

Study Guide: Human Reproductive System

Females

Vagina: Birth canal, opening for baby to come out and opening for sperm to enter

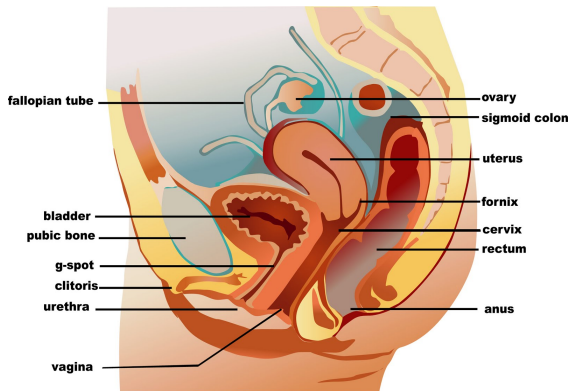
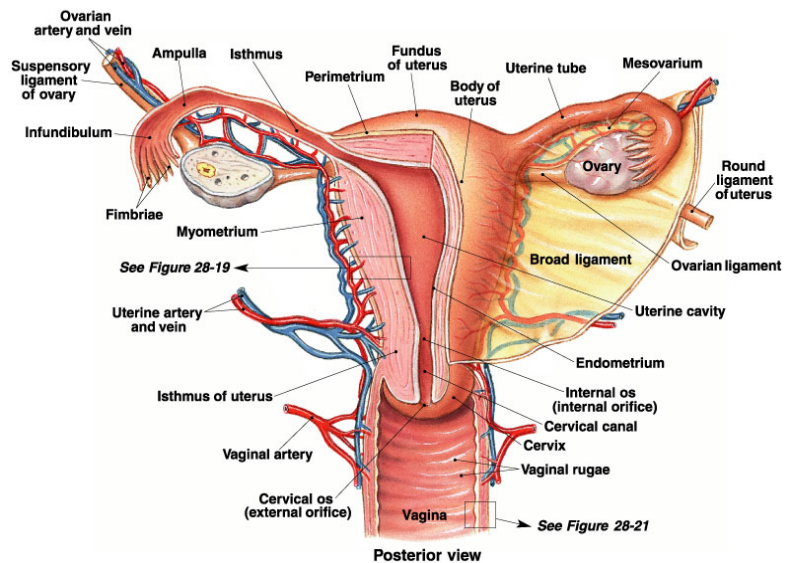
Cervix: Makes sure nothing comes in, besides sperm, small opening

Ovum: Eggs

Ovaries- produces eggs and hormones like estrogen and progesterone

Fallopian Tube: (oviduct) Extends from uterus to ovary, carries eggs and sperm to where fertilization occurs.

Uterus:(womb) Hollow and muscular organ where the fertilized egg gets embedded and is nourished until birth. Where the blood is built up in the menstrual cycle.



Myometrium/endometrium: Thick muscular layer of the wall of the uterus, smooth muscle,

Cilia: In the oviduct (Fallopian Tube) set up currents that draw the egg in

Follicle: immature egg, contains oocyte

Placenta- nutrient and waste exchange

Umbilical cord- connection between baby and mom

Male

Testes: Responsible for production of sperm and production of the male sex organ testosterone,

Epididymis: Tube that connects to the ducts inside the testis (storage and swimming pool for sperm)

Scrotum: Regulates the temperature of the testicles, if the temperature gets too high then the sperm will be messed up and infertile.

Vas Deferens:Transports sperm from the epididymis to the ejaculatory ducts (in urethra) in anticipation of ejaculation

Prostate Gland: Prostate makes a contribution to ejaculation of semen during sex, check for prostate cancer by sticking their finger up your butt and if swollen, you have cancer.

Semen: Semen is comprised of milky white mixture of simple sugars like fructose and glucose, enzymes and alkaline chemicals. Simple sugars are there for the sperm to have energy to swim to the egg, the alkaline chemicals are there for the protection of the sperm from the acid of the vagina

Seminal vesicle: Where the seminal fluid is stored, a transport system for sperm)

