Spicules

These are secreted by special mesenchymal amoebocytes, called Scleroblast

Spicules are minute needle like, crystalline, calcareous (consisting of spines & rays) and bodies, embedded in mesenchyme. These constitute the endoskeleton that protects and supports the softer parts of the body. These may be simple spines or of spines radiating from a point. These possess a central axis of organic matter surrounded by inorganic substance and an outer organic sheath. The spicules exhibit large number of shapes and sizes (great diversity in form and structure but constant for a given species) and are utilized in the identification of sponges. The classification of phylum porifera is also based on the kinds and arrangement of spicules.

These can be distinguished into two types.

(1) Megascleres (2) Microscleres

(1) Megascleres

The megascleres are large spicules which form the supporting framework of the sponges. They can be divided into the following types.

1. Monaxon spicules - Monaxon spicules are formed by growth along one axis. These may be straight, needle like or rod like, or may be curved. Their ends may be pointed, knobbed or hooked. These are of two kinds.

(a) Monactinal - growth occurs in one direction only along a single axis

(b) Diactinal - growth occurs in both directions, along a single axis (i) Oxeas - both ends pointed

(ii) Tornotes - lance-shaped end.

(iii) Strongyles - rounded at each end

(iv) Tylotes - knob like head at each end.

Monaxons spicules are both calcareous and silicous type.

(2) Tetraxon spicules - These are of common occurrence in Calcareous sponges. Normally these are composed of four rays which radiate from a common point, but one or two or even three rays may be lost during development.

Depending upon the no. and size of rays the tetraxons can be of the following types.

(i) Calathrops - four rays of equal size.

(ii) Triaenes - three rays are small and of the same size and termed as cladomes while one becomes elongated and forms the rhabdome

(iii) Diaenes - formed by the loss of one cladi from a triaene.

(iv) amphidisc - when the elongated ray bears a disc at both ends.

(3) Triaxon Spicules - Triaxon spicules has three axes they cross one another at right angles to produce six rays. It is thus hexactinal, and characteristic of class Hexactinellida.

(4) Polyaxon spicules - Spicules with several equal rays, radiating from a central point. their appearance are of star like and are common among microscleres.

(5) Spheres - Rounded spicules growing by the deposition of substance in concentric rings around a centre

(6) Desmas - these are modified monaxon, triaxon or tetraxon spicules deposited in irregular layers.

2. Microscleres

These are smaller spicules embedded in the mesenchyme but sometimes project into the canals. In certain cases these do not exhibit marked identification from the megascleres. these are of the following types.

(1) Monaxon microscleres

(2) Polyaxon microscleres.

1. Monaxon microscleres

these are only of diactinal types these can be simple rod like or specially curved type. The simple diactinal microscleres are known as microstrongyles. these can be either -

(i) Microxeas - both ends pointed.
(ii) Microstrongyles - both ends rounded

The spicory curved diactinal microscleres are of the following types.

(i) Sigmas - C-shaped microscleres.
(ii) Toxas - bowshaped.
(iii) Chelas - with recurved hooks.
(iv) Sigmaspires - spirally twisted.
(v) Streptasters - short and spiny.

(2) polyaxon microscleres

These possess several equal rays radiating from a central point. The polyaxon microscleres are more numerous than the polyaxon megascleres. These are commonly known as asters and are differentiated as :-

1. Large centred spicules
2. Small centred spicules.

1. Large centred spicules

(i) sphaerasters - possess definite rays
(ii) stereasters - rays are reduced to small projections.

(2) Small centred spicules

(i) Oxyasters - with pointed rays
(ii) Strongylasters - with rounded ends.
(iii) Tylasters - with knobbed ends.

Development of spicules :- Calcareous spicules are secreted by special cells, called Sclerocyts, derived from the mesenchymal Sclerobast. A monaxon spicule or each ray of triradiate spicule is secreted by a group of two sclerocyts. One acting as a thickener cell and the other as the founder cell.

A binucleate sclerobast is believed to give rise to these cells. Formation of spicule begins as a deposition of particle of calcium carbonate between two nucleus

the particle grows drawing apart from the two nuclei and then the two sclerocyts. Thicker basal cell lays down additional layers of $CaCO_3$ adding to the thickness of spicule. When the spicule is fully formed, both the cells wander into mesenchyme.

Scleroblast secreting a calcareous spicule is called calcoblast while that producing a siliceous spicule and is called silicoblast. A siliceous monaxon is believed to be secreted by a single silicoblast while the six rayed triaxon is secreted within a multinucleate mass formed by repeated nuclear division of a single silicoblast.

Skeleton in sponges

A skeleton is present in all sponges except some deep sea sponges which have a pseudoskeleton of foreign bodies. It is essential for supporting the soft and gelatinous sponge body. Sponge skeleton may be formed of — (i) Spongin fibres
(ii) Spicules.

(1) Spongin — Spongin is an organic horny elastic substance, resembling silk in chemical composition. Chemically it is related to collagen protein like nails, hair, and feather. Spongin is a sclero-protein containing sulphur and large amount of iodine (8 to 14%)

Spongin occurs in various forms in class Demospongiae. It may occur as a cement connecting together siliceous spicules, and occurs in following the forms

(i) In sub class - Monaxonida - Spongin may form (a) a cementing substance connecting siliceous spicules or (b) a network of anastomosing fibres in which siliceous spicules are embeded

(ii) In sub class - Keratosa - the spongin fibres form a