

## **Menstrual Cycle:**

Monthly Endometrial Cycle and Menstruation Driven by the cyclic production of ovarian hormones, the endometrium goes through a monthly cycle characterized by three phases: (1) proliferation, (2) development of secretory changes, and (3) menstruation.

The Proliferative Phase Is Initiated by Secretion of Estrogen from the Developing Follicles. At the beginning of each cycle, most of the endometrium has been lost during menstruation, and only a thin layer of basal endometrial stroma remains. The only remaining epithelial cells are located in the crypts of the endometrium and in the deep portions of the endometrial glands. Estrogen secreted from the developing follicles during the early portion of the cycle stimulates rapid proliferation of the stromal and epithelial cells. The entire endometrial surface is re-epithelialized within 4 to 7 days of the beginning of menstruation. During

the next 10 days, the stimulatory effects of estrogen cause development and thickening of the endometrium of up to 4 mm. The Secretory Phase Results from Changes Brought About by Progesterone. After ovulation, the corpus luteum secretes large amounts of progesterone and estrogen. The effect of the progesterone is to cause swelling and secretory development of the endometrium. The glands secrete fluid, and the endometrial cells accumulate lipids and glycogen in their cytoplasm. The vascularity of the endometrium continues to develop in response to the requirements of the developing tissue. At the peak of the secretory phase, at 1 week after ovulation, the endometrium is approximately 6 mm thick.

Menstruation Follows within 2 Days of Involution of the Corpus Luteum. Without the stimulation of the estrogen and progesterone secreted by the corpus luteum, the endometrium rapidly involutes, to about 65% of its previous thickness. Then, starting approximately 24 hours before menstruation, the blood vessels supplying the endometrium become vasospastic, resulting in ischemia and finally necrosis of the tissue. Hemorrhagic areas develop in the necrotic tissue, and gradually the outer layers separate from the uterine wall. At about 48 hours after the start of menstruation, all the superficial layers of the endometrium are desquamified. Distention of the uterine cavity, elevated levels of prostaglandin E<sub>2</sub> released from the ischemic and

necrotic tissue, and low levels of progesterone contribute to stimulation of uterine contractions, which expel the shed tissue and blood. The menstrual fluid is normally nonclotting resulting from the presence of fibrinolysin released from the endometrial tissue.