



FARM INNOVATORS GUIDE TO INCUBATION

WHERE TO GET HATCHING EGGS

Obtaining fertile eggs may present a problem, especially if you live in an urban area. Most of the eggs sold in grocery stores are not fertile and cannot be used for incubation. Fertile eggs can usually be obtained from hatcheries or poultry breeding farms. Look in the yellow pages of your telephone directory or on the internet for names of hatcheries and poultry breeders. Or contact the farm adviser in your county agricultural extension service office for suggestions.

If possible, pick up the eggs yourself rather than have them shipped or mailed. It is difficult for hatcheries, post offices, and transportation companies to handle small orders of eggs properly.

If you have rooster and hens, you can obtain them from your own flock.

CARE OF EGGS PRIOR TO INCUBATION

The hatchability of eggs can be severely reduced by improper care prior to incubation. Since it may not be practical for you to put the eggs in an incubator as soon as you get them, protect them from extreme variations in temperature. Ideally, eggs should not be more than 7 days old when they are set (placed in incubator). Beyond that point, hatchability declines.

If it is necessary to hold the eggs before you set them, turn them daily and keep them in a room where the temperature is around 50° F (10 C) and the relative humidity is 70 to 80 percent. The vegetable section of your refrigerator could be used for holding the egg until it is time to place them in the incubator. Temperatures below 40° F (4 C) reduce hatchability. Under no circumstances should the eggs be held at room temperature, because temperatures of this level are detrimental to hatchability. Embryos will begin develop at subnormal rates when the temperature reaches about 80° F (27 C)

LOCATION OF INCUBATOR

Locate your incubator in a room in which temperature is between 70° and 75° F (21 and 24 C), and which is free from drafts and excessive variations in temperature. Do not place the incubator near windows where it will be exposed to the direct rays of

the sun. The sun's rays may raise the temperature so much that all of the embryos will be destroyed.

READYING THE INCUBATOR FOR OPERATION

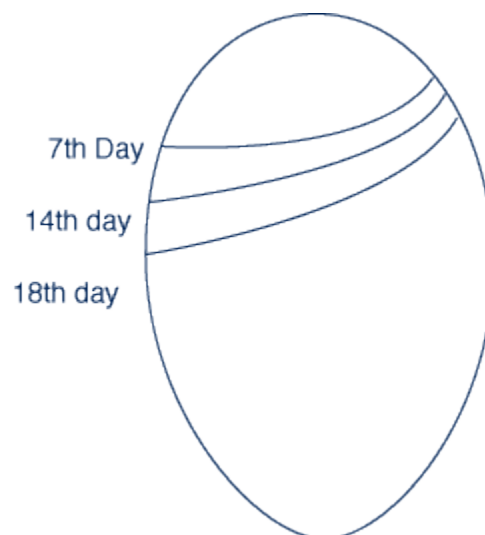
Before you set the eggs, be sure that the incubator is in good working order. Put some warm, distilled water in the water channels in the bottom tray of the incubator, place the glass bulb thermometer on the screen or on top of the egg turner, replace the lid, and then operate the incubator until the temperature inside it holds at 99° to 100°F. You may need to make many, small adjustments to reach a proper setting.

PREPARING THE EGGS FOR INCUBATION

Eggs must be turned while in the incubator, so if using our incubators without an Automatic Egg Turner, before you put in the eggs mark them with a pencil so you can tell when they have been properly turned. An excellent method is to put an "X" on one side of the egg and an "O" on the opposite side. Then you can always tell when the eggs have been turned, because either all "O" 's or all "X"'s are turned up at the same time. If you put them into our Model 3200 Auto Egg Turner, be sure to place them with the small or pointed end facing down.

HUMIDITY

Nature has provided that the eggs shall dry out to some extent during incubation (Fig. 4). This loss should be about 11 percent of the original weight, but more than this is detrimental. Water must be placed in the incubator to avoid excessive moisture loss. Keep water inside the incubator at all times.



