

Endocrine and Reproductive Systems

Ch 39

39-1 Endocrine System

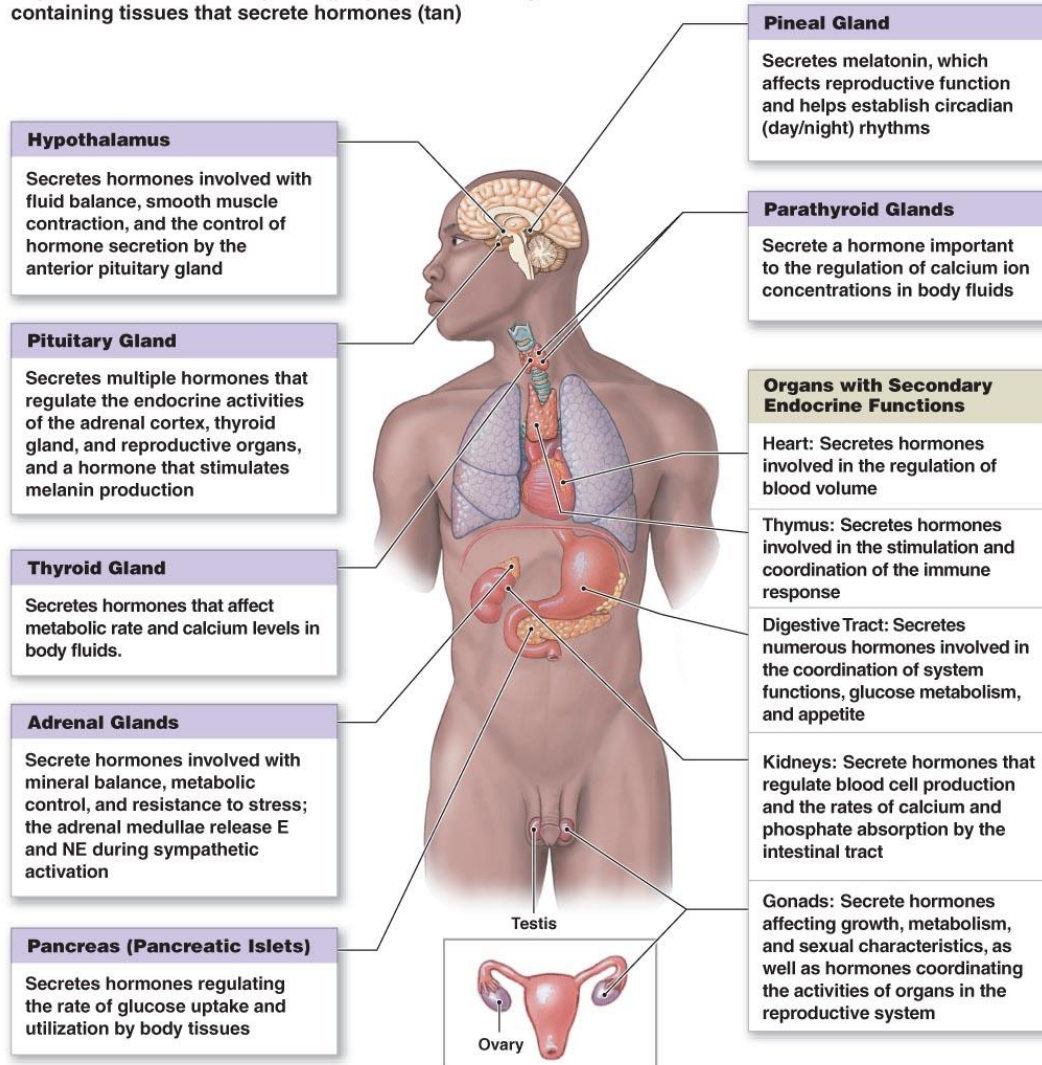
- Endocrine system consists of glands that release their products into the blood stream
- Like a radio broadcast system

39-1 Endocrine System

- Hormones- chemicals that travel through the blood and affect activities of other cells (target cells)
- Only work on cells with receptors for those hormones
- Responses are slow and long lasting
- Exocrine glands-release substances into ducts that lead to other organs (sweat, tears, digestive juices)
- Endocrine glands-release hormones directly into blood

39-1 Endocrine System

Organs of the endocrine system (purple) and other organs containing tissues that secrete hormones (tan)



