

Welcome to this lesson today on early development.

Today we are going to be discussing the development of the three germ layers which eventually give rise to organs and tissues of an embryo.

The very first step-- the first thing that needs to happen before an embryo can even develop-- is fertilization has to occur. Fertilization is the beginning of life, when an egg and a sperm combine nuclei, and this forms a single celled zygote. A zygote, as I mentioned, is composed of one cell. It's an individual's first cell. In order to develop into an embryo, that one cell has to undergo divisions. And those divisions will turn this one cell into a ball of many cells, which will then later specialize and develop into an embryo.

Cleavage are these rounds of cell division. As I mentioned, that one cell has to divide into many cells, and those rounds of cell division are called cleavage. So it's turning this one cell into two cells, and then each of those cells will divide, and so on and so forth. So it's turning this one cell into balls of more cells.

This cleavage, this process of cleavage, happens while the zygote is moving towards the uterus. So fertilization occurs here in the fallopian tubes, and then that's where the zygote is formed. And then that zygote will move towards the uterus, and then eventually implant in the uterus.

Each time a new cell is added to this ball of cells, through the process of cleavage, that new cell is called a blastomere. That blastomere will then take on a part of that cell's cytoplasm. And the part of the cytoplasm that it gets will eventually determine the structure and function of that cell. What type of cell it's going to become.

Eventually, through this process of cleavage, we'll end up with a morula, and this is a cluster of 16 cells. So it's about 16 cells around the time that it reaches the uterus.

Gastrulation is this process that occurs after cleavage. And what it does is, it rearranges the cells of the morula into three tissues. And we call these three tissues germ layers.

Our three germ layers in a developing embryo are the ectoderm, mesoderm, and endoderm. The ectoderm is the outer layer. The mesoderm is the middle layer. And the endoderm is the inner layer. So this ball of 16 cells gets rearranged into these different germ layers, and these different germ layers will develop into body tissues and organs.

Each layer is going to differentiate in a process called cell differentiation. This is when the cells become specialized. This process of cell differentiation-- or this process of the cells becoming specialized, becoming a

specific type of cell-- is called morphogenesis. Morphogenesis is when the tissues and organs form, as the cells began to become specialized. So one cell might develop into a nerve cell, which composes the nervous system. One type of cell might develop into a cell that becomes a part of your skin. So the cells begin to specialize into tissues and organs.

Generally, the ectoderm, cells of the ectoderm will develop into the nervous system, sense organs, pituitary gland, epidermis and hair. All of those will develop from cells of the ectoderm.

The mesoderm cells will specialize into cartilage, bone, muscle, connective tissue, cardiovascular system, the lymphatic system, the urinary system, the respiratory system, and then the outer layer of the digestive tube.

And then the endoderm, those cells well specialize into becoming the lining of the digestive tube, and also lining of the airways.

So these different layers produce different cells, which differentiate to become the different structures throughout the body.

This lesson has been an overview on early development and the three germ layers.