



## Embryology: Life in Twenty-one Days

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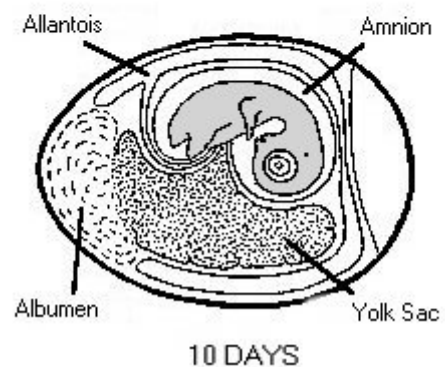
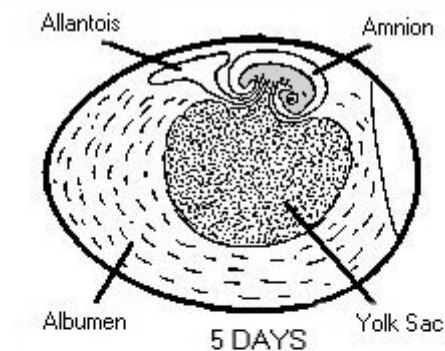
One of the greatest miracles of nature is the transformation of the egg into the chick. A chick emerges after a brief three weeks of incubation. Cell division begins soon after fertilization. It will continue if the egg is kept warmer than 67°F. At this time the egg is laid, it cools, and embryonic development usually stops until proper environmental conditions are established for incubation.

Before the first day of incubation is through, new organs are forming. The head of the embryo becomes distinguishable and the eye begins.

On the second day of incubation, the blood islands begin linking and form a vascular system, while the heart is being formed elsewhere. By the 42<sup>th</sup> hour of incubation, the heart and vascular systems join, and the heart begins to beat. Two distinct circulatory systems are established an embryonic system for the embryo and a vitelline system extending into the egg. The vitelline system is responsible for transporting nutrients from the yolk to the growing embryo. Before the fourth day, it oxygenates blood. The other blood system, made of allantoic vessels, is concerned with respiration and the storage of waste products in the allantois. When the chick hatches, both circulatory systems cease to function.

On the second day, the ears begin development, and the lenses in the eyes are forming.

At the end of the third day of incubation, the beak begins developing and limb buds for the wings and legs are seen.

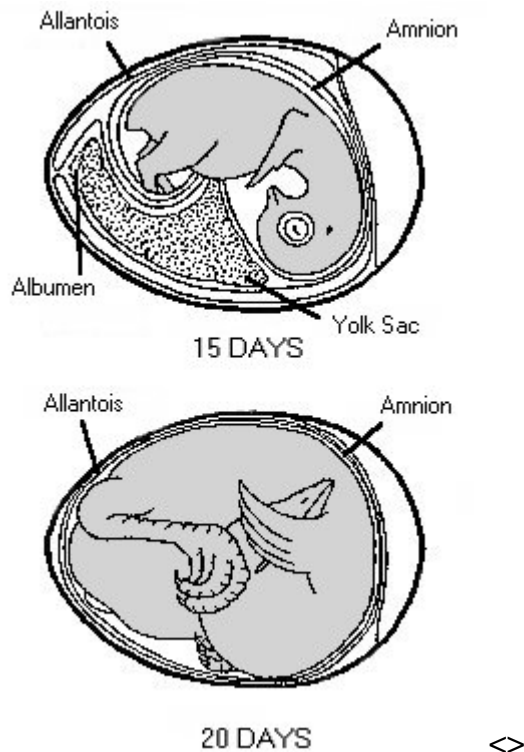


The fluid-filled amnion has surrounded the embryo to protect it for proper embryonic development. The tail appears, and the allantois is seen. The allantoic vesicle is a respiratory and excretory organ. Nourishment from the albumen and calcium from

the shell are transported to the embryo through the allantois.

The fourth day, the mouth, tongue, and nasal pits develop as parts of the digestive and respiratory systems. By the end of the day, the embryo has all organs needed to sustain life after hatching.

