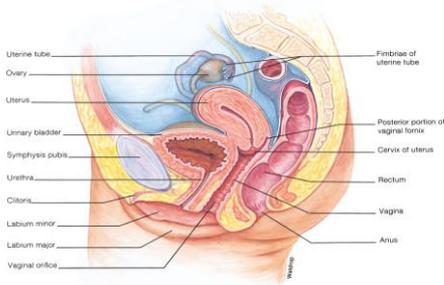


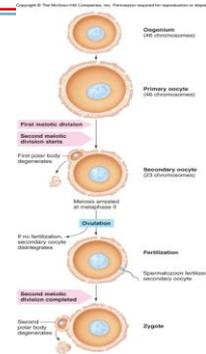
## Female Accessory Reproductive Organs



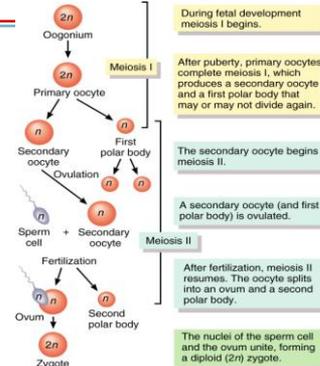
## Ovarian Cycle: Oocytes & Oogenesis

- **Oogonia** (Germ cells) in ovaries give go through mitosis producing oogonia & **primary oocytes** (2N)
  - Mitosis of germs cells until ~ 5 months after conception
  - All oogonia will develop into primary oocytes
- ovaries of a newborn have 2 - 4 million primary oocytes (eggs) (2N).
- These primary oocytes begin meiosis
- By puberty, there are about about 400,000 oocytes (and follicles).
- Only ~ 400 oocytes will be ovulated in a lifetime.

## Ovarian Cycle: Oogenesis



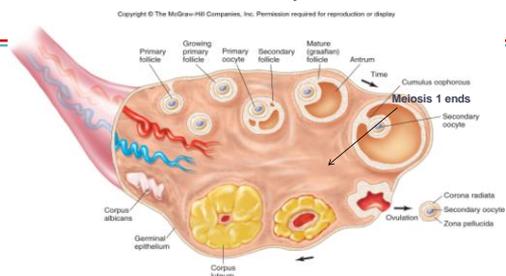
## Review of Oogenesis



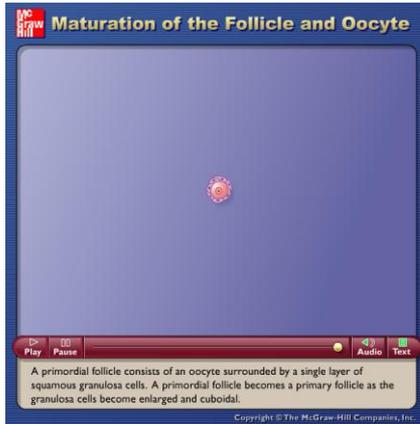
## Ovarian Cycle: Follicles

- Primary oocytes are contained within primary follicles.
  - FSH, stimulates some primary follicles to grow producing many layers of **granulosa cells**.
  - Some follicles (**Secondary follicles**) develop fluid-filled vesicles.
- **Mature Graffian follicle**: when fluid filled vesicles fuse to form an **Antrum**
- Some granulosa cells become corona radiata
- FSH also stimulates granulosa cells to secrete estrogens

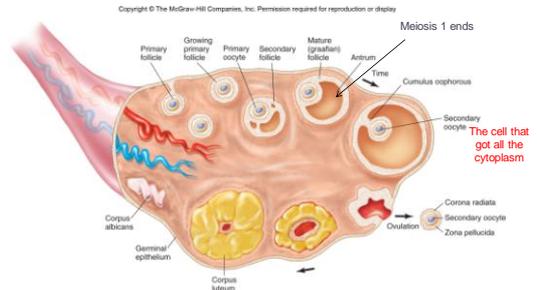
## Ovarian Cycle



As the Graafian follicle grows, the primary oocyte finishes meiosis I to become a secondary oocyte



## Ovarian Cycle Summary



Granulosa cells of Graafian follicle release Mullerian Inhibiting hormone that keeps other Primary follicles from maturing

