

Exercise 3 Cleavage in Frog's Embryo

Introduction

Cleavage is a rapid cell division that transform a single fertilized egg into a multicellular embryo known as the *blastula*. In frog, cell division is hindered by a moderate amount of yolk which results in the formation of unequal size of cells. The totality of cells that compose the blastula, however, is virtually equal to the original size of the zygote.

Methodology

1. Observation of live specimens of frog's eggs

Examine the frog's eggs and compare the structures that are visible in each kinds of specimens used. Place live frog eggs in a petri dish with water. Study the structures of the eggs using a dissecting microscope.

View a prepared CD or models of the frog's cleavage stages to verify the structures seen in the dissecting microscope.

Compare the structures visibly seen in the live frog's eggs with those of the model or CD.

2. Studying prepared slides of frog's cleavage

Look for the following cells or embryos and identify them:

A. Unfertilized egg - unsegmented and enclosed tightly by transparent *jelly coats*.

Note the dark upper region and a lighter lower region. These are the *animal and vegetal hemispheres or poles*, respectively.

B. 2- 4 Cell Stage - the zygote that has been divided into two or four cells of equal size. These daughter cells are called blastomeres.

From where did the cleavage plane originate?

C. 8- Cell Stage – embryo with eight cells but only four blastomeres may be seen.

Why?

Notice the direction of cleavage. The cells are now called *micromeres* and *macromeres* due to their unequal sizes.

D. Early Blastula Stage – composed of 32 to 64 blastomeres. The embryo at this point is specifically called a morula.

E. Late Blastula Stage – has more numerous (thousands) but smaller cells than the early blastula stage. In midsagittal section, an eccentric cavity adjacent to the animal pole can be seen.

3. Find the following parts or structures in the cleaving egg.

A. Nucleus – represented by mitotic figures or chromosomes in some cells.

B. Cleavage Furrow – a cleft or indented portion of the cell undergoing division.

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- C. Fertilization Membrane – a thin clear membrane around the cleaving embryos.
Usually torn or displaced away from the embryo.
- D. Pigmented Cells – animal pole cells concentrated at the peripheral region of the embryo.
- E. Micromeres – small cells in the animal pole.
- F. Macromeres – large cells in the vegetal pole.

Draw the 2-cell stage and the 4-cell stage of the frog's embryo.

Label the parts and cells found in each stage of cleavage.



Early cleavage

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Early Blastula



Late Blastula

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Questions:

1. Differentiate a mesolecithal egg from a macrolecithal egg. In what animals would you find them?

2. What laws govern the rate and direction of cleavage? What are the manifestations of such laws in the frog's embryos?

3. How do you distinguish a 4-cell stage from an 8-cell stage embryo when viewed from the animal pole or side?

4. Define the following terms:
 - A. Telolecithal egg
 - B. Holoblastic equal cleavage
 - C. Morula
 - D. Blastula
 - E. Coeloblastula
 - F. Stereoblastula