TOPIC: OBELIA:MORPHOLOGY AND LIFE HISTORY-II

LECTURE NO:14

B.SC PART 1

ZOOLOGY(HONS.)-PAPER I-GROUP A

CHAPTER 5

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Asexual Reproduction:

When the temperature of the water exceeds 20°C, the buds which would normally form gonangia in the colony break free from the colony and settle down; a stolon arises from the lower end of the bud which produces a new colony of Obelia asexually. This is a special mode of asexual reproduction.

Medusa:

The medusa is a modified zooid produced as a hollow bud from the coenosarc of the blastostyle in spring and summer. Medusa swims freely on the surface water.

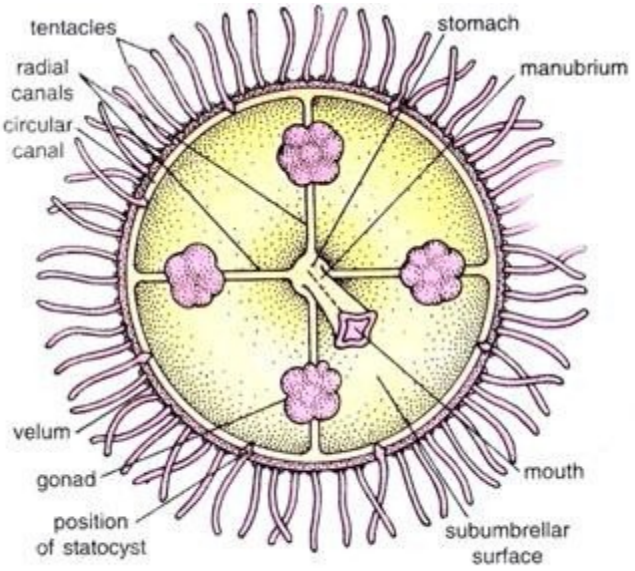

Fig. 32.4. *Obelia*. Medusa in oral view.

Structure of Medusa:

It is saucer-shaped, it is attached by the middle of the convex surface to the blastostyle, when fully formed it breaks free and emerges from the mouth of the gonotheca.

The medusa is circular and tiny umbrella-like in shape. The convex outer surface is known as the ex-umbrella and the concave inner surface is the sub-umbrella. From the centre of the sub-umbrella arises a short projecting manubrium (L., manus = handle), at its apex is a square mouth surrounded by four oral lobes.

The mouth leads into an enteric cavity or gastric cavity in the manubrium. From the enteric cavity, arise four radial canals which are delicate ciliated tubes, they run to the margin of the bell to join a ciliated circular canal running near the margin.

The enteric cavity and the canals represent the enteron which distributes food. Projecting from the middle of the radial canals are four gonads, since sexes are separate they are either four

testes or four ovaries,they are patches of modified sub-umbrellar ectoderm.

The gonads mature after the medusae escape from the gonotheca. The edge of the bell is produced inwards as a thin fold called velum.

Velum is characteristic of hydrozoan medusae but it is insignificant in Obelia. The medusae with a velum are called craspedote, and those with no velum are acraspedote (Scyphozoa). From the edge of the bell numerous small solid tentacles hang downwards. The tentacles have swollen bases due to the accumulation of interstitial cells which are practically absent from other regions.