Size of the air cell in the egg on the 7th, 14th, and 18th days of incubation. (Fig. 4)

The amount of opening in the incubator also influences the level of humidity. When the humidity is too high, open the red vent plugs on the incubator. When humidity is too low, the openings should be more nearly closed, but never completely so. Weather conditions will affect the relative humidity in the incubator.

The ideal moisture level is about 57-60 percent relative humidity for the first 18 days and about 65 percent for the last 3 days. Excessive drying because of low humidity will cause the chick to stick to the shell and fail to survive. Some variation above or below the ideal level usually will not affect hatchability drastically. Frequently, school incubators have too much ventilation and, therefore, too little moisture. This results in delayed or reduced hatches.

When you refill the water tray, use warm water. Hot or cold water will affect the temperature of the incubator too much. To increase the humidity level the last three days, you can put a wet sponge in the incubator. A word of caution: Do not let the eggs come into direct contact with the water at any time.

TEMPERATURE

Temperature in the still-air incubator can vary from 99° to 103° F, with no harmful effects if the temperature varies between these limits rather than staying at either extreme. If it stays at either extreme for several days, the hatch may be reduced somewhat. Overheating is much more critical than under heating. Overheating will result in abnormal embryos, speed up development, and lower hatchability. A thermometer should be in the center of the incubator if possible, and the bulb of the thermometer should be level with, but not touching, the tops of the eggs.

VENTILATION

Proper ventilation is very important during the incubation process. While the embryo is developing, oxygen enters the egg through the shell, and carbon dioxide escapes in the same manner. As the chicks begin to hatch, it is essential that they receive an increasing supply of oxygen. This means that the air openings need to be opened gradually to increase the flow of air.

LENGTH OF INCUBATION

Chicken eggs require 21 days to hatch, but the incubation period for the eggs of other species of poultry varies. The approximate periods of incubation required for various species of poultry and game birds are:

	Days
Chicken	21
Turkey	28
Duck	28
Muscovy duck	33-35
Goose	29-31
Guinea	26-28
Pigeon	16-18
Ring-neck pheasant	23-24
Mongolian pheasant	24-25
Bobwhite quail	23
Japanese quail	17-18
Chukar partridge	22-23
Peafowl	28

TURNING THE EGGS

When the eggs are put in the incubator, lay them on their sides and turn them at least three times a day. If using our Automatic Egg Turner, this will rotate the eggs for you so you don't have to do it manually. Turning prevents the embryo from sticking to the shell membranes as it will do if it is left in one position too long. Good results can be obtained by turning the eggs the first thing in the morning, again at noon, and the last thing at night. But it is better to turn the eggs more than three times a day. In any case they should be turned an odd number of times so that the side that is up longest will be staggered from day to day. Otherwise the egg will be in the same position every night, which is the longest stretch of time between turns.

When you turn the eggs, move them to a different part of the tray to offset variations in temperature in the different parts of the incubator. Continue to turn the eggs from the first through the 17th days but do not turn them after the 17th day.

TESTING OR CANDLING THE EGGS

Although it is not necessary to test eggs for fertility, you can eliminate the eggs which are not going to hatch by doing so. It is also an interesting phase of the project, since it is possible to see clearly the developing embryo.

We sell our Model 3300 Egg Candler to use for this process. Darken the room and hold the large end of the egg to the light. What you will see depends mostly on the age of the embryo. It is difficult to see much development until the 4th or 5th day of incubation. We recommend candling 3 times during incubation, on the 7th or 10th day, 14th day, and 18th day.

The first parts of the embryo which you will be able to see by candling will be the head and eye, and they will appear as a dark object. If the embryo is alive and circulation is established, the contents of the egg will have a pinkish color or cast. But if the embryo is dead the contents will appear muddy or brownish.

The live and growing embryo will eventually occupy all of the interior of the egg and will not transmit light; thus, it will be impossible to see anything but the air cell at the end of the incubation period. Infertile eggs and early dead embryos can be detected readily because they appear clear.

