CANAL SYSTEM IN SPONGES

Sponges,are pore bearing,multicellular,diploblastic animals that belong to phylum Porifera

Body of all sponges is perforated by large number of pores called ostia through which water enters Inside body and flows through a **system of criss-crossing canals** known as canal system

Three main types of canal systems **in the order of increasing complexity** are Asconoid, Syconoid and Leuconoid type.

Significance of canal system:
Canal system helps the sponges in
(i) Nutrition
(ii) Respiration
(iii) Excretion
(iv) Reproduction

What is Canal system in sponges?

- **The canal system of sponges is a complex network of interconnected channels and pores used for water circulation and feeding.**
- Sponges are filter-feeding aquatic organisms that receive their food by pumping water through their body
- In sponges, there are three types of canals: inhalant, exhalant, and choanocyte.
- The passages via which water enters the sponge's body are the inhalant canals. These canals are lined with specialized cells known as porocytes that control the flow of water.
- The passages through which water escapes the sponge's body are its exhalant canals. These canals are lined with specialized cells known as oscula that control the flow of water.
- Choanocyte tubes lead to the sponge's internal chambers, where the majority of water filtering and food capture occurs.
- Choanocytes are specialized cells that line the choanocyte canals and feature a collar of flagella that generates a current to trap food particles.
- Sponge survival is dependent on their canal system, which promotes the transport of water and nutrients throughout their bodies.
- The canal system of sponges is quite diverse and can vary considerably between species.
- Some sponges have a simple canal system, but others have a system with several branching canals.

- The organisation and complexity of the canal system are influenced by the feeding habits and ambient factors of the sponge.
- Based on the form and arrangement of the canals, the structure of the canal system can also be used to categorize sponges into distinct groups.
- Asconoid sponges have a simple canal system, but syconoid and leuconoid sponges have complex canal systems.
- As oxygen is absorbed from the water and carbon dioxide is released through the exhalant canals, the canal system in sponges is also engaged in gas exchange.
- The canal system is also responsible for regulating the sponge's internal water balance and preventing the accumulation of surplus water.
- Little fish and other aquatic species that take sanctuary within the sponge's chambers can also find protection throughout the canal system.
- Environmental problems such as pollution can disturb the canal system, which can reduce the sponge's feeding efficiency and overall health.

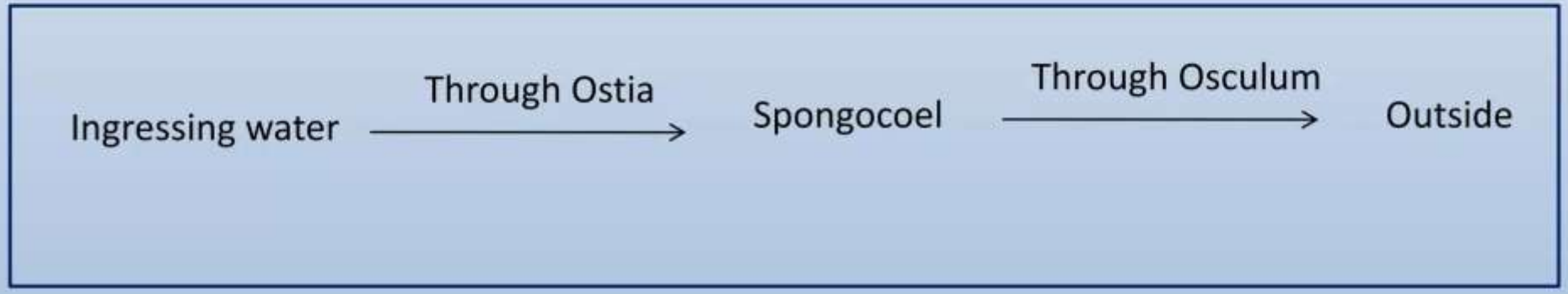
- **Components of canal system in sponge**
- **Ostia or dermal pores:** A thin membrane covers the exterior grooves of the body's surface. It has at least two or more holes, ostia or dermal pores. Around these apertures are contractile myocytes. These substances can reduce the size of skin pores, regulating the amount of incoming water. They are connected to the incurrent canals.
- **Incurrent canals:** These are thin spaces located radially between adjacent radial canals that are similar in size and shape. They are surrounded by pinacocytes. They open to the exterior by ostia, but their interior ends are blind.
- **Prosopyles**: Via prosopyles, incurrent canals communicate with radial canals. Each prosopyle is a puncture in the porocyte, a single tubular cell.
- **Radial or flagellated canals:** These chambers are bordered with flagellated choanocytes and are referred to as flagellated chambers or radial canals. Parallel and alternating, the radial canals and the incurrent canals are separated by the mesenchyme. On a vertical piece of the body wall, each radial canal appears to be surrounded by four incurrent canals, and each incurrent canal appears to be encircled by four radial canals. At their outside ends, radial canals end aimlessly, but at their inner ends, they open into spongocoel.
- **Apopyles**: The apertures of radial canals into the spongocoel are known as apopyles or gastric ostia. They are surrounded by contractile myocytes that control the apopyle diameter.
- **Spongocoel**: This is the huge central chamber into which the radial canals' apopyles open. It is the longitudinal centre of the entire body.
- **Osculum**: The spongocoel communicates with the outside world through its terminal orifice, the osculum. Specialized contractile myocytes surround the osculum. They provide a sphincter that regulates the rate at which water leaves the body. Sponge physiology is primarily determined by the water current. The water current is created by the beating of collar cell flagella. By way of this current, all exchanges between the sponge body and external medium are maintained. This water circulation transports nutrients and oxygen into the body. Moreover, the excreta are removed from the body by this water current. The reproductive cells are conveyed by the water stream into the sponges' bodies.

