

Welcome students to this session. This is for the First Year B.Sc. students. Subject Zoology, Semester 1, Paper Code ZOC 101, Title of the paper: Diversity of Non-Chordates and Cell Biology. The Title of the Unit is: Phylum Porifera.

Today we are going to study the Canal System, Module Number nine. I am Sister Maria Lizanne A.C., Vice Principal of Carmel College of Arts, Science and Commerce for Women, Nuvem, Salcette Goa. The outline of the session is Canal System: Asconoid type of Canal System which will be dealt in brief and Syconoid type of Canal System which will be dealt in detail.

What we are going to know after this session, i.e. the learning outcome, the students will be able to know 1) What is a canal system, 2) Asconoid type of canal system, 3) Syconoid type of canal system, its structure and working, 4) Significance of the canal system and 5) Relevance of the canal system in the present times.

So what is a canal system? A Canal System is a feeding water current on which life depends. It can also be understood as exchange between the sponge body and the external medium wherein food and oxygen is brought into the body and the excreta and the reproductive bodies are carried out of the body. This is managed by the beating of the flagella of the collar cells. The body of the sponge is perforated by various pores for the ingress and the egress of water. But inside the body of the organism, the current flows through a system of spaces which are called canals and so the system is called the canal system or water transport system or aquiferous system. Now when we talk of the complication of the system, the system can be divided into simple and complicated and when we talk of the organization of the canal system, it has four main types or it can be categorized into four main types the Asconoid type, the Syconoid type, the Leuconoid type and the Rhagonoid type. For the first year B.Sc. students, the Syconoid type of canal system is done in detail.

Moving on to the Asconoid type of canal system, this is a very simple canal system and it is rarely found in the existing sponges or the present day sponges. It was common in the ancient sponges. This canal system is found in simple calcareous sponges, example Leucosolenia. Leucosolenia is attached at the base but it is open at the free end by an opening called as osculum which is also called as the exhalant or egress pore and the whole body surface of the organism bears small rounded pores called as ostia or inhalant or ingress pores, a canal through a tubular cell.

In this type of water canal system, the water current passes through the ostia into the spongocoel and through the osculum to the outside, that is the outside medium, the exterior and the flow of the water current is maintained by the beating of the flagella of the collar cells. So the water route in this canal system is - the water enters from the exterior through the dermal pores called the ostia, it moves on into the incurrent canal which are formed by the porocytes and then into the spongocoel, from the spongocoel it moves to the exterior through an opening called as osculum, the major egress opening.

Here is the diagram where we can see the various parts of the Asconoid type of water canal system So you have the water that enters through the dermal pore that is ostium into the incurrent canal that is formed by the porocyte, moves into those spongocoel and from the spongocoel to the exterior by means of the osculum. This is a very simple type of canal system found in the Ascon type of sponges.

Moving on to the Syconoid type of canal system, this is found in the order Heterocoela, examples could be scypha, grantia etc. How is the Syconoid type of canal system formed? It is formed as a result of the thickening and the folding of the body wall. It is more complex than the Asconoid type but it is derived from the Asconoid structure by the out pushing of the body wall into finger-like

processes or projections and these projections invade into the spongocoel. These finger-like projections are called radial canals or the flagellated canals or chambers. So there are two types of canals found in the syconoid type of canal system: the incurrent canals and the radial canals.

There are three grades of syconoid type of canal system: 1) Simple Syconoid type, 2) Complex Syconoid type and 3) Syconoid type with cortex. The incurrent canals that are formed end blindly into the spongocoel, that means they don't have any opening into the spongocoel because there are other canals called the radial canals which open into the spongocoel, the major cavity in the organism. The incurrent canals and the radial canals are interconnected by pores called prosopyle that means water from the incurrent canal moves into the radial canal by means of opening called as prosopyle. The incurrent canals are lined by pinacocytes while the radial canals are lined by choanocytes. This happens because of the folding of the body wall that takes place. The radial canals open into a single large space called as spongocoel by means of an opening called as apopyle. The incurrent canals open into the radial canals by prosopyle and the radial canals open into the spongocoel by means of the apopyle.

