Egg to Chick Care Guide

Introduction

Watching a baby chick emerge from its egg is a remarkable experience. Hatching chicken eggs is an excellent, hands-on experience that captivates and encourages curiosity in students of all ages while building on important scientific concepts and skills.

Concepts

- Reproduction
- Animal behavior
- Embryonic development

Background

A miracle of nature is the transformation of a seemingly "lifeless" egg into a living organism. Egg hatching provides students with the rare opportunity to study the stages of embryonic growth within a short 21-day incubation period. Students can use this activity to compare the stages of chick development to that of other embryos. Some amazing developments occur within hours of incubation; for example, by hour 24, the vertebral column, brain, nervous system and eyes have formed. Within three days, the heart, nose, wings and legs begin forming. By day six, the embryo is capable of voluntary movements. The second week of incubation is even more spectacular—digits of the legs and wings become visible, claws, scales and feathers begin to form and the embryo takes the shape of a bird. By day 18, embryo growth is nearly complete with hatching occurring by day 21.

Hatching chicken eggs does require advanced and responsible planning. Eggs must be ordered with an expected delivery time of 10 days. The incubation period is 18–21 days, making this an excellent activity that can begin and culminate a unit of study.

Materials

Chicken eggs
Egg turner
Hygrometer
Incubator
Large sponge
Thermometer

Requirements and Procedure

Part I. Preparing the Incubator

1. Wipe down the entire incubator with a 10% dilute bleach solution and allow to air dry.
2. Place the incubator in a room with a controlled environment. This includes: a constant temperature of 68–75 °F, free of drafts, minimal foot traffic and away from direct sunlight, vents, and heaters.
3. Insert an automatic egg turner, if available. (If not available, see *Part II: Setting the Eggs*.)
4. Fill water trough #1 (see incubator instructions) with room temperature, distilled water to provide humidity.
5. Set the temperature inside the incubator to 101 °F and adjust the thermostat by turning the dial counter-clockwise (left) to increase the temperature and clockwise (right) to decrease the temperature.
6. Place the thermometer and hygrometer at a height even with the center of the eggs, in a visible area of the incubator window.
7. Adjust the front vent plug (red) to set the humidity to 55–60% for days 1–18.
8. Allow the incubator to stabilize for a minimum of 2 days before setting the eggs.

Part II. Setting the Eggs

1. Upon arrival, allow eggs to warm or cool to room temperature (70–75 °F) without interference; up to 12 hours is acceptable.
2. Before handling the eggs, wash hands thoroughly with soap and water.

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3. Open the incubator and place the eggs, narrow end down, in the automatic egg turner. Flip the eggs from pointy end to blunt end daily. This will ensure that the chicks do not stick to the internal membrane. If an automatic egg turner is not available, mark each egg with a pencil. Place an "X" on one side and an "O" on the other. All eggs should show the same marking. Eggs must be turned a **minimum of 3 times per day** to prevent the chicks from sticking to the membrane. When turning the eggs, roll gently from one marking to the next to prevent any blood vessel rupture. Roll in different directions each turn.
4. Add room temperature, distilled water to water trough #1 as needed to maintain proper humidity levels. Close the vent plug and add distilled water to increase humidity. To decrease humidity, open the vent plug to allow more air flow. A hygrometer is highly recommended as constant humidity is essential for healthy embryonic development.
5. Gradually open the vent plug from day 1–18, and have completely open by day 18.
6. Maintain a temperature between 100–101 °F.

Part III. Candling

Candling is a method used to check egg fertility and embryo development with the use of a dark room and a light source. The embryo is easily identified around day 8 and beyond. Candling of eggs is typically performed on days 3, 6, 9, 12, 15 and 18. Embryos are not to be candled after day 18 and they are not to be disturbed from day 18 until hatching.

1. Wash hands thoroughly with soap and water before and after handling the eggs.
2. Darken the room and obtain a light source (e.g. flashlight, light bulb without shade).
3. Hold an egg up to the light source and observe the egg.
4. Fertile eggs have a black spot and possibly blood vessels spider-webbed throughout the egg. The black spot will grow larger and eventually fill the egg except for the air space. If the egg appears clear, it is infertile. If a blood ring is visible around the yolk or a dark spot dried to the inside of the shell is observed, then the embryo is most likely no longer alive.