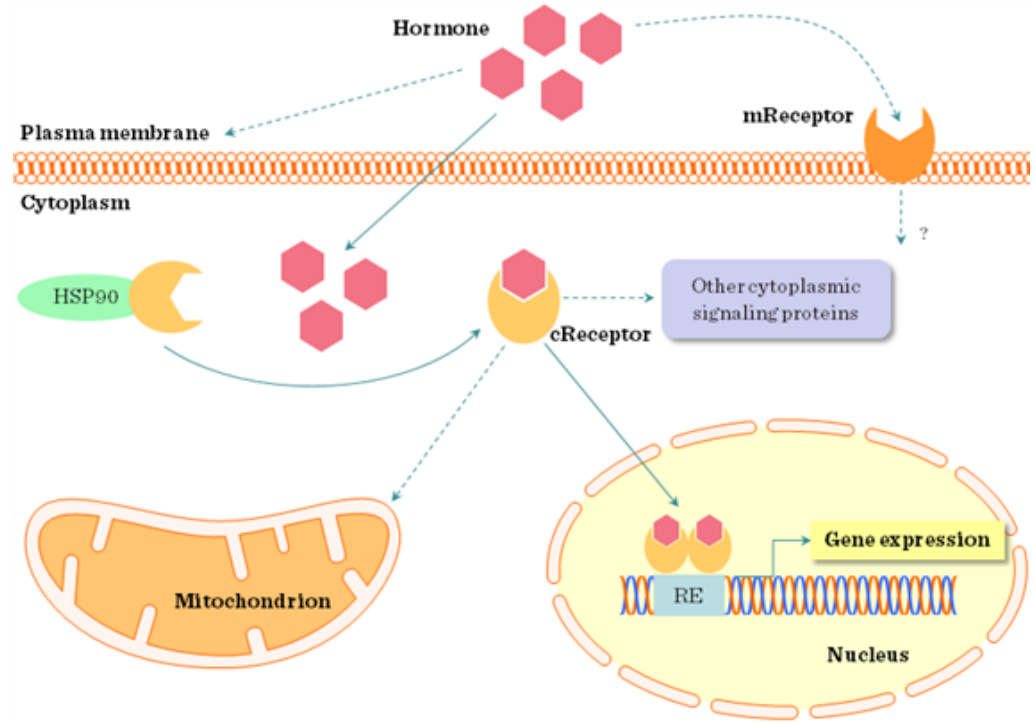
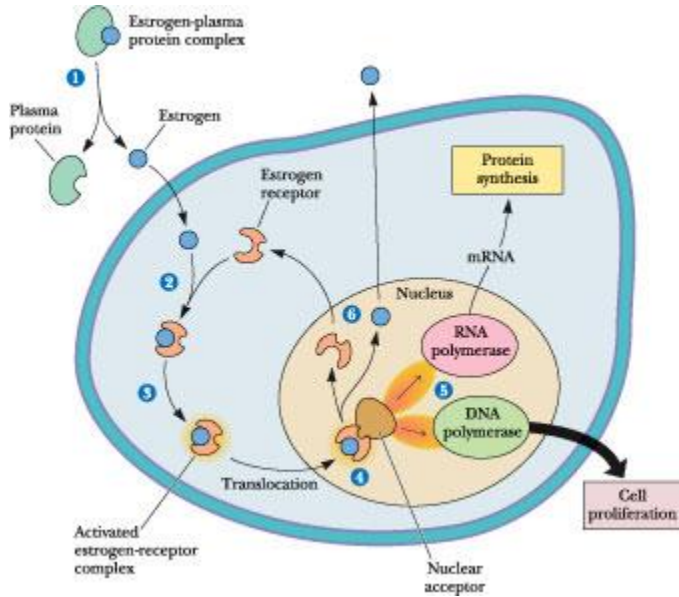
39-1 Endocrine System

- Hormone Action
- Steroid and Non-steroid
- Steroids
 - Lipids
 - Enters cell by passing through cell membrane
 - Binds to steroid receptor inside cell
 - Hormone-receptor complex enters nucleus
 - Initiates transcription and translation of new proteins

39-1 Endocrine System

- Non-steroids
 - Bind to receptors on cell surface
 - Binding activates enzymes on inner surface of membrane
 - Messengers get activated (fatty acids, calcium, nucleotides)
 - Messengers activate or inhibit other activities

39-1 Endocrine System



39-1 Endocrine System

- Prostaglandins-hormone like substances released in small amounts by all cells (except RBCs)
- Modified fatty acids
- Cause smooth muscles to contract, causes pain of some headaches (Aspirin block these)

39-1 Endocrine System

- Control of endocrine system
- Regulated by feedback to maintain homeostasis
- Thyroxine
 - Released by thyroid gland
 - stimulates the activity of all cells
 - Controlled by hypothalamus and pituitary gland
 - Thyroxine low, thyroid releasing hormone (TRH) released, that stimulates thyroid stimulating hormone (TSH) from pituitary, TSH stimulates release of thyroxine by thyroid
 - Also happens when body temperature drops

