
Unit B

Understanding

Animal Body Systems

Lesson 9

Understanding Fertilization and Embryonic Development

Terms

- Air Cell
- Albumen
- Blastoderm
- Chalazae
- Ectoderm
- Entoderm
- Fertile
- Germinal Disc
- Infertile
- Parthenogenesis
- Shell
- Shell Membranes
- Yolk

What are the internal structures of an egg and what are the functions associated with each structure?

- 1. **Shell**—The shell serves to protect the growing embryo, provide calcium, and allow for oxygen to pass into the shell and carbon dioxide to escape.
- 2. **Shell Membranes**—Two membranes surround the yolk and albumen and provide protection against bacterial invasion as well as water retention.
- 3. **Air Cell**—An air space between the two shell membranes, usually at the larger end of the egg. The air cell will enlarge as the egg matures. The air cell is formed when the cooling egg pulls the two shell membranes apart.

- 4. **Chalazae**—Two white cords that attach to each end of the yolk to support and keep the yolk centered in the albumen. The chalazae serve as a rotating axis to keep the germ cell on the top side of the yolk.
- 5. **Yolk**—The round yellow mass which provides nutrients for the developing embryo.
- 6. **Germinal Disc**—Found in every egg, embryo development will take place in the germinal disc if the egg is fertilized.
- 7. **Albumen**—The albumen is the liquid commonly called egg white. The function of the albumen is to cushion the egg and provide water and protein during development.

