

# TECH REPORT | Poultry

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## Managing Chick Quality for Improved Broiler Flock Performance

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Good quality chicks are the foundation to achieving better overall flock performance. Early livability will be better, and the chicks will be more tolerant of vaccines and adverse environmental conditions. There is a strong connection between chick quality and condemnation rate at processing: poor chick quality leads to higher condemnation rates. The influence of chick quality does not stop after 7 to 14 days. Chick quality is mainly influenced by 3 areas: Breeders, Hatchery, and Brooding.

### Good quality chicks can be recognized by the following characteristics:

- Bright, alert, strong and active.
- Legs are yellow and fully fleshed.
- Good size uniformity.
- Hatch from eggs that are a minimum of 20 ounces average per dozen.
- Well-healed navels.
- No mechanical defects (such as ulcerated hocks, crossed beaks).
- No bacterial infection of any kind.
- Reaction to day-of-age respiratory vaccines is within normal limits; drastic reduction of live vaccine dose is not necessary.
- Good tolerance of *minor* day-to-day fluctuations in brooding management.

### The Breeder Flock and Their Influence on Chick Quality

1. **Flock Age.** Young breeder flocks produce smaller chicks which are often weaker and less tolerant of any type of stress; they lose heat and water very quickly. It is common to have high mortality in these flocks due to dehydration and “starveout” (chicks that never move

to feed or water) unless special brooding precautions are taken.

Older flocks produce larger chicks; but the thin, porous shell is more prone to bacterial and mold penetration. Chicks from these flocks are more likely to be infected.

2. **Disease.** Some diseases, like *Mycoplasma gallisepticum*, *M. synoviae*, reovirus, avian encephalomyelitis (AE) and Chick Anemia Virus (CAV) can be passed from hen to chick. Bacterial infections of the hen's oviduct can be passed into the egg or contaminate the shell (*Salmonella enteritidis*, *E. coli*).
3. **Nutrition.** Nutritional status of the breeders can affect both the egg shell quality and the quality of the chick itself. Improper levels or ratios of calcium, phosphorus and vitamin D can result in thin egg shells which are easily penetrated by bacteria or mold. Summer heat can have the same effect on shells because the birds decrease feed (nutrient) consumption. Vitamin or mineral deficiencies in the hens can result in embryos which die in mid-incubation (between 5 and 16 days of incubation). Chicks hatching from vitamin deficient hens may be weak, unable to withstand stress, or may have deformities.
4. **Maternal Antibody.** The ability of the chick to withstand early field challenge or vaccination is related to the level of passive immunity (maternal antibody) it receives.
5. **Egg Pack Handling and Storage.** Once the eggs are laid, chick quality is affected by anything which promotes entry of bacteria or mold into the egg. Some common problems which result in egg contamination include:
  - *Dirty Eggs*- poor nest conditions and infrequent collection



- *Wet Eggs /Sweating eggs- do not wash eggs, avoid fluctuations in temperature.*
- *Cracked eggs – due to rough handling or poor eggshell quality*

Common problems associated with egg contamination are exploding eggs, Aspergillosis, and yolk sac infection. Yolk sac infection and exploding eggs are commonly associated with hot, humid summer conditions and older breeder flocks. Contamination with mold and bacteria is of particular concern when Marek's Disease vaccine is applied by in-ovo injection. Contamination will easily spread from the shell into the interior of the egg through the puncture.

Under the best real-life conditions, hatch may take 12 – 18 hours from first to last chick out of the shell. Unfortunately, hatch often takes longer. This is called a slow or "dragging" hatch. Some causes of a slow or dragging hatch:

- Pre-incubation
  - Some embryos get an incubation head start because they were collected infrequently in warm weather, or because they were exposed to temperatures at or above 70°F on the farm or in transport.
- Egg Holding Temperature and Humidity
  - Proper egg holding temperature ranges from **55° - 68°F**, depending upon egg age and holding time. Humidity in the egg holding facilities is essential to avoid moisture loss from the eggs which could reduce hatch, but levels over 80% Relative Humidity (RH) may result in mold problems. **65% RH is ideal.**

## The Hatchery and its Influence on Chick Quality

Hatching is dependent on the correct combination of temperature and humidity, which, in turn, are controlled by ventilation, just like a broiler house. The eggs are the main source of heat. The humidity nozzles provide humidity and cooling (through the evaporation of the spray). Dampers allow fresh air to enter and cool the machine (like vent boards in a broiler house). Dampers also close to conserve heat and humidity. Fans work to keep heat and humidity evenly distributed. The goal is to maintain identical, perfect microclimates around each individual egg.

Any reduction in airflow or disruption of airflow can produce hot or cold spots. This includes improper room pressure, worn or bad seals, dirty fans, improper placement of racks in machines, and inability of the hatchery to control the

temperature or humidity of air *entering* the machine.