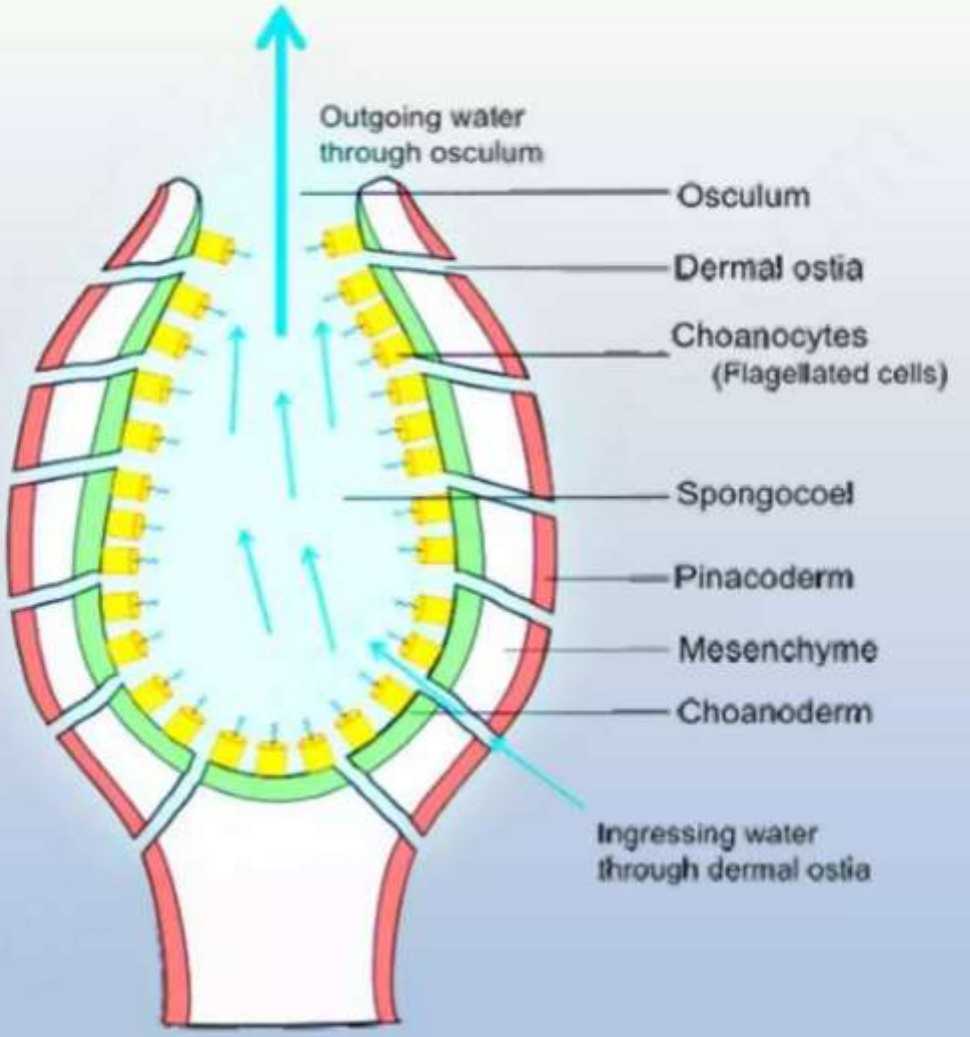
- **Types of canal systems in sponges**
- Various sponges have varying arrangements and degrees of complexity of internal channels; hence, the canal system has been categorized into four types:

- Ascon type of Canal system
- Sycon type of canal system
- Leucon type of canal system
- Rhagon Type of canal system

ASCON TYPE

- Simplest type of canal system
- Found in asconoid sponges e.g. *Leucosolenia* and developmental stages of Syconoid sponges
- Ostia are present on the surface of body and lead directly into the spongocoel which is lined by flagellated choanocyte cells.
- Spongocoel opens to the outside through a narrow circular opening, the *osculum* located at the distal free end of the sponge body.
- Water enters through ostia into spongocoel and goes out of body through the *osculum*.





Ascon type canal system in *Leucosolenia*

SYCON TYPE

➢Characteristic of syconoid sponges, e.g. *Scypha* and *Grantia*.

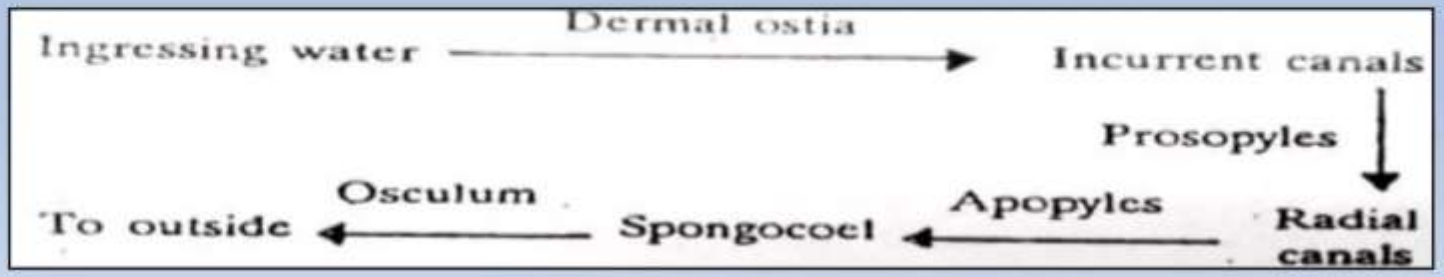
➢Body wall is secondarily folded to form incurrent and radial canals, which open into the spongocoel by an opening called *apopyle*.

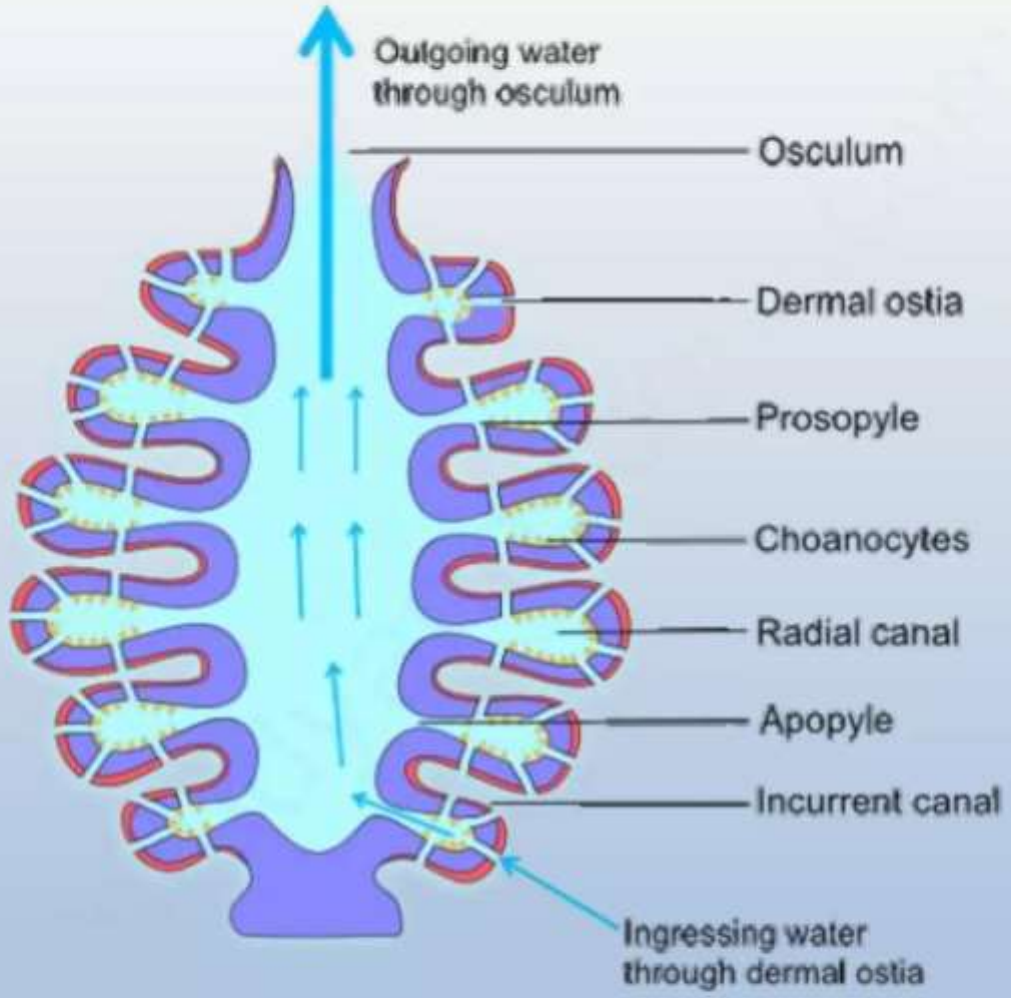
➢Ostia open into the incurrent canals, which lead into adjacent radial canals through minute openings called *prospyles*.