## The Cycles

- Gametes produces in monthly cycles of ~28 days
  - Menstrual cycle: So named for 3 -7 days of menstruation (menses)
- Menstrual cycle can be described by:
  - following changes in the follicles that occur during ovarian cycle
  - following changes in endometrial lining of uterus during (Uterine cycle)
- Follicular changes in the ovarian cycle can be broken into three phases:
  - Follicular phase
  - Ovulation
  - Luteal phase

## Ovarian Cycle: Follicular Phase

- FSH stimulates a number of follicles to mature
  - As follicles grow:
    - granulosa cells release MHH
    - theca cells release estrogens
  - Increased estrogen levels:
    - Stimulate granulosa cells to secrete estrogens
    - Exerts negative feedback on Hypothalamus and Pituitary
    - Endometrium starts to grow
    - Mucous glands of cervix to produce watery mucous

## Ovarian Cycle: Follicular Phase

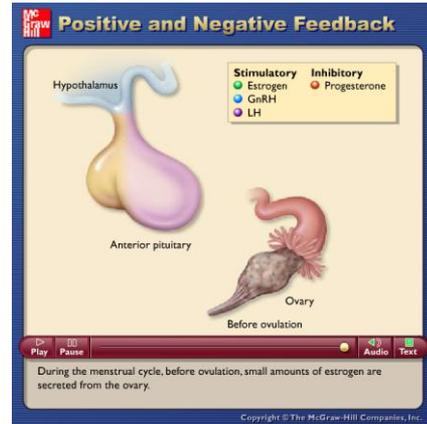
- As follicular phase nears its end only one follicle is developing
  - Estrogen secretion peaks
- Granulosa cells secrete Inhibin and Progesterone
  - Inhibin: Creates Negative feedback on Pituitary (FSH)
  - Progesterone (and high estrogen) have positive feedback on hypothalamus (LH surge)
- High Progesterone and Estrogens promote continued buildup of endometrium
- LH surge causes Ovulation (Ovulation Phase)

## Ovarian Cycle: Ovulation phase

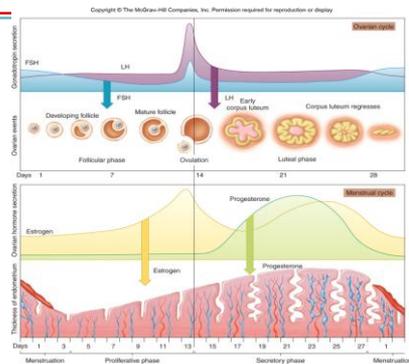
- Follicle ruptured & egg is released into fallopian tube
- Follicle thecal & granulosa cells transform into luteal cells and the follicle becomes the Corpus luteum

Ovarian cycle: Luteal Phase

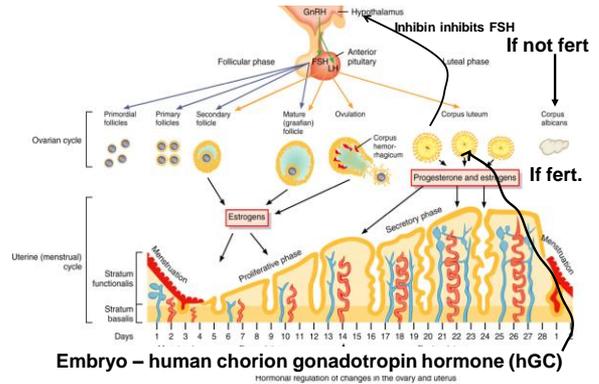
- **Corpus luteum secrete Progesterone & some estrogen:**
  - Exerts **negative feedback** on hypothalamus and pituitary gland (Inhibin also inhibits FSH)
  - Endometrium continues to prepare for implantation
  - Progesterone causes cervical plug (to keep out sperm & bacteria)
- **Corpus luteum lasts ~12 days**
  - If no pregnancy it undergoes apoptosis (corpus albicans)
  - No estrogen and progesterone
    - Endometrial Blood Vessels contract and O2 starved cells die (menses)
- **Low levels of Estrogen and progesterone initiate new cycle**
  - i.e, Negative feedback removed Hypothalamus secretes GnRH



