

Basics of Incubation for the Home Flock

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Use of incubators and care of eggs for successful incubation.

- Moving air incubators, in which air circulates for a more even temperature throughout the incubator. Moving air incubators operate 3°F cooler than still air incubators.

Sources of Hatching Eggs

A local flock, an exotic bird auction, or a swap meet all can be good sources of fertile eggs. The mail order companies listed on page 2 also would be good sources of eggs. To prevent the spread of potential disease, all eggs should come from the same source. Two sources¹ of incubators, poultry information, and a large selection of fertile eggs are:

Murray McMurray Hatchery
P.O. Box 458
191 Closz
Webster City, IA 50595
Telephone: 1-800-456-3280
Web: www.mcmurrayhatchery.com

Stromberg's Chicks
P.O. Box 400
100 York St.
Pine River, MN 56474
Telephone: 1-800-720-1134
Web: www.strombergschickens.com

Other sources can be found on the Internet.

Incubators

There are two types of incubators:

- Still air incubators, which have no air circulating within the incubator.

Table I. Incubation parameters for various species of poultry.

| <i>Species</i> | <i>Days</i> | <i>Temp.</i> <i>°F</i> | <i>Humidity</i> <i>web bulb</i> <i>temp.</i> | <i>Do not turn</i> <i>after given</i> <i>day</i> | <i>Humidity</i> <i>last three</i> <i>days</i> | <i>Vents</i> <i>completely</i> <i>opened</i> |
|----------------|-------------|---------------------------|--|--|---|--|
| | | | (WBT) | (day) | (WBT) | (day) |
| Chicken | 21 | 102 | 84-85 | 18 | 90 | 18 |
| Turkey | 28 | 101 | 85-86 | 25 | 90 | 25 |
| Duck | 28 | 102 | 85-86 | 25 | 90 | 25 |
| Muscovy Duck | 33-35 | 102 | 85-86 | 31 | 90 | 30 |
| Goose | 29-31 | 101 | 86-88 | 25 | 90 | 25 |
| Peafowl | 28-30 | 101 | 84-86 | 25 | 90 | 25 |
| Pheasant | 23-28 | 102 | 86-88 | 21 | 92 | 20 |

Keep in mind that no incubator is 100 percent effective. Plan for a 5-10 percent post-hatch loss for your flock as it grows to maturity and order a few extra eggs. An incubator that employs good management of the temperature, humidity, egg turning, and ventilation can expect a 50 percent (very low) to 85 percent (high) hatching rate.

Care of Eggs and Preparations for Incubation

Before handling hatching eggs, it is a good practice to wash and thoroughly dry your hands to prevent the spread of bacteria.

For disease prevention and health reasons, it's best to get all the eggs from one source. If you get your eggs locally but cannot get the number you want in one day, the eggs can be held for up to seven days before they are set in the incubator. Longer storage periods are possible but require further measures to keep the eggs viable. The eggs should be gathered twice a day and can be stored for the first three days at about 70°F (*i.e.* room temperature). If you need more time to collect the number of eggs you need, start putting three- to seven-day-old eggs in a cooler (60°F) room. It is important to clean eggs gently by scrubbing, while taking care not to scrub off the natural protective coating. If the eggs are stored over three days, rotate them once a day. Mail order eggs should be set as soon as they arrive.

Eggs must be turned while in the incubator to prevent the embryo from sticking to the shell. If your incubator is not equipped with the optional mechanical turner, mark each egg with an X on one side and an O on the opposite side. When the eggs are turned, all the Xs or all the Os should be face-up at the same time.

Setting the Eggs in a Still Air Incubator

It is important to remember that chicken eggs need to be kept in a controlled environment for 21 days to insure a healthy hatch. The temperature, humidity, and ventilation are all controlled. The eggs have to be turned to help the chick embryo develop into a healthy chick during the incubation period. To help the incubator control the egg environment, keep it in a room free from drafts, where the room temperature remains constant (e.g. 70°F.). Placing the incubator near a window, heater, or vent could cause detrimental fluctuations in the temperature inside the incubator.

(Note: Temperature and humidity are the first two factors to consider when the hatch is poor.)

Bring the incubator up to a working temperature of 102°F. The water pan should be filled with warm water and the thermometer set in place. Once the temperature has stabilized, allow any stored eggs to warm gradually to room temperature before putting them in the incubator. Eggs sweat if warmed too rapidly, providing another chance for bacteria to enter the shell.

