

"INCUBATION and EMBRYOLOGY of the CHICKEN EGG"

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"INCUBATION and EMBRYOLOGY of the CHICKEN EGG"

I.

In this project I constructed the incubator, incubated fertile eggs and opened and displayed the live embryos. The growing embryo, watched day by day and being opened, either by removing the hard shell and outer membrane or by breaking the egg into a dish, can be studied carefully.

The development of the chick can be studied after the shell is opened and the embryo will continue to live as long as no blood vessels are broken, if it is kept covered (with plastic wrap) and no damaged while being opened.

II.

Constructing the Incubator.

After obtaining the electrical equipment from the company and the other materials, it took about $2\frac{1}{2}$ hours to construct the incubator. This was because I used a ready-made cold chest which gave the proper insulating qualities, rather than build and insulate a separate box. When this was ready, it was tested for even temperature for 24 hours, then the fertile eggs were placed in. The eggs, considered to have an 80% fertility, were purchased from a poultry farm in Clarence. The eggs must be incubated immediately, or within

Constructing the Incubator (continued)

a few days in order to realize a high fertility potential. After ten days' wait to incubate, the hatching potential is almost zero.

III.

Incubating the Eggs

I made out a schedule telling when the eggs were to be put in. (3 the first day; 5 the next day; 3 the next day, etc.) I labeled each egg with marking pen with the date, when it was put in. After the first egg had reached a ten day incubation, I opened the top to look inside, keeping it alive. The temperature must be kept at 100.5° for successful incubation. Eggs must be turned three times daily, also.

IV.

Displaying living chick embryos.

Opening the top of the egg is like performing surgery, like a doctor. This must be done very carefully so as not to damage the chick as it will die and would not longer be good for daily observation on the growth.

To open: (1) Tap the large end of the shell (where the air cell is located) with the heavy end of the tweezers. (2). Cut away a circle in the top, but do not cut below the air cell into the egg. (3). Place a drop of water on the inner shell membrane and very gently with the forceps tug away the membrane without rupturing any blood vessels. (4) Cover the opening with plastic wrap. (5) Keep in incubator until you wish to study them, and while studying them, return immediately to the incubator if they are to be kept alive.

V.

Function of Embryonic Membranes.

Special temporary organs or embryonic membranes are formed within the egg, both to protect the embryo and to provide for its nutrition, respiration, and excretion. These organs include the yolk sac, amnion, and allantois. The yolk sac supplies food material to the embryo. The amnion, by enclosing the embryo, provides for its protection. The allantois serves as a respiratory organ and as a reservoir for the excreta. These organs function within the egg only until time of hatching, and form no part of the fully developed chick.

VI.

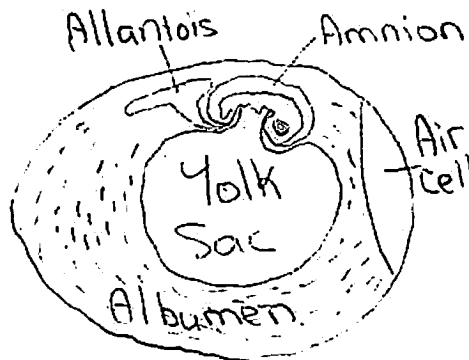
Hatching

The time of hatching is an important event in the life of the chick. Several changes preparatory to hatching take place on the 17th to the 19th days. Fluid decreases in the amnion and the neck acquires a double bend so that the beak is under the right wing and toward the air chamber. The remaining yolk sac is retracted into the body cavity for use as food after hatching.

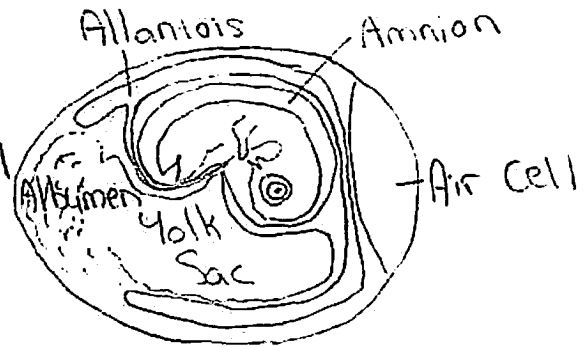
On the 20th day the chick thrusts forward its head. The beak rapidly pierces the membranes and enters the air chamber. The chick begins to breathe slowly the contained air, and it may be heard to peep within the shell.

On the 21st day the chick begins to escape. The first break in the shell is made by a sharp horny structure, the egg tooth. The chick begins to breathe normally. The allantois dries up and the circulation in it rapidly ceases.

