The Reproductive System

Overview

- Reproduction is the formation of new individuals
- The reproductive system is the only system in the body that is not essential to living
  - Individuals can lead a healthy life without reproducing
  - Reproduction is vital for the continuation of a species

Reproductive Glands

- The gonads are the body's reproductive glands
- Two important functions:
  - Production of gametes
  - Production of sex hormones
- Male – Testes
  - The pituitary gland releases Follicle Stimulating Hormone and Luteinizing Hormone
  - Produce sperm
  - Produce testosterone
    - Growth of facial and body hair, increase in body size, deepening of voice

Reproductive Glands

- Female – Ovaries
- The pituitary gland releases Follicle Stimulating Hormone and Luteinizing Hormone
  - Produce ova (eggs)
  - Produce estrogen and progesterone
    - Responsible for the menstrual cycle
    - Female secondary sex characteristics (breasts, widening of hips, etc.) are mainly due to estrogen, not progesterone

The Male Reproductive System

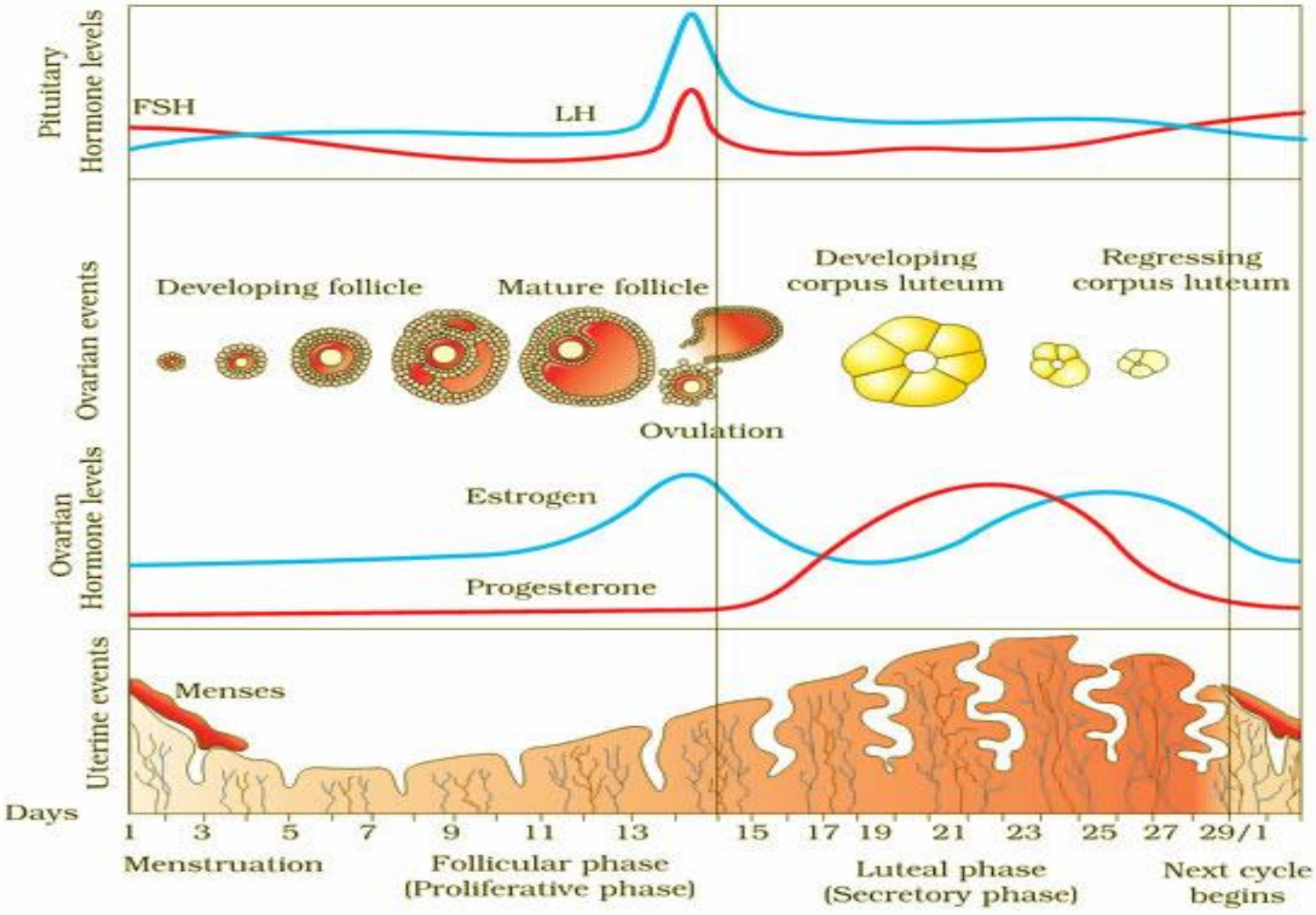
- Scrotum: External sac that houses the testes and associated structures
  - Helps maintain a temperature essential for sperm development
- Testes: Sperm are produced in the seminiferous tubules within the testes
- Epididymis: Sperm are moved to fully mature and are stored here
- Vas Deferens: Tube that connects the epididymis to the subsequent structures
- Seminal Vesicles: Produce seminal fluid – nutrient-rich fluid that combines with sperm to form semen
- Prostate Gland: Produces seminal fluid
- Bulbourethral Gland: Produces seminal fluid
- Urethra: Tube that leads to the outside of the body

