Pregnancy and Hormone Production

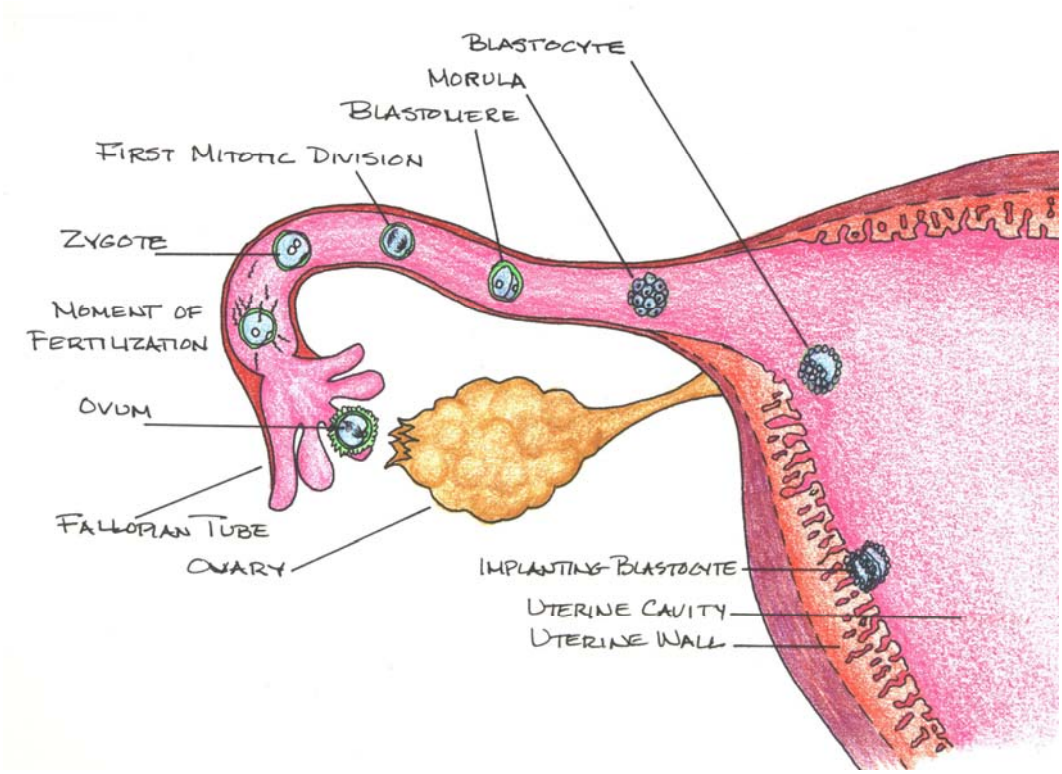

Figure 1: Pregnancy Begins

Figure 1 illustrates the development of a fertilized egg into first a zygote (day 1), then a blastomere after its first mitotic division (day 2-3), then a morula (multiplied bundle of cells, around day 4), a blastocyte, and finally an implanted blastocyte (after about one week). At the beginning of the ovarian cycle, certain hormones are secreted that control events leading up to fertilization of the egg. When a woman ovulates, her uterus is already prepared to receive the fertilized egg – and once fertilized and implanted, a new series of hormonal changes take place to support the pregnancy and eventual birth of the child (parturition), as depicted in Table 1.

Table 1: Regulation of Pregnancy and Birth

When	Hormone	Purpose	Where Produced
After implantation	Human Chorionic Gonadotropin (hCG)	Helps form corpus luteum of pregnancy; binds to LH receptors, promoting survival and growth. Secreted to maternal blood, peaks during first trimester and gradually falls off thereafter, but continues to stimulate ovary and placenta to produce female sex hormones. Failure of this hormone would result in aborting the implanted blastocyte at end of first 28-day cycle (the body would not respond to the pregnancy).	Placental syncytiotrophoblast cells of implanted blastocyt
After implantation	Maternal Estrogen and Progesterone	Significant increase in these hormones in maternal blood cause cessation of menses and inhibit LH and FSH to prevent ovulation. Stimulates growth and secretions of endometrium for fetal support. Stimulate growth and development of myometrium (smooth muscle wall of uterus) and mammary glands. These hormones will continue to be produced at required levels during the pregnancy.	Corpus Luteum
By End of First Trimester	More Maternal Estrogen and Progesterone	Augments corpus luteum with increasing amounts of these hormones, continuing to support development of endometrium and myometrium, as well as stimulating metabolic changes in the mother, such as fluid retention, increase in subcutaneous fat, and gains in body weight (every pregnant woman's favorite part, to be sure). These hormones continue rising to peak before parturition. Too little of these will terminate the pregnancy.	Placenta
Throughout gestation in increasing amounts	Human Chorionic Somatomammotropin (hCS)	Simial to growth hormone, this 'antagonizes' or regulates the action of mother's insulin, ensuring a supply of glucose and amino acids for the developing fetus. Stimulates growth of mammary glands. Fetal growth is reduced by a deficiency of hCS due to lack of nutrients for the fetus.	Secreted from placenta into maternal blood
During pregnancy	Prolactin	Increases during pregnancy, but inhibited from actual milk production by high levels of estrogen and progesterone; with hCG and other substances (such as thyroid and growth hormones, cortisol, and insulin) stimulate large degree of mammary gland development in preparation for lactation. Lack of this hormone prevents full development of glands, resulting in lack of mother's milk for the newborn.	Pituitary
Fetal Period	Fetal Insulin, Insulin-like Growth Factors (IGF-1, IGF-2)	Regulates fetal growth, supporting the continuing development of the fetus. In the first trimester, embryonic development is critical and can be easily influenced by drugs and other agents that may pass from mother to baby, as this is the period of time when organs and major systems are formed. Problems in this area can result in poor fetal development, birth defects, and either premature birth or loss of the fetus.	From maternal insulin

Table 1: Regulation of Pregnancy and Birth (Continued)

Before Birth	Cortisol, Estrogen, Oxytosin, Prostaglandins, Relaxin	It is suspected that cortisol from the fetal adrenal glands increases before labor, is converted to estrogen by the placenta, and induces uterine contractions. Prostaglandins from the uterine glands induce mymoetrial contractions during the early stages of birth. Oxytocin receptors proliferate with the increased estrogen levels during late pregnancy. During first part of labor, the baby's head causes cervical dilation, stimulating stretch receptors of the cervix (the cervical wall and pelvic joints have been softened by the hormone Relaxin). Sensory nerves in the cervix stimulate the hypothalamus and pituitary to release oxytocin pulses, which bind to the many receptors, inducing very strong contractions. This forces the fetus out of the uterus. After the head is out, stretch receptors relax slightly, and this feedback causes oxytocin release to decline. Oxytocin and prostaglandins help to expel the placenta. In cases where the mother does not go into labor, oxytocin can be injected to induce contractions.	Fetal Adrenal Glands Uterus Hypothalamus and pituitary

After birth, or post-partum, the mother's body returns to more normal levels of hormones (more rapidly than the rate of change related to the pregnancy), and she may experience a period of swinging emotions known as 'post-partum depression' or the 'baby blues' as things settle down. If she chooses to breastfeed, certain of her hormones will support the production of milk for the baby so long as her nipples remain regularly stimulated by suckling.

Bibliography

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