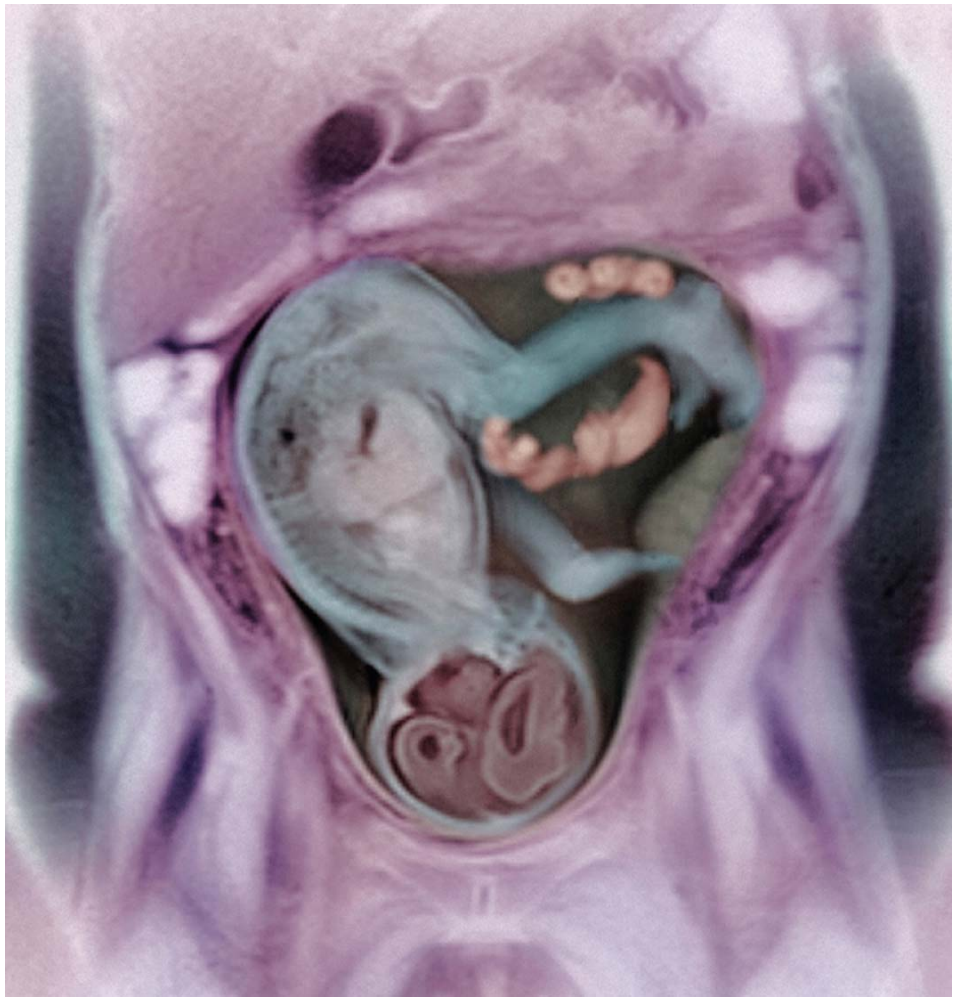
Chapter 28

Female Puberty & Menopause



Puberty

- Puberty begins at age 8-10 for most girls in US
  - Use to occur later but initial release of GnRH is function of total body fat / obesity at early age induces early release of GnRH production
  - triggered by rising levels of GnRH
  - stimulates anterior lobe of pituitary to produce
    - follicle-stimulating hormone (FSH)
    - luteinizing hormone (LH)
- **FSH** stimulates developing ovarian follicles
  - Ovarian follicles begin to secrete estrogen, progesterone, inhibin
  - a small amount of androgen
- **estrogens** are feminizing hormones with widespread effects on the body
  - estradiol (most abundant), estriol, and estrone

Puberty

- **thelarche** – onset of breast development is the earliest noticeable sign of puberty
  - initial duct and lobule formation – estrogen, progesterone and prolactin
  - completion of duct and lobule formation – glucocorticoids and growth hormone
  - adipose and fibrous tissue complete breast enlargement by age 20
- **pubarche** - appearance of pubic and axillary hair, sebaceous glands, and axillary glands
  - androgens from ovaries and adrenal cortex stimulates pubarche and libido
- **menarche** - first menstrual period
  - requires at least 17% body fat in teenager, 22% in adult
    - improved nutrition has lowered age of onset to age 12
    - leptin stimulates gonadotropin secretion
    - if body fat and leptin levels drop too low, gonadotropin secretion declines and a female's menstrual cycle might cease
    - first few menstrual cycles are **anovulatory** (no egg ovulated)
    - girls begin ovulating regularly about a year after they begin menstruating

Hormones of Puberty

- **estradiol**
  - stimulates vaginal metaplasia
  - stimulates growth of ovaries and secondary sex organs
  - stimulates growth hormone secretion
    - increase in height and widening of the pelvis
  - responsible for feminine physique because it stimulates the deposition of fat
  - makes a girl's skin thicker
    - but remains thinner, softer, and warmer than males of the corresponding age
- **progesterone**
  - primarily acts on the uterus preparing it for possible pregnancy in the second half of the menstrual cycle
- **estrogens and progesterone** suppress FSH and LH secretion through negative feedback
- **inhibin** selectively suppresses FSH secretion
- *hormone secretion is distinctly cyclic and the hormones are secreted in sequence*

Climacteric and Menopause

- **climacteric** -midlife change in hormone secretion
  - accompanied by **menopause** – cessation of menstruation
- female born with about 2 million eggs, climacteric begins when there are about 1000 follicles left
  - follicles less responsive to gonadotropins
  - less estrogen and progesterone secretion
  - uterus, vagina, and breast atrophy
  - intercourse becomes uncomfortable as vagina becomes thinner, less distensible, and drier
  - vaginal infections more common
  - skin becomes thinner
  - cholesterol levels rise increasing the risk of cardiovascular disease
  - bone mass declines producing increased risk for osteoporosis
  - blood vessels constrict and dilate in response to shifting hormone balances
  - **hot flashes** – spreading sense of heat from the abdomen to the thorax, neck, and face
- **hormone replacement therapy (HRT**) – low doses of estrogen and progesterone to relieve some of these symptoms
  - risks and benefits are still being debated

Evolution of Menopause

- Hypothesis – older mother would not live long enough to rear an infant to a survivable age
  - better to become infertile and help rear her grandchildren
- However // Pleistocene ice age skeletons show early hominids rarely lived past age 40
  - Therefore - menopause may be an artifact of modern nutrition and medicine allowing us to live longer than our ancestors