The Female Reproductive System

- Ovaries: Contain primary follicles, which later develop into ova (eggs); the primary function of a follicle is to help an egg mature for release into the reproductive tract (ovulation), where it can be fertilized
- Fallopian Tubes: Egg is released to these tubes, where fertilization occurs
- Uterus: Holds a fertilized egg in its lining
- Cervix: Outer end of the uterus
- Vagina: Canal that leads to the outside of the body

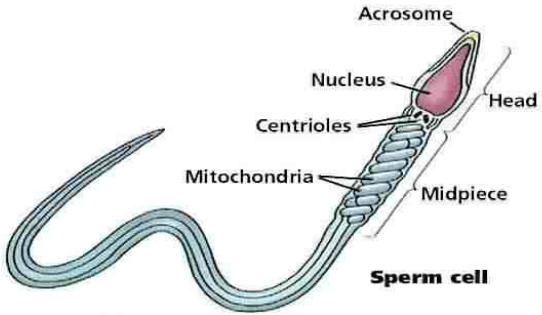
The Menstrual Cycle

- The menstrual cycle takes approximately 28 days
- During the menstrual cycle, an egg develops and is released from an ovary
- The uterus is prepared for implantation of a fertilized egg or eggs
- If the egg is not fertilized, the egg and lining of the uterus are discharged
- The menstrual cycle is regulated by hormones that are controlled by negative feedback
- The menstrual cycle has four phases:
  - Follicular phase
  - Ovulation
  - Luteal phase
  - Menstruation


Pituitary Hormone levels
FSH
LH
Ovarian events
Developing follicle
Mature follicle
Developing corpus luteum
Regressing corpus luteum
Ovulation
Ovarian Hormone levels
Estrogen
Progesterone
Uterine events
Menses
Days
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29/1
Menstruation
Follicular phase (Proliferative phase)
Luteal phase (Secretory phase)
Next cycle begins

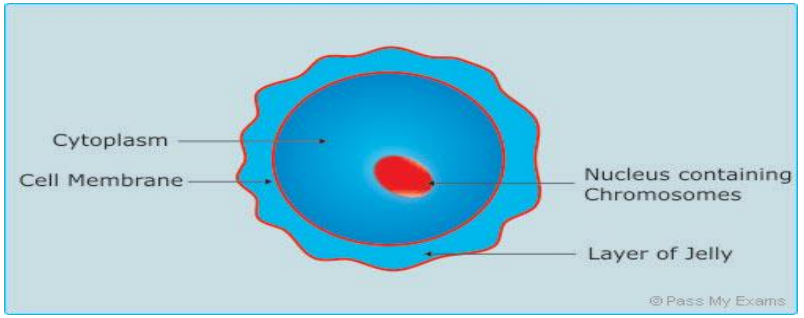
Sperm Cells

- Haploid cell – 23 chromosomes
- Smallest cell in the body
- Men produce sperm cells from the onset of puberty and throughout the rest of their lives
- The acrosome contains enzymes that are released when the sperm comes into contact with the egg
- The head contains the nucleus, which contains 23 chromosomes
- The midpiece contains many mitochondria to provide sufficient energy for the sperm to swim
- The flagella (tail) whipping back and forth/side to side causes movement of the sperm



