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## Incubation of Bird Eggs

When incubating bird eggs it is important to control temperature, humidity, ventilation, and egg turning. Chart 1 lists the major incubation factors and the values of each that produces the best incubation conditions for various species of birds.

Improper control of temperature and/or humidity during storage of eggs prior to setting or during incubation often produces low hatch rates. Temperatures and/or humidity that are too high or low over time interfere with the normal growth and development of the embryo. Improper ventilation, egg turning, and sanitation of the machines and/or eggs may also lead to low hatch rates.

### Temperature

When using a forced-air incubator, the best hatch rates for chicken eggs are obtained by maintaining the temperature at 99.5° F throughout the incubation period. Temperatures can fluctuate  $\frac{1}{2}$  degree + or – without any negative impacts. Prolonged periods of high or low temperatures will alter hatching percentage. The developing embryo will die when temperatures rise above 103°F. Under low temperatures, embryo development will slow, but survival rates may not be affected. A forced-air incubator that is too warm, e.g., greater than 99.5°F, tends to produce early hatches. If the incubator runs cooler, e.g., less than 99.5°F, late hatches may result. In both cases, the total chicks hatched will be reduced. Still-air incubators are best kept at 102°-103F, + or –  $\frac{1}{2}$  degree to compensate for the temperature stratification within the incubator. Temperature should be measured at the mid-point to top of the eggs. The thermometer should not touch the eggs or the incubator.

### Humidity

Humidity should be carefully managed to prevent unnecessary loss of egg moisture. The relative humidity in the incubator from the time the eggs are placed in the incubator until 3 days prior to hatching should range 59-60% (or 86-87°F., wet-bulb). During the last three days of incubation, the humidity is increased to at least 65% relative (90-92°F wet bulb). Rarely is the humidity too high in properly ventilated still-air incubators. The water pan area should be equivalent to one-half the floor surface area or more. Increased ventilation during the last few days of incubation and hatching may necessitate the addition of another pan of water. Humidity is regulated by increasing or decreasing the surface area of the exposed water.

### Ventilation

Ventilation is very important during the incubation process. While the embryo is developing, oxygen enters the egg through the pores in the shell and carbon dioxide escapes in the same manner. Around day 18 or 19, the developing chick pecks a hole into the air cell and begins to breathe air with its lungs, thus increasing the need for supply of fresh air/oxygen. As embryos grow, the air vent holes need to be gradually opened to satisfy increased embryonic oxygen demand. Care must be taken to

maintain humidity during the hatching period; failure to do so will result in chicks unable to get out of the shell. Unobstructed ventilation holes, both above and below the eggs, are essential for proper air exchange.

### Turning

Eggs must be turned at least 3-7 times daily during the incubation period for proper development, if hand turning, an uneven number of times is recommended. Do not turn eggs during the last 3 days before the chicks are due to hatch since they are moving into hatching position. Keep the incubator closed during hatching to maintain proper temperature and humidity. The air vents should be almost fully open during the latter stages of hatching.

Eggs are initially set in the incubator with the large end up or horizontally with the large end slightly elevated. This enables the embryo to remain oriented in a proper position for hatching.

Where the eggs are turned by hand, it may be helpful to place an "X" on one side of each egg and an "O" on the other side, using a pencil. This serves as an aide to determine whether all eggs are turned. When turning, be sure your hands are free of all greasy or dusty substances; soiled eggs may not hatch. Be gentle when turning eggs during the first week of incubation. The developing embryos have delicate blood vessels that rupture easily when severely jarred or shaken, thus killing the embryo. Always wash your hands before and after handling the eggs.

Table 1. Incubation requirements for various species of fowl.

Requirement	Chicken	Turkey	Duck	Geese	Bobwhite Quail	Guinea
Length of Incubation	21 days	28 days	28 or 35 <sup>1</sup> days	30-35 days	24 days	28 days
Egg Storage before Incubation	<8 days	<8 days	<7 days	<7 days	<14 days	<8 days
Storage Temperature	55-65 <sup>0</sup> F	55-65 <sup>0</sup> F	55-65 <sup>0</sup> F	55-65 <sup>0</sup> F	55-65 <sup>0</sup> F	55-65 <sup>0</sup> F
Storage Humidity	70-85% RH	70-85% RH	70-85% RH	70-85% RH	70-85% RH	70-85% RH
Setting Temperature <sup>2</sup>	99.5 <sup>0</sup> F	99.5 <sup>0</sup> F	99.1 <sup>0</sup> F	99.0 <sup>0</sup> F	100.0 <sup>0</sup> F	99.5 <sup>0</sup> F
Setting Humidity <sup>3</sup>	86-87 <sup>0</sup> wet bulb	87-88 <sup>0</sup> wet bulb	94 <sup>0</sup> wet bulb	89-90 <sup>0</sup> wet bulb	85-86 <sup>0</sup> wet bulb	85-86 <sup>0</sup> wet bulb
Hatch Temperature	98.5 <sup>0</sup> F	98.0 <sup>0</sup> F	98.4 <sup>0</sup> F	99.0 <sup>0</sup> F	99.0 <sup>0</sup> F	98.0 <sup>0</sup> F
Hatch Humidity	90-92 <sup>0</sup> wet bulb	90-93 <sup>0</sup> wet bulb	96 <sup>0</sup> wet bulb	89-90 <sup>0</sup> wet bulb	88-92 <sup>0</sup> wet bulb	85-86 <sup>0</sup> wet bulb

<sup>1</sup> Muscovy

<sup>2</sup>Measured at degrees F. in a forced-air incubator. For still-air incubators, add 2-3 degrees F.

<sup>3</sup> Measured as degrees F. using a wet-bulb thermometer. Use chart to convert to relative humidity.

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Additional information including a video on incubation can be found at:

<http://www.extension.org/poultry>

[http://msucares.com/poultry/reproductions/poultry\\_environment.html](http://msucares.com/poultry/reproductions/poultry_environment.html)