Sex Differentiation & Menstruation
Basic Genetics

• Every cell in your body should have 46 chromosomes
• 23 from the ovum, 23 from the sperm
• Eggs only carry X chromosomes
• The sperm determines the sex of a child
• XX = girl
• XY = boy
To create a karyotype, a cell is grown in a laboratory, magnified, and then photographed. The photo is cut into pieces and rearranged so that the matched pairs of chromosomes are lined up from largest to smallest.
Sex Linked Disorders

- In some cases, individuals have a sex chromosome combination other than XX or XY.
- This results in various types of sex-linked genetic disorders.
<table>
<thead>
<tr>
<th>Embryonic Source</th>
<th>Homologous Organs</th>
<th></th>
<th></th>
<th>Analogous Organs</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonad (medulla plus cortex)</td>
<td>Testes (from medulla)</td>
<td>In</td>
<td>the</td>
<td>Adult</td>
<td>Male</td>
<td>In</td>
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<tr>
<td>Genital tubercle</td>
<td>Glans penis</td>
<td>In</td>
<td>the</td>
<td>Female</td>
<td>Testes (from medulla)</td>
<td>Ovaries (from cortex)</td>
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<tr>
<td>Genital swelling</td>
<td>Scrotum</td>
<td>In</td>
<td>the</td>
<td>Female</td>
<td>Glans penis</td>
<td>Clitoris</td>
</tr>
<tr>
<td>Müllerian duct</td>
<td>Degenerates, leaving only remnants</td>
<td>In</td>
<td>the</td>
<td>Female</td>
<td>Fallopian tubes, uterus, part of vagina</td>
<td>Clitoris</td>
</tr>
<tr>
<td>Wolffian duct</td>
<td>Epididymis, vas deferens, seminal vesicles</td>
<td>In</td>
<td>the</td>
<td>Female</td>
<td>Degenerates, leaving only remnants</td>
<td></td>
</tr>
<tr>
<td>Urethral primordia</td>
<td>Prostate, Cowper’s glands</td>
<td>In</td>
<td>the</td>
<td>Female</td>
<td>Prostate, Cowper’s glands</td>
<td>Skene’s glands, Bartholin glands</td>
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<td></td>
<td></td>
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<td>the</td>
<td>Female</td>
<td></td>
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</table>
Atypical Prenatal Gender Differentiation

- **Intersex** (pseudohermaphrodite) - biologically a person’s gender is ambiguous.

- **Congenital Adrenal Hyperplasia (CAH)** - also called adrenogenital syndrome; normally-developed ovaries begin to function abnormally later in the course of prenatal development.
Biology and the Menstrual Cycle

- Menstrual cycle is regulated by fluctuating levels of sex hormones.
- These hormones produce certain changes in the ovaries and uterus.
- Humans are nearly unique among species in having a menstrual cycle.
- Other species of mammals have estrous cycles. Ovulation occurs while the animal is in heat, which is the only time the females will engage in sexual behavior.
The Phases of the Menstrual Cycle

• The menstrual cycle has 4 phases:
  – 1. **Follicular phase** - proliferative or preovulatory phase.
  – 2. **Ovulation**
  – 3. **Luteal phase** - secretory or postovulatory phase.
  – 4. **Menstruation**
The Biological Events of Menstrual Cycle

(c) Changes in ovarian follicles and uterine endometrium

- Ovarian follicles
- Uterine endometrium

Days 1-28:
- Uterine phases: Menstrual flow, Proliferative phase, Secretory phase
- Ovarian phases: Follicular, Ovulation, Luteal
Length and Timing of the Menstrual Cycle

- Normal menstrual cycle = 20 to 36 - 40 days; average is about 28 days. In an average cycle:
  - Menstruation begins on day 1 and continues until about day 4 or 5.
  - Follicular phase - about days 5-13.
  - Ovulation occurs on day 14.
  - Luteal phase - day 15 to the end of the cycle, day 28.
The Biological Events of Menstrual Cycle

(c) Changes in ovarian follicles and uterine endometrium

- Uterine phases:
  - Menstrual flow
  - Proliferative phase
  - Secretory phase

- Ovarian phases:
  - Follicular
  - Ovulation
  - Luteal

Days:
- 1
- 5
- 10
- 15
- 20
- 25
- 28
What Happens in the Ovaries During the Menstrual Cycle

- Follicular phase - high levels of FSH secreted.
  - Function is to stimulate follicles in the ovaries.
  - One follicle begins to ripen and brings an egg to maturity.
  - Follicle secretes estrogen.
- Ovulation - follicle ruptures open and releases the ripened egg.
What Happens in the Ovaries During the Menstrual Cycle

• Luteal phase - after releasing an egg, the follicle turns into the *corpus luteum* and manufactures progesterone.

• Menstruation - shedding of the inner lining of the uterus.
What Happens in the Uterus During the Menstrual Cycle

• Follicular phase - high levels of estrogen stimulate the endometrium.
• Luteal phase - progesterone secreted by the corpus luteum stimulates the glands of the endometrium to start secreting nourishing substances.
What Happens in the Uterus During the Menstrual Cycle

- Corpus luteum continues to produce estrogen and progesterone for about 10 to 12 days.
- If pregnancy has not occurred, hormone output declines.
- Menstrual fluid is combination of blood from the endometrium, degenerated cells, and mucus from the cervix and vagina.
- The ovaries call the shots in regulating the cycle.
Ovulation

- *Mittelschmerz (middle pain)* - some women report that they can feel themselves ovulate in the form of cramping in lower abdomen.
- *Anovulatory cycle* - menstruation may take place without ovulation.
- Masters & Johnson recommended masturbation to help relieve menstrual pain.
Toxic Shock Syndrome

- Caused by bacterium staphyloccus aureus
- Symptoms include high fever, vomiting, diarrhea
- Death occurs in 10% of cases
- Tampon use seems to encourage an abnormal growth of bacteria
Fluctuations in Sex Drive

• Studies have indicated contradictory results.
  – Some found a peak frequency of intercourse around ovulation.
  – Others found peaks just before and just after menstruation.
  – One indicated that sexual activity initiated by the woman peaked during the three days before and three days after ovulation.
Fluctuations in Mood

• Premenstrual syndrome (PMS) - a combination of severe physical and psychological symptoms, such as depression and irritability, occurring just before menstruation which affects 90% of women.
  - American Psychiatric Association has formalized PMS with the diagnosis premenstrual dysphoric disorder (PMDD).
Neuron Malfunction

1. Electrical impulses (action potentials) travel from one neuron to another across a tiny junction known as a synapse.

2. When an action potential reaches an axon terminal, it stimulates the release of neurotransmitter molecules from sacs called vesicles. These molecules cross the synaptic gap and bind to receptor sites on the receiving neuron.

3. The sending neuron normally reabsorbs excess neurotransmitter molecules, a process called reuptake.
Fluctuations in Performance

• Research on intellectual or athletic performance generally shows no fluctuations over the cycle.
• Research on academic performance, problem solving, memory, or creative thinking shows no fluctuations over the cycle.