

Exercise 6 Gastrulation in Frog's Embryo

Introduction

The process of gastrulation is a highly orchestrated and coordinated movements of cells towards the inside of the embryo. Cell migration may vary slightly in different animals but the basic steps are similar and results in the formation of a two- or three-layered embryo called a gastrula. The three germ layers so produced proliferate, differentiate and eventually give rise to the entire body of the animal characteristic of the species.

Methodology

1. View CD on frog's gastrulation
2. Study models of gastrulation stages of frog's and chick's embryos
3. Focus prepared slides of transverse sections of frog's gastrulae and identify the following stages:
 - A. Early Gastrula – the onset of gastrulation is characterized by the appearance of a crescentic slit or “dimple” on the left side just beneath the animal pole of the embryo. This opening is called a *blastopore*. A few less yolky vegetal cells start to undergo invagination or bend inward.
 - B. Middle Gastrula –the presumptive mesoderm cells at the marginal zone or ventral limit of the animal hemisphere “roll inward”(involution). A new cavity called *gastrocoel* begins to appear.
 - C. Late Gastrula – an elongated embryo with a large gastrocoel and a three-layered germ cells called the ectoderm, mesoderm and endoderm. The cell layers represent the outer, middle and inner layers, respectively, of cells of a gastrula.
4. Label the following parts of the gastrula:
 - A. Blastocoel – a hemispherical cavity of the early embryo. It becomes smaller as obliterated by the advancing gastrocoel.
 - B. Blastopore – opening of the embryo into which the migrating cells entered. It starts as a slit –like opening which enlarges and form a complete circle. In the late stage, it becomes clogged with yolky cells.
 - C. Gastrocoel –cavity of the embryo which enlarges, thus, gradually displacing the blastocoel. It is also called the archenteron or the primitive gut.
 - D. Dorsal Lip of the Blastopore – a shallow transverse opening on the dorsal surface of the embryo. It widens laterally into a crescent concave toward the vegetal pole. It is also called the *Primary Organizer* because it induces nearby cells to change into different cell types.
 - E. Ventral lip of the Blastopore -- slit-like opening opposite the dorsal lip of the blastopore and located on the vegetal hemisphere.

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- F. Lateral lip of the Blastopore – concave region of the blastopore beneath the dorsal and ventral lips. This is visible only in the late gastrula.
- G. Chordamesoderm – strip of cells lying on the roof of the gastrocoel. These cells are still undifferentiated and will become the future notochord and mesoderm. These are usually depicted by a red color.
What are those cells immediately above these cells?
- H. Ectoderm – outer layer of cells which are pigmented. Use a blue crayon in your drawing.
- I. Mesoderm – middle layer sandwich between the ectoderm and the endoderm. They are the most actively migrating cells. Use a red crayon in your drawing.
- J. Endoderm – innermost layer of cells surrounding the gastrocoel. Note that they are more numerous in the floor of the archenteron. Use the yellow crayon in your drawing.
- K. Yolk Plug – vegetal cells that protrude to the outside and fill the blastopore.
- L. Completion Bridge – one or two layers of cells just above the diminishing blastocoel or below the gastrocoel.

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



Early gastrula

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Late gastrula

Questions:

1. How does avian gastrulation differ from that of frog's gastrulation?
2. Differentiate invagination from involution. Which cells undergo these processes?
3. Enumerate the three germ layers and the major organs that develop from each of them.
4. What are the fates of the following?
 - A. Blastopore
 - B. Yolk plug
 - C. Archenteron
 - D. Chordamesoderm