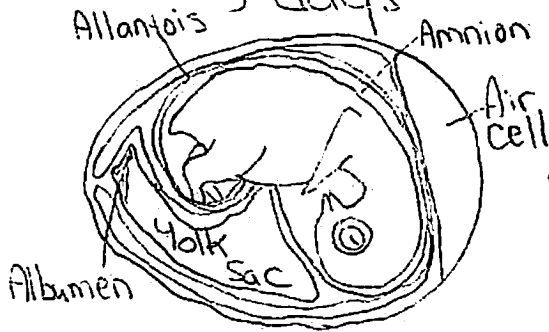
The rest of hatching is by the chick while he slowly moves in the shell, chipping away in a circular path. Then by a twist of his neck, the walls begin to shake and the foundation falls apart. The chick is very



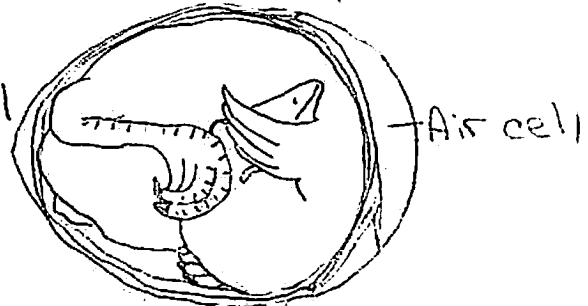
5 days



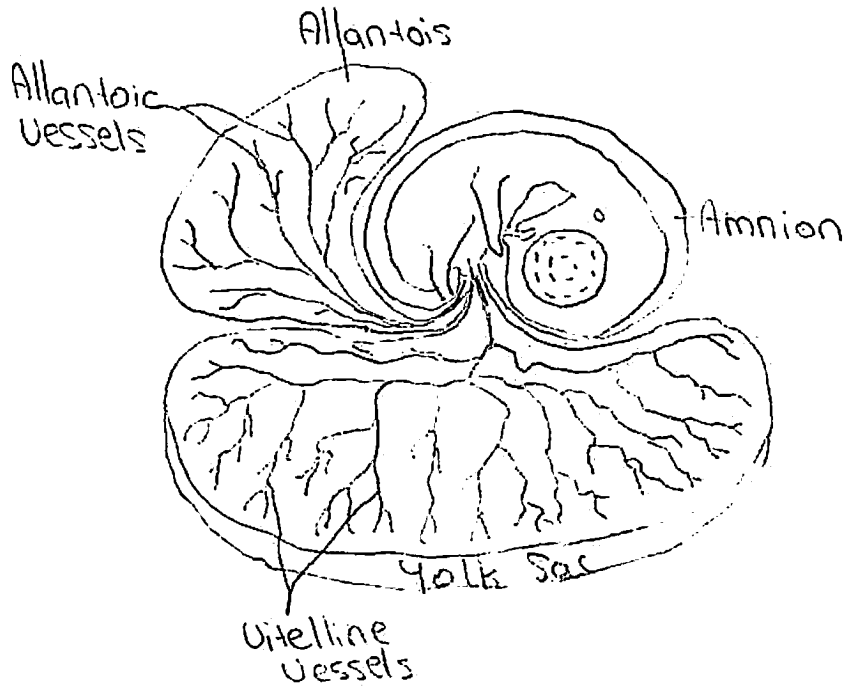
10 days



15 days



20 days



VI. Hatching (continued)

tired and for awhile seems helpless, and sopping wet. A few hours later he is dry and fluffy and wanders about the new world.

VII.

After hatching.

The egg-tooth has served a very good purpose, but only for a single critical event in the life of the chick as a tool to crash through the shell. It will be lost in a few days.

The yolk material which weighs about 1/6th of the chick weight will be utilized as food for the chick for a day or two..

VIII.

From the egg to the chick.

By opening the eggs, you can watch a dequence of development take place. From watching these live chicks grow you can stabilize the important events that take place during development.

Important events in Embryonic Development:

Fertilization

Before egg-laying - Division and growth of living cells

Between laying and incub.-No growth. Inactive embryonic life.

During incubation:

First day: 16 hours - first sign of resemblance to chick embryo

18 hours - appearance of alimentary tract

20 hours - appearance of vertebral column

22 hours-- beginning of formation of head

24 hours - beginning of formation of eye

Second day:

25 hours - Beginning of formation of heart

35 hours - Beginning of formation of ear

42 hours - heartbegins to beat.

Third day:

60 hours - Beginning of formation of nose.

64 hours - Beginning of formation of legs and wings.

VIII. Formation of chick within egg (continued)

Fourth day:	Beginning of formation of tongue
Fifth day:	Formation of reproductive organs
Sixth day:	Beginning of formation of beak and egg-tooth.
Eighth day:	Beginning of formation of feathers.
Thirteenth day:	Appearance of claws.
Sixteenth day:	Beak and claws becoming firm.
Twentieth day:	Embryo occupies practically all the space within the egg except the air cell.
Twenty-first day:	Hatching of chick.

IX.

Candling Eggs.

Candling eggs is done by holding up to a strong light to see the size of the air cell and embryo. A candler can be made by having a strong light coming out of a small, 1 inch, hole. I used a gooseneck lamp with a piece of cardboard with the light coming through a small hole to shine through the egg.

RESOURCES

Cornell University booklet L-8-2a, "From the Egg to the Chick", by Alexis L. Romanoff.

Cornell University, College of Agriculture booklets, 1-8-1a
"How to Make A Still-Air Incubator", by E. A. Schano

Cornell University, College of Agriculture booklet, 1-8-2d
"Displaying Living Check Embryos", by E. A. Schano
"Candling Eggs", L-8-15B, by E. A. Schano

X.

Materials Used and Cost

To construct the incubator:

Plastic foam cold ice chest	\$ 2.00
Heating Cable and Micro-Switch	8.00
Thermometer	2.00
Glass pane	.50
Wire screen	.50
Water pan, available at home	

To display:

Fertile eggs.	2.00 per dozen
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Forceps (tweezers)
Eye dropper
Plastic wrap
Magnifying glass
Mounting blocks

These materials all available
at home.