Part IV. Day 18–Day 21

1. After candling the eggs on day 18, the incubator will need adjustments. *Note:* the eggs can be out of the incubator safely for 10 minutes.
2. Wash hands thoroughly with soap and water before and after handling the eggs.
3. Remove the eggs and the automatic egg turner from the incubator.
4. Increase the humidity to 70–80% by adding room temperature, distilled water to water trough #1 and #2. If extra humidity is needed, add a large, damp sponge to the water trough. Another option is to place a plastic container of water onto the grate. Make sure it has a lid and several holes poked through to allow for more evaporation. It cannot be left open because hatched chicks can fall into the water and drown.
5. The front ventilation plug should be completely removed as increased oxygen is needed for the chicks during hatching.
6. Place the eggs gently onto the metal grate in preparation for hatching. Eggs are not be disturbed. During this time period, the chicks will orientate their bodies to prepare for hatching.
7. Prepare a brooder box for the chicks; see *Part VI. Brooder Box and Raising Chicks*.

Part V. Hatching

1. Chicks will pip (chip through the shell in order to get out of shell). Make sure humidity levels are between 70–80%. Humidity will increase as chicks emerge and condensation may form on the window of incubator. This is normal, do not lower humidity to compensate.
2. When all chicks emerge from their shells, lower the temperature to 95 °F.
3. Do not remove the chicks from the incubator until they are fully dried and fluffy.
4. Chicks feed from the yolk sac for 24 hours after hatching, so they do not need food or water immediately after hatching.
5. Do not open the incubator unless extremely necessary.
6. Do not interfere or help with the hatching process. This process can take 2–12 hours or longer, so be patient.
7. When most of the chicks have emerged and are dry and fluffy, they can be moved safely to the brooder box.

8. Wash hands thoroughly with soap and water before handling chicks.
9. Handle one chick at a time. Cup one hand under the chick's legs and belly, then gently place other hand over the chick's back and head to secure it.
10. Move the chick quickly and cautiously to the brooder box. Place it gently onto the towel surface, as described in *Part VI. Brooder Box and Raising Chicks.*

Part VI. Brooder Box and Raising Chicks

1. Place the brooder box in a draft-free room with proper ventilation.
2. The size of the brooder box changes throughout growth, but the end size can be used from the start. Chicks at 6–8 weeks require a 2 square feet brooder box per chick. This includes sides that are 18-inches high to protect from drafts. Below are brooder box sizes by age. Bigger is always better as it reduces stress and mess.

Age (in weeks)	Brooder Box Size
Newly Hatched (0–1)	0.5 square feet per chick
1–4	0.75 square feet per chick
4–6	1 square foot per chick
6–10	2 square feet per chick

3. Chicks should be moved to an outside coup by 7 weeks of age.
4. Brooder boxes can be purchased or constructed at home. Examples include: cardboard boxes with a changeable floor, wooden box or kiddie pool.
5. Brooder boxes need a secure lid (wire mesh) to protect from other pets/predators. The heat lamp will also be attached to this lid.
6. Substrate options include: towels, paper towels, cardboard, aspen or pine wood shavings (cedar and redwood cannot be used due to toxicity), or shredded newspaper. Avoid newspaper that is not shredded; it is slippery and can lead to walking abnormalities. Clean the floor daily.
7. Place old towels over the substrate to help the chicks find their footing/walking in the first weeks.
8. Temperature regulation is essential. Center the heat lamp over the brooder box, suspended 16–18 inches from the floor. The lamp can be raised weekly to lower the temperature as follows. This is just a general guideline, observe chick behavior to determine if the temperature is appropriate for the chicks.

Age (in weeks)	Temperature (°F)
0–1	90–95
1–2	85–90
2–3	80–85
3–4	75–80
4–5	70–75
5–6	70

9. Temperature and lighting should be from two separate sources:
   a. For temperature, use a dull emitter bulb, if available. If a dull emitter is not available, a red infrared bulb (250 watt) can be used for heat and night lighting. Be sure the lamp is designed to hold a bulb of this wattage. The heat lamp is left on 24 hours per day.
   b. Natural lighting or incandescent lights can be used to simulate day and night for the chicks. Incandescent light bulbs are not used for temperature because they cause the chicks to grow too fast, struggle to settle at night and can lead to feather pecking.