Important Considerations for the hatchery Include:

- 1. Hatchery Sanitation.** Eggs or chicks which are exposed to contaminated surfaces or contaminated air may pick up either mold or bacteria and may become infected. Since the hatchery must maintain warm, humid conditions, it provides the ideal environment for mold and bacterial growth. Extensive sanitation programs are essential to every hatchery, including cleaning of floors, ceilings, walls, ducts, heaters, processing equipment, belts, air conditioning or evaporative coolers, chick vaccinating equipment, delivery boxes, hatcher trays, etc. A detailed laboratory quality assurance procedure using plates and swabs must be used to monitor the success of sanitation efforts.
- 2. Machine Maintenance.** Since the incubation and hatching environment are ventilation dependent, any disruption in air flow or air speed, however minor, will affect a portion of the eggs in the machine and result in uneven hatching.
- 3. Control of Temperature and Humidity.** The halls (or plenum) should be maintained at 78° - 80°F with a relative humidity of 55 – 65%. If these conditions cannot be maintained, the machines are forced to make up the difference. Even well-maintained machines may develop hot or cold spots; machines in need of maintenance will produce poor quality chicks and may also result in a reduced hatch. Check internal (infertile) egg temperatures: they should be equal to the set point. Check air temperature on the entrance end of incubators: look for machine problems or adjust set times if temperatures exceed 101°F. Low hall humidity or high hall temperature will cause machines to use the humidity spray to excess:
- 4. Set / Pull Time.** Chicks must be pulled when they are ready; not in machine order, or at the convenience of the automatic processing equipment. Early pull may result in poor hatch and increased chick infection rate. Late pull will result in dehydrated, weak chicks. Monitor hatch daily and adjust set times as needed according to hatch and machine temperatures. Hatchery performance should be judged by a combination of percent hatch and 7-day mortality.
- 5. Chick Processing and Delivery.** Poor chicks may be culled by some hatcheries. The advent of the automatic chick separators and chick counters and the in-ovo vaccination method have eliminated much of the opportunity to cull at the larger hatcheries.

Chick processing involves much handling, whether by automation or by hand. This can result in injury to the chicks. Chicks can be overheated, chilled, oxygen-starved or injured during delivery and dumping at the chicken house. A common sign of early stress (from hatch through the first 24 hours in the house) is vent pasting at 4 to 6 days of age.

## Brooding Management and its Influence on Chick Quality

Good quality chicks can be hurt by poor brooding management and poor quality chicks can be made worse. On the other hand, good management of dehydrated, weak or stressed chicks can turn a flock around. Never underestimate the effects of brooding conditions. House conditions can begin to affect chicks starting on day one. Brooding management is also critical to the future performance of a flock. It may impact respiratory vaccination reactions and effectiveness, feed conversion, weight gain, flock uniformity, and the ability to withstand leg problems. Brooding chicks properly is a lot of hard work. It's easy to cut corners if you can't see a measurable difference immediately.

Four factors which are the most critical to brooding chicks are: Air Quality, Water, Temperature and Feed.

- Air Quality.** The newborn chick is very sensitive to ammonia, carbon dioxide and carbon monoxide at fairly low levels. Adequate ventilation is necessary to remove these metabolic by-products from the chick's environment. Good ventilation will also regulate temperature and humidity. Consider the microclimate at the chick's level. Chicks surround gas brooder stoves. These stoves are burning oxygen as well as fuel, so the lowest concentration of oxygen in the house is likely to be around the stove. Ammonia is heavier than oxygen, so any oxygen in the house will be displaced by a layer of ammonia settling on the floor. Properly mixed air will eliminate these problems, but chicks in a still house could easily face a low-oxygen environment that will do enough heart damage to cause ascites (water belly) later in the bird's life. Use of ammonia control products may reduce ammonia released into the air, but if ventilation is also reduced, oxygen may be depleted, promoting more ascites later in the flock. Use power ventilation from day one, and always evaluate air quality at bird level.
- Temperature.** Chicks can't regulate their own body temperature; they lose all of the heat they can produce.

They are like a cold-blooded animal: when they are cold, they are sluggish. They need external heat to become active and hunt. Floor temperature as important as air temperature. A warm room with cool floors will chill a chick; the chick will remain sluggish and eventually starve out or dehydrate. For this reason, pancake-style brooder stoves or radiant brooders that heat the floor are better for brooding chicks than forced-air space heaters. Forced-air heaters are better for supplemental heat on the non-brood end of the house. It is very important that the warm floor area encompasses the feed and water. If the floors are warm under the brooder, but the feed and water are over in a cool area, the chicks will crowd under the brooder and fail to eat and drink. If the chicks do find the feed, they may crowd in the feed lids because the feed warms up better than the floor. Chicks may be weak due to either winter or summer incubation problems, but we only see "starve out" and dehydrated chicks in the winter. Why? Summer brooding floors are always warm. Ideally, litter temperature at the feed and water lines will be 84° - 86°F. Litter should be dry and of sufficient depth to prevent floor moisture from wicking through. Litter directly under brooder stoves should be dry, crisp and very warm.

- Water.** Water is 60 - 70% of the chick's weight. It is critical that a fresh supply of water is available. It is also important to remember that "available" is a relative term: if the water is "over there where it's cold", and the chick is under a warm brooder, the water may as well be absent. The same is true of water that is too cold, or too difficult for the chick to reach or trigger due to drinker height or pressure setting.
- Feed** Like water, feed needs to be within reach. It also needs to be the right feed: leftover withdrawal feed is pelleted (difficult for chicks to swallow) and low in essential nutrients.

To achieve 95% total livability or better, we have to keep the weakest 5% of the chicks alive through the first week. Improving chick quality is a team effort. Breeder, hatchery and field management personnel must all work together to identify and correct problems. Most mortality problems are the result of a combination of factors from all of these areas.

**Reference:** A Field Guide to Broiler Chick Quality. Schering-Plough Animal Health.1998



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