TOPIC: CANAL SYSTEM IN SPONGES

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B.SC PART 1
ZOOLOGY(HONS.)-PAPER I-GROUP A
CHAPTER 4
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Canal system in sponges:

In majority of sponges the body wall is folded and is placed by a complicated system of canals, through by which water current enters the spongocoel. This system of canals is collectively known as canal system.

These are of 3 types in porifera-

Asconoid or ascon type of canal system (Fig. 29).

Syconoid or *Sycon* type of canal system (Fig. 30 and 31).

Leuconoid or leucon type of canal system (Fig.32, 33 and 34).

Asconoid or ascon type of canal system -

It is a simplest type of canal system.
The body is radially symmetrical.
The body wall of an asconoid sponge is formed of two layers (Outer and inner epithelium).

Thin walled and vase like with central cavity, the spongocoel opens free end, narrow aperture, the osculum.

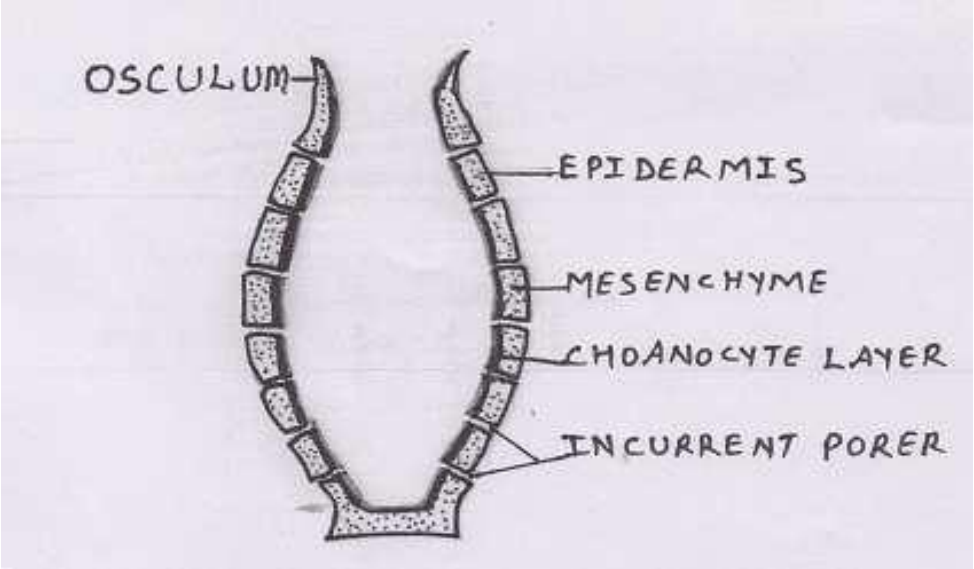

Fig.30 Asconoid Types of Canal System in Sycon

The thin wall of cylinder has numerous regularly arranged small intracellular appertures, which are known as inhalants pores or Ostia. Each of them opens in a canal through a tubular porocyte (tubular cell called porocyte). and extends from the exterior to the spongocoel.The water current enters through ostia, reaches the spongocoel and finally leaves the body through osculum. The outer ectoderm is formed of pinacocytes while the inner endoderm of loosely arranged choanocytes (Fig.24).

2. **Syconoid or *Sycon* type of canal system**

It's theoretically derived from asconoid type by out pushing its wall into finger like structures. These structures are lined by choanocytes and are called as radial canals. The wide opening between two radial canals forms ostium and space is called as incurrent canal.

