

Lec. 7

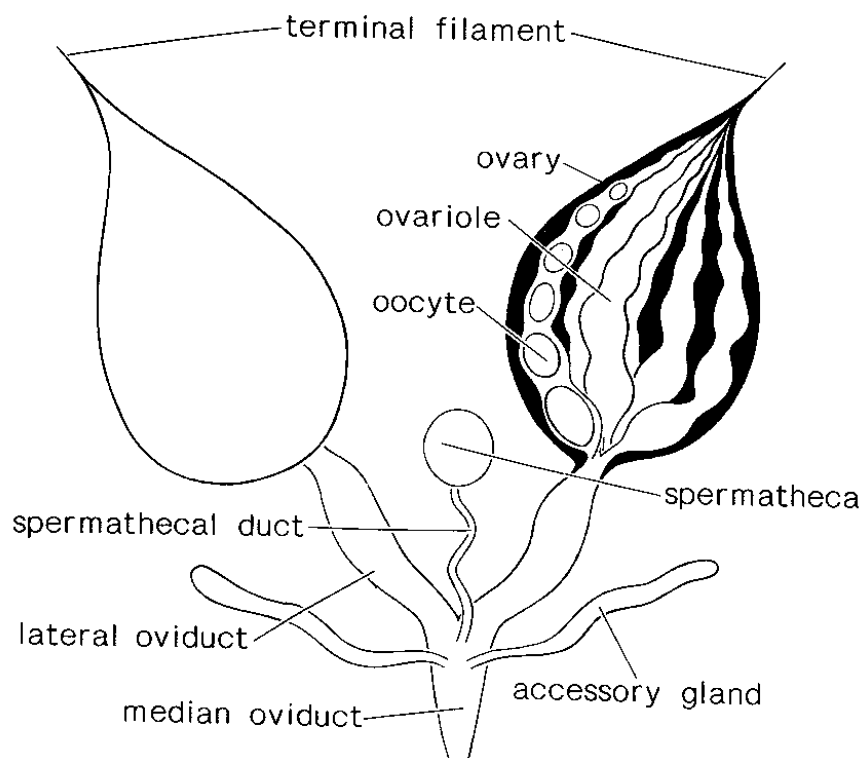
The Reproductive System

Most insects are sexual and thus mature males and females must be present at the same time and place for reproduction to take place. As insects are generally short-lived, their life history, behavior and reproductive condition must be synchronized. This requires finely tuned and complex physiological responses to the external environment.

The female reproductive system

The female reproductive system consists of a pair of ovaries, which connect with a pair of lateral oviducts. These join to form a median oviduct opening posteriorly into a genital chamber.

