



*The University of Georgia*

**Cooperative Extension Service**

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SEPTEMBER 2002



## ***HATCHERY/BREEDER TIP . . .***

### **MINIMIZING EMBRYONIC MORTALITY**

The main purpose of the avian egg is to produce a viable, healthy chick. Embryogenesis is dependent on several factors that are referred to as the four basic principles of incubation. These include temperature, humidity, ventilation and mechanical agitation (egg turning). Light and sound have been implicated as environmental elements that affect embryo development, but do not have enough influence to be incorporated as major components of a commercial hatching program. Both of these factors influence time of hatching more than embryo survival. Modern incubators are designed with the four basic principles in mind to provide an optimum environment for embryo development and successful hatching. There are other factors that can affect embryo development and viability that can be managed successfully.

There are two peak periods of poultry embryo mortality that occur during incubation that include the first (3.0 %) and last weeks (2.5 %) of incubation. Mortality observed between these periods is infrequent (< 1%). In addition to incubator errors, there are many factors that could affect embryo survival. These include, but are not limited to lethal chromosomal abnormalities, age of hen, hen nutrition, shell quality, length of egg pre-incubation storage period, egg pre-incubation storage conditions, and embryonic malpositions. When losses that are attributed to these factors are examined, one can observe that each may only account for a small percentage of embryonic mortality and be satisfied that the majority of the eggs are hatching. Though in a hatchery where millions of eggs are set each year even a 0.3 % improvement would be significant. Problems due to lethal chromosomes and hen nutrition cannot be corrected in the incubator. Altering the incubator environment to meet the metabolic demands of the embryo could result in lower embryonic mortality. Long preincubation storage of hatching eggs results in reduced hatchability and longer incubation period when compared to eggs stored for short periods. Eggs from young hens tend to

### **PUTTING KNOWLEDGE TO WORK**

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have higher incidences of early embryonic mortality where eggs from older hens have more late embryonic mortality. Mortality seen during the second week of incubation has been attributed to a variety of nutritional disorders (e.g. Vitamin B<sub>12</sub> deficiency). Sanitation is another concern that influences mortality during incubation. The warm, humid environment can provide excellent microbial growing conditions. Hatcheries need to continue current practices but should be looking to new areas to decrease embryonic mortality as much as possible, even if it is less than 0.5% increase in hatchability. Current studies are examining ways of improving hatchability through manipulation of the incubator environment.

Research is being conducted to examine the effects of using single stage incubation profiles to improve hatchability. Studies have indicated that the single stage profile of incubating eggs in warmer conditions and lowering the temperature through a step down process through the incubation period may better imitate natural incubation. This may better match embryo metabolism to the ability of the egg to exchange water and gas, thus improving embryo survival. Eggs have to exchange water vapor and vital gases through the eggshell. Eggs from young hens have different eggshell properties than eggs from older hens that might result in them taking longer to reach maturity and hatch. If the incubator could be operated in a way to optimize the growth rate (maybe incubate at a higher temperature for a week or so) to match the ability of the eggshell to provide gas exchange hatchability could be improved. Another research project has examined the effect of oxygen and carbon dioxide environments during hatching on chicks. Although these studies were not able to monitor hatchability and embryonic mortality due to oxygen and carbon dioxide concentrations, it is possible that changing the gas environment during the last week of incubation could improve embryo viability (thus reducing late embryonic mortality) as well as chick quality. Electrostatic space charge units have been tested in incubators and found to decrease dust by 80 to 90 % depending on the particle size. These units create a charge on dust particles that will cause them to be attracted to and collect on grounded objects. Microbes can adhere to dust particles thus creating a mechanism by which cross contamination of eggs could occur. This is especially true during hatching when particles could be inhaled by the hatched chick. By reducing the amount of air particulates in the incubator, there are less chances of microbe transmission from egg to egg providing a way to prevent embryo mortality due to bacterial contamination. These are three examples of current research that may impact embryonic survival and increase hatchability by altering the incubation environment.

#### References

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U.S. Poultry & Egg Research Reports.



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**\*\*Consult with your poultry company representative before making management changes\*\***