➢Radial canals are the flagellated chambers that open into central spongocoel by internal openings called *apopyles*.

➢Spongocoel is a narrow, without flagellated cells but is lined by pinacocytes and opens to exterior through the osculum.

➢In more complex sycon type e.g. *Grantia*, the incurrent canals travel along an irregular course through the tissue and connect to the radial canals, thus forming large sub-dermal spaces.

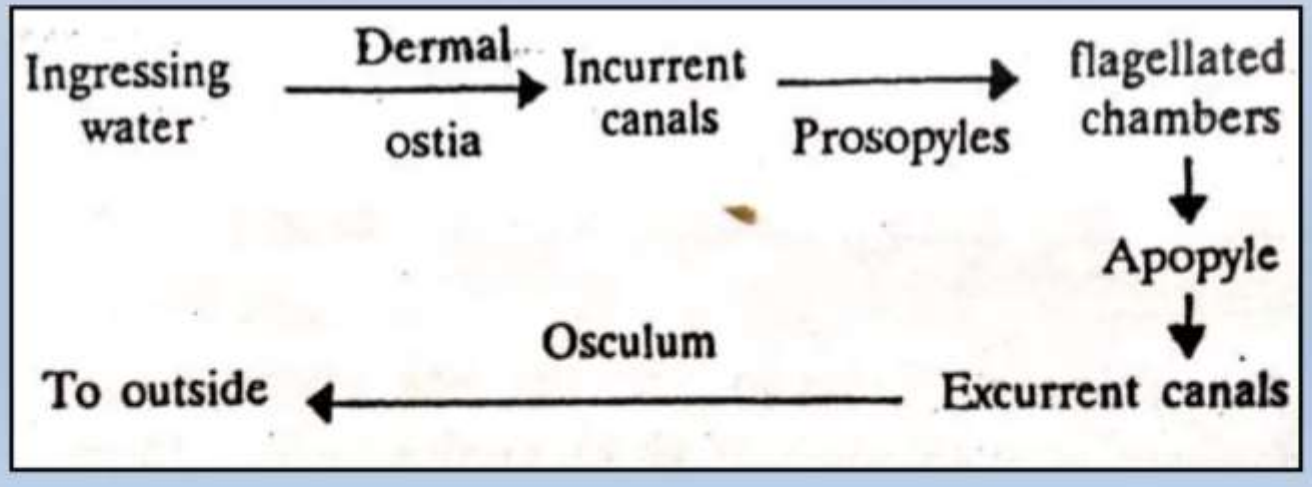


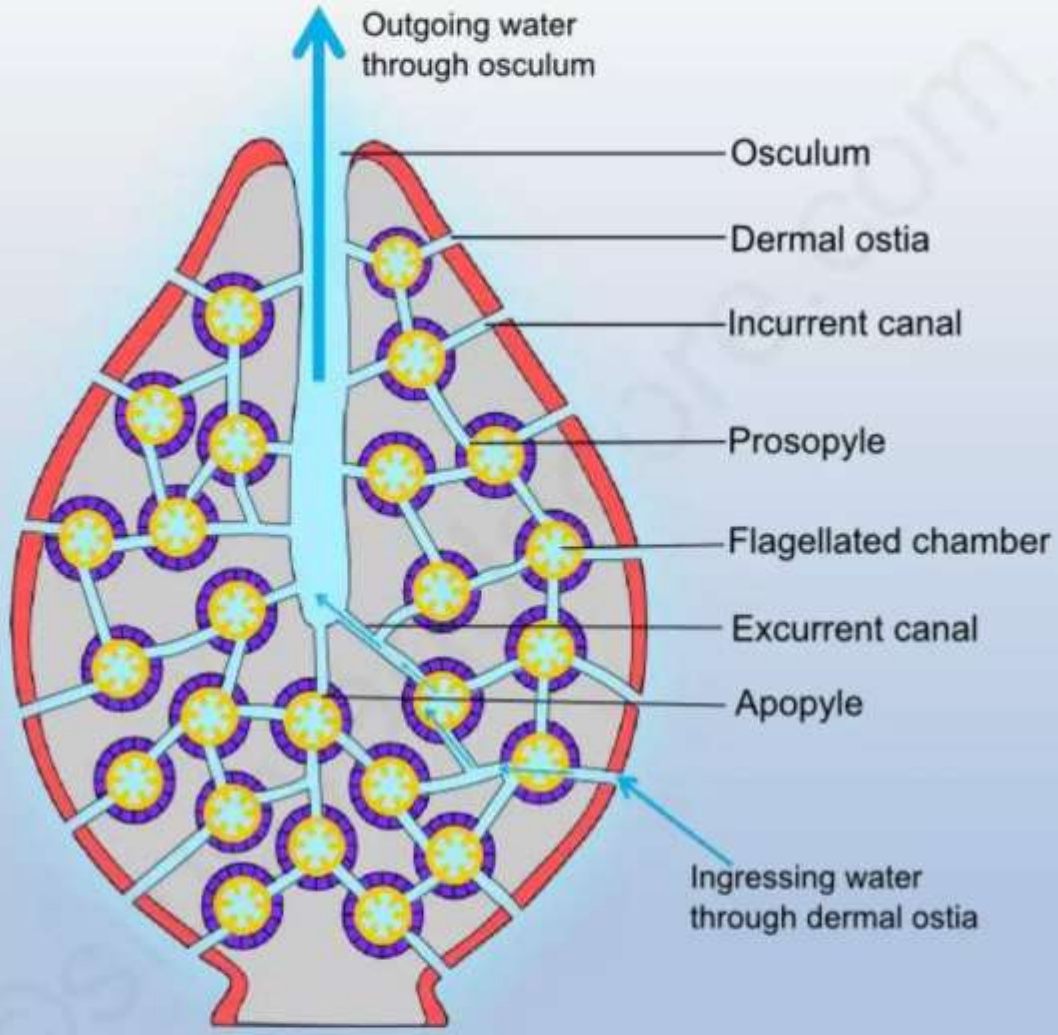


Sycon type canal system in *Scypha*

LEUCON TYPE

- In this case, the radial canals get divided into small rounded or oval flagellated chambers by further folding of the body wall.
- This is a characteristic feature of the leuconoid sponges such as *Spongilla*.
- Incurrent canals open into flagellated chambers through *prosopyles*.
- Flagellated chambers, in their turn, communicate with excurrent canals through *apopyles*.
- Excurrent canals are formed as a result of division of spongocoel which has almost disappeared in these sponges.
- Thus excurrent canals communicate with the outside through a small spongocoel and an *osculum*.

