

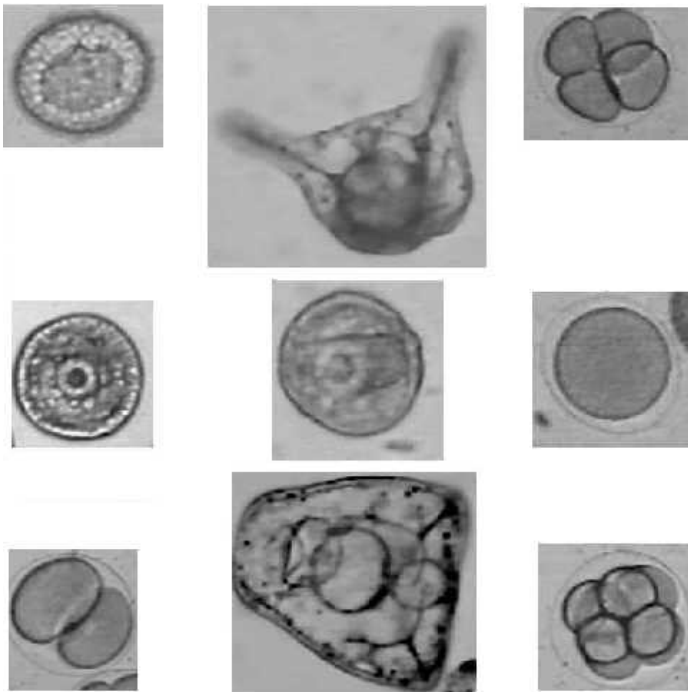
Urchin Embryology



In this lab you will become familiar with the various stages of embryo development in starfish or Sea Urchins. You will look at slides and diagrams to see these various stages.

Sea Urchin Fertilization:

1. Obtain a sea urchin and invert on top of a shedding cup.
2. Obtain 0.5M KCl and inject 10 ml of it into the area surrounding the mouth.
3. Watch for either orange or milky secretion out of the top surface (opposite of the mouth)
4. Get a Petri plate and add one or two drops of eggs to sea water.
5. Add one drop of diluted sperm. Sit on side counter until the next period or until you can take a sample out to look at the development.
6. Take another small drop and add to a depression slide. Add a drop of diluted sperm.
7. Watch sperm fertilize egg and look for first cell division.
8. Take samples as often as you can and see how many stages you can find and draw.



Guess the stages:

- a. Blastula
- b. Fertilized egg
- c. Young pluteus
- d. Four-cell
- e. Early gastrula
- f. Two-cell
- g. Late gastrula
- h. Eight-cell
- i. Pluteus

Stages of Development:

The early development of starfish is used because of how easy it is to see the various stages of development. After fertilization the **zygote** undergoes various divisions or cleavages. In starfish the cleavage is relatively equal. When the cleavage furrow forms it splits the cell in two relatively equal pieces.

You will either use slides or diagrams or a combination of both to locate and identify these stages of development.

A. One celled stage- Find a cell that is surrounded by a membrane which is raised somewhat from the surface of the egg. This fertilization membrane forms after fertilization. This is now referred to as a zygote and is in the one-celled stage.

B. Two celled stage- After the first cleavage you will see two cells. These adhere together within the membrane

C. Four celled stage- Fertilization membrane is relatively hard to see at this stage.

D. Eight celled stage-Third cleavage comes at right angles to the first two and gives two tiers of four cells each when viewed from the right angle.

E. Morula- This will appear as a cluster of sixteen or more cells which appears somewhat like a mulberry.

F. Blastula- The cells form a hollow ball. The cavity inside is called the blastocoel.

G. Gastrula- There will be an invagination of the hollow ball of cells. This is the gastrula stage. The cavity of the cup formed by the invagination is the archenteron which is destined to form the digestive tract. The outer layer of cells is now called the ectoderm and the inner layer is now called the endoderm. The opening into the archenteron is called the blastopore.

You should observe all of the stages and be able to tell what state of division they are and label all key structures.

Questions:

Compare the size of the embryos in the various stages of cleavage. Has there been growth in size of the embryo as the number of cells has increased? If not explain why growth in such an embryo is limited.

Arthropods, such as insects, have an embryogenesis which is quite different from that of starfish, yet the starfish is very similar to primitive chordates. Of what significance is this fact in terms of evolutionary relationships?

The eggs of birds and reptiles have an outer shell within which the embryos develop. Why is such a shell not necessary for the eggs of the starfish?

Although mammals include the largest of the living animals, yet they have one of the smallest eggs. Why would the egg of a starfish or a frog need to be larger than the egg of a large animal?

You can see the formation of two germ layers in these early stages of embryogenesis. What is the third germ layer to be formed and how is it formed?