CH. 15 - REPRODUCTIVE SYSTEM, part 2

Objectives:
1. Review male & female reproductive anatomy
2. Gametogenesis & steroidogenesis
3. Reproductive problems

5. Female Reproductive Anatomy & Physiology.

**Ovaries** = paired gonads making eggs, estrogen & progesterone.

**Vagina** = copulatory & birth canal.

External genitalia

> **Vulva** = labia major & minor

> **Clitoris** = erectile tissue with sensory nerves (similar to head of penis)

Internal structures:

**Uterus** = muscular sac capable of supporting developing fetus.

> **Fallopian tubes** = paired tubes that can transport fertilized egg from ovaries to uterus.

> **Cervix** = entryway into uterus from vagina.

> **Endometrium** = secretory layer of uterus.

> **Myometrium** = muscular layer of uterus, responds to oxytocin & prostaglandin.
External Genitalia

Clitoris = equivalent of glans penis. Same sensory nerves & erectile tissue
Labia minor = smaller inner labia
Labia major = larger outer labia
Vestibule = tissue surrounding urethral & vaginal openings. Prone to tearing during childbirth!

Question:
What is an episiotomy?

[Click the film strips below to see YouTube videos of the following:

delivery epidural C-sec episiotomy]
Human uterus: normal Vs menstrual

Endometriosis = when endometrial tissue of uterus wanders out of uterus to different locations. Still responds to progesterone by proliferating, and then shedding when progesterone declines each menstrual cycle. *Painful!
**Uterine Fibroids** = benign (noncancerous) growths of myometrium, which often appear during childbearing years.

Also called **leiomyomas** (lie-o-my-O-muhs) or **myomas**.

Are NOT associated with an increased risk of uterine cancer (almost never develop into cancer).

**Symptoms:**
- May have none
- Heavy menstrual bleeding
- Pelvic pressure / pain
- Backache
- Frequent/difficult urination

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**Clinical Applications**

The majority of **hysterectomies** (surgical removal of the uterus) are performed because of **uterine fibroids** (leiomyomas). These are nonmalignant (noncancerous) neoplasms (growths) in the uterus that also include abundant extracellular matrix. Fibroids can be as small as 10 mm or as large as 20 cm, and produce such symptoms as pelvic discomfort and profuse menstrual bleeding. Uterine fibroids have receptor proteins for estradiol and progesterone, which can stimulate their growth. Because most fibroids are located within the uterine wall, they usually can be surgically removed only by a hysterectomy.
Ectopic Pregnancy = pregnancy “out of place” (basically anywhere except within the uterus). Frequency of 2% among females.

Danger of an Out-of-place pregnancy = only uterus & its strong ligaments can support weight of growing fetus. Only endometrium capable of forming a fully functional placenta. All other tissues not compatible for pregnancy.

An ectopic pregnancy is NEVER viable for the embryo AND is life-threatening for the mother.
**HPV –** human papilloma virus. Present in 50% of sexually active adult population. Can cause polyps and warts at site of contact. Can lead to increased risk for cancer.

**HPV Vaccine - 2006**
- **Gardasil** marketed by Merck & **Cervarix** by GlaxoSmithKline
- Both are set of 3 vaccinations given over a 6 month period.

**Only Gardasil is:**
- Effective against 4 strains HPV – 2 which cause cancer & 2 which cause warts
- Tested & recommended for 9-26 yr old girls AND boys
  (younger is better - before sexual exposure!)
- Can get up to 21-26 yrs but protection goes down w/sexual exposure.

[https://www.cdc.gov/hpv/parents/vaccine.html](https://www.cdc.gov/hpv/parents/vaccine.html)
The prevalence of human papillomavirus (HPV) infections in adolescent girls in the United States has declined significantly since the human papillomavirus vaccine (*Gardasil*, Merck) was introduced in 2006, a new study by the Centers for Disease Control and Prevention (CDC) estimates.

The study, published June 2013 in the *Journal of Infectious Diseases*, reveals that HPV prevalence decreased 56% among female adolescents aged 14 to 19 years since 2006, despite relatively low immunization rates.

Only about half of all girls in the United States received the first dose of the HPV vaccine, the CDC said in a statement. A series of 3 shots is recommended over the course of 6 months. In contrast, countries such as Rwanda and Australia have vaccinated more than 80% of their teenaged girls.

[http://jid.oxfordjournals.org/content/early/2013/06/18/infdis.jit192.abstract](http://jid.oxfordjournals.org/content/early/2013/06/18/infdis.jit192.abstract)

**Ovarian cycle**

Days:
- **1-13 = Follicle phase**
  - Egg development from FSH
- **Day 14 = ovulation**
  - LH high
- **Days 15-28**
  - CL makes progesterone

**Menstrual cycle**

Days:
- **1-5 = menstruation**
  - progesterone low
- **5 – 14 = Estrogen ↑**
- **15 – 28 =**
  - endometrium thickens
  - progesterone↑
IF no fertilization:
- Corpus luteum breaks down and stops progesterone secretion @ day 28.
- Without **progesterone**, endometrium secretes **prostaglandin**, which cause uterine contractions to expel menstrual tissue.
- Menstrual flow – egg and lining shed

IF fertilization:
- Embryo makes **hCG** within 1 week (*the hormone pregnancy tests detect*)
- hCG “rescues” corpus luteum – it keeps making progesterone ~ 1 month (until placenta forms and takes over progesterone production).
Polycystic Ovarian Syndrome = follicles in ovary fill with fluid (cysts). Painful condition that decreases fertility.

Treatment:
Ovarian cancer

↑ risk factors include:
- Genetics (close female relative had it)
- Mutation in BRCA gene
- More ovulations in life (never on birth control, never pregnant)
- Hormonal problems
- Polycystic ovarian syndrome

↓ risk factors include:
- Not have genetics
- No mutation in BRCA gene
- Fewer ovulations in life (have taken BC, or pregnant)

Question: Why do you think having been on birth control lowers risk of ovarian cancer??

Ovarian and Breast Cancer and the BRCA Gene:

BRCA Gene = tumor suppressor gene that normally suppresses tumor growth (a good thing!)

Mutation in BRCA Gene – means the gene does not suppress tumors. Mutation in this gene associated with increased risk for ovarian & breast cancer. Can get blood test for it.

CA-125 test = cancer antigen 125
increased levels of this in blood associated with ↑ risk of ovarian cancer (separate from BRCA gene)
**Cancer and the BRCA Gene:**

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>General Population (No Mutation)</th>
<th>Individuals With Mutation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BRCA1</td>
</tr>
<tr>
<td>Breast</td>
<td>12%</td>
<td>50-80%</td>
</tr>
<tr>
<td>Ovarian</td>
<td>1-2%</td>
<td>24-40%</td>
</tr>
<tr>
<td>Male Breast</td>
<td>0.10%</td>
<td>1-2%</td>
</tr>
<tr>
<td>Prostate</td>
<td>15% (N. Europe Origin)</td>
<td>up to 30%</td>
</tr>
<tr>
<td></td>
<td>18% (African American)</td>
<td></td>
</tr>
<tr>
<td>Pancreatic</td>
<td>0.50%</td>
<td>1-3%</td>
</tr>
</tbody>
</table>

**Review**

Female reproductive anatomy & physiology
- reproductive structures
- ectopic pregnancy & endometriosis
- HPV, warts, cervical cancer, HPV vaccine, ovarian & breast cancer
- review of oogeneis
- menstrual & ovarian cycle
- role of hCG in rescuing corpus luteum in pregnancy