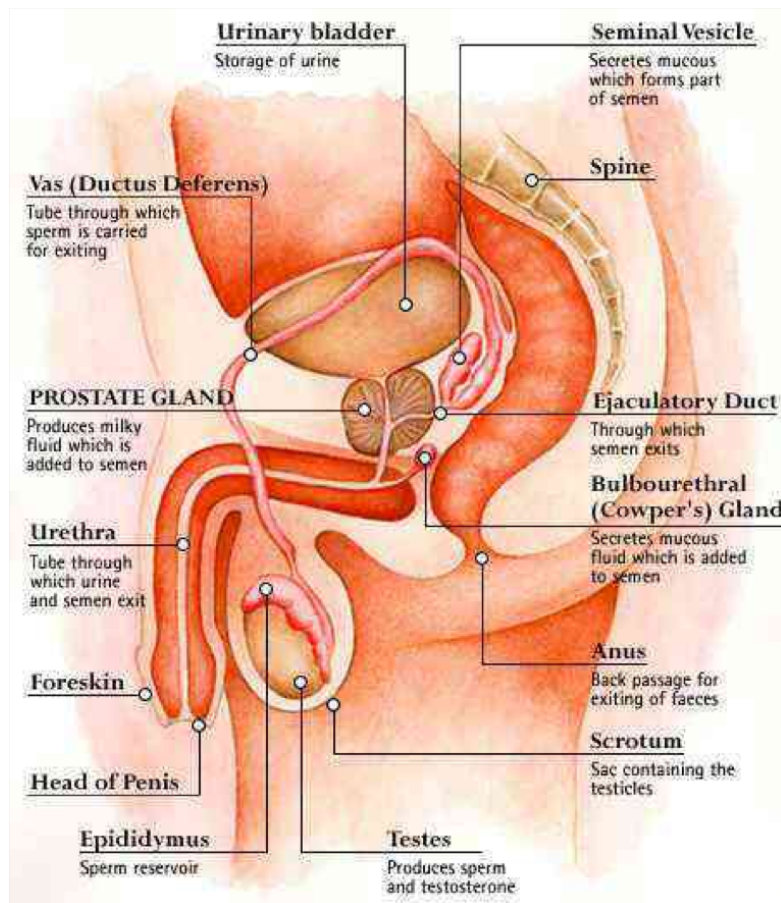
Bulbourethral Gland (Cowper's gland): Comprised of many tubes that secrete a fluid released in response to sexual stimulation to provide lube to the end of the penis

Urethra: Tube that conveys urine from the urinary bladder to the outside of the body, wall is lined with mucous membranes that contain a thick layer of smooth muscle tissue-- urinary canal and a passageway for cells and secretions from various reproductive organs

Penis: Used for urination and to deliver semen to the vagina, erection allows the deliverance of semen deeper into the female reproductive tract during sexual intercourse

Rectum: Acts as a temporary storage site for feces

Foreskin: Protects penis from bacteria and gives it skin to expand into when it becomes erect



(Prostate gland and cowpers gland produce alkaline fluid to counteract the acidity of the vagina-- to protect the sperm)

Menstrual Cycle

- **based on a 28 day period**
- vascularization- creation of capillaries

The Phases

- I. Follicular Phase
 - A. FSH and LH- Pituitary gland is in control, released from the brain through your blood to the ovaries
 - B. hormones stimulate the growth of eggs
 - C. hormones trigger an increase in production of estrogen
 - D. ESTROGEN hormone thickens the uterus lining
 - E. estrogen levels rise, production of FSH reduces
 - F. one follicle in one ovary becomes dominant and continues to mature
- II. Ovulatory Phase (instant)
 - A. begins 14 days after follicular phase
 - B. midpoint of the menstrual cycle
 - C. rise in estrogen from the dominant follicle triggers a surge in the
 - D. most fertile here!
 - E. follicle gets too big and the egg bursts out of the ovary
 - F. FSH production stops here and LUTEINIZING HORMONE peaks right before the
- III. CORPUS LUTEUM -Luteal Phase (12-14 days)
 - A. Follicle releases progesterone, which stimulates development of blood supply
 - B. The follicle turns yellow (corpus luteum)
 - C. empty follicle is filled with cells becomes corpus luteum -> hormone progesterone is released to stimulate growth/development of blood supply and surrounding tissue in already-thickened uterine lining
- IV. Menstruation (2-7 days except its more like a week in reality)
 - A. release of blood + egg
 - B. corpus luteum shrinks
 - C. progesterone level goes down (means you're not pregnant)
 - D. uterus lining sheds which is the blood (repeats)

Men obligations in sexual reproduction

- Delivery device for sperm to get into female
- Produce healthy and fertile sperm
- Provides liquid or fluid and energy for sperm to swim
- Provide protection for the sperm

Female Obligations in Sexual Reproduction

- Need to give birth (birth canal- vagina)
- Production of healthy fertile eggs (ovaries)

- Need a place for embryo development (uterus)
- Need nutrients for embryo (placenta)
- Needs a place where sperm meets egg (fallopian tube/ oviduct)
- Need an entrance for sperm to come in (vagina)

Human Gestation

- **Fertilization-** Egg+Sperm= Zygote
 - Must happen in oviduct
- Egg cell goes through mitosis without G1 phase (growth and replication of organelles)
- Egg goes to uterus where it will implant itself in the uterine wall (Becomes an Embryo)

Zygote Cell Division

1. Zygote: Sperm and egg together
2. 2 cells: cleavage
3. 4 cells: more cleavage
4. Morula: Solid ball of about 64 cells
5. Blastula/Blastocysts: Hollow ball of cells
6. Gastrula: Differentiated jobs (ectoderm, mesoderm, and endoderm cells)

Gastrulation: produces the 3 cell layers of the embryo

Neurulation: (follows gastrulation) **leads to formation of nervous system**; Block of mesodermal tissue begins to differentiate into the notochord. As the notochord develops, the ectoderm near the notochord thickens and forms the

neural plate. The raised edges of the neural plate form folds and the neural crest. These move together and form the neural tube - from which **the spinal cord and brain will develop**.

