

A Presentation For
B.Sc. -II, Semester-IV
Zoology Paper-I (Developmental Biology)
on
Blastulation

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Blastulation

I. Definition:

The blastomeres in the early cleavage stage tend to assume a spherical shape like a fertilized egg before cleavage. Their mutual pressure flattens the surfaces of the blastomeres when comes in contact with one another but their free surface remains spherical. The embryo in this stage resembles like a mulberry. The embryo in this stage is called as a 'morula' (Latin: *mulberry = morula*). The arrangement of the blastomeres in morula stage may vary in different groups of animal kingdom. It has massive structure in coelenterates. As the egg undergoes cleavage, the blastomeres become arranged in one layer and participates in the external surface of the embryo.

In this case, a cavity soon appears. This cavity is called as 'blastocoel'. As the cleavage proceeds, the adhesion of the blastomers to one another increases and they arrange themselves into a true epithelium, in a single layer around the blastocoels. The layer thus formed is known as the 'blastoderm' and the cavity is known as 'blastocoel'. The hollow spherical embryo at this stage is known as 'Blastula' and the process of formation of blastula is refers as 'Blastulation'. Thus, the morulation follows the blastulation and after blastulation, embryo undergoes gastrulation stage.

II. Types of blastula

Different types of blastula are observed in different groups of animals based on the size of the egg, the amount and distribution pattern of its yolk, type, rate and number of cleavage division etc. However, the various types of blastula are placed in six categories. These are as follows:

1. Coeloblastula,
2. Periblastula,
3. Discoblastula,
4. Amphiblastula,
5. Stereoblastula and
6. Blastocyst.

1. Coeloblastula: The blastula of echinoderms and Amphioxus are coeloblastula. It is in the form of a hollow sphere. The blastocoel is filled with mucopolysaccharides. The blastoderm forms a single layer of cells.

2. Periblastula: The periblastula is also called as 'Superficial blastula'. It is found in the eggs of insects. It is similar to the coeloblastula except the blastocoels filled with yolk.

3. Discoblastula: The discoblastula is found in fishes, reptiles and birds whose eggs contains large amount of yolk sac. In this type of blastula, the blastocoel forms a yolk sac and roof is of epiblast.

4. Amphiblastula: The amphiblastula is found in amphibians. In this type of blastula, two structurally different blastomers are formed during blastulation. These are micromeres and macromere. In *Xycon*, the anterior half of blastula is formed of large rounded granular cells.

5. Stereoblastula: The stereoblastula found in the spirally cleaving eggs of annelids, molluscs, nemertens and certain planarians. In all these, blastocoelic cavity root appears in the blastula but the small micromeres accumulate as a cluster of cells over the large vegetally placed macromeres. At the end of cleavage, this results in a solid blastula, called 'Stereoblastula'.

6. Blastocyst: The blastocyst is found in mammals. During the development of mammals, a solid ball of cells, morula is formed. The cells of the outer peripheral layer of the morula are arranged more like an epithelium and form the trophoderm or trophoectoderm or trophoblast. The cells inside the morula are irregular shaped and form the inner cell mass. The cells of trophoderm stretch, flatten and also increase in number. This causes the appearance of a cavity within the morula, and changes embryo into blastula. Such blastula is as called as 'blastocyst'.

III. Significance of blastulation

The significance of blastulation is as follows:

1. During blastulation, the shape of the blastulae and major presumptive organ forming areas of future embryonic body are segregated into definite parts of the blastoderm.
2. The arrangement of presumptive organ forming areas varies from species to species.
3. Blastulation follows gastrulation. During gastrulation, blastocoel permits the migration and rearrangement of the major presumptive organ forming areas.