CHICKEN EGG INTERNAL STRUCTURES

ALBUMEN

Outer Thin

Firm

Inner Thin

Chalaziferous

Chalazae

SHELL

Cuticle

Spongy (Calcareous) Layer

Mammillary Layer

YOLK

Germinal Disc

Lutebra

Light Yolk Layer

Dark Yolk Layer

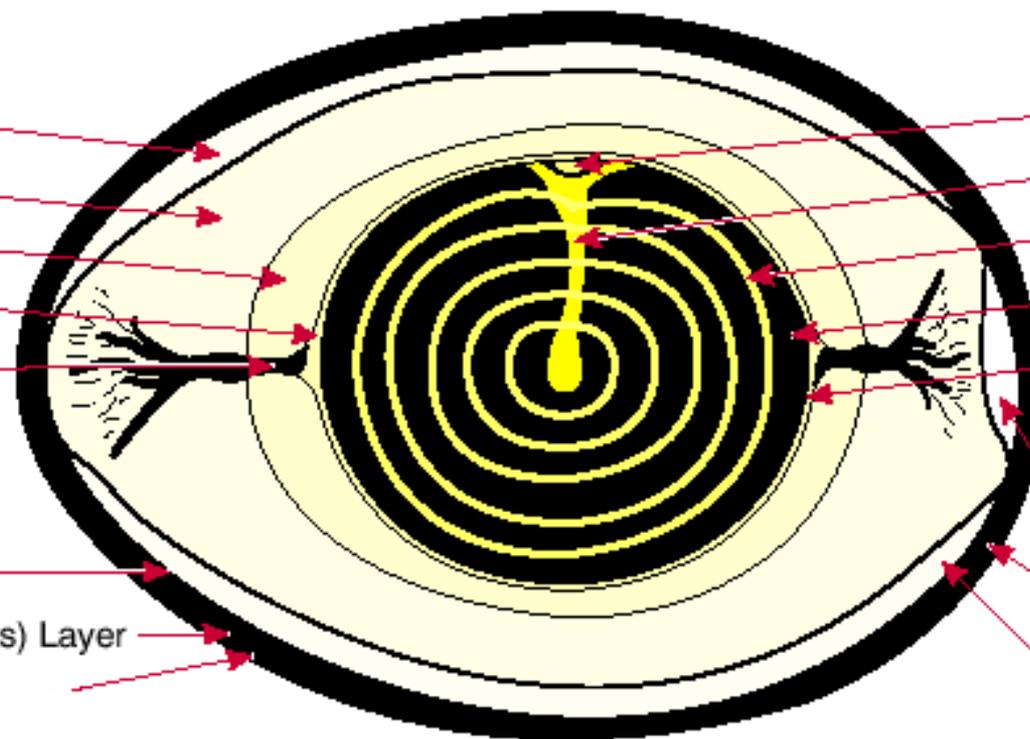
Yolk Membrane

MEMBRANE

Air Cell

Outer Shell Membrane

Inner Shell Membrane



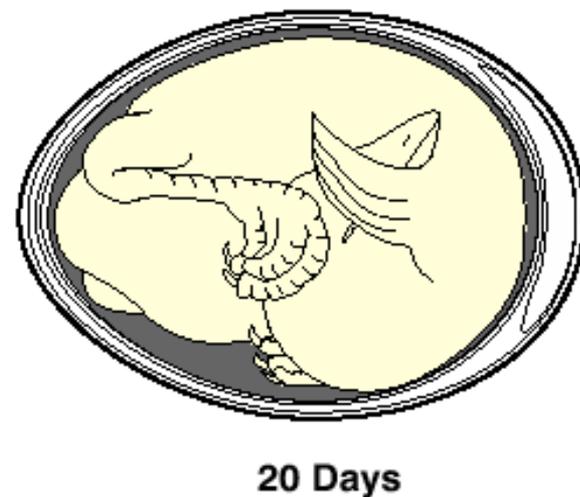
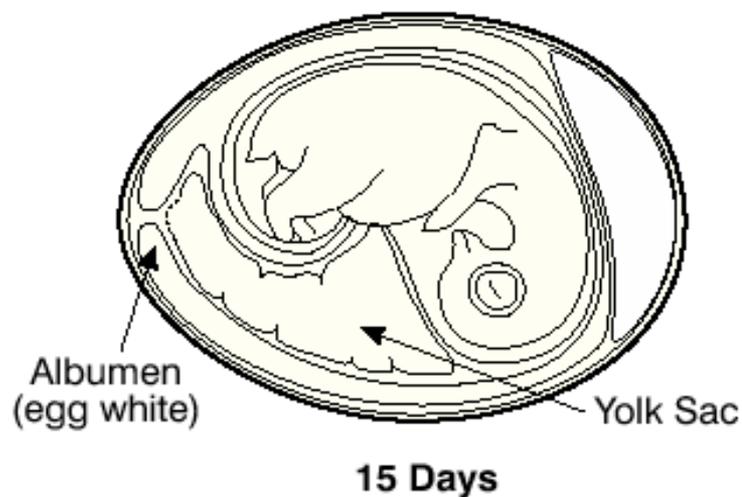
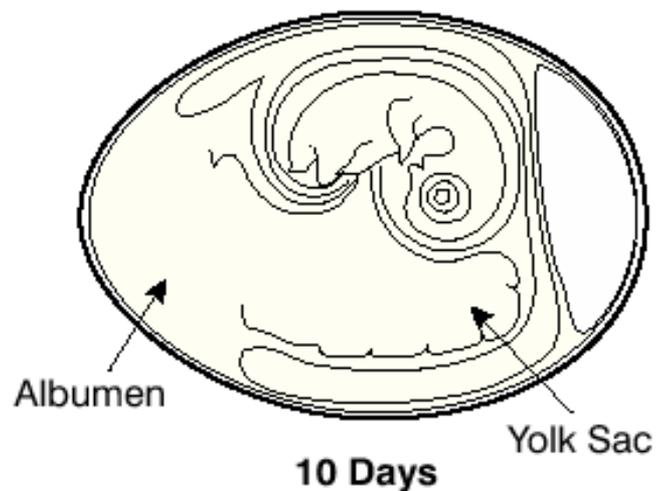
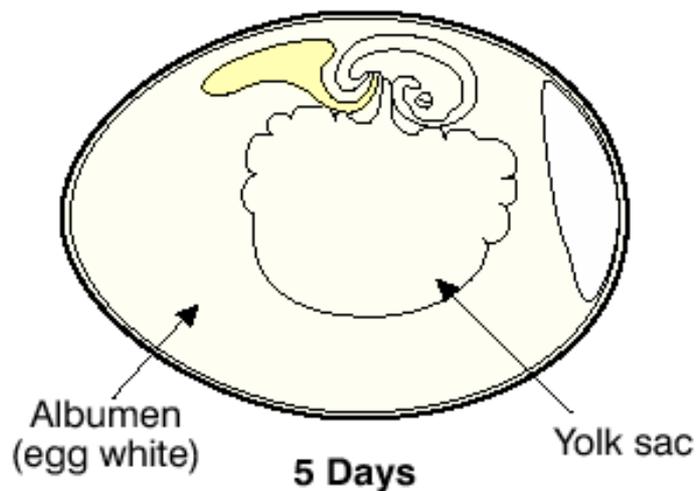
What is the process of embryo development and laying of an egg?

- Chicken eggs that are capable of developing into a chick are known as **fertile**. An **infertile** egg is one that will not develop a chick or hatch.
- A. A chick embryo will develop in 21 days under the proper conditions for incubation.
 - 1. Organ systems begin forming in the first few days of embryonic development.
 - 2. Organ systems appear in the following order:
 - a. Nervous System
 - b. Blood and Circulatory System
 - c. Skeletal and Muscular System
 - d. Digestive System

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- 3. Structure and development in a fertile egg is dependent on time, temperature, and humidity of incubation.
 - B. A normal hen requires slightly over 24 hours to completely form an egg.
 - C. **Parthenogenesis** is an inherited trait that causes the development of unfertilized eggs. About 1% of parthenogenetic embryos will develop and hatch. Parthenogenesis is more common in turkeys than in chickens.

- D. After fertilization, cell division proceeds as the embryo begins to develop.
 - 1. The blastoderm spreads over the yolk and differentiates into the ectoderm layer and the entoderm layer.
 - a. The **ectoderm** layer forms the skin, feathers, beak, claws, nervous system, lens and retina of the eye, and the lining of the mouth and vent.
 - b. The **entoderm** layer forms the linings of the digestive tract and the respiratory and secretory organs.
 - 2. Soon after incubation begins, a third layer, the mesoderm, begins to form the bones, muscles, blood, reproductive, and excretory organs.

