Life Cycle of Obelia

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Obelia Colony

There are three types of **zooids** in *Obelia* colony as follows:

Polyp or Hydranth

It is the nutritive zooid of the colony and is also called *gastrozooid* or *trophozooid*. Its distal end is produced into a conical elevation called the *manubrium* or *hypostome*, in the middle of which is located the mouth. From the base of hypostome arises a circle of up to 30 filiform tentacles containing nematocysts. *Perisarc* around the hydranth dilates to form a loose cup-like, transparent protective sheath, the *hydro theca* into which the polyp withdraws when in danger.

Blastostyle or gonangium

When the colony has reached full development, it produces special club-shaped bodies called *blastostyles* or *blastozooids* or *gonozooids*. The perisarc, covering the blastostyle, forms a loose, transparent, vase-like capsule called the gonotheca. The blastostyle, by lateral asexual budding, produces sexual zooids called *medusae* or *gonophores*. Fully formed medusae detach from blastostyle and escape through an aperture called the *gonopore*. Gonotheca, together with blastostyle and medusae is referred to as *gonangium*.

Medusa or Nectophore
(nectophore- A medusa specialized for swimming)

Large number of medusae is produced by budding on blastostyle. They detach and escape from *gonangium* through its opening called gonopore and freely swim and feed in water.

A fully grown Obelia medusa is a radially symmetrical tiny umbrella, measuring 1 or 2 mm in diameter. The subumbrellar surface has four radial canals and a

circular canal on the margin. A mature medusa bears four gonads, one in the middle of each radial canal.

From the centre of the sub-umbellar surface projects down a hollow process, the *manubrium* that bears a four-sided *mouth* in the centre leading into a gastrovascular cavity. Circular edge of umbrella is produced inwards into a fold called *velum*, which does not carry any canal in it. Margin of the umbrella bears numerous short tentacles with nematocysts.

Nervous system in medusa is a diffused network of neurons.

Medusa floats in water and is drifted by water currents with manubrium hanging downward and tentacles swaying freely. It also swims actively by muscular contractions and velum. Medusa is carnivorous and feeds on planktons. Medusa has eight marginal statocysts, situated at the bases of tentacles on the subumbrellar surface for providing a sense of equilibrium to the animal.

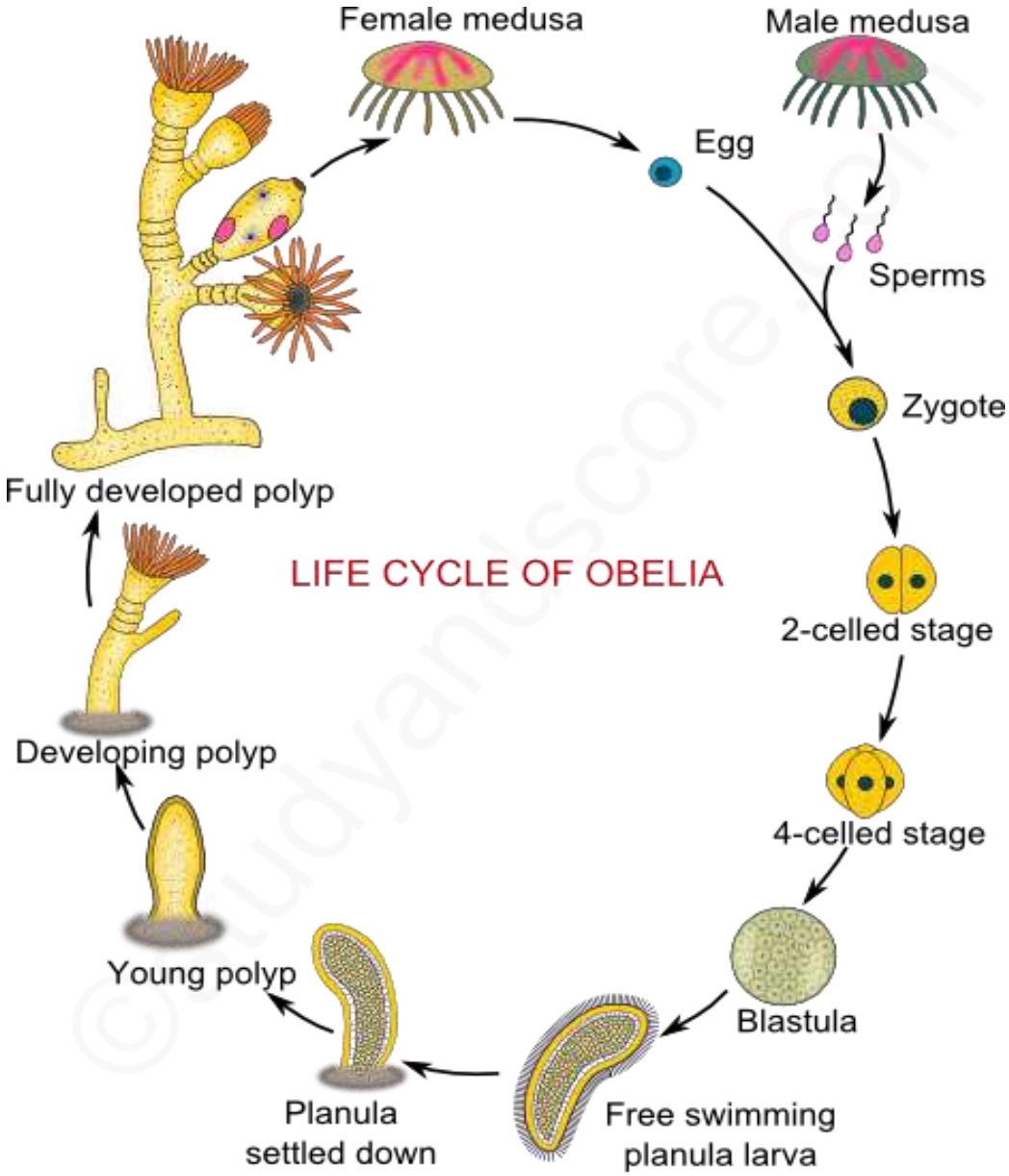
Medusae are reproductive zooids or gonozooids possessing four gonads. They are dioecious as testes and ovaries are derived from different individuals. Each medusa bears only four gonads situated on the subumbrellar surface, over each radial canal. Although medusa bears gonads and sex cells, it does not produce them. Spermatogenesis and oogenesis take place inside the blastostyle and the resulting sperms and ova migrate and fill the gonads of the medusa. So, the function of medusa is to disperse them in water.