39-1 Endocrine System

- Maintaining water balance and levels of Calcium, Sodium and Potassium, even when you are sweating
- Hypothalamus senses water concentration in blood
- As water decreases, concentration of salts increases
- Hypothalamus signals pituitary to release anti-diuretic hormone (ADH), which goes to kidneys
- Removal of water by kidneys slows down, you get thirsty
- When water concentration increases, ADH secretion is slowed down, kidneys remove more water

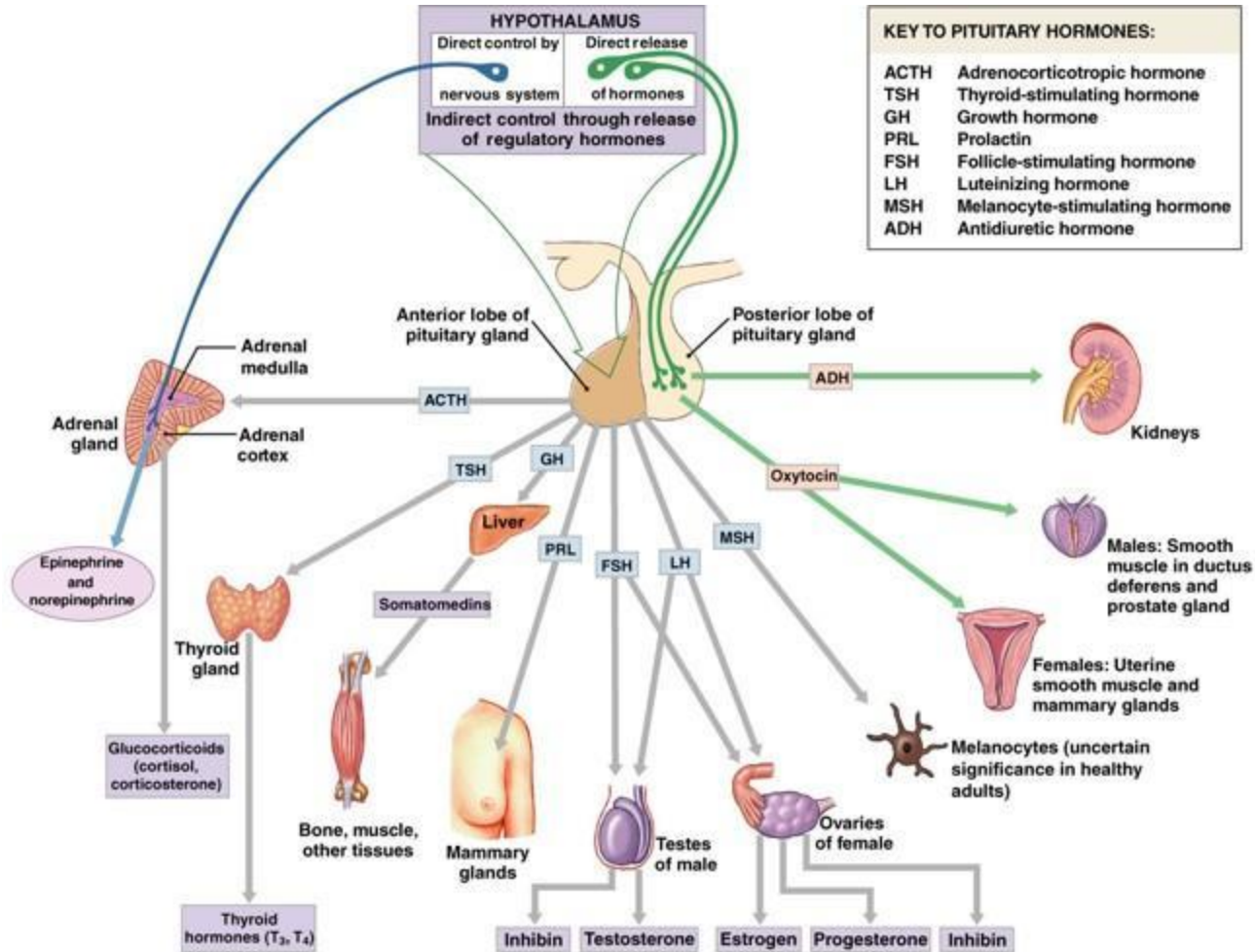
39-1 Endocrine System

- Complementary Hormone Action
- Two hormones can have opposite effects
- Calcium regulated by calcitonin (from thyroid gland) and parathyroid hormone (PTH, from parathyroid gland)

