkled (obvious) | 61.2 |
| Dark top (rough area) | 66.3 |

1. Mechanical Factors

Some hatching eggs will become dirty, stained, cracked, or Punctured in the breeder house.

2. Biological Factors

The physiological condition of the hen can affect the quality of the eggs she lays. Stress and certain diseases affecting the oviduct and ovaries, i.e., bronchitis and IBD, may cause thin or wrinkled egg shells and erratic ovulation .Early maturing pullets lay more defective eggs than when sexual maturity is delayed.

Feed the hens a diet adequate in protein, calcium, phosphorous, vitamin D, and other nutrients. When shells appear thin, calcium may be added in the form of crushed oyster shell or large particles of limestone. The source of calcium is important because of its solubility. If a source of calcium is low in solubility, thin shells may result even though dietary calcium in the ration is sufficient

REDUCING CONTAMINATION OF HATCHING EGGS

Poor hatching egg sanitation can be a major cause of lower hatchability and poor chick quality.

Even eggs removed from the oviduct will have some bacteria. More bacteria are picked up on the shell when the egg passes through the cloaca where urine and intestinal contents also pass. The bacterial load found on an egg shell at the time of lay ranges from 300 to 500 organisms.

In conventional nests, it is very important to maintain clean nest litter to prevent further contamination. Periodically remove fecal material from the litter and add fresh litter.

Eggs laid on the floor can have thousands of bacteria, even if the shell appears clean.

- **Table 38-3 shows the relationship between shell surface contamination and subsequent two-week chick mortality**

During the cooling process the egg contents begin to shrink producing negative pressure. This is one of the more opportune times for bacteria on the shell surface to penetrate the egg shell. Therefore, it is imperative that the eggs be moved to cool storage as soon as possible after lay.

Table 38-3. Eggshell Contamination and 2-Week Chick Mortality

| Egg Condition | Total Bacteria | Coliforms | 2-wk Mortality (%) |
|-----------------|----------------|-----------|--------------------|
| Nest clean | 600 | 123 | 0.9 |
| Slightly soiled | 20,000 | 904 | 2.3 |
| Dirty | 80,000 | 1307 | 4.1 |

Source: Muller, H. D., 1980, personal communication

- **Transporting Hatching Eggs**

Hatching eggs should be picked up from the breeder farm a minimum of twice each week and transported in environmentally controlled egg trucks.

Most eggs are currently delivered to the hatchery on farm carts or egg racks where cracks can easily occur.

Hatching egg trucks must be equipped to control both temperature and humidity. Temperature should be kept at 65°F (18°C) and the relative humidity in a range from 60 to 70%.

the time required for shipments to reach their destination, and temperature and humidity fluctuations that may occur during shipment. All of these conditions reduce hatchability

- **HANDLING EGGS PRIOR TO INCUBATION**

Hatching eggs are generally 1 to 3 days old by the time they reach the hatchery where they are stored prior to incubation. Holding conditions.

- **1. Hatchery Egg Holding Room Temperature**

Temperature in the hatchery egg room should be kept at about 65°F (18°C) to prevent preincubation embryonic development. When eggs must be stored for a week or longer, it is advisable to reduce egg storage room temperature to 55°F (13°C).

Figure 38-1 shows the amount of time required to reduce internal egg temperature from 100 °F to 65°F (38°C to 18°C) with different packing methods. Over four days were required for the proper reduction in temperature to occur when eggs were sealed in cases, while less than one day was needed where eggs were stored on hatchery buggies.