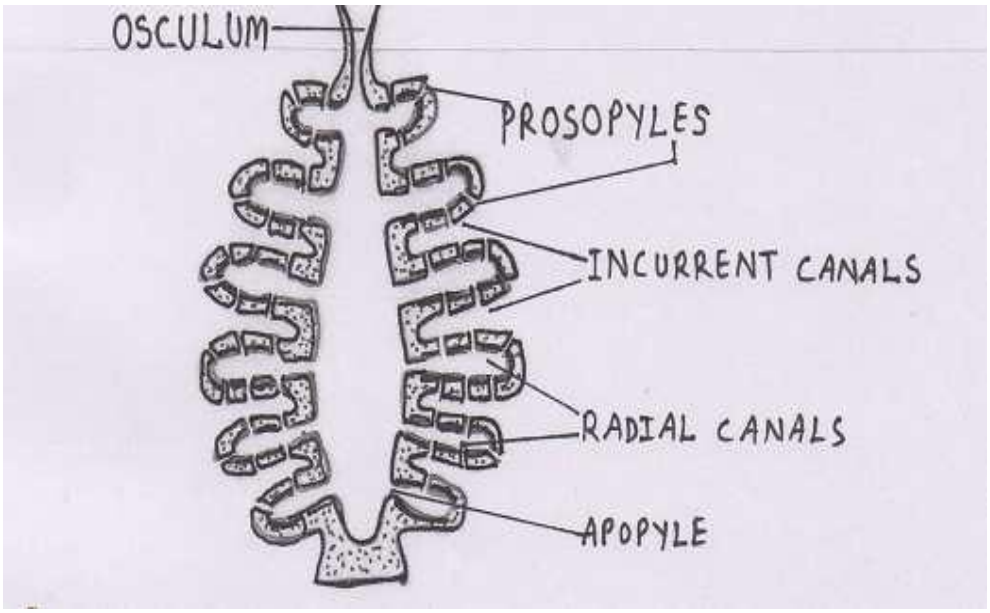

Fig.31 Syconoid Types of Canal System in Sycon

The water current in Syconoid sponges takes the following route: dermal pores → in current canals → prosopyles → radial canals → internal ostia (apopyles) → spongocoel → osculum → out.

The Syconoid sponges differ from the Asconoid type in two important particulars:-

(a) - The thick folded walls containing alternating incurrent and radial canal.

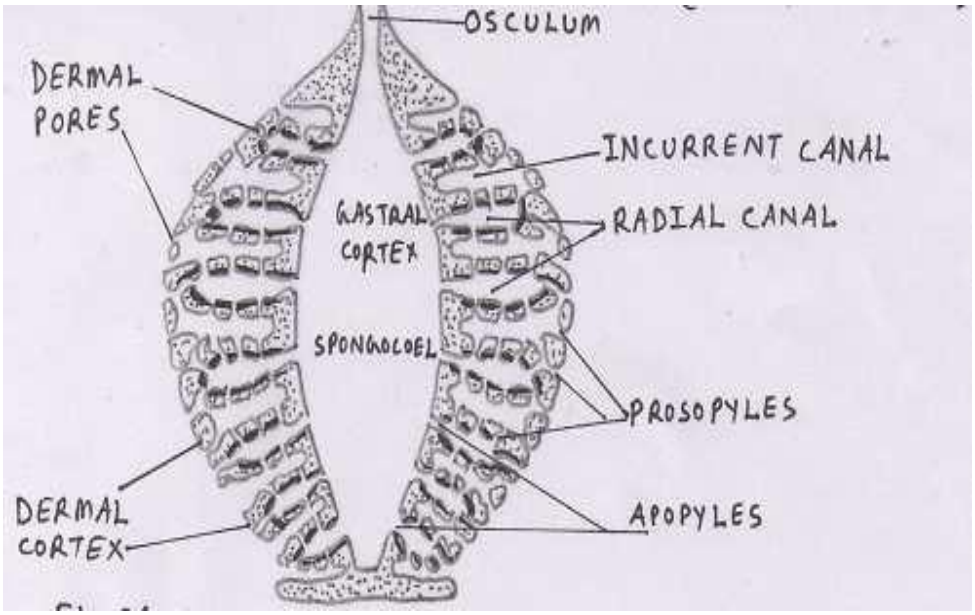

Fig.32 Final Syconoid Canal System in Sycon (with cortex)

- The breaking of the choanocyte layer, which no longer lines the whole interior but is limited to certain definite chamber(radial canals).