Part VII. Chick Behavior Related to Temperature

1. Cold: huddled under the heat lamp with little activity (makes eating and drinking difficult leading to dehydration and even death)
2. Hot: panting, scattered and avoiding the heat lamp
3. Drafty: huddled in one corner with droppings stuck to abdomen

4. Content: spread out, making short "chip" or "peep" sounds
5. Unhappy: long, drawn out "chips" or "peeps"

Part VIII. Feeding the Chicks

1. Once the chicks are in the brooder box, add a feeder with starter crumb formula for young chicks.
2. Place the feeder near the perimeter and away from water.
3. Sprinkle hard grit, chick size, in food after week one to aid in digestion and crop/gizzard development.
4. Encourage feeding by "pecking" the food with a finger to engage the chicks. If needed, place finely chopped hard-boiled egg with food to get chicks to feed. Typically, once one chick figures out eating and drinking the others will mimic.
5. Water must be constantly available and clean.
6. Use a shallow dish for water; chicks are known to drown in their water dishes. Marbles or rocks can be added to the water to help prevent drowning.
7. Place the water dish toward the center of the brooder box, but not under the heat lamp.
8. The chicks must be shown where the water is and how to drink. Place a chick near the water dish and gently dip the beak into the water. Show the chick several times a day for several days to ensure proper hydration.

Disposing of Chicks

- A plan for where the chicks will be placed after reaching 6–8 weeks of age is essential.
- Placing chicks at farms or homes can be difficult in urban and rural areas.
- Check with your local farm bureau or S.P.C.A.

Safety Precautions

Always treat live organisms with respect and proper care. Remind students to wash their hands thoroughly with soap and water before entering and leaving the laboratory. Remind students to wash their hands thoroughly with soap and water before and after handling eggs and chicks.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. Never release live organisms into the local environment. They may harbor pathogens that could decimate the local population or become invasive. Deceased animals may be disposed of according to Flinn Suggested Biological Waste Disposal Method Type IV.

Tips

Prior to Incubation:

- Check the incubator several times a day for temperature and humidity accuracy.
- Do not wash or wipe the eggs with damp cloths, this removes a protective coating and allows entry of disease-causing organisms.
- Set the incubator temperature to between 99–102 °F, with 100–101 °F being optimal.
- Room temperatures below 60 °F will reduce the temperature inside the incubator.
- Room temperature changes of 10 °F or more, increase or decrease, will effect the temperature inside the incubator.
- Avoid opening the incubator unless extremely necessary.

Incubation

- Overheating eggs in the incubator is more dangerous than under-heating the eggs because it will speed up embryo

development.

- Excessive temperatures (below 97 °F or above 103 °F) will severely reduce the hatch rate.
- Ventilation must increase as embryos develop. Gradually open the front vent until day 18, after which it should be completely removed.
- If vent plug is lost, it can be covered with transparent tape.
- To increase the level of humidity, a damp sponge or plastic container with holes in the lid can be added to incubator.

Brooder Box/Chick Raising

- Do not remove the chicks from the incubator until completely dry and fluffy.
- Use Chick Starter Crumb until 6–8 weeks of age. Add chick size, hard grit after 1 week.
- Heat and light must be available 24 hours a day. Do not use incandescent white light for heat.
- Place pebbles or marbles in the water to prevent drowning.

References

Graham, Chris. *Choosing and Keeping Chickens*. Octopus Publishing Group Ltd: China, 2006.

How to Incubate Chicken Eggs—The Complete Guide. http://www.howtoincubate.com/ (accessed February 2015).

University of Illinois Extension: Incubation and Embryology. http://urbanext.illinois.edu/eggs/about.html (accessed February 2015).

Materials for *Egg to Chick Care Guide* are available from Flinn Scientific, Inc.

Catalog No.	Description
FB2100	Hova-Bator Incubator
FB0537	Automatic Egg Turner
LM1265	Fertile Chicken Eggs, Pkg. of 12
FB1166	Digital Hygro-Thermometer Clock
FB1150	Thermo-Hygromter
AP5372	Infrared Lamp and Reflector
FB0517	Cage Litter, Natural Pine
AP1345	Cellulose Sponge

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.