TOPIC: BLASTULATION AND GASTRULATION

LECTURE NO:09
BSC(HONS.) PART 1-PAPER II-GROUP B
DATE: 30TH MARCH 2020
AUTHOR:NIRMAL KUMARI

OBJECTIVES

To understand the Basic concept Blastulation and Gastrulation process

To study of Blastulation & Gastrulation in Frog and chick

To describe foetal membrane and their formation and significance

INTRODUCTION

(1)Balastulation

As a result of repeated cleavage, a solid ball of blastomers is produced. It is Known as **morula**.Later on blastomers rearrange themselves on the periphery of the egg to fom single layer blastoderm leading to the formation of a fluid filled cavity called the **blastocoels.** This Structure is known as **blastula** and the process of formation of blastula known as Blastulation**.**

(2) Gastrulation

Gastrulation is a process involving large scale movement of blastula cells resulting in the formation of three germ

layers. The three layered structure is known as gastrula and the process involved is called gastrulation.

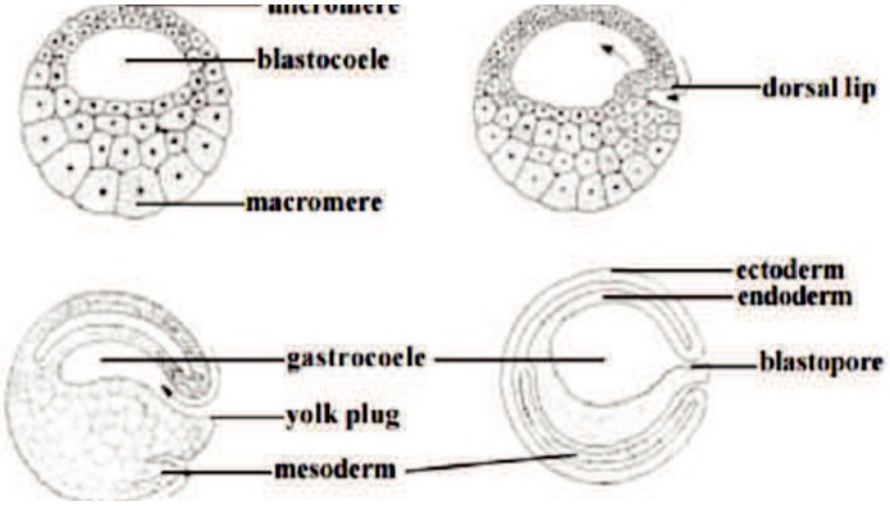

Fig. Gastrulation of Frog

Gastrulation in frogs resembles closely the gastrulation of many other animals. We see the three germ layers forming just as they would in humans. In the end, we'll see the process look
very similar, if not the same, as the gastrulation process of human beings. So for the most part, once you get down the concept of gastrulation, you essentially understand it for most animals out there.

One of the main differences in frogs over humans is that there is a larger amount of yolk-laden cells that are due to become the endoderm. These cells also end up forming a yolk plug. Also, in frogs, the **blastocoel**, hollow space

inside of the blastula, is slightly off-center, but this doesn't make much of a difference in the gastrulation process.

BLASTULATION AND GASTRULATION PROCESS

BLASTULATION IN FROG

The first division of the zygote is said to be the cleavage or segmentation. This division is mitotic. The cleavage is said to be of the holo blastic type (the entire zygote divides).

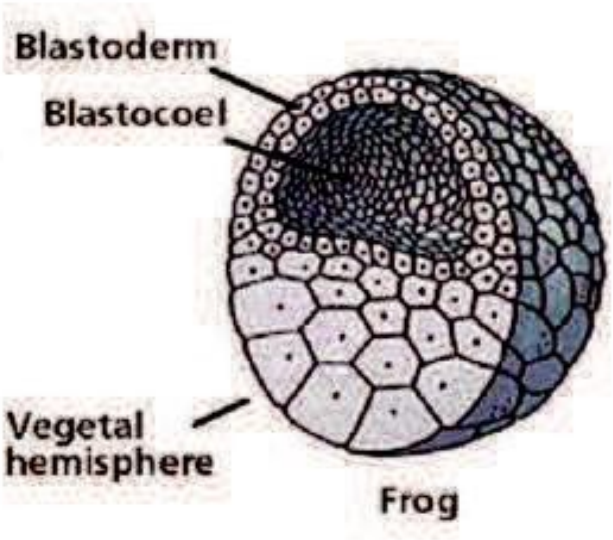

Fig: Blastula of Frog

The first cleavage results in the formation of two cells of unequal size. Hence the cleavage is said to be of

the unequal type. The pigmented half contains cells that are smaller in size than the half containing the yolk.