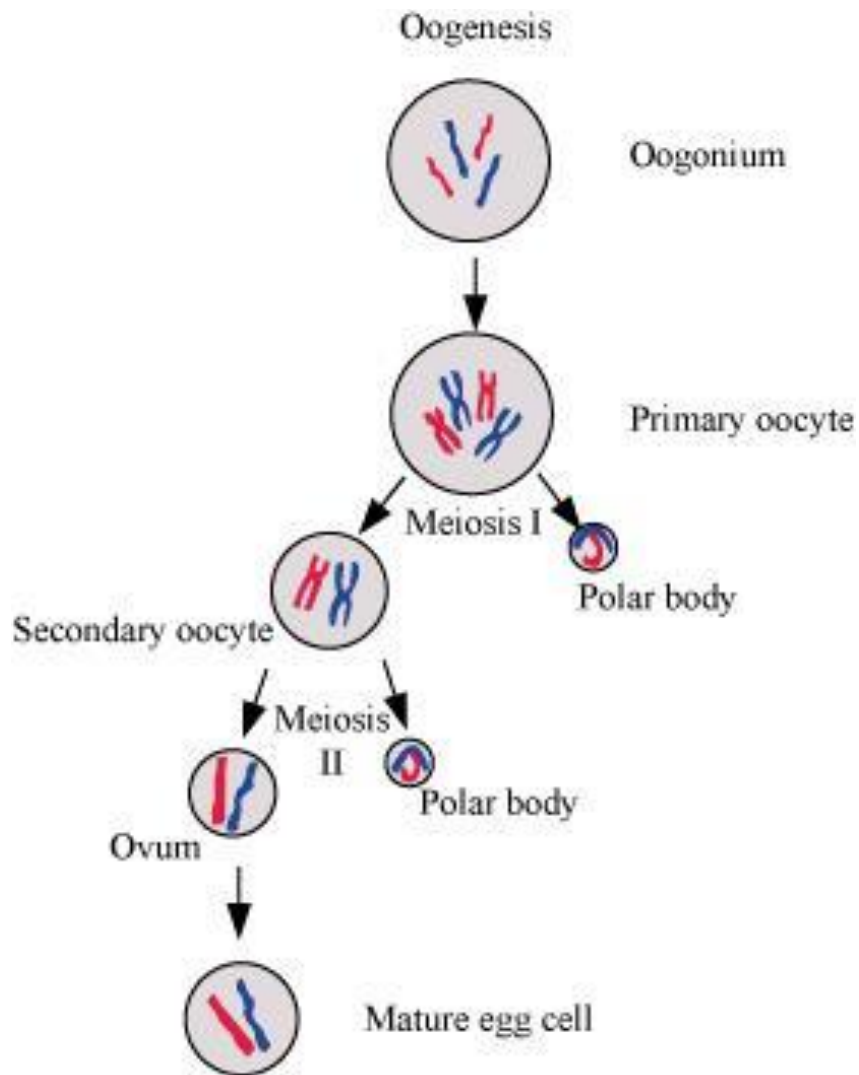
Sometimes the genital chamber forms a tube, the vagina. Opening from the genital chamber or the vagina is a spermatheca for storing sperm, and, frequently, a pair of accessory glands is also present.



Female reproductive system

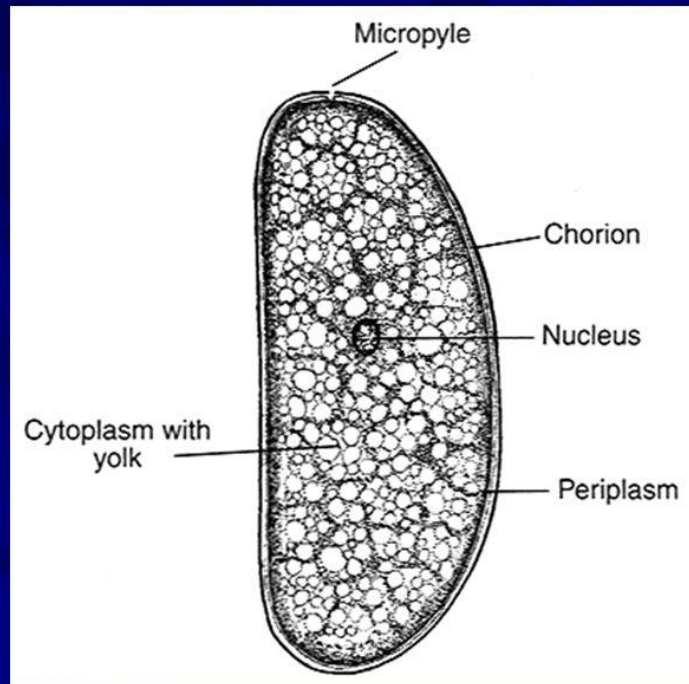
Oogenesis

Oogenesis: Is the process by which germ cells develop into eggs.



Process of oogenesis

Cross-Section of an Insect Egg



Specialized Structures of Insect Eggs

- **Micropyle** 受精孔: an opening of chorion that allows a single sperm to enter. (some with many micorpyles)
- **Respiratory appendages**: structures that serve as a plastron to extract oxygen from water.
- **Operculum** 卵蓋: a cap that is surrounded by hatching regions and opens to allow the larva to exit.



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Types of eggs of insect

The ovaries

The two ovaries lie in the abdomen above or lateral to the gut. Each consists of several egg-tubes, or ovarioles, comparable with the testis follicles in the male. The oocytes develop in the ovarioles. **The number of ovarioles** in an ovary varies in **relation to size** and **lifestyle** of the insect as well as its **taxonomic position**. In general, larger species within a group have more ovarioles than small ones; thus, small grasshoppers commonly have only four ovarioles in each ovary, while larger ones may have more than 100.