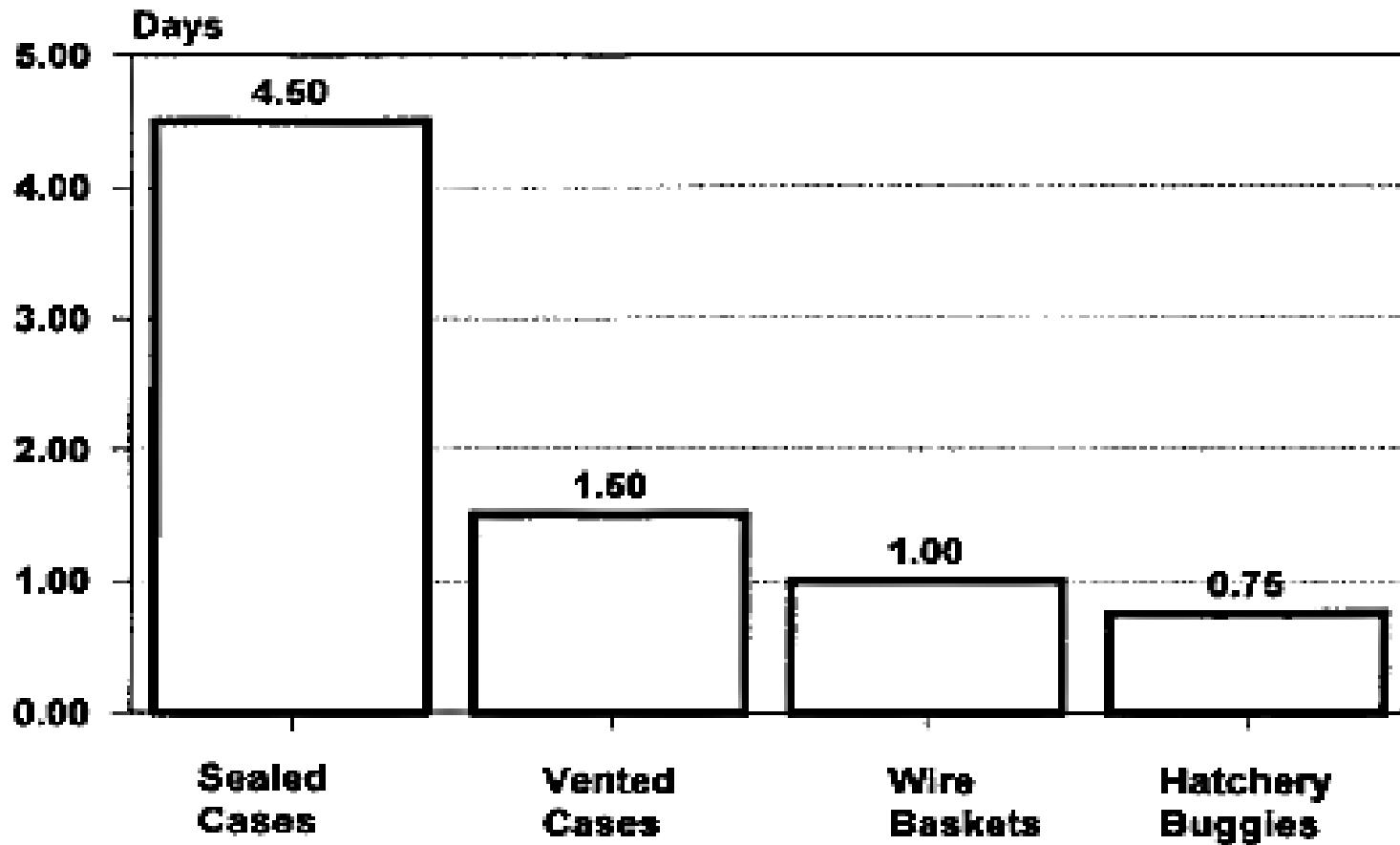


Figure 38-1. Time Required to Reduce Internal Egg Temperature to 65°F from 100°F

2. Hatchery Egg Holding Room Humidity

Moisture from inside the egg is lost through shell pores via evaporation. The rate of moisture loss is controlled in part by the relative humidity of the air surrounding the egg. When relative humidity is low, loss is greater than when the relative humidity is high. Relative humidity in hatchery egg storage rooms should be maintained between 75 and 80%.

Hatchability will be optimum when hatching eggs are held from one to five days. After five days of storage, hatchability begins to fall.

Long holding periods not only reduce hatchability but also increase the incubation time. For each day of egg holding longer than five days the incubation time will increase about one hour.

Figure 38-3 shows the effects of egg holding time on hatchability and hatching time. Hatchability falls rapidly after five days of storage and incubation time increases by nearly 10 hours after 22 days of storage.

