(102CR-1.3) REPRODUCTION IN SPONGES

Reproduction is the process by which living organisms produce their progenies in order to perpetuate their kind and continue their race. Sponges reproduce both asexually and sexually and they also possess the power of regeneration. Even though their body organization is primitive type yet their sexual reproduction is similar to higher animals.

ASEXUAL REPRODUCTION

Asexual reproduction which does not involve the sexes occurs throughout porifera and takes place by regeneration, budding, fission, reduction bodies and gemmule formation.

Regeneration

The power of regeneration is very great in sponges and they possess a remarkable ability to regenerate lost parts. Any cut part will regenerate the whole sponge. If a sponge is cut into small pieces and squeezed through a fine silken mesh to separate cells, the separated amoebocytes will reunite and in a few days will develop into a new sponge. The power of regeneration is used for cultivation of bath sponge industry and also helps the sponges to repair the damage caused in the harsh environment.

Budding & Branching

In sponges budding takes place in various ways mostly exogenous and endogenous. In exogenous budding, numerous archaeocytes gather near the surface resulting in a small outgrowth on the pinacoderm. This bud thus formed grows outward to produce a small individual, which either remains attached with the parent individual or gets detached and attached to a nearby rock to grow into an independent colony. Sometimes stolon of the sponge grows by branching and secondary branching and many small vertical buds grow out of it which develops into sponge colony.

Fission & Fragmentation

Fission develops in some sponges along a line that leads to throwing off parts of the body, each of which later can develop into a new sponge. In some sponges multiplication can also take place by fragmentation during which a sponge body breaks into several pieces by developing fission along several lines and the separating fragments that are capable to tide over unfavourable environmental conditions are able to grow into complete sponges in the following favourable season.

Reduction bodies

During winter when environmental conditions are adverse some fresh water and marine sponges before disintegration, develop small rounded balls the reduction bodies consisting of an internal mass of amoebocytes, covered by a pinacoderm and spicules outside. At the onset of favourable conditions, these reduction bodies grow into new sponges.

Gemmules

Gemmules are endogenously produced specialised bodies to thrive during unfavourable conditions and germinate to produce new sponges as and when favourable conditions prevail. Fresh water sponges such as *Spongilla* as well as some marine forms such as *Ficulina, Suberites,* and *Tethya* possess the remarkable ability to produce these specialized endogenous bodies. A fully formed gemmule is a small hard ball having a mass of food laden archaeocytes enclosed in a double layered tough envelope with amphidisc spicules in between. There is a small opening the micropyle through which the cells come out during development in favourable conditions. Food laden archaeocytes get aggregated into a mass before gemmule formation which are surrounded by amoebocytes. The amoebocytes secrete a thick hard chitinous inner layer and an outer membranous layer over this central mass of archaeocytes.Between these membranes amphidisc spicules are secreted by scleroblasts. During autumn the sponges die and disintegrate, liberating the gemmules, which settle down at the bottom where they remain quiescent throughout the winter. Similarly during summer when water level recedes the gemmules are released. During both the seasons when the conditions become conducive and water becomes available in abundance the gemmules absorb water and begin to germinate. The contained cells stream from the micropyle and by differentiation and arrangement give rise to a new sponge around the gemmule shell.

SEXUAL REPRODUCTION

All sponges reproduce sexually by production of sperms and ova and majority of the sponges are hermaphrodite but there is cross- fertilization. The sex cells arise either from archaeocytes or choanocytes. Oocytes produced inside the body remain in mesogloea and sperms that are produced from, archaeocyte and trophocyte cells or from choanocytes in demospongia, leave the body of sponge in large numbers through osculum and enter the body of another sponge through canal system and reach the flagellate chambers, where choanocytes trap and transport them to the mature ova present in the mesogloea. The sperm nucleus then fuses with the nucleus of ovum, ensuring internal fertilization.

LARVAL DEVELOPMENT

Since there is internal fertilization so early development takes place within maternal sponge body leading to the formation of a larval stage. The zygote undergoes holoblastic but unequal cleavage forming different types of blastula and gastrula.

Development in syconoid sponges

In syconoid sponges the larva produced is called *stomoblastula*, since it has a mouth and feeds on nurse cells within mesogloea and grows for a few days. Stomoblastula after growing changes into *amphiblastula* by inverting inside out bringing the flagellated cells on the outer surface so that the larva can swim in water. Amphiblastula leaves the sponge body and swims freely in water feeding on micro-organisms.

Gastrulation is by invagination of micromeres, bringing the flagellated cells again inside the body, lining a cavity which later becomes spongocoel. Cells on the outer surface transform into pinacocytes.

Gastrula swims about and settles on a rock with blastopore against the rock and grows to form *Olynthus* stage that looks like a little sponge. An osculum is formed later.

Development in asconoid and leuconoid sponges

In asconoid and leuconoid sponges, the blastula is called *coeloblastula* as it does not possess a mouth but has a blastocoel and flagella on the surface of the body. This larva escapes from the sponge body and swims about freely in water.

Gastrulation takes place by delamination of the *archaeocytes* which are located on one end of the blastocoel. The archaeocytes gradually fill the blastocoel completely and the gastrula becomes solid. This solid gastrula is known as *stereogastrula, parenchymula* or *parenchymella,* which swims about for some time and then settles on substratum to form olynthus stage. The inner archaeocytes migrate to form pinacocytes on the surface and the outer flagellated cells migrate towards inside to form choanocytes lining the spongocoel.

Development with Rhagon larva

In *Spongilla*, the larva is different from parenchymula and it is called *rhagon* larva, which has a tent-like body with a broad flat base called *hypophare* and a conical body called *spongophare,* with a narrow upper end on which is located the *osculum*. There are flagellated chambers which open to the outside by *ostia* and into the spongocoel by *apopyles*. The sedentary larva grows to become adult.

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