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HATCHERY/BREEDER TIP...

FACTORS AFFECTING CHICK QUALITY

A recent review article entitled "The day-old chick: a crucial hinge between breeders and broilers" published in *World's Poultry Science Journal* (Decuyper et al., 2001) challenges the idea that chick quality will be optimized by maximizing hatchability. Here is an overview of the points these authors make.

What are the characteristics of high quality chicks? When removed from the hatcher the chick should be clean (free from adhering dried yolk, shell and membrane), dry with a completely sealed navel, no deformities (straight feet and legs with no lesions or swellings), and alert and ready to engage the world. Let's review the management practices that influence hatchability and chick quality.

Quality of hatching eggs:

- Size, shape, color, and integrity of the shell are influenced by nutrition, genetics, age of flock, and house temperature.
- Shell contamination is affected by house environmental management (temperature, relative humidity, ventilation and drinker height and flow rate) and the frequency of egg collection.

Embryo development and time of collection:

- Stage of embryo development at the time the egg is laid differs by genetic strain in cell division rates. The embryos in the more advanced stages (gastrulation) prior to being laid by the hen withstand storage better or more successfully restart development when placed in the incubator.

Egg cooling stops embryo development. House temperature and collection frequency impacts time needed to cool the eggs. Gastrulation stage is preferred for good embryo survival after storage. Exposing newly laid eggs to prolonged high temperatures before storage causes continued development past this preferred stage.

Egg storage:

- Carbon dioxide level in the albumen is inversely related to albumen pH and is influenced by storage time. Carbon dioxide level is high when an egg is laid and decreases with time causing the pH of the albumen to increase. Eggs stored less than 6 hours have too low a pH decreasing hatchability. Too high a pH impedes the initiation of embryo development once eggs are placed in the incubator. The higher the storage temperature the faster albumen pH will increase. Each day of egg storage increases incubation time by 1 hour.

PUTTING KNOWLEDGE TO WORK

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- Short-term (5 days or less) egg storage temperature should be 60-70 F. For long-term storage, lower the temperature to 52-55 F, which is thought to reduce the amount of disproportionate or out of sequence embryo development that occurs at these at higher temperatures.
- Note the interaction of stage of embryo development (breed dependent) at the time of lay with storage length and temperature.

Incubation temperature:

- For optimum hatchability a consistent setter temperature between 99.5 to 100 F is necessary and influenced by machine size, incubator type (single or multi-stage), design, tray position, ventilation rate and space between eggs.
- Temperature fluctuations during incubation should be kept to 0.5 F.
- The challenge during this phase is to prevent variations within the machine that would result in advancement or delay in embryo development. Depending on breed and stage of developmental variations might not be proportional causing reduced hatchability and chick quality and performance problems.

Incubation carbon dioxide concentration:

- In multistage incubators carbon dioxide concentration of 0.1 to 0.4% is optimal while an acceptable range for the hatcher is 0.5 to 0.8%.
- Be advised that there is a general lack of information in this area, but hatchery managers should generally seek to control carbon dioxide concentrations through ventilation rates so as not to negatively impact embryo livability.

Spread of hatch time:

- Hatchability will decreased artificially in an industrial setting anytime the hatching process is delayed or prolonged, because the production schedule dictates when chicks are removed and processed the hatchers. All late hatching chicks are not included in the percentage hatchability, and obviously this low hatch number decreases flock performance.
- The difference in time between the first and last eggs that hatch is influenced by the uniformity of breeder hen weight (directly related to variation in egg size/weight), flock age, storage time and conditions, and variation in incubator conditions.
- A delay in feed and water consumption by early hatching chicks causes a delay in yolk sac utilization, stunting of GI tract development, delay in maturation of the enzyme systems that control metabolism and delay in development of the immune system.
- Delaying placement of chicks after hatch causes a delay in feed and water consumption and is especially detrimental to chicks from small eggs as they have less residual yolk.

This summary outlines the interactions between fertile eggs (size, storage time and conditions, etc.) and incubation conditions (temperature, humidity, ventilation rate and carbon dioxide), suggesting complex relationships that are intra-independent. These authors give us good reason to alter our chick quality and production goals. To achieve the best chick quality, variation in egg source, storage length and conditions, and incubation conditions must be minimized. In situations where the hatch process is prolonged, adding incubation time must be evaluated on the basis of how many chicks are lost as pips verses the damage to the chicks that have already hatched (chick quality and broiler performance loses).

Reference

Deceuypere, E., K. Tona, V. Bruggeman and F. Bamelis, 2001. The day-old chick: a crucial hinge between breeders and broilers. *World's Poultry Science Journal* 57:127-138.



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Consult with your poultry company representative before making management changes

“Your local County Extension Agent is a source of more information on this subject.”