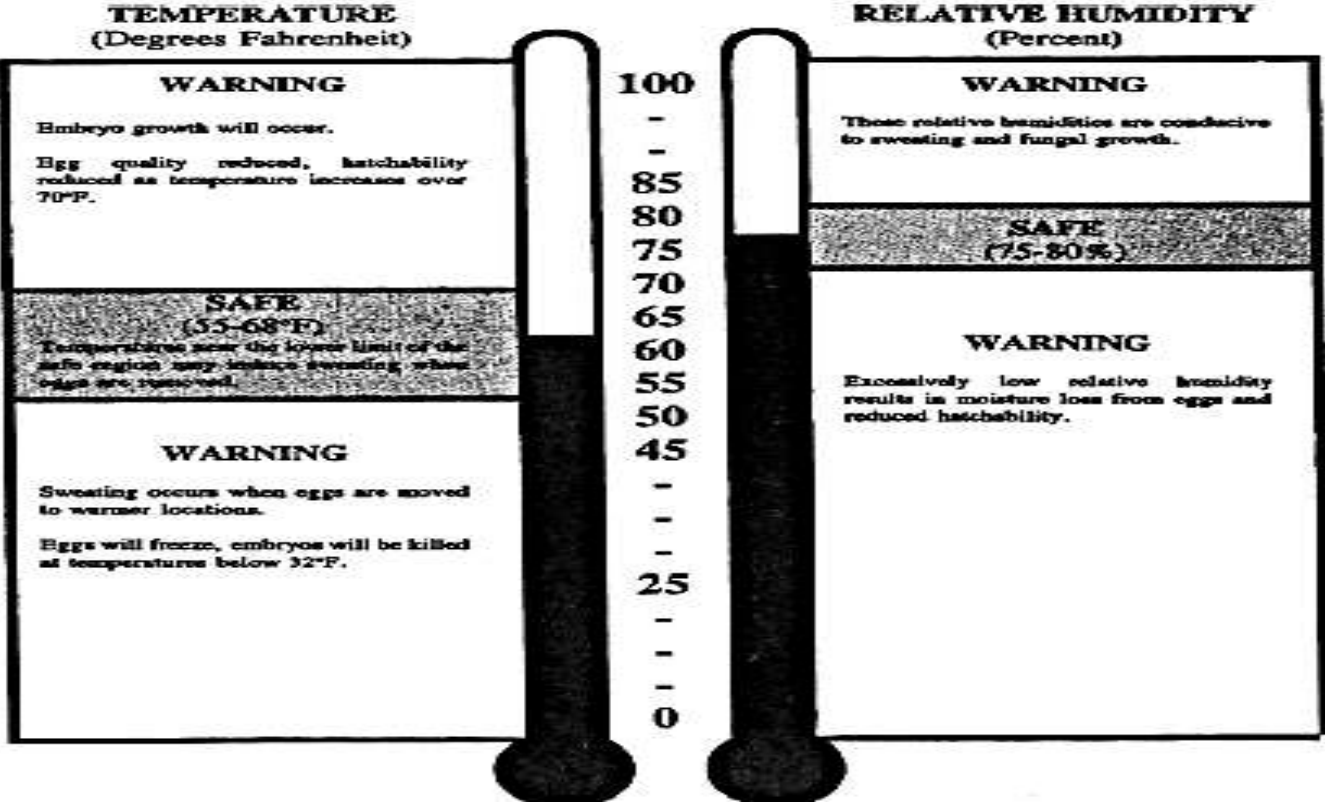


Figure 38--2.-Hatching egg room temperature and relative humidity

Long storage times also reduces chick weight and ultimately market weight in broilers. Plastic bags may be used to prevent rapid moisture loss when eggs are stored for long periods. For further preservation of egg quality, flush the plastic bags with nitrogen and seal the bag.

Procedure for storing eggs in plastic bags:

- 1. Disinfect eggs with a good sanitizer.
- 2. Cool eggs thoroughly to 55°F (13°C).
- 3. Place eggs in plastic bags, flush with nitrogen gas, and seal.
- 4. Store eggs at 55°F (13°C).
- 3. Positioning and Turning Eggs During Long-Term Storage.

- When storing eggs less than 10 days, store them with the large end up. If eggs are held for 10 days or more, hatchability will be improved if stored with the small end up. It is necessary to turn them back over with the blunted up before setting. For long periods of egg storage, some producers will turn eggs 90° daily.
- **Optimum conditions for storing hatching eggs**

| Storing conditions | Storing periods | | | |
|------------------------|-----------------|--------|---------|-----------|
| | 4 | 7 | 14 | 21 days |
| Degrees of temperature | 17 – 18 | 16 -17 | 14 - 16 | 12 – 13 C |
| Humidity % | 80 | 85 | 85 | 85 % |
| Small end up | No | Yes | Yes | Yes |
| Plastic bags | No | No | Yes | Yes |
| Nitrogen | No | NO | No | Yes |