OBSERVING THE GROWTH OF CHICK EMBRYOS OUTSIDE THE SHELL

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Embryology of the chick is a fascinating project for 4-H and school clubs. A new method for observing the growth of avian embryos outside of the shell has been developed and used extensively by Mr. Ed Shano of Cornell University. Three-day-old chicken embryos placed in observation chambers within an incubator frequently live to be 16-day-old embryos or older.

OBJECTIVES

A. To make direct and daily visual observations of living embryos;

B. To learn the anatomy and physiology of the egg and embryos;

C. To understand that chicken embryos are more readily available and less expensive to use than frogs in the study of embryology, anatomy and physiology.

D. To gain a deeper interest in biology and science. This is a "hands on" project and is an excellent opportunity for young people to appreciate the development of the embryo. The project teaches young people a skill, provides an observer-recorder laboratory partnership between two or more youngsters, provides an independent or class study of embryonic physiology, and related chicken embryonic growth and development to those of other species.

MATERIALS

- Incubator
- Fertile eggs
- Candler
- Magnifying glass
- Plastic wrap; inexpensive store brand or white label
- Plastic drain pipe (4" in diameter, cut in 2" lengths) or 4" cottage cheese container, or similar
- Rubber bands large enough to fit snuggly around the pipe
- Scissors
- Masking tape
- Pencil or marking pen
- Study Materials:
    1. Refer to Helpful Hints for Teachers on Incubation and Embryology, and
    2. The Beginning of Life, official documentation (pdf)

PROCEDURE

Step 1. Set up and operate your incubator as described in "From egg to chick." Use an incubator with a see-through top in order to best observe the developing embryos.

Step 2. Think ahead! For example, when planning to display 9-day-old embryos on a specific day, let's say March 10, then the fertile eggs should be set in a properly operating incubator on March 1. If you are planning to have hatching chickens on display, remember it takes approximately 21 days to hatch chicken eggs.

Step 3. You may use 0, 1, 2, or 3 day incubated eggs. Place eggs into the incubator three days prior to the day you plan to break them out into the observation container. Chicken embryos "broken out" on the third day of development live longer and are easier to open that those incubated longer. The yolk of the embryos more than three days will break more easily due to the advanced development of the embryo at this time.

Step 4. Thoroughly wash your hands twice before performing the next few steps! Tear off a piece of plastic wrap approximately 12 inches by 12 inches. Place this over the 2" section of the plastic pipe as illustrated in figure 1.

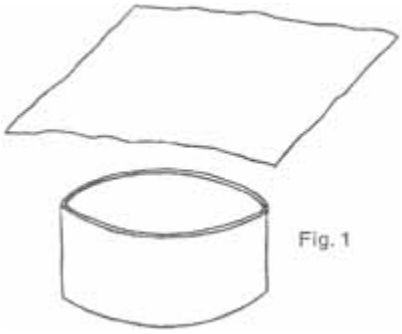

Fig. 1

Step 5. Secure the plastic wrap by placing a rubber band over the plastic wrap around the pipe. (See figure 2.) Roll or move the rubber band down the pipe until it is approximately 1/2 inch from the bottom of the pipe and the plastic surface across the pipe is taut like a drum. Now slide the rubber band and plastic wrap up the side of the pipe until a well or pouch about 1-inch-deep is formed in the center of the pipe.

Fig. 2

Step 6. Now take a 3-day-old embryo and carefully break it into the pouch. The embryo should be on the top of the yolk when it is broken out. If not, carefully move the yolk and embryo around by moving the underside of the pouch until the embryo comes into position. It will usually come to the top in less than an hour on its own. To aid in breaking out the embryo on

the top, lay the egg on its side for a few minutes before breaking it, causing the embryo to come to the top side; keeping this side up, break it out.

Step 7. Tear off another 12-inch by 12-inch piece of plastic wrap. Secure it tightly across the top of the plastic pipe, over the yolk and embryo (see figure 3). If the plastic touches the yolk or embryo, then the well made in step 5 is not deep enough.

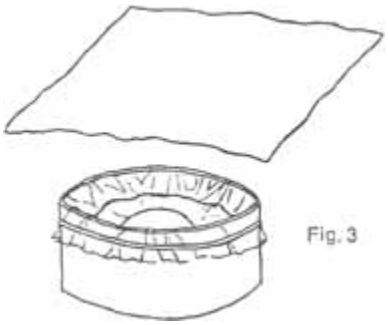
Fig. 3

Step 8. With scissors snip away the excess plastic wrap from around the side of the pipe. Your finished observation chamber should look like figure 4. A top view of the finished product is given in figure 5.

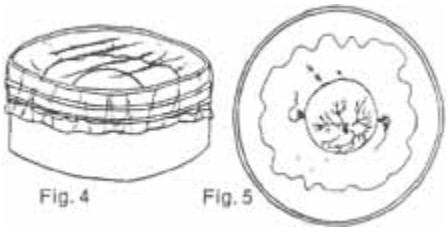
Fig. 4 Fig. 5

Step 9. Use masking tape to label the day on which the fertile egg was set and the day on which it was opened into the plastic warp observation chamber. For example, eggs set on March 10 and opened on March 13 would be labeled 10/13. There is no need to indicate the month or year unless you have a specific need. *DO NOT* label as 1st day, 2nd day, 3rd day of the experiment. You will easily confuse what you did and when, and how old the embryo really is. Always label with the date the activity occurs.

Step 10. Return the embryos to the incubator, and maintain the incubation as you would for normal fertile eggs. If you have a still air incubator with a glass top you can directly observe the developing embryo through the top and will not have to open the incubator except to add water for moisture (see figure 6).

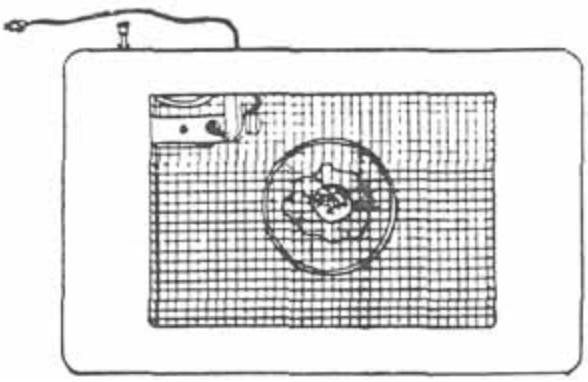

Fig. 6

Step 11. Observe the embryos frequently over the net 10 to 15 days and carefully record what you observe. Discuss with other members of the group what is occurring each day.