Spina bifida: Serious birth defect where neural tube does not close completely

Ectopic Pregnancy - a pregnancy in which the fetus develops outside the uterus, typically in a Fallopian tube. It may be the cause of endometriosis.

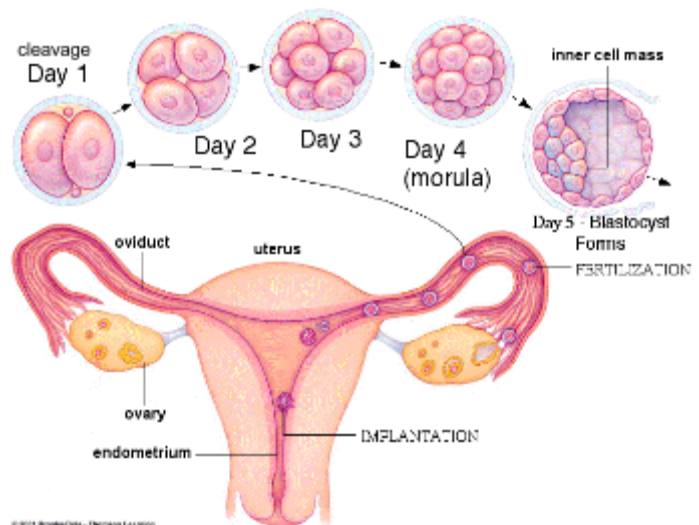
Endometriosis- a condition resulting from the appearance of endometrial tissue outside the uterus and causing pelvic pain. Displaced tissue has no way to exit your body, it becomes trapped. #Fertility problems.

Identical twins- genetically the same during cleavage the cells don't hold onto each other and are treated as diploids

Fraternal twins- release of two eggs and sperm goes to both eggs, the genetic makeup is different and it's like you and your 4 year old brother, the same genetic makeup but they look different.

Miscarriage- implantation unsuccessful can happen anytime during pregnancy, most often happen in the first 3 months

C- section- cut your tummy then cut your uterus (?)



Menopause- when you stop menstruating, therefore no more babies (it is uncommon to have more babies) osteoporosis and night sweats are signs of this aging.

Birth Process

1. 9 months of fertilization
 2. Release of hormone Oxytocin from mom's posterior pituitary gland
 3. Oxytocin affects group of large involuntary muscles in uterine wall
 4. Muscles begin rhythmic contractions (aka labor)
 5. Opening of cervix expands until large enough for head to pass through
 6. Amniotic sac breaks and fluid rushes out of vagina
 7. Contractions of uterus force baby out (usually head first)
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1. Baby cries to rid of fluid in lungs.
 2. Breathing starts almost immediately
 3. Blood supply to placenta dries up
 4. Umbilical cord is clamped and cut, leaving a small piece attached to baby (will dry and fall off leaving only the belly button)
 5. Pituitary hormone prolactin stimulates production of milk in breast tissues of mom

Immature sperm are made in the testis, through spermatogenesis. After spermatogenesis they move into the epididymis where they gain motility and remain until ejaculation. During ejaculation the sperm are pushed through the vas deferens by smooth muscles that contract and force the sperm through the tract. The sperm mix with mucous from the seminal vesicle and form semen. They then pass the prostate which adds more mucous to the semen. Finally, the sperm are pushed out of the head of the penis and into the female's body (or wherever else they are destined to go). Boys start producing sperm in their semen once they have started puberty. It may take a while for the production to begin but it will have by the time puberty has ended. \things that lower sperm count and production

- Hot tubs
- Tight jeans / boxers
- Overheating of testis
- Smoking
- Radiation Pollution

