43.7A: Human Gestation

Once the zygote implants in the uterine wall, embryonic and fetal development continue through three trimesters to birth.

Learning Objectives

- Describe the development of the human fetus from fertilization through the third trimester

Key Points

- After fertilization, the zygote implants itself in the uterine wall; its outer layer grows into the endometrium, where it begins to produce human chorionic gonadotropin.
- During the first trimester, the placenta forms along with the internal organs and structures; however, not all of the internal organs function at this point.
- During the second trimester, internal organs continue to develop and the fetus becomes active.
- The third trimester is one of rapid growth, in which the fetus reaches its full size; pregnancy often becomes uncomfortable for the mother.

Key Terms

- **zygote**: a diploid fertilized egg cell
- **chorion**: allows exchange of oxygen and carbon dioxide between the embryo and the egg’s external environment
- **human chorionic gonadotropin**: a peptide hormone, produced during pregnancy, that prevents the breakdown of the corpus luteum and maintains progesterone production
- **placenta**: a vascular organ in mammals that supplies food and oxygen from the mother to the fetus, while passing
back waste; it is implanted in the wall of the uterus

Human gestation

Twenty-four hours before fertilization, the egg has finished meiosis and become a mature oocyte. When fertilized (at conception), the egg, now known as a zygote, travels through the oviduct to the uterus. The developing embryo must implant into the wall of the uterus within seven days or it will deteriorate and die. The outer layers of the zygote (blastocyst) grow into the endometrium by digesting the endometrial cells. Wound healing of the endometrium closes up the blastocyst into the tissue. Another layer of the blastocyst, the chorion, begins releasing a hormone called human chorionic gonadotropin (hCG) which makes its way to the corpus luteum, keeping it active. This ensures adequate levels of progesterone that will maintain the endometrium of the uterus for the support of the developing embryo. Pregnancy tests determine the level of hCG in urine or serum: if the hormone is present, the test is positive.

Figure \(\PageIndex{1}\): Development of the embryo: In humans, fertilization occurs soon after the oocyte leaves the ovary. Implantation occurs eight or nine days later. The embryo divides several times as it travels.

First trimester

The gestation period is divided into three equal periods or trimesters. During the first two to four weeks of the first trimester, nutrition and waste are handled by the endometrial lining through diffusion. As the trimester progresses, the outer layer of the embryo begins to merge with the endometrium and the placenta forms. This organ takes over the nutrient and waste requirements of the embryo and fetus, with the mother’s blood passing nutrients to the placenta and removing waste from it. Chemicals from the fetus, such as bilirubin, are processed by the mother’s liver for elimination. Some of the mother’s immunoglobulins will pass through the placenta, providing passive immunity against some potential infections.

Internal organs and body structures begin to develop during the first trimester. By five weeks, limb buds, eyes, the heart, and liver have been basically formed. By eight weeks, the term fetus applies; the body is essentially formed. The individual is about five centimeters (two inches) in length and many of the organs, such as the lungs and liver, are not
yet functioning. Exposure to any toxins is especially dangerous during the first trimester, as all of the body’s organs and structures are going through initial development. Anything that affects that development can have a severe effect on the fetus’ survival.

Second trimester

During the second trimester, the fetus grows to about 30 cm (12 inches). As it becomes active, the mother usually feels the first movements. All organs and structures continue to develop. The placenta has taken over the functions of nutrition and waste, along with the production of estrogen and progesterone from the corpus luteum, which has degenerated. The placenta will continue functioning up through the delivery of the fetus.
Figure \( \PageIndex{1} \): **Second trimester**: This fetus is just entering the second trimester, when the placenta takes over more of the functions performed as the baby develops.

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### Third trimester

During the third trimester, the fetus grows to 3 to 4 kg (6 ½ -8 ½ lbs.) and about 50 cm (19-20 inches) long. This is the period of the most rapid growth during the pregnancy. Organ development continues to birth (and some systems, such as the nervous system and liver, continue to develop after birth). The mother will be at her most uncomfortable during this trimester. She may urinate frequently due to pressure on the bladder from the fetus. There may also be intestinal blockage and circulatory problems, especially in her legs. Clots may form in her legs due to pressure from the fetus on returning veins as they enter the abdominal cavity.