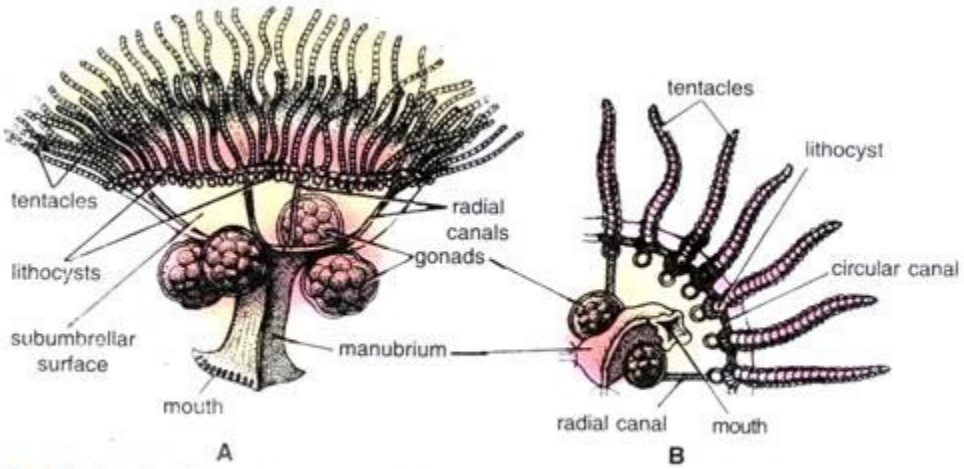

Fig. 32.5. *Obelia*. A—Mature medusa swimming with everted medusa; B—One quarter of the same in oral view.

The basal swellings of tentacles are called vesicles or bulbs, nematocysts are formed continuously in the bulbs from where they migrate to the tentacles.

Digestive enzymes are secreted from the endoderm of bulbs. Near the bulbs the ectoderm has pigment granules and nerve cells, they are often called ocelli and it is claimed that the ocelli are sensory to light, but more probably there are no ocelli, the pigment granules are accumulated excretory matter.

Above the bulb of every tentacle is a tiny fluid-filled vesicle. Nematocysts are confined to the manubrium and tentacles, there may be some on the bell margin. There are eight marginal sense organs called statocysts or lithocysts lying at regular intervals, being attached on the sub-umbrella side to the bulbs of eight tentacles, they are developed in response to a locomotory habit.

A statocyst is a tiny, circular closed vesicle lined with ectoderm and filled with a fluid containing calcareous granules called otoliths which lie in a special cell called lithocyte.

The lining has some sensory cells with thin sensory processes on which the otoliths produce a stimulus which is transmitted by nerves to muscles; the muscles coordinate the snake-like swimming movements of the medusa, and should the medusa become tilted, the muscles contract to right the position of medusa bell, thus, statocysts are balancing organs.

Histology of Medusa:
The ectoderm covers the bell on all sides, its epitheliomuscular cells are produced into muscle processes which run longitudinally in the manubrium and tentacles. In the sub-umbrella, the muscle processes of the ectoderm are so large in proportion to the epithelial part that they almost form muscles only.

The muscle processes form a striated circular muscle and some radial muscles in the sub-umbrella, they bring about locomotory movements. The ectoderm of the ex-umbrella is devoid of musculature.

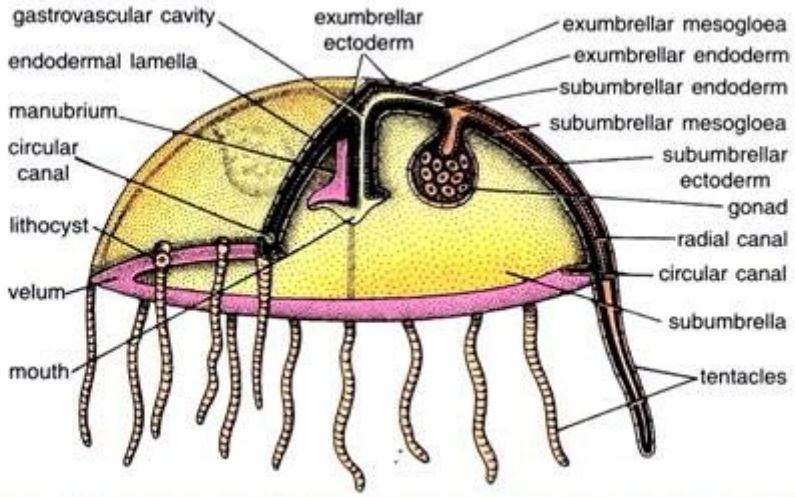

Fig. 32.6. *Obelia*. Diagrammatic structure of medusa with more than one-quarter of the umbrella and manubrium cut away.

The endoderm lines the enteric cavity and the radial and circular canals. The endoderm cells have no muscle processes, they are ciliated epithelial cells, they are digestive. Between the two ectoderm layers of the bell is a thin sheet of endoderm lamella except where the enteron lies.