39-2 Human Endocrine Glands

- Pituitary-bean shaped, on the brain stem
- Secretes 9 hormones
- Master regulator
- Essential to good health
- Growth hormone, anti-diuretic hormone (ADH), oxytocin, follicle stimulating hormone (FSH), leutinizing hormone (LH), thyroid stimulating hormone (TSH), adreno-corticotropic hormone, prolactin, melanocyte stimulating hormone (MSH)

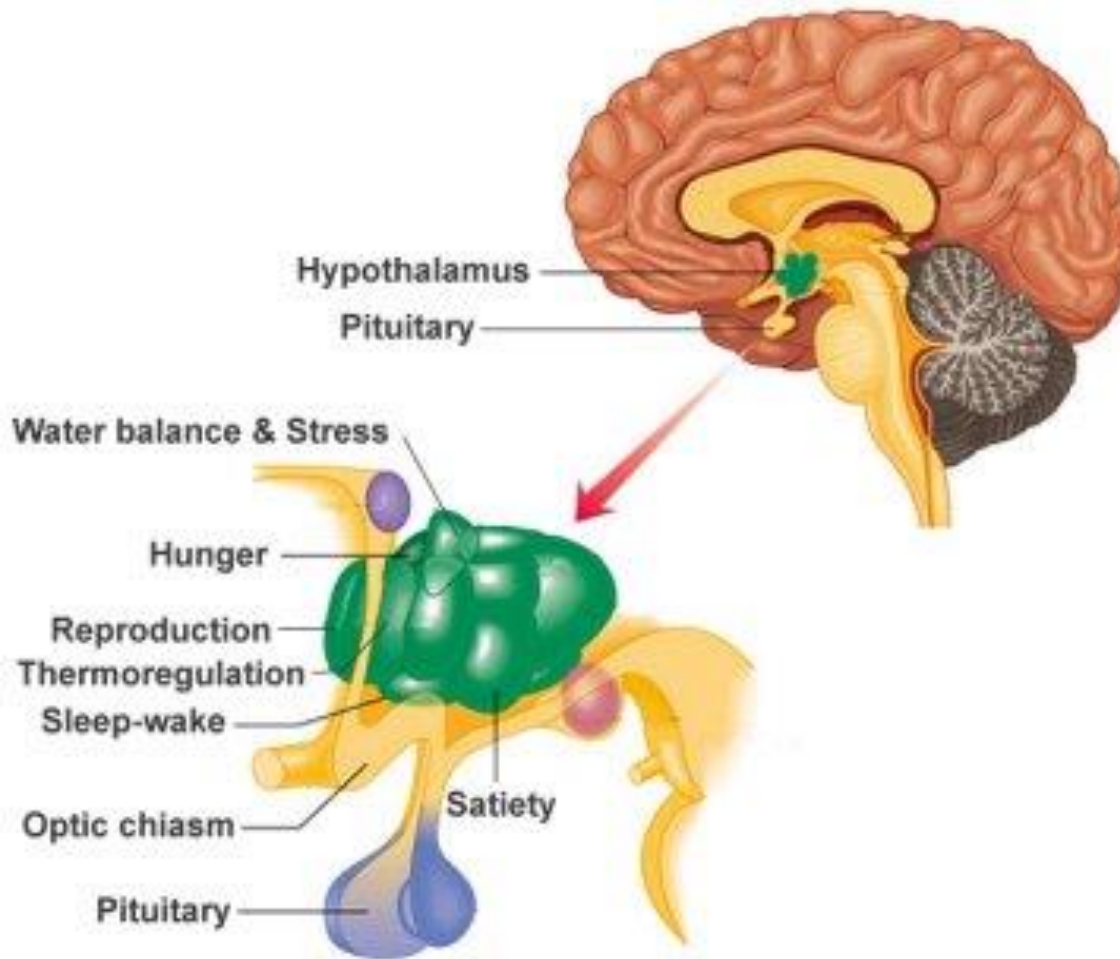
39-2 Pituitary Hormones



39-2 Human Endocrine Glands

- Hypothalamus
- Above and attached to pituitary
- Affected by levels of other hormones in blood and input from CNS
- Interactions between endocrine and NS take place here
- Cell bodies of neurons from pituitary found in hypothalamus
- When cell bodies stimulated, axons in posterior pituitary release hormones
- Produces small amounts of releasing hormones that stimulate the anterior pituitary to release other hormones