A simple Sycon type of canal system can be understood through the diagram over here. The water enters in a usual way through the dermal pore called as the ostium, it moves into the incurrent canal and from the incurrent canal it moves into the radial canal by means of prosopyle, from the radial canal the water enters into the spongocoel the major body cavity by means of what we call as the opening is called as the apopyle and from the spongocoel into the exterior.

So once again we just see the water route here the water enters through the dermal pore by means of ostia into the incurrent canal and from the incurrent canal into the radial canal by means of opening called as prosopyle from the radial canal the water enters into the spongocoel by means of apopyle and from this spongocoel the water moves out into the exterior by means of osculum.

Next we move onto the Syconoid type of canal system with cortex. Here there is a little bit of modification that takes place in the syconoid type of canal system with the cortex. The epidermal layer and the mesenchyme forms the cortex. Now mesenchyme is a layer in between the pinacoderm and the choanoderm. Pinacoderm is the outside layer and choanoderm is the inner layer. Mesenchyme is the layer in between the two layers. The epidermis and the mesenchyme form the cortex then the incurrent canals become irregular because of the presence of the cortex that is formed and they become branched. They form large cortical spaces called as the subdermal spaces and the spongocoel also gets lined by the cortical cells so the sponge has no longer a simple body cavity but it also gets lined by the cortical cells.

Here we have the diagram which shows the Syconoid or Syconoid type of canal system with the cortex. The body wall folds inside. You can see the folding of the body wall giving rise to the incurrent canal which we had seen earlier and the radial canal but the epidermal layer and the mesenchyme forms the cortex. That is why this is understood as a Syconoid type of canal system with the cortex. You have the epidermal layer with the cortex. So the water enters the first entrance, the dermal pore ostium, it moves into the incurrent canal, from the incurrent canal into the radial canal with the same opening which we had seen in the earlier case, the prosopyle, from the radial canal into the spongocoel by means of the apopyle and from the spongocoel out to the exterior by means of osculum. Spongocoel here is no longer simple as we had seen in the early case but it gets transformed or modified to form a cortex and that cortex is called the gastral cortex. This is also called as the gastral cavity or the spongocoel and because it is called as the gastral cavity the cortex that is present here is called as the gastral cortex.

The water route in the two different types of canal system that is simple Syconoid type of canal system and Syconoid type of canal system with the cortex: water enters from the exterior that is the aquatic medium wherever the organism is present maybe a river or sea or even could be lake, any aquatic water body, water enters from the exterior moves into the dermal pores, now dermal pores are also called as ostia or ostium singular, into the incurrent canal, this in current canal is formed by the pinacocytes which get modified to form porocyte so they form the incurrent canal, so from the dermal pore water enters into the incurrent canal, from the incurrent canal through the prosopyle, it enters into the radial canal and from the radial canal enters into the spongocoel, through an opening called apopyle, so from here the water moves into the exterior by means of osculum.

The significance of the canal system: it has two important significances - 1) that it brings in microscopic food particles from the water medium for nutrition and it also brings in oxygenated water for respiration, 2) it carries away sperms for reproduction and undigested food and nitrogenous waste for ejection from the organism's body.

Relevance of the canal system - 1) it helps in knowing how to increase water holding capacity by increasing the surface area as in the syconoid type that by folding of the body wall so increases the surface area. 2) This will help us in our understanding of how winding furrows and grooves on the ground surface can trap water before it flows into the rivers and the seas especially during the rainy season. The water can easily run down but if you have furrows and grooves on the ground that will trap the water and this knowledge will help us to increase the ground water table.

These are the references:

- 1) R.L. Kotpal, (1998), Porifera 7th edition, Rastogi Publications
- 2) E.L. Jordan and P.S.Verma, (2015) Invertebrate Zoology by S. Chand and Company Limited.