Oviducts

The oviducts are usually two lateral tubes join a median oviduct. The median oviduct is opens at the **gonopore** which, in Dermaptera, is ventral on the posterior end of **segment 7**, but in most other groups opens into a genital chamber invaginated above the sternum **of segment 8**.

Sperm theca

A spermatheca, used for the storage of sperm from the time the female is inseminated until the eggs are fertilized, is present in most female insects. Sometimes there are two, as in *Blaps* (Coleoptera) and *Phlebotomus* (Diptera), and most of the higher flies have three.

Accessory glands

Female accessory glands often arise from the genital chamber or the vagina. Accessory glands often produce a substance for attaching the eggs to the substratum during oviposition and hence are often called colleterial **(glue) glands**. In several insects, they **produce an ootheca** that protects the eggs after oviposition). The function of the female accessory glands is generally to **fix eggs in position** or protect them from desiccation and predators.

Male Reproductive system

The male reproductive organs typically consist of a pair of testis connecting with paired seminal vesicles and median ejaculatory duct in most insects there are also a number of accessory glands which open into the vasa deferentia or the ejaculatory duct.

Testis

The testis may lie above or below the gut in the abdomen and are often close to the midline. Usually, each testis consists of a series of testis tubes or follicles ranging in number from one in Coleoptera Adephaga to over 100 in grasshoppers (Acrididae).

Vas deferens and seminal vesicle:

From each testis follicle, a fine, short, vas efferens usually connects with the vas deferens (plural: vasa deferentia). The vasa deferentia run backwards to lead into the distal end of the ejaculatory duct.

The seminal vesicles

In which sperm are stored before transfer to the female, are expansion of the vasa deferentia in many insects.

Ejaculatory Duct

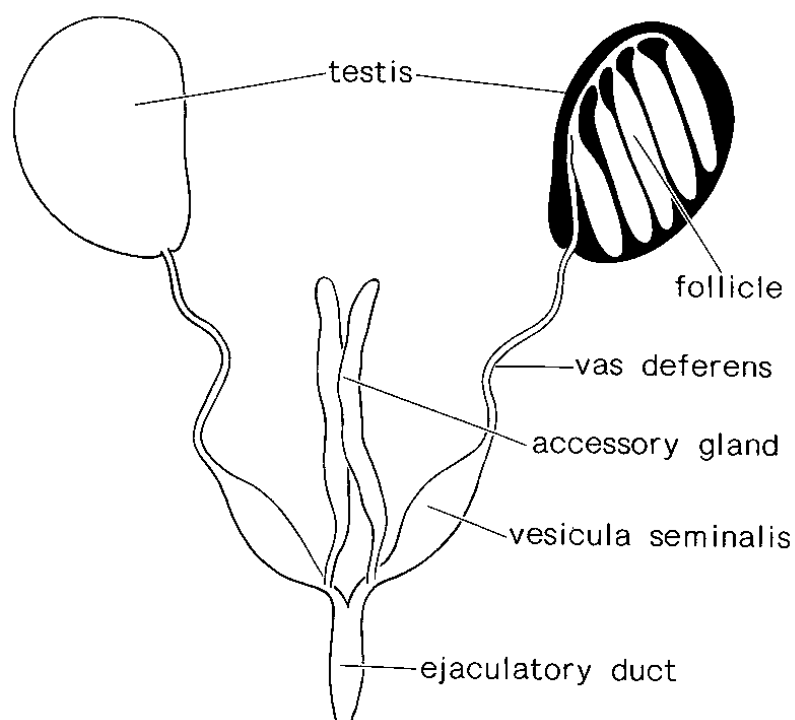
The vasa deferentia join a median duct called the ejaculatory duct, which usually opens posteriorly in the membrane between the ninth and tenth abdominal segments (gonopore).

Accessory Gland

The male accessory glands are mesodermal in origin, the number and arrangement of accessory glands varies considerably between different groups of insects. In Lepidoptera there is a single pair of glands.

The functions of male accessory glands

- 1- Facilitate transfer of sperm to the females.
- 2- Synthesize and secrete a complex mixture of proteins, carbohydrates, lipids, and amino acids that are transferred to the female during copulation.



Male reproductive system