SECTION C2: MAMMALIAN REPRODUCTION (continued)

3. A complex interplay of hormones regulates reproduction
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• The Male Pattern.

  • Androgens secreted by Leydig cells are responsible for primary and secondary sex characteristics.

  • Primary sex characteristics:

    • Development of the vasa deferentia and other ducts.
    • Development of the external reproductive structures
    • Sperm production.
• Secondary sex characteristics:
  • Deepening of the voice.
  • Distribution pattern of facial and pubic hair.
  • Muscle growth.
• Androgens are also responsible for sexual behavior and general aggressiveness.

Fig. 46.14

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• The Female Pattern.

• A cyclic pattern of hormone secretion and reproductive events.

• Humans and many other primates have menstrual cycles.

• If pregnancy does not occur the endometrium is shed through the cervix and vagina: menstruation.
• Other mammals have **estrous cycles**.
  • If pregnancy does not occur the endometrium is reabsorbed by the uterus.
  • Associated with more pronounced behavioral cycles than are menstrual cycles.
  • More pronounced seasonal and climatic effects than seen associated with menstrual cycles.
• Humans females may be sexually receptive throughout their cycles.

• Most mammals will copulate only during the period surrounding ovulation.

• This period of sexual activity is called estrus.
• The Reproductive Cycle of the Human Female.
  
  • **Menstrual cycle**: changes that occur in the uterus.
    
    • Day 1: the first day of menstruation.

  • **Menstrual flow phase**.
    
    • Menstrual bleeding.
    
    • Usually lasts for a few days.
• **Proliferative phase.**
  
  • Regeneration and thickening of the endometrium.
  
  • About 1 – 2 weeks in duration.
• **Secretory phase.**
  
  • Continued endometrial thickening, increased vascularization of the endometrium, endometrium develops glands that secrete a glycogen-rich fluid, and a duration of about 2 weeks.
  
  • If, by the end of the secretory phase, an embryo has not implanted in the uterus a new menstrual flow commences.
• **Ovarian cycle.**

• **Follicular phase.**
  
  • Several ovarian follicles begin to grow.
    
    • The developing egg enlarges.
    
    • Coat of follicle cells thickens.
  
  • Usually only one follicle continues to develop, the others disintegrate.

  • The follicular phase ends with **ovulation.**
    
    • Follicle and adjacent wall of the ovary rupture
    
    • Secondary oocyte is released.
• Luteal phase.

• Follicular tissue remaining in the ovary develops into the corpus luteum.

• Secretes estrogens and progesterone.

Fig. 46.15c
Hormonal coordination of the menstrual and ovarian cycles involves five hormones.

- Gonadotropin releasing hormone (GnRH) secreted by the hypothalamus.
- Follicle-stimulating hormone (FSH) secreted by the anterior pituitary.
- Luteinizing hormone (LH) secreted by the anterior pituitary.
- Estrogens secreted by the ovaries.
- Progesterone secreted by the ovaries.
Fig. 46.15
- Follicular phase of the ovarian cycle.
  - GnRH stimulates secretion of small amounts of FSH and LH.
    - FSH stimulates the growth of immature ovarian follicles.
      - The growing follicles secrete small amounts of estrogens.
      - Inhibits secretion of FSH and LH.
    - FSH and LH levels remain relatively low.
• The rate of secretion of estrogens by the growing follicle rises steeply.
  • Stimulates the secretion the GnRH.
    • Stimulates the secretion of FSH and LH.
    • LH secretion is especially high.
    • LH induces the final maturation of the follicle and ovulation.
• The follicular phase of the ovarian cycle is coordinated with the proliferative phase of the menstrual cycle.

  • Secretion of estrogens during the follicular phase stimulates endometrial thickening.
Following ovulation, LH stimulates the formation of the corpus luteum.
• Luteal phase of the ovarian cycle.
  • LH stimulates the corpus luteum to secrete estrogens and progesterone.
    • High levels of estrogens and progesterone inhibit FSH and LH secretion.
  • Near the end of the luteal phase the corpus luteum disintegrates.
    • Concentrations of estrogens and progesterone decline abruptly.
    • FSH secretion increases and initiates a new follicular phase.
• The luteal phase of the ovarian cycle is coordinated with the secretory phase of the menstrual cycle.

• The estrogens and progesterone of the luteal phase stimulate development and maintenance of the endometrium.

• With the disintegration of the corpus luteum estrogens and progesterone levels decline.
  
  • Menstruation occurs and a new menstrual cycle begins.
• Estrogens are also responsible for female secondary sex characteristics.
  • Deposition of fat in the breasts and hips.
  • Increased water retention.
  • Affects calcium metabolism.
  • Stimulates of breast development.
  • Mediates female sexual behavior.
• **Menopause**: cessation of ovarian and menstrual cycles.

  • Usually occurs between ages 46 and 54.

  • Due to ovaries decreased responsiveness to gonadotropins.