Water Vascular System

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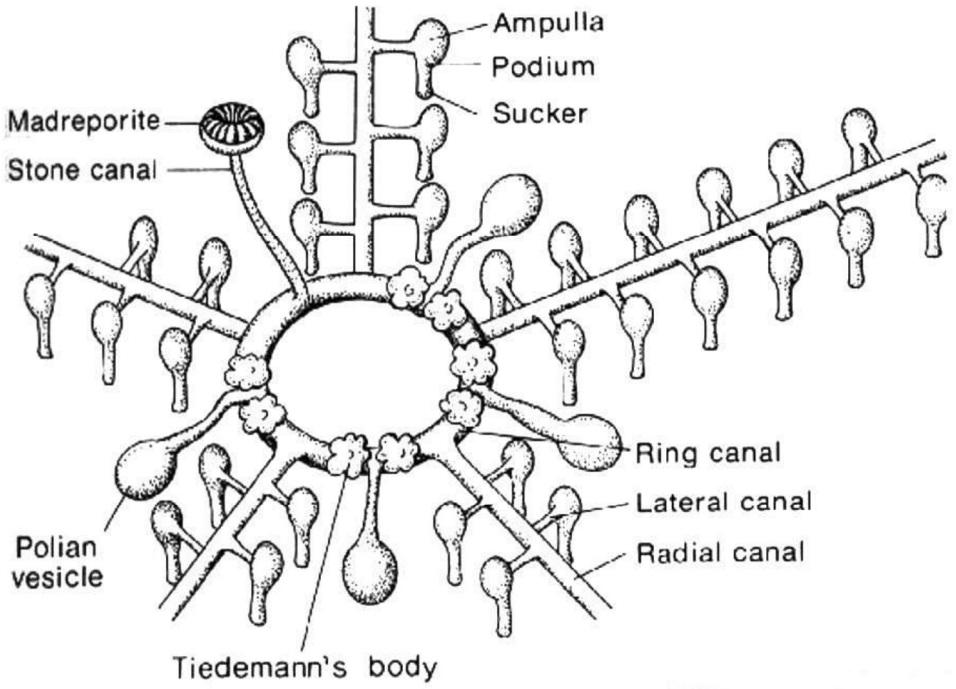
In Echinoderms, there is a peculiar system called water vascular system or Ambulacral system, which is filled with seawater. The system is lined with ciliated epithelium and is well developed in Asteroidea. It contains Madreporite, stone canal, ring canal, 5 radial canals, Tiedemann's bodies, lateral canals and tube feet.



Madreporite:

It is a calcareous plate like structure present on the aboral surface of the central disc of star fish. It is placed on interadiusnrar the bases of two adjacent arms forming **bivium**. Madreporite or sieve plate is calcareous which have many ridges and furrows. Each furrow contains a number of pores about 200. Hence it is called sieve plate. These pores led into small canal, called pore canal which open into a stone canal.

Pores → pore canal → collecting canal → Ampulla → stone canal

Stone Canal:

It is a 'S' shaped canal, it is called Madreporic canal. It travels towards the oral side and unite with ring canal around the mouth. The walls of stone canal are strengthened by calcarious rings. The inner surface of stone canal is lined with flagellated cells. The movement of flagella draws water currents into the stone canal. In older star fish, wall of the stone canal shows a ridge and two spirally coiled lamellae within its lumen.

Ring Canal:

It is penta - radial and is present around the mouth, on the oral side. At each inner radius, it shows polian vesicles and Tiedemann's bodies.

Pollan Vesicle:

In the Asteroidea groups, four muscular, pear-shaped, like polian vesicles are present at the 4 inter radii. Some scientists believe that they store water regulating pressure in ambulacral system and are considered as reservoirs. Some scientists consider that they produce amoebocytes.

Tiedmann's Bodies:

Usually in Asterias 9 Tiedeman's bodies are present. These are small, rounded, yellowish and glandular sac that opens into the ring canal. On either side of the poiian vesicle two Tiedemann bodies are present. At the stone canal union with ring panal only one Tiedmann body is present. They are lymphoid sac like structures. They are believed to produce amoeboytes.

Radial Canals:

From the ring canal, five radial canals arise and run throughout the entire length of the arm. Each radial canal lies below the ambulacral groove of the

oral surface of the arm. Each radial canal ends at the tip of the arm as a tentacle. It is olfactory in function.

Lateral Canals:

From the radial canal of each arm pairs of lateral canals will arise and they end with tube feet.

Tube Feet:

There are two double rows of tube feet in each arm. Each tube feet has three parts:

Ampulla: It is the basal part of the tube feet which is bulged.

Podium: It is middle tubular part that extends through ambulacral groove.

Sucker: It is cup like at the lower end of podium.

The ampulla contains circular and longitudinal muscles. The long tube feet like structure contain only longitudinal muscles. Lateral canal open into ampulla and is guarded by a valve. Podia have ring of inelastic connective tissue.

Functions of Water vascular System:

This system is mainly used for locomotion and food collection.

1) Locomotor function: water vascular system ring about locomotion y providing a hydraulic pressure mechanism. The thin walls of tube feet may serve for respiratory exchange of gases.

The water from ampulla never enters into lateral canal because of presence of valves. Longitudinal muscles of tube feet contract and animal is pulled forward and the Podia becomes short. The fluid is drawn back into the ampulla. Thus, relaxation and contraction of tube feet bring locomotion in Starfish. Usually the locomotion is carried on by tube feet of one or two arms in one direction only.

2) Food collection: Tube feet help in capturing and handling of food