The endoderm lamella is formed by the fusion of upper and lower layers of endoderm, the fusion having occurred at all places except in the region of the enteron. Between the ectoderm and endoderm is thick mesogloea forming the bulk of the bell of the medusa, manubrium and tentacles. The velum has a double layer of ectoderm and the thick mesogloea in the middle, it has no endoderm.

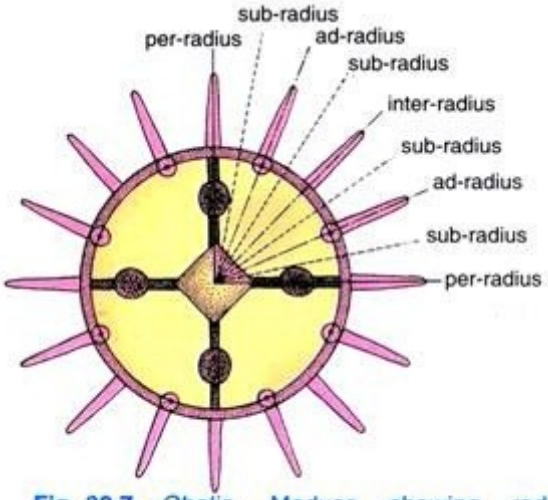

Fig. 32.7. *Obelia*. Medusa showing radial symmetry and various orders of radii.

Radial symmetry of Medusa:
Like polyp, the medusa is radially symmetrical.

The presence of the four radial canals distinguishes the four principal radii or per-radii. Halfway between any two per-radii a radius of the second order or inter-radius may be taken. Halfway between any per-radius and inter-radius on either side a radius of third order, or ad-radius, and halfway between any ad-radius and the adjacent per- or inter-radius, a radius of fourth order or sub-radius.

Thus, there are four per-radii, four inter-radii, eight ad-radii and sixteen sub-radii. In Obelia, the radial canals, the angles of the mouth and four of the tentacles are the per-radial, four more tentacles are inter- radial, and the remaining eight tentacles, bearing the lithocysts are ad-radial. Sub-radii are of no importance in this particular form.

Development of Medusa:
The blastostyle produces medusae by budding in large numbers. The cavity of the blastostyle pushes the coenosarc out to form a small protuberance or bud. The bud grows larger and its

coenosarc becomes like a vesicle which is attached to the blastostyle by a narrow stalk. The cavity of the vesicle is continuous with the enteron of blastostyle.

The distal ectoderm of the vesicle separates into two layers, then the inner layer of ectoderm splits to acquire a cavity called a bell rudiment. There are now two layers of ectoderm outside the bell rudiment and one layer on the inner side. The cavity of the bell rudiment assumes the shape of the sub-umbrella, and a manubrium is formed in the centre.

The two layers of ectoderm which enclose the bell rudiment from outside now break leaving a marginal and circular shelf called velum.

In most hydrozoan medusae, the velum grows and becomes prominent, but in Obelia it decreases and becomes insignificant. The manubrium acquires a mouth, marginal tentacles are formed, the stalk breaks and its aperture closes up, thus, a medusa is formed which is set free, it escapes from the gonotheca, later its gonads mature.

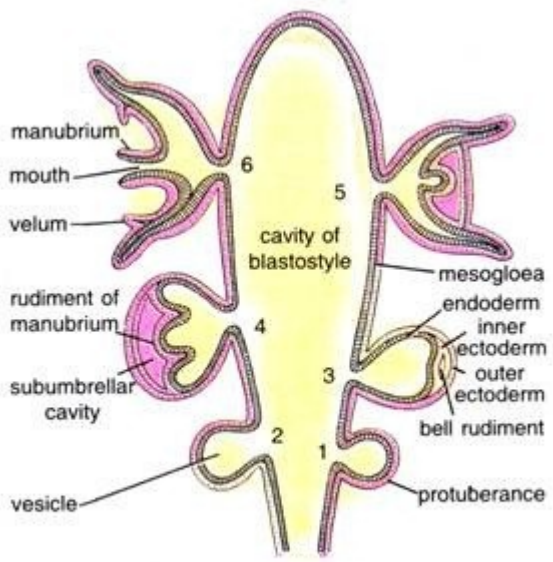

Fig. 32.8. *Obelia*. Stages of the development of medusa from a blastostyle.