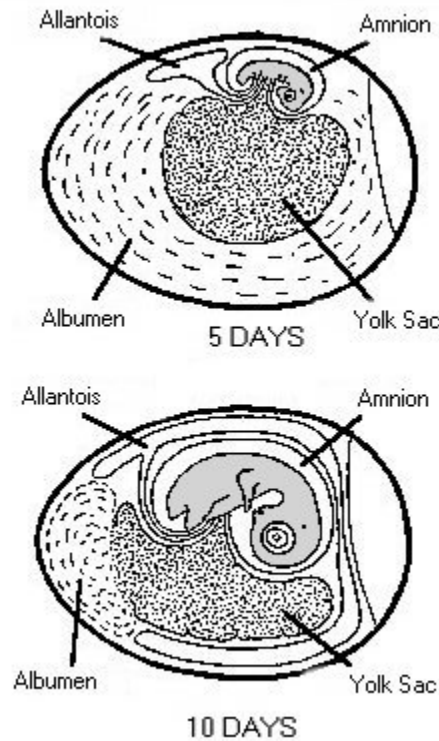


Stages in chick embryo development

 extension.msstate.edu/content/stages-chick-embryo-development

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. The complexity of the development cannot be understood without training in embryology.

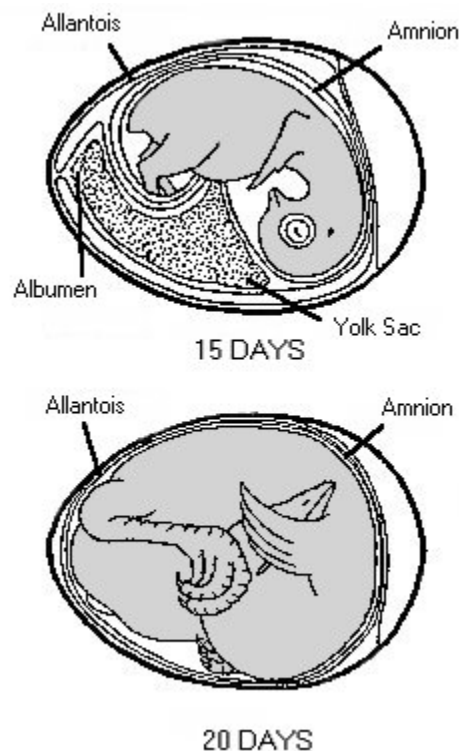


When the egg is laid, some embryonic development has occurred and usually stops until proper cell environmental conditions are established for incubation to resume. At first, all the cells are alike, but as the embryo develops, cell differences are observed. Some cells may become vital organs; others become a wing or leg.

Soon after incubation begins, a pointed thickened layer of cells becomes visible in the caudal or tail end of the embryo. This pointed area is the primitive streak, and is the longitudinal axis of the embryo. From the primitive streak, the head and backbone of the embryo develop. A precursor of the digestive tract forms; blood islands appear and will develop later into the vascular or blood system; 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 44th hour of incubation, the heart and vascular systems join, and the heart begins beating. Two distinct circulatory systems are established, an embryonic system for the embryo and a vitelline system extending into the egg.

At the end of the third day of incubation, the beak begins developing and limb buds for the wings and legs are seen. Torsion and flexion continue through the fourth day. The chick's entire body turns 90° and lies down with its left side on the yolk. The head and tail come close together so the embryo forms a "C" shape. The mouth, tongue, and nasal pits develop as parts of the digestive and respiratory systems. The heart continues to enlarge even though it has not been enclosed within the body. It is seen beating if the egg is opened carefully. The other internal organs continue to develop. By the end of the fourth day of incubation, the embryo has all organs needed to sustain life after hatching, and most of the embryo's parts can be identified. The chick embryo cannot, however, be distinguished from that of mammals.



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 and feather tracts are visible, and the beak hardens. On the fourteenth day, the claws are forming and the embryo is moving into position for hatching. After twenty days, the chick is in the hatching position, the beak has pierced the air cell, and pulmonary respiration has begun.

After 21 days of incubation, the chick finally begins its escape from the shell. The chick begins by pushing its 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 then kicks free of the bottom portion of the shell. The

chick is exhausted and rests while the navel openings heal and its 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.

EVENTS IN EMBRYONIC DEVELOPMENT

Before Egg Laying:

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:

First day:

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

Second day:

25 hours - beginning of heart

35 hours - beginning of ear

42 hours - heart beats

Third day:

60 hours - beginning of nose

62 hours - beginning of legs

64 hours - beginning of wings

Fourth day - beginning of tongue

Fifth day - formation of reproductive organs and differentiation of sex

Sixth day - beginning of beak

Eighth day - beginning of feathers

Tenth day - beginning of hardening of beak

Thirteenth day - appearance of scales and claws

Fourteenth day - embryo gets into position suitable for breaking shell

Sixteenth day - scales, claws and beak becoming firm and horny

Seventeenth day - beak turns toward air cell

Nineteenth day - yolk sac begins to enter body cavity

Twentieth day - yolk sac completely drawn into body cavity; embryo occupies practically all the space within the egg except the air cell

Twenty-first day - hatching of chick