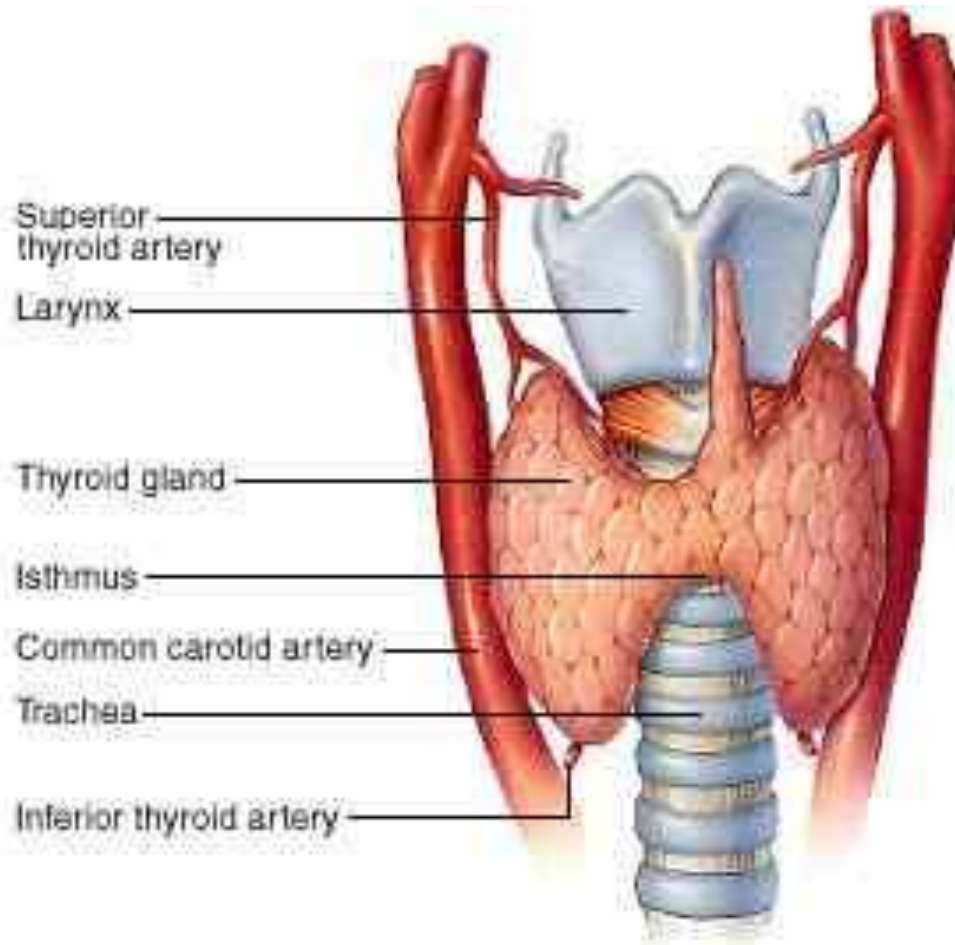
39-2 Hypothalamus



39-2 Human Endocrine Glands

- Thyroid Gland
- Base of neck, wraps around trachea
- Regulates metabolism
- Thyroxine-amino acid tyrosine and iodine
- Regulates cellular respiration
- Hyper- and hypo-thyroidism
- Hyperthyroidism-nervousness, elevated body temp, heart rate, BP
- Hypothyroidism-lack of energy, low body temp, nervous system and skeleton don't develop properly (cretinism)

39-2 Thyroid Gland



39-2 Human Endocrine Glands

- Parathyroid
- On back of thyroid
- Works with thyroid to maintain calcium levels in blood
- PTH-parathyroid hormone increases resorption of calcium in the kidneys, increases uptake of calcium from digestive system, maintains proper nerve and muscle function and bone structure