Egg Cells

- Called an ova or oocyte
- Haploid cell – 23 chromosomes
- Largest cell in the body
  - About the size of a period at the end of a sentence
- Women are born with ova and do not produce any more throughout their lives
- The menstrual cycle begins at the onset of puberty and stops at menopause
  - Menopause typically occurs in the early 50's



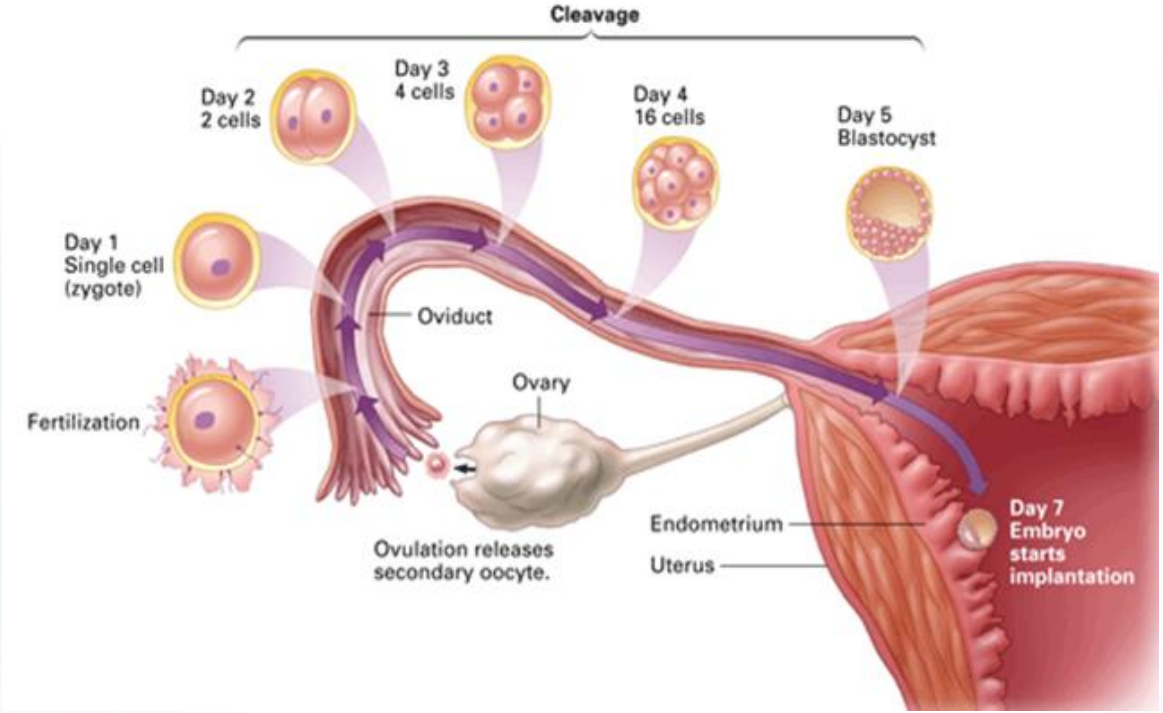
Fertilization & Development

- Fertilization: The process of a sperm joining an egg
- Hundreds of millions of sperm are released during ejaculation
- Approximately 1% reach the egg in the upper region of the Fallopian tube
- The egg is surrounded by a thick outer layer that contains binding cites
- When a sperm attaches to a binding cite, the acrosomes release enzymes which break down the outer layer of the egg, allowing the sperm to enter the egg
- Once a sperm has entered the egg, chemicals are released by the egg which prevent more sperm from entering
- Once a sperm has entered the egg, the nuclear membrane of the sperm and egg rupture, and the nuclei combine (46 chromosomes)
- The fertilized egg is called a zygote