Many complex physiological processes take place during transformation from the egg to the chick. They include: the use of highly nutritious food materials in the egg; the respiration of gases, or oxygen - carbon dioxide exchange; and the building of living energy within the chick.



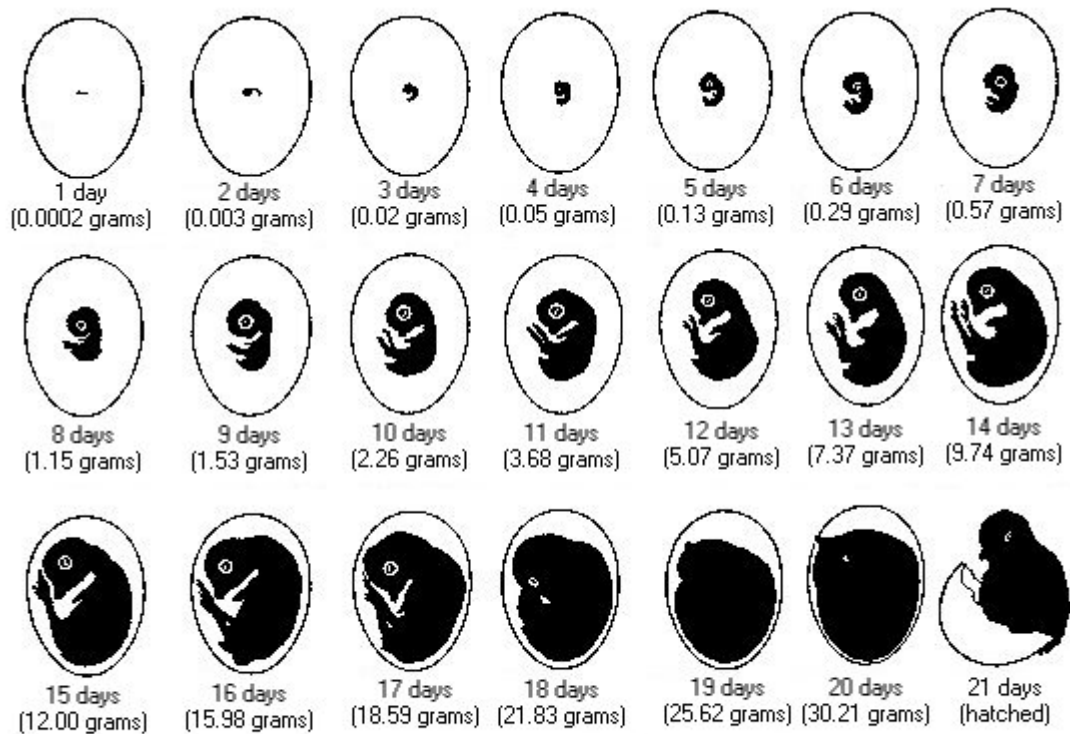
The embryo grows and develops rapidly. By the seventh day, digits appear on the wings and feet, the heart is completely enclosed in the thoracic cavity, and the embryo looks more like a bird. After the tenth day of incubation, feathers are visible, and the

beak hardens. On the 14 day, the claws are forming and the embryo is moving into position for hatching. The supply of albumen is exhausted by the 16 day, so the yolk is the sole source of nutrients. After 20 days, the chick is in the hatching position, the beak has pierced the air cell, and pulmonary respiration has begun. The yolk sac is contained completely within the body cavity in preparation for hatching.

The normal position of the chick for hatching is with the head in the large end of the egg, under the right wing, with the legs drawn up toward the head. If the head is positioned in the small end of the egg, the chick's chances of survival are reduced by at least one-half.