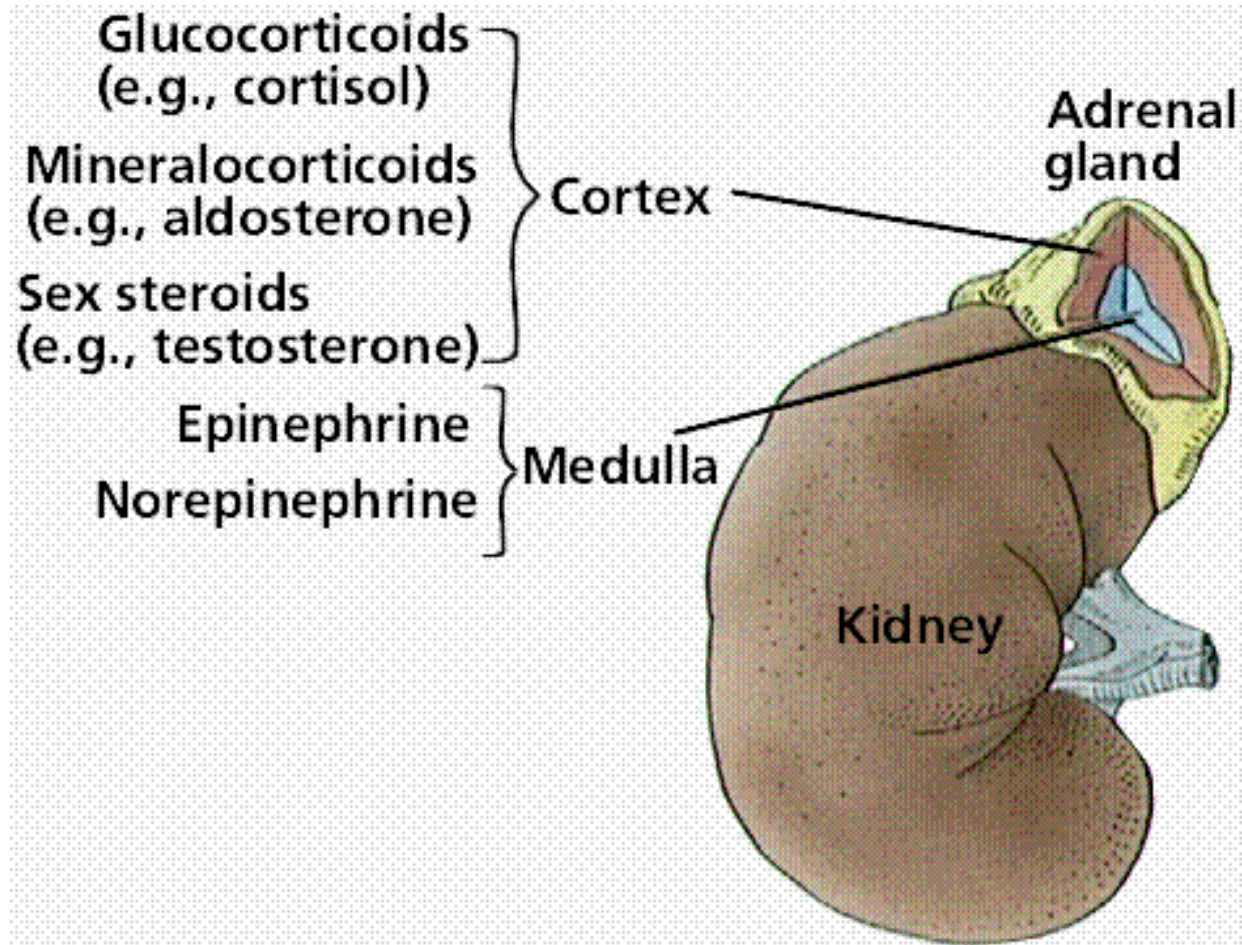
39-2 Human Endocrine Glands

- Adrenal Glands
- Pyramid shaped, on kidneys
- Help body prepare for and deal with stress
- Cortex (outer, largest part) and medulla (inner)
- Cortex produces more than 2 dozen hormones called corticosteroids
- Aldosterone regulates resorption of sodium and excretion of potassium in kidneys
- Cortisol controls metabolism of carbs, fats and proteins

39-2 Human Endocrine Glands

- Adrenal Glands
- Medulla
- Release of hormones controlled by sympathetic nervous system
- Epinephrine (80% of secretion of adrenal medulla), norepinephrine
- Fight or flight response
- Nervous or frightened
- Increase heart rate, BP and blood flow to muscles, airways open, extra glucose in the blood
- Causes a sudden burst of energy