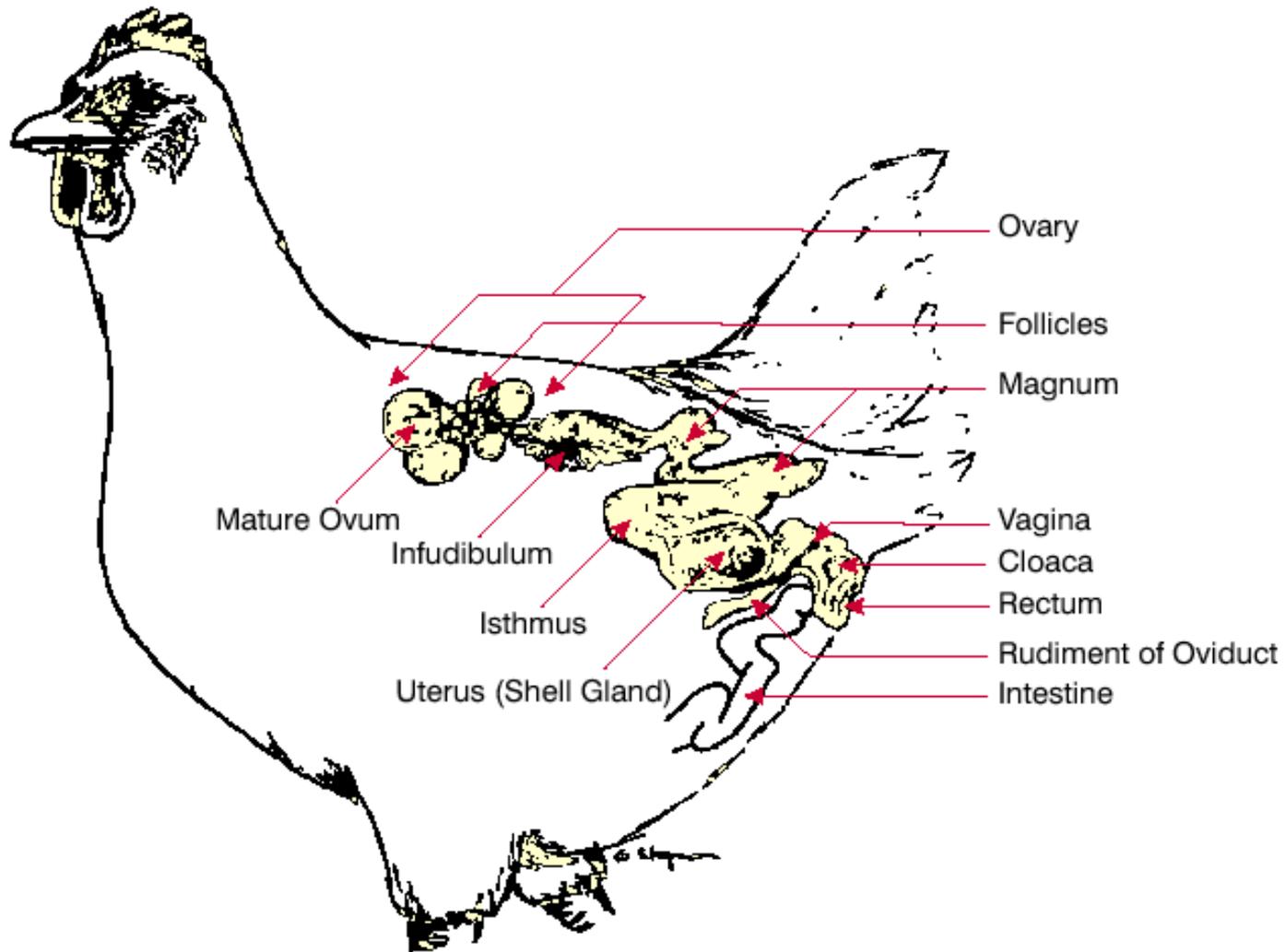
DEVELOPMENTAL STAGES OF CHICK



How does the process of fertilization take place in a chicken egg?

- Fertilization of a chicken egg takes place when the sperm unites with the egg, forming the **blastoderm**.
- A. The sperm will fertilize the egg in the funnel of the oviduct of the hen, called the infundibilum.
 - 1. The yolk will only stay in the funnel of the reproductive tract for 15 minutes, then moving on to other organs that will create the egg.
 - 2. Fertilized eggs move through the reproductive system of the hen in exactly the same way as unfertilized eggs.
- B. Within 30 minutes of laying an egg, another yolk will be released by the ovary of the hen to begin another egg cycle.

REPRODUCTIVE TRACT OF HEN



Review/Summary

- What are the internal structures of an egg and what are the functions associated with each structure?
- What is the process of embryo development and laying of an egg?
- How does the process of fertilization take place in a chicken egg?