After 21 days of incubation, the chick finally begins its escape from the shell. The chick begins by pushing the beak through the air cell. The allantois, which has served as its lungs, begins to dry up as the chick uses its own lungs. The chick continues to push its head outward. The sharp horny structure on the upper beak (egg tooth) and the muscle on the back of the neck help cut the shell. The chick rests, changes position, and keeps cutting until its head falls free of the opened shell. It kicks free of the bottom portion of the shell. The chick is exhausted and rests while the navel openings heal and down dries. Gradually, it regains strength and walks. The incubation and hatching is complete. The horny cap will fall off the beak within days after the chick hatches.

Provide chicks with feed and water on the first day of life, so they can learn to eat and drink immediately. The yolk is largely unused by the embryo and is deposited within the chick's body on day 19, just before it hatches. The yolk is highly nourishing and provides proteins, fats, vitamins, minerals, and water for several hours after hatching. The yolk is consumed gradually during the first 10 days of the chick's life.



DAILY CHANGES IN THE WEIGHT AND FORM  
OF THE DEVELOPING CHICK EMBRYO (WHITE LEGHORN) <>

## Events in Embryonic Development

### Before Laying Egg:

Fertilization, Division and growth of living cells,  
Segregation of cells into groups of special function  
tissues

Between laying and incubation, No growth - stage  
of inactive embryonic life

### During Incubation:

- Day 1- 16 hours - first sign of resemblance to a  
chick embryo
- 18 hours - appearance of alimentary tract
- 20 hours - appearance of vertebral column
- 21 hours - beginning of nervous system
- 22 hours - beginning of head
- 24 hours - beginning of eye
- Day 2 - 25 hours - beginning of heart
- 35 hours - beginning of ear
- 42 hours - heart beats

- Day 3 -60 hours - beginning of nose
- 62 hours - beginning of legs
- 64 hours - beginning of wings
- Day 4 - beginning of tongue
- Day 5 - formation of reproductive organs and  
differentiation of sex
- Day 6 - beginning of beak
- Day 8 - beginning of feathers
- Day 10 - beginning of hardening of beak
- Day 13 - appearance of scales and claws
- Day 14 - embryo gets into position suitable for  
breaking shell
- Day 16 - scales, claws and beak becoming firm and  
horny
- Day 17 - beak turns toward air cell
- Day 19 - yolk sac begins to enter body cavity
- Day 20 - yolk sac completely drawn into body  
cavity and embryo occupies practically all  
the space within the egg except the air cell
- Day 21 - hatching of chick

**What temperature does the incubator need to  
be?**

99° to 101° F

## How many days does it take for different eggs to hatch?

Dove, Finch	14
Parakeet	18
Chicken	21
Pheasant	23
Geese, Swan	28

## Parts of the egg are:

- Albumen (white) – high water content food for the developing embryo;
- Allantois – serves as the lungs for the embryo, also collects waste; it is the tough lining left in the shell after the chick has hatched;
- Amnion – sac completely surrounds and protects embryo similar to placenta in a horse, cattle, sheep or humans;
- Blastoderm (Germ spot) – spot where new life develops if egg has been fertilized;
- Chalazae – anchors the yolk and keeps it from rising and touching the shell, acts like axis;
- Membranes – protects yolk and albumen, prevents evaporation of liquid;
- Shell – porous, allows for exchange of gases;
- Yolk (Yellow) – food for the embryo composed of protein, carbohydrates, fats, vitamins and minerals.

## What is a brooder?

A brooder box is a temporary home for baby chicks up to one week of age. It contains 2 to 3 inches of litter, a feeder, and water. It also includes a heat

source suspended above the box. The temperature should remain at 86°F. The box may be made from a cardboard box (2' X 3' X 1'). The bottom of the brooder would contain soft pine-wood shavings, untreated cat litter, sand, rice hulls, or ground corn cobs, but not newspaper.

## What do chickens eat?

Grains, corn, soybeans, wheat, and barley

Local feed stores have a balanced feed ration with the right combination of protein, fats, vitamins and minerals.

## References

The author does not claim all material as original. Credit is given to the following sources:

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This publication is issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Noelle E. Cockett, Vice President for Extension and Agriculture, Utah State University.