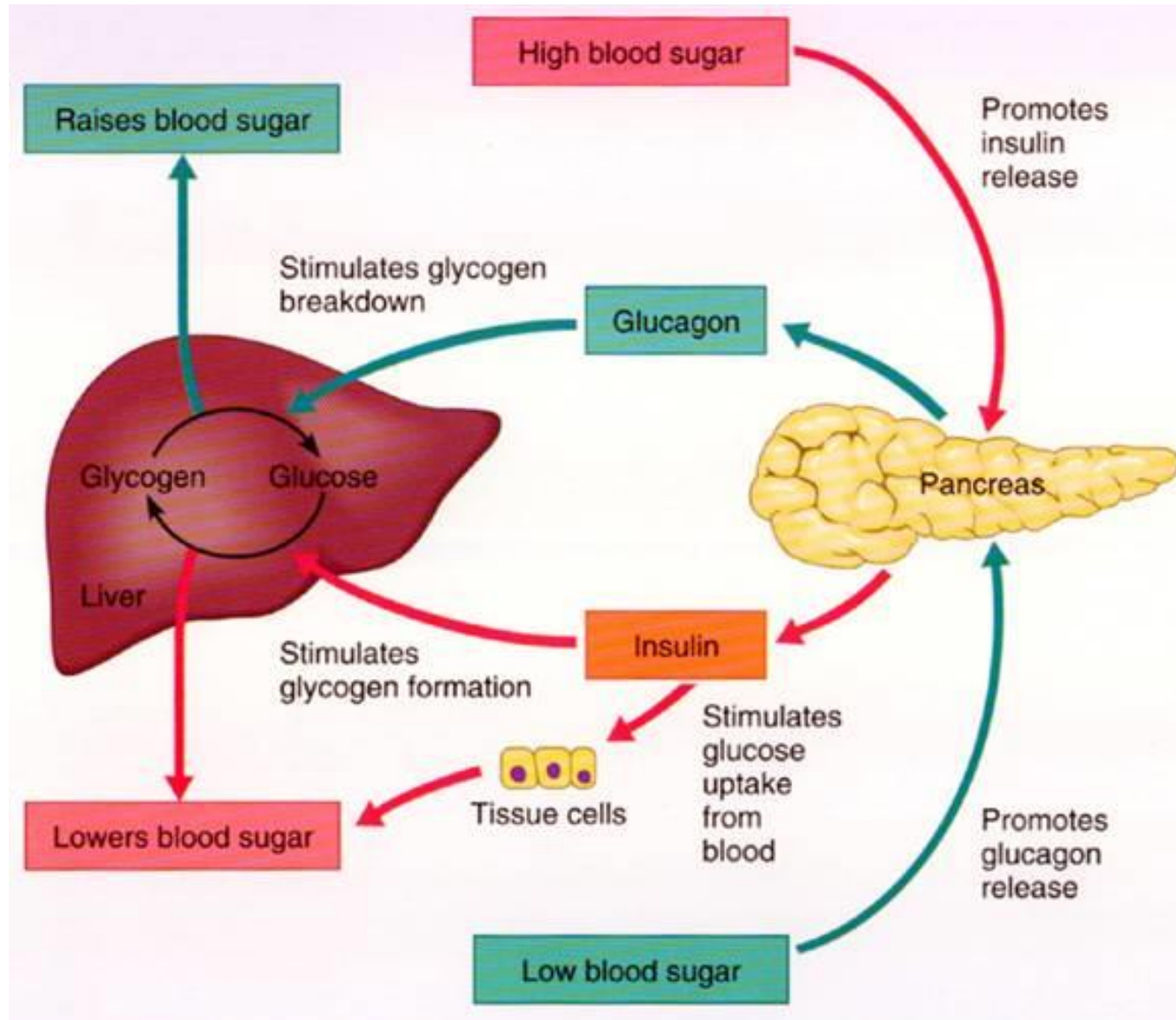
39-2 Adrenal glands



39-2 Human Endocrine Glands

- Pancreas
- Right side of and behind stomach
- Digestive organ (exocrine)
- Endocrine because also releases hormones into blood
- Islets of Langerhans
 - beta cells-insulin-stimulates cells to take up glucose from blood
 - Alpha cells-glucagon-stimulates liver to break down glycogen (stored form of sugar) and release into blood

