

**A presentation on**  
**'Cleavage'**  
**for B.Sc.-II, Semester-IV**  
**Zoology Paper-I**  
**(Developmental Biology)**

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# Cleavage

## I. Definition:

The animals which reproduce sexually, develop male and female sex cells during the gametogenesis and the fusion of male and female sex cells results in the formation of fertilized egg or zygote. Within few hours of fertilization, the fertilized egg undergoes a series of repeated mitotic division and transforms the single cell into a multicellular body. This transformation takes place at the very beginning of development and is attained by mean of a number of cell division following in rapid succession. This series of cell division or repeated division of egg is known as 'Cleavage'.

## **II. The special features of cleavage are :**

1. Cleavage begins immediately after the fertilization. The egg provides sufficient energy and the substances needed for cell division. The resultant cells are called 'blastomers'.
2. During the process of cleavage, the unicellular fertilized egg is transformed by consecutive mitotic divisions into a multicellular complex.
3. The volume and general shape of the embryo does not change during the cleavage. Only blastocoel forms.
4. No growth of egg occurs during the process of cleavage.

5. Apart from the transformation of cytoplasmic substances into the nuclear substance, quantitative changes in the chemical composition of egg are limited.
6. The constituent part of cytoplasm of the egg are not displaced to any great extent and remain on the whole in the same position as in the egg at the beginning of cleavage.
7. As a result of cleavage, the zygote changes into a hollow ball of numerous small cells with a surface layer and enclosing a central space, the 'blastocoel'.

### **III. Patterns of Cleavage**

The repeated cleavage furrows produces a number of blastomers. These blastomers exhibit a specific pattern of arrangement. In different animals, following four patterns of cleavage were studied:

1. Radial cleavage pattern,
2. Biradial cleavage pattern,
3. Spiral cleavage pattern and
4. Bilateral cleavage pattern.

## **IV. Types of Cleavage**

The cleavage is classified in two ways:

- A. Based on the developmental ability of egg cytoplasm and
- B. Based on the distribution and amount of yolk.

Both these types are explained below:

### **A. Types of cleavage based on the developmental ability of egg cytoplasm:**

On the basis of developmental ability of the egg cytoplasm, there are two types of cleavage.

1. Determinate cleavage and
2. Indeterminate cleavage.

## **B. Types of cleavage based on the distribution and amount of yolk:**

On the basis of distribution and amount of yolk, there are four types of cleavage. These are:

1. Holoblastic equal cleavage,
2. Holoblastic unequal cleavage,
3. Meroblastic or discoidal cleavage, and
4. Superficial cleavage.

## **V. Products of Cleavage**

The cleavage results into the blastomers. The blastomers are small cells. After each cleavage, the number of blastomere gets multiplies in geometric rate in a typical doubling sequence producing 2,4,8,16 and 32 blastomeres. Only early cleavage are regular, later becomes irregular.

## **VI. Significance of Cleavage**

The significance of cleavage is as follows:

1. Cleavage begins immediately after fertilization of the egg. It divides the egg into 'blastomeres'.
2. The blastomeres follows morulation and blastulation.
3. During the process of cleavage, the cytoplasmic substances transfers into nuclear substances with quantitative changes in the chemical composition of egg.

4. Due to the cleavage, the zygote changes into a hollow ball of numerous small cells with a central space, the 'blastocoel'.
  5. The cleavage converts a unicellular fertilized egg into a multicellular complex.
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**Thank you!**