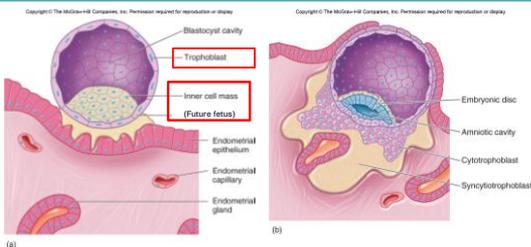
Menstrual and Ovarian Cycles



Phases of Female Reproductive Cycle



Implantation



~ 6 days after fertilization, trophoblast cells secrete enzyme that allows blastocyst to "eat" into the endometrium.

Blastocyst Development

- Trophoblast secretes enzymes that eat into endometrium and endometrial cells grow outward and around the blastocyst
- Some Trophoblast cell enzymes digest into endometrium forming blood-filled cavities
- Other trophoblast cells form chorionic villi that invade the cavities
  - i.e., chorionic villi (Chorion frondulosum) are surrounded by maternal blood
- Other trophoblast cells form the chorion – an extraembryonic membrane that will surround the embryo and form the placenta
- The inner cells

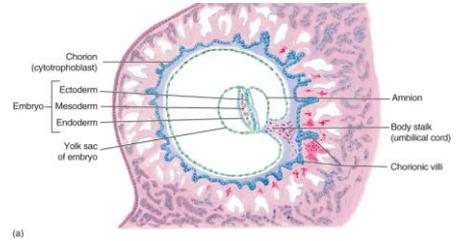
Development of extraembryonic membranes

• From day 7 to day 12 (cont.)

The inner cells mass (embryoblast) also develops:

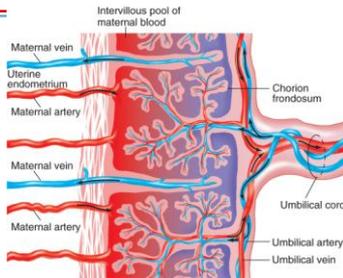
- Endoderm: will become the gut organs
- Ectoderm: will become skin and nervous system (Mesoderm develops later and gives rise to muscle and connective tissues)
- 3 other extra-embryonic membranes:
  - Yolk Sack
  - Amnion
  - Allantois

Extraembryonic membranes



(a)  
 Chorion: Becomes part of placenta (also fetal nutrition, waste removal)  
 Amnion: Surrounds embryo, filled with fluid  
 Yolk sac: contributes to formation of digestive tract, first blood cells  
 Allantois: becomes caudal end of gut, forms foundation of umbilical cord

Placenta and exchange

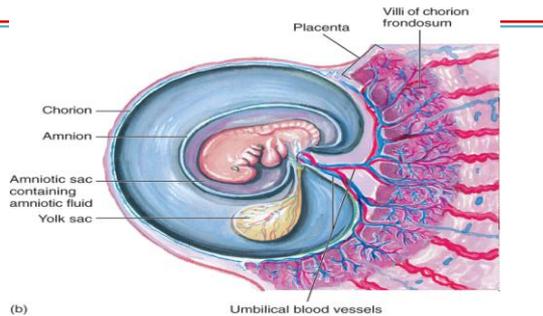


- Maternal and fetal blood do not mix.
- Molecules diffuse (some are transported) across tissues of placenta
  - Oxygen and nutrients diffuse from maternal blood to fetal blood
  - CO<sub>2</sub> and wastes diffuse from fetal blood to maternal blood

Endocrine Functions of the Placenta

- Placenta secretes hormones:
  - Chorionic gonadotropin Hormone: acts like LH (maintains corpus luteum)
  - Chorionic somatomammotropin (along with GH): promotes lipolysis to increase blood fatty acid levels so mom's cells get energy while keeping glucose levels high so Jr. can get energy.

Development



(b)  
 Maternal tissue in contact with chorionic frondosom = decidua basalis (together = placenta)

Endocrine Functions of the Placenta

- Placenta also secretes steroid hormones:
  - Estrogen and progesterone
  - Needs maternal precursor (cholesterol)