Removing the eggs from the incubator for candling does little harm if you handle them gently. It may slow up development of the chick, though, depending upon how much the egg is cooled. Generally, if the eggs are removed from the incubator two or three times for a period of no more than 15 minutes each, such cooling will make little difference in the total incubation time required for hatching. On the other hand, if the eggs are cooled for several hours because of power failure or some other reason, hatching time may be delayed. It is as important not to cool the eggs too long as it is to avoid overheating.

FINAL STAGES OF INCUBATION

After the 17th day, eggs should not be turned. If using an Automatic Egg Turner, remove them from the turner and place them on the metal screen. The incubator also should not be opened unless it becomes necessary to add water, or make some other necessary adjustment. Chicks will start to pip the shell as early as the 19th day. All chicks which are going to hatch should be out of their shells by the 21st day. If the eggs were chilled or you ran into operational difficulties during the incubation period, the hatch may be delayed. Chicks that hatch beyond the 22nd day are usually not healthy, vigorous ones.

When most of the eggs are hatched, lower the temperature to approximately 95° F. This permits the newly-hatched chicks to dry off. At this time, all the air vents in the incubator should be opened, and the glass viewing windows should be opened wider.

HOW THE CHICK EMERGES FROM THE SHELL

The head of the chick develops at the large end of the egg. Between the 15th and 16th days, the chick orients itself so that its head is near the air cell at the large end

of the egg. Not long before the chick is ready to attempt to make its way out of the shell its neck acquires a double bend so that its beak is under its right wing and pointed toward the air cell. About the 19th day the chick thrusts its head forward. Its beak quickly breaks through the inner shell membrane, and the chick's lungs begin to function. Complete breathing by the lungs usually does not occur until the 20th day of incubation.

Using its egg tooth (a tiny, sharp, horny projection on the end of its beak), the chick pecks at the shell thousands of times. Finally, the young bird pips its way through the shell and begins to breathe air directly from the outside. After the chick has made a hole in the shell, it stops pipping for three to eight hours and rests. During this time, it is acclimating its lungs to the outside atmosphere. After the resting stage is completed, the second stage of pipping begins.

The chick begins to turn slowly inside the egg. As it turns, usually counter-clockwise, the cutting edge of the chick tooth continues to chip away. In two to five hours, the chick has made about three quarters of a turn inside the egg. As the chick progresses in its movement around the shell, it begins pushing on the egg cap (large end). Squirming and struggling, the chick works feverishly for about 40 minutes pushing at the cap. Finally with a vigorous shove, the chick breaks free from the shell, still wet and panting.

When the chick is freed completely from the shell, it lies still. Its energy has been virtually exhausted, and it is extremely tired. After a rest of some few minutes, the chick begins to rise to its feet and gain coordination of its muscles. Within a few days the egg tooth, its usefulness over, will disappear.

REASONS FOR POOR HATCHES

1. Infertile eggs.
2. Eggs too old when set.
3. Parent stock weak, unhealthy, or fed a nutritionally deficient diet.
4. Improper care of eggs prior to incubation.
5. Shell contamination.
6. Eggs not turned often enough.
7. Temperatures too high, too low, or too variable during incubation.
8. Too little humidity in the incubator or occasionally too much.
9. Improper ventilation.
10. Oxygen starvation.

WHAT TO DO AFTER THE CHICKS HATCH

As soon as the chicks have dried and fluffed up completely, remove them from the incubator and place them in holding quarters where the temperature is approximately 95° F. We have developed a *Baby Chick Starter Home* (Model 3700) to use for this purpose. Then give them fresh water and feed. Rearing the chicks as a project has certain limitations, but if they are to be kept for a few days, they should be given a chick-starting mash obtainable at any feed or farm supply store. Fresh water is also important.

Cleaning the incubator. When the hatch is completed, disconnect the incubator. Remove all shells and unhatched eggs and wipe the interior clean with a soapy sponge. Permit the incubator to air dry for several days by leaving the door open.

Cleaning can be made easier if you place a layer or two of cheesecloth or crinoline on the rack on the 17th or 18th day of incubation to catch the egg shell and other debris. This will also help to prevent injury to the chicks' navels. After the chicks are removed the cheesecloth can be discarded.