1. Temperature in a still air incubator should be about 102°F \pm 0.5°F. Fluctuations beyond this can be harmful to the developing embryo, which is why thermostatic control is useful. Overheating is more critical than underheating. For example, 105°F for half an hour can kill the embryo, whereas 98°F for several hours may only delay the hatch. High temperatures (103-104°F) also can cause rough navels, small chicks, splayed legs, and/or shell sticking to the chick. Low temperatures for an extended period can cause crooked toes, large weak chicks, and eventually death.
2. Ventilation is crucial because the embryo is a living organism that exchanges oxygen and carbon dioxide through the shell during the incubation process. The amount of air exchange needed increases as the embryo develops. The vents, which are located above and below the eggs, should be opened gradually until they are fully open the final three days of incubation. Ventilation rates that are too low prevent normal moisture evaporation and cause large weak chicks or death. High ventilation rates remove too much moisture and can cause the shell to stick to the chick, making hatching difficult.
3. Humidity is also important because of the egg's porosity. Keeping adequate humidity in the incubator will help insure that no more moisture than necessary is lost by the developing embryo. Humidity should be adequate for the first 18 days of incubation if the water pan is kept full and covers an area greater than half the floor of the incubator. During the last three days of incubation, adding a large sponge inside the incubator should increase the surface area of water and give the necessary boost to humidity. Low humidity can cause the shell to stick to chicks, rough navels, small chicks, short down, and/or death. High humidity can cause an unabsorbed yolk sac, resulting in the chicks being smeared with yolk.

The relative humidity inside the incubator should be between 50 percent and 55 percent during the first 18 days and between 60 percent and 65 percent during the remainder of the incubation period.
4. Eggs must be turned during the first 17 days of the incubation period to prevent the embryo from sticking to the shell. In still air incubators, it's a good idea to move the eggs around the incubator so that they are not always in the same spot, in case there are hot or cold spots that would cause uneven development. (*Note: During the last three days, the eggs should not be turned.*) How often you turn the eggs depends on your schedule, but remember that it will improve hatchability. Mechanical turners turn the eggs every hour, but there is no problem with turning the eggs by hand. Be wary of the reliability of an inexpensive turner. Regular turning, such as every eight hours (*e.g.* 6:00 a.m., 2:00 p.m., and 10:00 p.m.), consistency and gentle handling are important elements to ensure good hatchability and prevent disruption of the developing embryo.

Final Stages

During the last three days the eggs should not be turned and the incubator should not be opened except to add water or make necessary adjustments to the temperature. The first chicks will start to pip the shell as early as the 19th day of incubation. All chicks that are going to hatch should be out of the shell by the 21st day. Chicks that hatch beyond the 22nd day are often weak and not healthy.

When most of the chicks are hatched, lower the temperature in the incubator to 95°F. After 24 hours the chicks should be dry and ready to move to a brooder where they can be given food and water.

Candling

It is a good idea to candle eggs to check their fertility and the embryo's continuing viability during the incubation period. Candling does not harm the egg (eggs can be out of the incubator for up to half an hour) and can be done by holding the egg in front of a strong flashlight or a commercial candling kit. At three days, eggs can be candled for fertility. A fertile egg has a small spot with "spider" veins radiating out from it. Signs of infertile eggs are a red ring, a clear appearance, or a blood spot. Infertile eggs can explode and should be discarded. If one explodes in the incubator, it can be difficult to clean and a source of bacterial contamination.

During incubation the air sac size should increase as moisture evaporates from the egg. *Figure 1* shows the air sac size you should see when candling on different days of incubation.

Note: It is recommended that eggs not be handled after the 18th day of incubation.

Possible Problems with Hatch

1. Expect at least 5 percent of the eggs to be infertile; if this number is greater than 5 percent, the age of the parents (too young or too old), the ratio of cocks to hens (at least 1:14 or 1:10-12 is better), or storage conditions could be factors.
2. A large number of deaths during the incubation process can be related to several factors: genetics, incubator management (usually only if there is a large deviation from normal such as caused by a power outage during

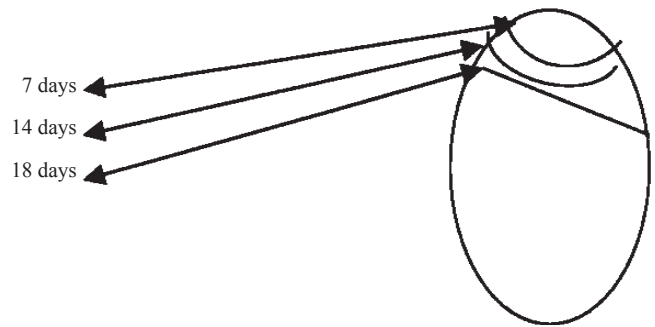


Figure 1. Air sac development in eggs at various days of incubation.

incubation), viral infection, rough handling, hygiene, or vitamin deficiencies in the parent birds.

3. If many chicks die after they begin pipping, it is usually related to incubator management.

Further Information

An excellent source of information on incubating eggs can be found on the University of Nebraska–Lincoln Extension in Lancaster County Web site at <http://lancaster.unl.edu>. A Web search of extension publications from other states also will provide good sources of information on poultry.

*Reference to commercial products or trade names is made with the understanding that no discrimination is intended of those not mentioned and no endorsement by University of Nebraska–Lincoln Extension is implied for those mentioned.

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