Syconoid structure occurs in two main stages-

In its simplest form the radial canal extends out freely to exterior and do not touch each other at any point so that water surrounds the sponge body.

In complex form the epidermis and mesenchyme spread over the outer surface forms cortex which may be thin and becomes thick in still more complex forms. The wide space between radial canals has tubular appearance and forms in current canals. The epidermis at distal end has pores known ostia by which water enters inside. E.g-Sycon (Fig.25 and 26).

Leuconoid or leucon type of canal system:

The more complex leuconoid structure develops by further out folding of the radial canals of Syconoid stage and thickening of mesenchyme. Radial canals are replaced by clusters of small rounded flagellated chambers.

The mesenchyme fills space between flagellated chambers, so that sponge assumes irregular shape. Its interior has network of channels.These are excurrent channels between radial canals.

The excurrent canal from different radial chambers opens into wider chambers and finally to exterior osculum. Similarly incurrent canal also gets branched and irregularly arranged. The dermal ostia may lead directly into incurrent canals or open into subdermal spaces crossed by spicules.

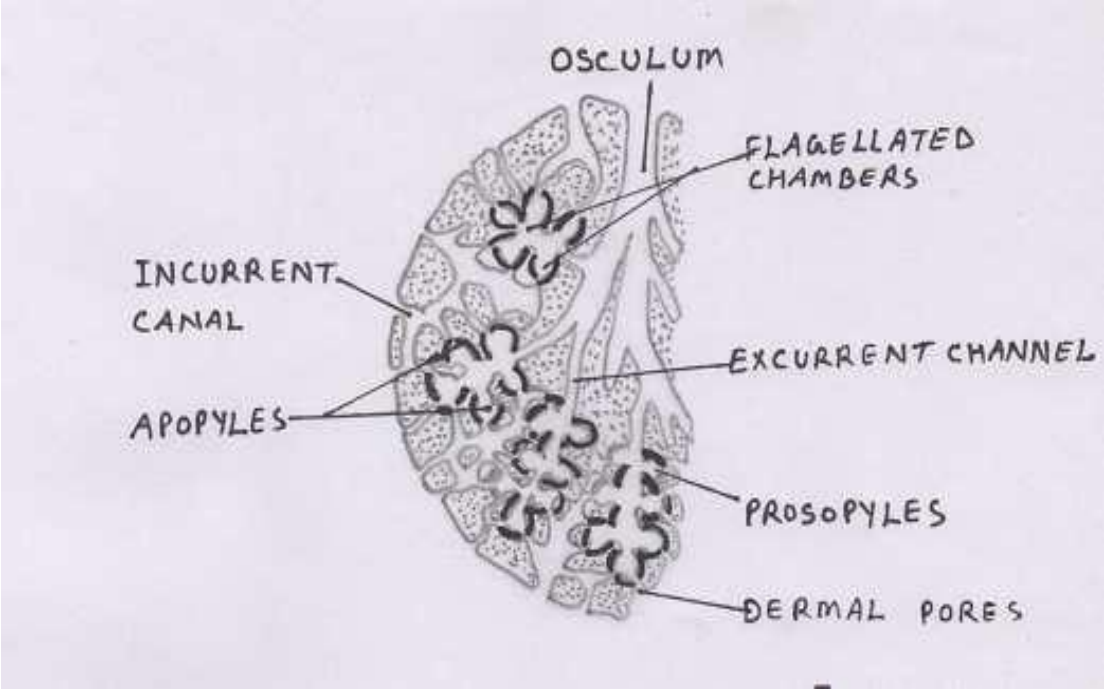

Fig.33 Leuconoid type of Canal System in Sycon

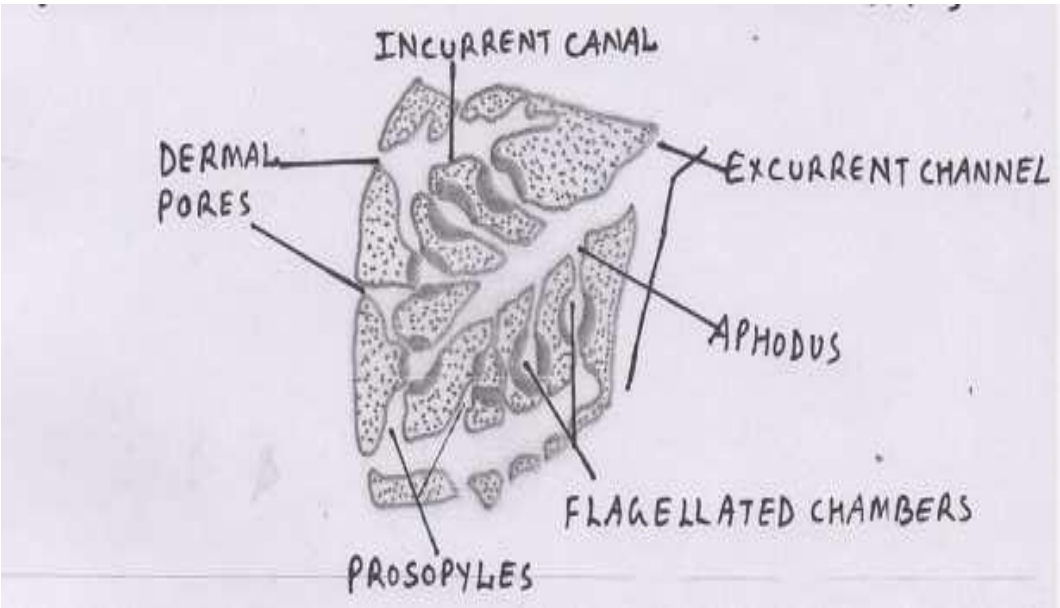

Fig.34 Leuconoid type of Canal System in Sycon (Aphodal Chamber)

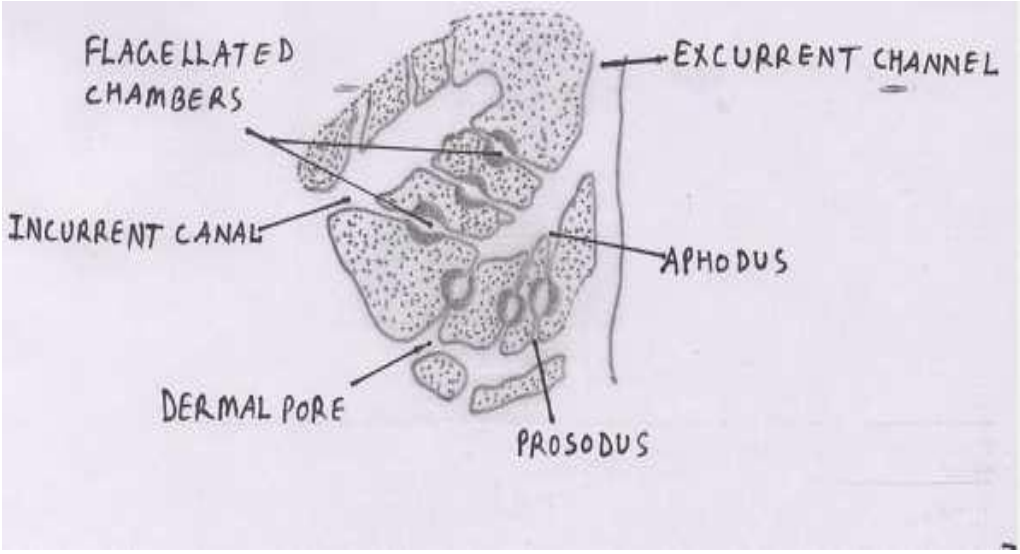

Fig.35 Leuconoid type of Canal System in Sycon (Diplodal Chamber)

The special features of the leuconid type of canal system are the limitation of the choanocytes to small chamber, the major development of the mesenchyme, and the complexity of the incurrent and excurrent canals.The leuconid type of canal system exhibits numerous variations but present three stages of evolution, viz., eurypylous, aphodal and diplodal (Fig.27, 28 and 29).