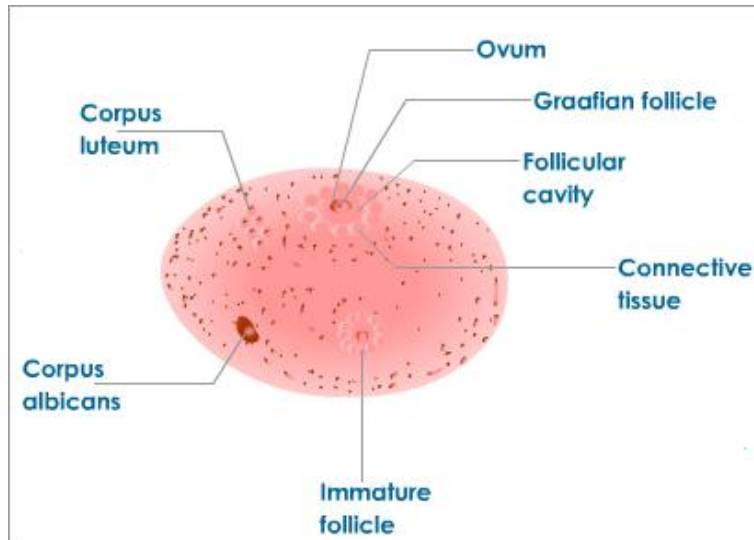
Menstrual Phase

Lasts for the first 3-4 days. During this phase the inner lining of the uterus is shed which causes the blood vessels to rupture. This causes bleeding and is called menstruation. The first occurrence of menstruation is termed menarche. It stops by the age of 45-50 years and is called menopause.

In the ovary, during this phase, the follicles where the eggs are produced are growing. Follicles are structures formed by the aggregation of the germinal epithelial cells of the ovary.

Follicular Phase

In this phase, the follicles grow further. The FSH stimulates one of the follicles. The stimulated follicle grows in size.



T.S. of Ovary of a Mammal

One of the cells of this follicle becomes bigger and separated from the rest by a follicular cavity. This cell becomes the egg. The outer layer of cells of this follicle is called theca interna. This layer secretes a hormone called oestrogen. This follicle is the **Graafian follicle**. This phase lasts from the 6th -10th day. In the uterus, this phase sees the inner wall of the uterus being built up again in order to receive the product of fertilisation, if there is one. It is again supplied with blood vessels.

Ovulatory Phase

When the follicle is mature, the pituitary gland secretes another hormone called luteinizing hormone (LH). LH stimulates the follicle to rupture and release the egg. The release of egg is called **ovulation** and occurs between the 10th and the 16th day. The egg moves along the oviduct during this time and may be fertilized by the sperm. If not, it starts disintegrating.

Luteal Phase

This phase lasts between the 16th and the 28th day. Once the egg is released, the Graafian follicle re-aggregates to form corpus luteum. The corpus luteum secretes two pregnancy hormones - progesterone and relaxin. The degenerating corpus luteum is called corpus albicans.

In the uterus, its lining is thickened further.

At the end of 28 days, if fertilisation has not taken place, the lining is shed along with the egg. This starts a new cycle all over again.

- 1st phase, follicular phase/proliferative phase. The follicular phase begins on Day 1 of the menstrual cycle. Estrogen and progesterone levels are at their lowest during menstruation. During this phase the uterine lining/endometrium lining, both sheds through menstruation and begins a period of regrowth and thickening in preparation for an embryo should conception occur. The follicular phase lasts about 10 - 14 days, or until ovulation occurs.
- 2nd phase of menstrual cycle, luteal phase begins when ovulation occurs. Ovaries release a single egg from only 1 of 2 ovaries during each menstrual cycle. Ovulation begins when the level of luteinizing hormone/ LH surges, ends 16-32 hours later with release of an egg from ovary
- Luteal phase continues till Day 1 of next menstrual period. Levels of estrogen and progesterone rise during luteal phase. These hormones work together to cause changes to the endometrial lining that prepare it for an embryo if pregnant. When pregnancy does not occur, levels of estrogen and progesterone decrease causing endometrial lining to shed through menstruation.
- In embryology, **cleavage** is division of cells in the early embryo. Zygotes of many species undergo rapid cell cycles with no significant growth, producing a cluster of cells, same size as original zygote. Different cells derived from cleavage are blastomeres and form a compact mass, morula. Cleavage ends with the formation of the blastula.
- **Morula**, embryo at an early stage of embryonic development, consisting of cells/blastomeres in a solid ball contained within the zona pellucida. Produced by embryonic cleavage, division of the zygote. Once the zygote has divided into 16 cells, it begins to resemble a mulberry. Within a few days after fertilization, cells on the outer part of the morula become bound tightly together with the formation of desmosomes and gap junctions, becoming nearly indistinguishable.
- **Blastula**, hollow sphere of cells, blastomeres, surrounding an inner fluid-filled cavity, blastocoele formed during an early stage of embryonic development in animals. Embryo development begins with sperm fertilizing an egg to become a zygote which undergoes many cleavages to develop into a ball of cells called a morula. When the blastocoele is formed, the early embryo become a blastula. Blastula precedes formation of gastrula in which the germ layers of the embryo form