The first cleavage is meridional, that is it passes through both the animal and vegetal poles. The cleavage begins near the animal pole and extends downwards to the vegetal poles. It appears like a shallow groove on the zygote and bisects the grey crescent area. The two cells that are formed as a result of the first cleavage are called blastomeres. The formation of the first two blastomeres is completed in about 3 to 3.5 hours after fertilization.

The second cleavage takes place about sixty to seventy minutes after the first cleavage. This cleavage is also meridional but it takes place at right angles to the first plane of division. As a result of this division four cells or blastomeres are formed. All the four blastomeres are not identical.

Two of them contain parts of the grey crescent while the other two are without it. The third cleavage which begins about eighty minutes after the second cleavage is latitudinal (horizontal) and is at right angles to the second cleavage and passes slightly above the equator. The third cleavage results in the formation of eight cells. Of these eight cells the four cells towards the vegetal pole are larger in size and have yolk content. These are called megameres or macromeres.

The four upper cells towards the animal pole are smaller in size, pigmented and are called micromeres. The eight cell stage is completed approximately about 5.5 hours after fertilization. The fourth cleavage is meridional and it consists of two cleavage planes passing between the first and the second cleavage. This takes place in about 20 minute's time after the third cleavage. As a result of this cleavage, sixteen cells are formed of which eight are pigmented micromeres (towards the animal pile) and the remaining eight are yolk filled megameres (towards the vegetal pole).

The four cleavages is completed approximately about six and half hours after fertilization

The fifth cleavage is double and horizontal. It consists of two latitudinal cleavage furrows one of these cleavages is above and the other below the third cleavage furrow. As a result of this thirty two cells are formed of which sixteen are pigmented micromeres and the other sixteen yolky megameres. These thirty two cells are arranged in forties of eight each. The thirty two cell stage is formed approximately about seven and half of hours after fertilization. From this stage onwards the division becomes rather irregular (in fact the unequal division begins from the third cleavage itself due to the unequal

distribution of yolk which seems to determine the cleavage pattern.

The rate of division also varies between the micromeres and megameres. It has been seen that the micromeres divide at a faster rate than the megameres. Initially the continued division of blastomeres forms a solid ball like structure. It is called the morula stage, as this has superficial resemblance to a mulberry fruit. Morula stage gives rise to a stage called the blastula which is a hollow ball like structure.

Blastula: At the end of cleavage the solid ball of cells give rise to blastula which consists of number blastomeres. The characteristic features of the blastula stage are the presence of a well-defined cavity called the blastocoel. This is the beginning of the primary body cavity. The process of the formation of blastula is called blastulation. The blastula of frog is called amphiblastian as the cavity is confined to only the animal pole. The vegetal pole however is composed of a solid mass of non-pigmented yolky cells.

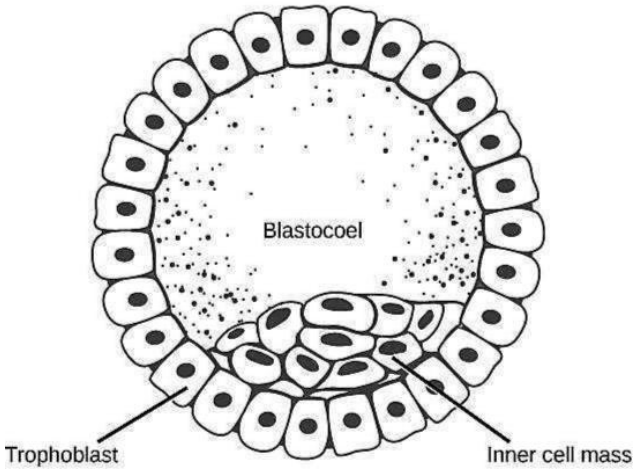

Fig. Blastula

In the thirty two cell stage, the blastula consists of a single layer of cells and is called the early blastula. The pigmented cells (micromeres) are found in the anterior half while the yolky megameres are present in the posterior half. As has been already pointed out, the blastocoel lies entirely in the anterior half. The blastula of frog is hollow and has a very well developed blastocoel. It is said to be a coeloblastula.

As segmentation proceeds, the number of cells in the blastula increase; so also the blastocoel. The floor of the blastocoel is flat while its top portion is arched. The roof (top) is made up of three to four layers of pigmented micromeres while the floor is formed by yolky megameres. Between the micromeres and the megameres and along the equator is found a group of cells which are intermediate in size (between megameres and micromeres). These cells constitute the germ ring. The germ ring is formed in the region of the grey crescent.

****