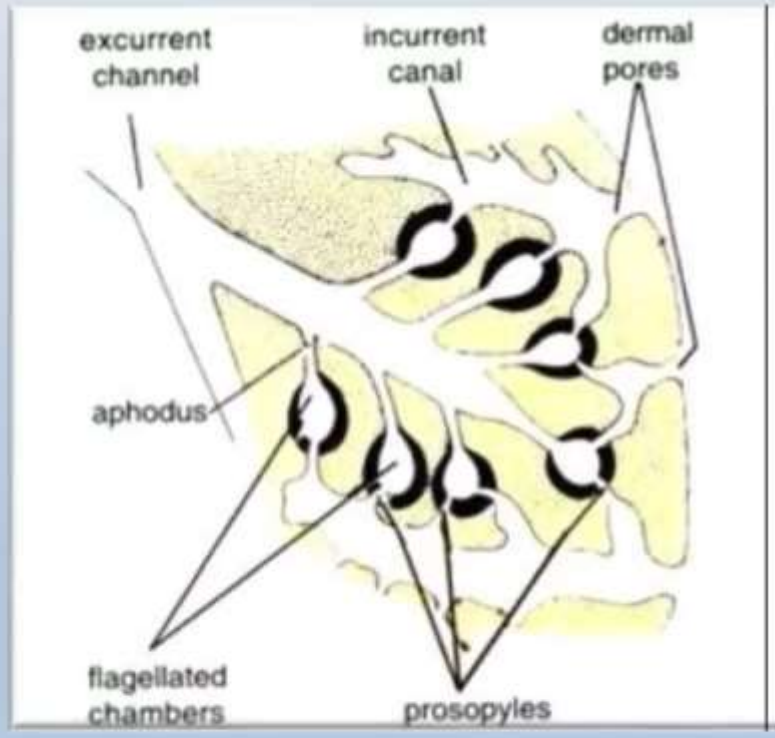




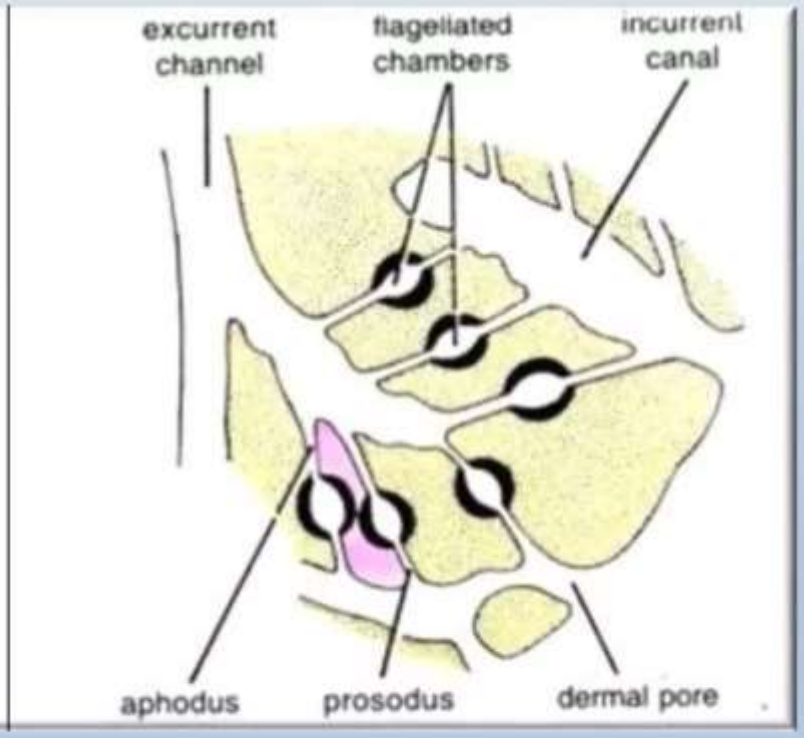
Leucon type canal system in *Spongilla*

Aphodal type: In this type, the *apopyle* is drawn out as a narrow canal, called *aphodus*, which connects the flagellated chamber with excurrent canal E.g. *Geodia.*

Diplodal Type: In some sponges, besides aphodus, another narrow tube, called prosodus, is present between incurrent canal and flagellated chamber.
E.g., *Spongilla* and *Oscarella.*



Leuconoid type of canal systems with aphodal chambers



Leuconoid type of canal systems with diplodal chambers

Rhagon Type

This form of canal system is present in demospongiae, which emerges from the direct rearranging of the inner cell mass.

The rhagon sponge has a large base and is conical with a single osculum at the top.

The hypophare is the basal wall that is devoid of flagellated chambers.