LIFE CYCLE OF OBELIA – THE METAGENESIS

Life Cycle of Obelia includes both asexual and sexual generations that alternate with each other to complete the life cycle. In the life cycle of *Obelia* there is a regular alternation of hydroid and the medusoid phases. Medusae produce eggs which after fertilization develop into hydroids. The hydroids produce medusae by asexual budding. This phenomenon was formerly called as “alternation of generations.”

Thus, in fact, there is no true alternation of generations in *Obelia*. The medusa is only a modified zooid that swims freely. This free-swimming medusa is very

useful to *Obelia* because it causes wide dispersal of gametes. Secondly, the gametes carried in the gonads of the medusae do not actually originate there. These originate in the ectoderm of blastostyle, develop, and later migrate into medusae and enter the gonads. It is impossible to differentiate between sexual and asexual generations in *Obelia*. Such alternation of generation in which the asexual polypoid generation appears to alternate regularly with the sexual medusoid generation but both forms are diploid, is called *Metagenesis.* In true *alternation of generation* one of the stages in life cycle is haploid, whereas in metagenesis both stages are diploid.



Events in life cycle

The sedentary hydroid colony alternates with the pelagic medusa phase. Hydroid colony reproduces by asexual budding to produce hydranths and blastostyles. Medusae are also produced by budding from blastostyle but they are free swimming sexual forms that carry ova and sperms in four gonads and disperse them in water far and wide.
Medusae are the sexual zooids or gonozooids possessing gonads. They are dioecious, i.e. testes and ovaries are borne by separate individuals.

Each medusa bears four gonads on the subumbrellar surface, one in the middle of each radial canal. Each gonad is an ovoid, knob-like body having an outer epidermis and an inner lining of gastrodermis.

Gametes are placed between the two layers. Outer wall of mature gonads ruptures to release the gametes in water.

Fertilization occurs in sea water where the gametes are set free. Parent medusae die soon after liberating the gametes.

Fertilized egg or zygote undergoes holoblastic cleavage, resulting in a solid *morula*, which then transforms into a hollow ball of cells called *blastula.* Blastula is made of *blastomeres* and encloses a cavity called *blastocoel*.

Gastrulation takes place by delamination of the endodermal cells from one end of blastula, eventually filling the blastocoel completely. Such solid gastrula is called stereo gastrula in which the outer layer of cells is the ectoderm and the inner mass of cells filling the blastocoel is endoderm.

Gastrula elongates and forms an elongated free-swimming ciliated *planula* larva that swims about in search of a suitable substratum for fixing to form a sedentary colony. Soon the solid endoderm splits and develops a cavity, the *enteron*. Now the fixed planula becomes a truly two-layered larva with an outer ciliated ectoderm and an inner endoderm. The larva now closely resembles a simple polyp and is called *hydrula*. By budding, *hydrula* gradually grows into a branching *Obelia* colony.