

Embryonic and Fetal Development

by Sophia



WHAT'S COVERED

In this lesson you will explore key steps in embryonic (weeks 1 to 8) and fetal (weeks 9-40) development. Specifically, this lesson will cover:

1. First Trimester (Weeks 1-13)

The **first trimester** of pregnancy refers to the first 13 weeks of pregnancy. It is a critical period of embryonic development, that includes rapid growth and the formation of major organ systems.



TERM TO KNOW

First Trimester

Marks the start of the pregnancy through the first 13 weeks, where the fertilized egg implants in the uterus and develops into an embryo.

1a. Embryonic Development (Weeks 1-8)

"Weeks of pregnancy" refers to the number of weeks after the first day of the mother's last menstruation. Thus, in the first two "weeks of pregnancy", the mother's oocyte hasn't even ovulated, let alone been fertilized.

Recall that when a sperm cell fertilizes an oocyte, the resulting cell is called a zygote. This cell will cleave several times to form many smaller cells. When the zygote has cleaved into 16 cells, it is a ball of cells called a morula (three to four days after fertilization/conception). The morula fills with fluid contained within a thin layer of cells called the trophoblast (this layer of cells will become the placenta); within the fluid is the inner cell mass, which becomes the embryo. It does so by first undergoing gastrulation—becoming the three germ layers (endoderm, mesoderm, and ectoderm). It is around this time (9-12 days after fertilization, or the fourth "week of pregnancy") that the embryo implants in the endometrium.

The following table shows embryonic developmental milestones and risks during weeks four through eight of pregnancy:

Developmental Milestones and Risks	Description
	During the process of gastrulation (when the three germ layers differentiate), an embryonic disk will form. This disk doesn't look much like a person, but it is essentially the first stage of

The basic body plan of an embryo will begin to develop.	setting up a body plan of the embryo. From there, the neural tube will form within the embryonic disk and will actually become the brain and spinal cord. The cells that form into the neural tube originate from within the ectoderm (the inner layer of germ cells). Following this, other germ cell layers will also begin to specialize and give rise to certain body features, organs, and organ systems. By the end of week eight, the embryo will actually begin to resemble a human being.
The reproductive structures will also begin to develop, depending on the inheritance of the sex chromosomes.	Sex chromosomes are the chromosomes that determine the sex of the individual. If the individual inherited X and Y chromosomes, male reproductive structures would form. If the individual inherited X and X chromosomes, female reproductive structures would form. However, the baby isn't large enough, and the sexual features not developed enough, to see on an ultrasound until about week 20 of pregnancy. At the end of week eight, the embryo is then called a fetus . It is considered an embryo prior to week eight, and by the end of week eight, it becomes a fetus.
There is always a chance a miscarriages can occur.	Miscarriages can also occur later in development, although it's much less common. A miscarriage is when an embryo or fetus will be spontaneously expelled from the uterus. The cause or causes of miscarriage can be many factors, but often it is a genetic abnormality. As the body plan is being laid out and as the embryo is starting to develop into a fetus, genetic abnormalities can cause improper development. The body, often times, will expel the abnormal fetus from the uterus because of these genetic abnormalities.



TERMS TO KNOW

Embryonic Disk

Part of the inner cell mass of the blastocyst, the embryonic disk is the cellular framework that begins embryonic development; the nervous system develops from a cell layer within called the ectoderm.

Neural Tube

A tube formed from the ectoderm of the blastocyst that serves as the framework for the development of the central nervous system (brain and spinal cord).

Sex Chromosomes

The X & Y chromosomes that, when paired, determine the gender of the child and carry other genetic traits as well; XX will create a female while XY will create a male.

Fetus

The developing baby after the first eight weeks of development up to birth.

Miscarriage

Also called spontaneous abortion, a miscarriage is when the embryo is expelled from the uterus.

1b. Fetal Development (Weeks 9-13)

When the organism is about nine weeks old, the embryo is called a fetus (an unborn human baby from nine weeks after conception until birth). At this stage, the fetus is about the size of a kidney bean and begins to take on the recognizable form of a human being, as the “tail” begins to disappear. From this point onward, a fetus undergoes immense growth as it develops organs, and dramatically increases in length and weight.



IN CONTEXT

Between 9-12 weeks, the sex organs begin to differentiate. By the 12th week, the fetus has all its body parts including external genitalia. In the following weeks, the fetus will develop hair, nails, teeth, and the excretory and digestive systems will continue to develop. At the end of the 12th week, the fetus is about 3 inches long and weighs about 28 grams.

At about 16 weeks, the fetus is approximately 4.5 inches long. Fingers and toes are fully developed, and fingerprints are visible. At this point, the fetus can kick, urinate, and swallow, and the taste buds are developing.

2. Second Trimester (Weeks 14-28)

The **second trimester** of pregnancy starts at the fourth month and lasts until the end of the sixth month. During this time of fetal development, organ and organ systems are maturing, and fetal movement can be felt.



DID YOU KNOW

During the second and third trimesters, the child that's developing in the mother's uterus is referred to as a fetus and is no longer considered an embryo.

During months 4-6, the eyes become more sensitive to light and hearing develops. Teeth, hair, fingernails, eyebrows, and eyelashes begin to develop around the 5th month. At the same time the respiratory system and reflexes such as sucking, swallowing and hiccuping continue to develop. Cycles of sleep and wakefulness start to become present as well.



TERM TO KNOW

Second Trimester

Marks the start of the fourth month until the end of the sixth month of pregnancy in which the fetus continues to develop as organs and organ systems mature.

3. Third Trimester (Weeks 29-40)

The **third trimester** is marked as the seventh month until birth, which on average is within the ninth month. During this time, organ and organ systems are continuing to mature, and the fetus is preparing for birth. Babies who are born before the third trimester will generally have a low survival rate because their organ systems are too underdeveloped. The time within the mother is very important for organ and organ systems to properly develop. Essentially, if the baby is born before the seventh month, the baby's organ systems aren't well enough developed to allow for survival outside of the uterus.

The circulatory system of a fetus is composed of temporary vessels and lungs that do not function while inside the uterus. While the fetus is within the uterus gas exchange is not occurring like it usually would. The lungs at that point are not functioning because the placenta is playing this role by delivering oxygen and removing carbon dioxide; the fetus is not actually breathing. Once the baby is born, the circulatory system becomes independent, and the lungs will begin gas exchange when the first breath is taken. While the fetus is within the mother, the circulatory system depends on the mother's circulation to undergo gas exchange vs. breathing air.



TERM TO KNOW

Third Trimester

Marks the seventh month of pregnancy until birth and is characterized by the continued development of the fetus as it prepares for birth.



LEARN MORE

Investigate the fetal development in three dimensions using augmented reality (AR)!

If you're on a laptop or desktop computer: Scan the QR code using the camera on your smartphone or tablet.

If you are on a phone or tablet [click here](#).



SUMMARY

This lesson has been an overview of the development of an embryo and a fetus throughout pregnancy. Specifically, this lesson focused on the **first trimester**, which involves both **embryonic and fetal development**. The first trimester is a period of pregnancy with formation, reproductive structure development, and the possibilities of a miscarriage. We also discussed fetal development during the **second and third trimesters** of pregnancy. Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND



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