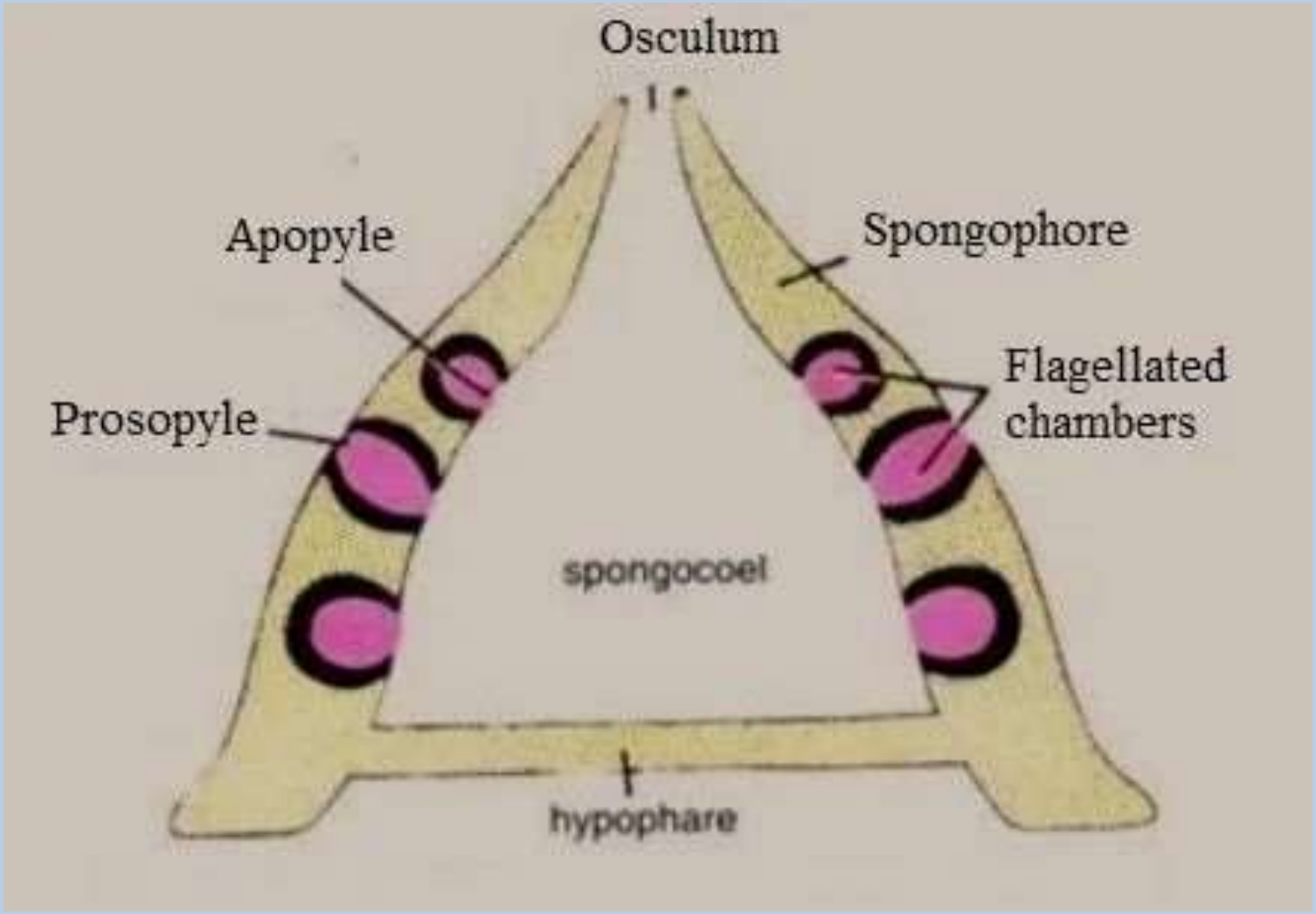
The upper wall that has a series of small, oval flagellated chambers is known as spongophare.

Spongocoel is surrounded by flagellated chambers that open into it by broad apopyles.

Dermal pores or ostia lead to subdermal areas that extend beneath the entire body's surface.

From the subdermal spaces, branching incurrent canals lead to small flagellated chambers generated by the dissolution of the radial canal; the flagellated chambers are bordered by choanocytes and lead to the spongocoel.

The spongocoel is accessed via a solitary osculum.


Osculum
Apopyle
Spongophore
Prosopyle
Flagellated chambers
spongocoel
hypophare

Rhagon Type

THANK YOU