Early Development

- The first few cell division take place while the zygote is still in the Fallopian tube
  - The embryo consists of approximately 50 cells 4 days after fertilization
- The embryo travels through the Fallopian tube toward the uterus over the course of approximately 7 days
- Once the embryo reaches the uterus (approximately 7 days), the embryo secretes enzymes that enable it to attach to the wall of the uterus - implantation

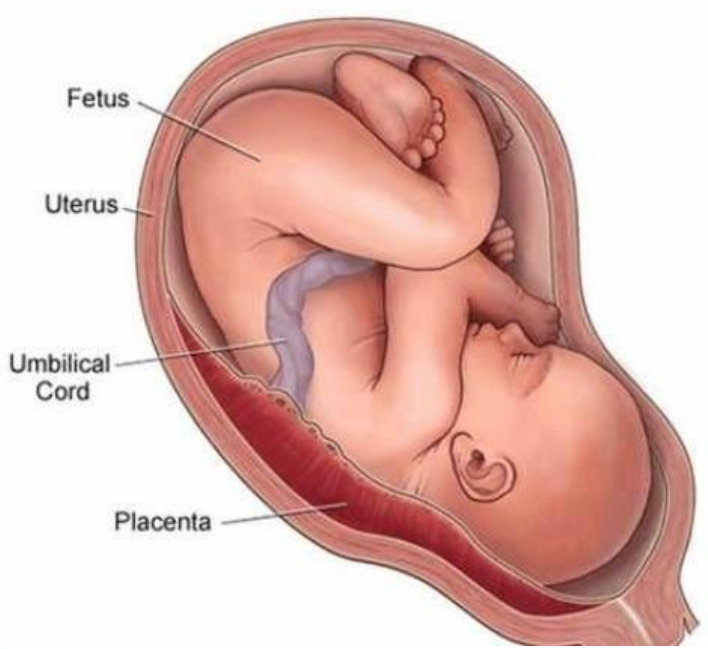
Early Development



Early Development

- The nervous system and digestive system and placenta begin to form after approximately 3 weeks
  - The placenta is attached to the wall of the uterus on the maternal side, and forms the umbilical cord on the embryonic side
  - The placenta supplies nutrients and oxygen to the embryo, and eliminates wastes from the embryo
  - These substances diffuse; there is no shared blood between the mother and embryo

Placenta & Umbilical Cord



Early Development

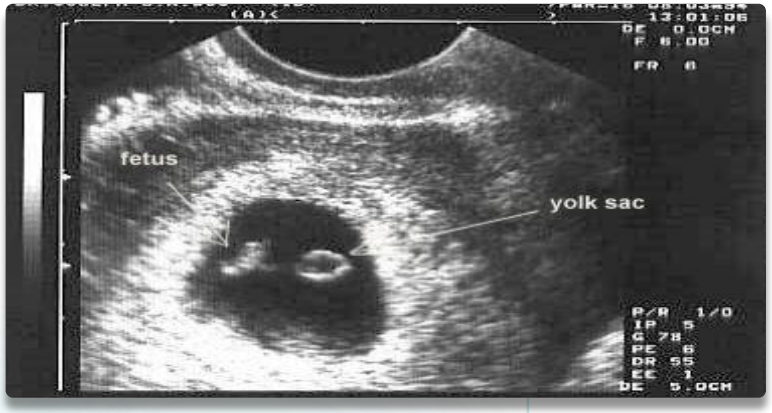
- The embryo's heartbeat may be detected by ultrasound after 6 weeks
- After 8 weeks, the embryo is called a fetus
- After 3 months, most of the major organs and tissues are fully formed
  - The muscular system is well developed, and the fetus may begin moving and showing signs of reflexes

Kathryn At 2 Months

Later Development

- During the 4th, 5th and 6th months, the tissues become more complex and specialized
  - Skeleton forms
  - Heartbeat can be heard with a stethoscope
- The fetus may be able to survive outside the uterus after 6 months if placed under proper care
- The fetus doubles in mass and lungs and other organs fully develop during the 6-9 month period

ULTRASOUNDS



6 Weeks

12 Weeks

6 Months

ULTRASOUNDS

Brain

Fetal Heart

Fetal Spine

KATHRYN