(a)- **Eurypylous**- In this type of canal system, the flagellated chamber are wide and thimble – shaped, each opening directly into the excurrent canal by a wide aperture called apopyle and receive the water supply direct from the incurrent canal through the prosopyle. Eg. *Leucilla* (Fig.27).

(b)- **Aphodal**- In this type of canal system, the flagellated chamber is small and rounded. The opening of each flagellated chamber into the excurrent canal is drawn out into a narrow tube, usually not of great length, known as aphodus. E.g. *Geodia* (Fig.28).

(c)- **Diplodal**- In this type of canal system, a narrow current tube, the prosodus between the incurrent canal and the flagellated chamber, this type of situation are known as diplodal. This type of canal system is found in *spongilla* (Fig.29).

Table1: Different kinds of sponge structure.

	Asconoid	***Syconoid***	**Leuconoid**
Sponge wall	Simple	Without alternating radial incurrent canals	Irregular
Choanocytes	Lining central spongocoel	Lining radial canal	Restricted to flagellate chambers
Mesenchyme	Limited amount, simple layer	Increased in thickness. Numerous long complex tubular canals traversed by porocytes	Highly developed
Direction of water current	In-current pores ↓ Spongocoel ↓ Osculum	Dermal pores ↓ In-current canals ↓ Prosopyles ↓ Radial canal ↓	Dermal pores ↓ Subdermal spaces ↓ In-current channels ↓ Prosopyles ↓

		Apopyles spongocoel ↓ Osculu m	Flagellate chambers ↓ Apopyles ↓ Excurrent channels ↓ osculum

Affinities:

There has been a great controversy over the nature and affinities of sponges ever since they were discovered. Aristotle (384-322 B.C.) was the first to recognise them as animals. Phylum Porifera shows affinities with protozoa as well as with metazoa.

1. AFFINITIES WITH PROTOZOA

Resemblance with protozoa

Intracellular digestion and absence of definite and digestive system.
Production of skeletal spicules by cells.
Presence of collar cells and amoeboid cells.
The cells of sponge body are interdependent in their function.
Inversion process occurs in amphiblastula larva like those of volvox.

Differences with protozoa

Sedentary in habitat.
Diploblastic acoelomates with absence of cellular mesenchyme.
Development of multicellular organization by cleavage of fertilised egg.
Possession of a canal system and skeleton made of spicules.
Differences between characteristic feature of skeleton and canal system
Development of specialised cells such as pinacocytes, choanocytes and porocytes show division of labour in somatic cells. Thus, sponges are more complex than a colony of protozoans but resemble multicellular metazoa.

AFFINITIES WITH METAZOA

Resemblance with metazoa

Both are sedentary in habit.
Both are diploblastic and acoelomate.
Both reproduce asexually and form colonies.
Both sponges and coelenterates show the presence of same nucleic acids and amino acids.
Parenchymula larva of sponges resembles planula larva of coelenterates.
Spongocoel in sponges opening out through osculum can be compared with gastro-vascular cavity of coelenterates opening out through mouth.

Differences with metazoa

In sponges, cells are less specialised and less independent than those of metazoa.
Sponges do not have anterior end though osculum serves physiologically as controlling region.
Primary openings are not present as osculum in sponges.
Body surface is perforated by inhalent pores or ostia extend by water channels, a unique feature of sponges only.
Tissue formation is restricted to the formation of epithilial lining on the surface. There are no organs as found in higher animals.
Sponges lack true mouth. Osculum does not correspond with the mouth of coelenterates.
Stinging cells are found in coelenterates are lacking in sponges.
Nervous system is lacking in sponges.