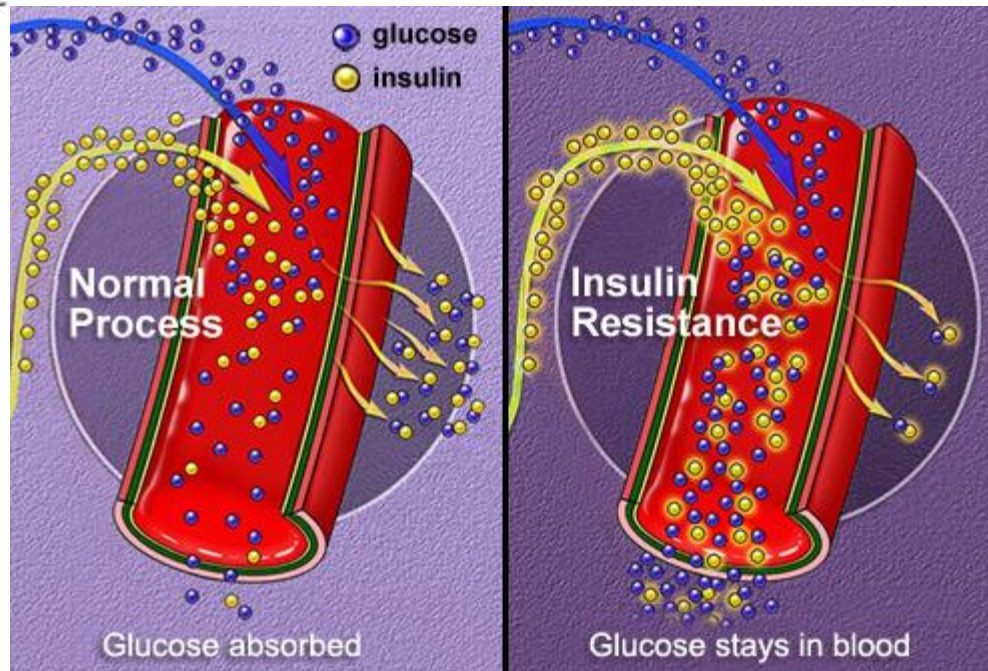
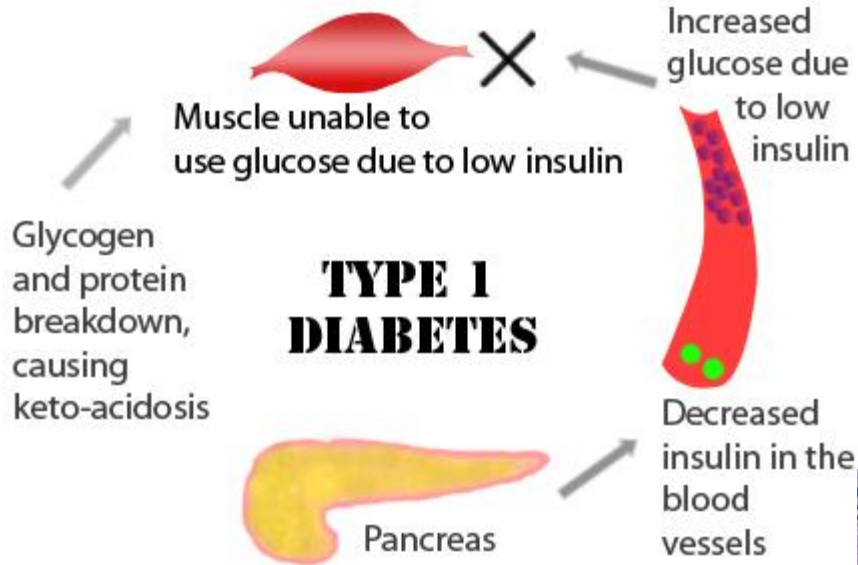
39-2 Pancreas



39-2 Pancreas

- Diabetes
- Can't regulate blood sugar levels, damages tissues and organs, arteries, excrete glucose in urine
- Type I-little or no secretion of insulin
 - Juvenile, born with it
- Type II-cells don't respond to insulin
 - Adult onset-poor diet and unhealthy lifestyle, no exercise

39-2 Diabetes



39-2 Reproductive glands

- Gonads
- Production of gametes
- Secretion of hormones
- Ovaries and testes

- <https://www.youtube.com/watch?v=WVrIHH14q3o>

39-3 Reproductive system

- Sex organs don't develop until 7th week of development *in utero*
- Controlled by hormones testosterone, estrogen and progesterone
- Puberty is when sex organs are fully functional

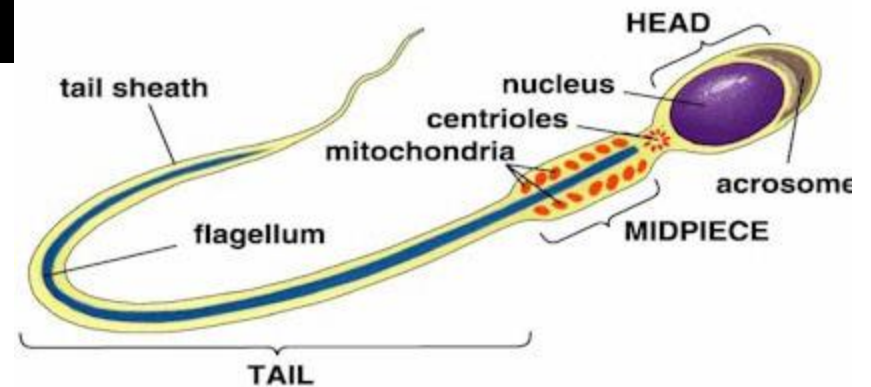
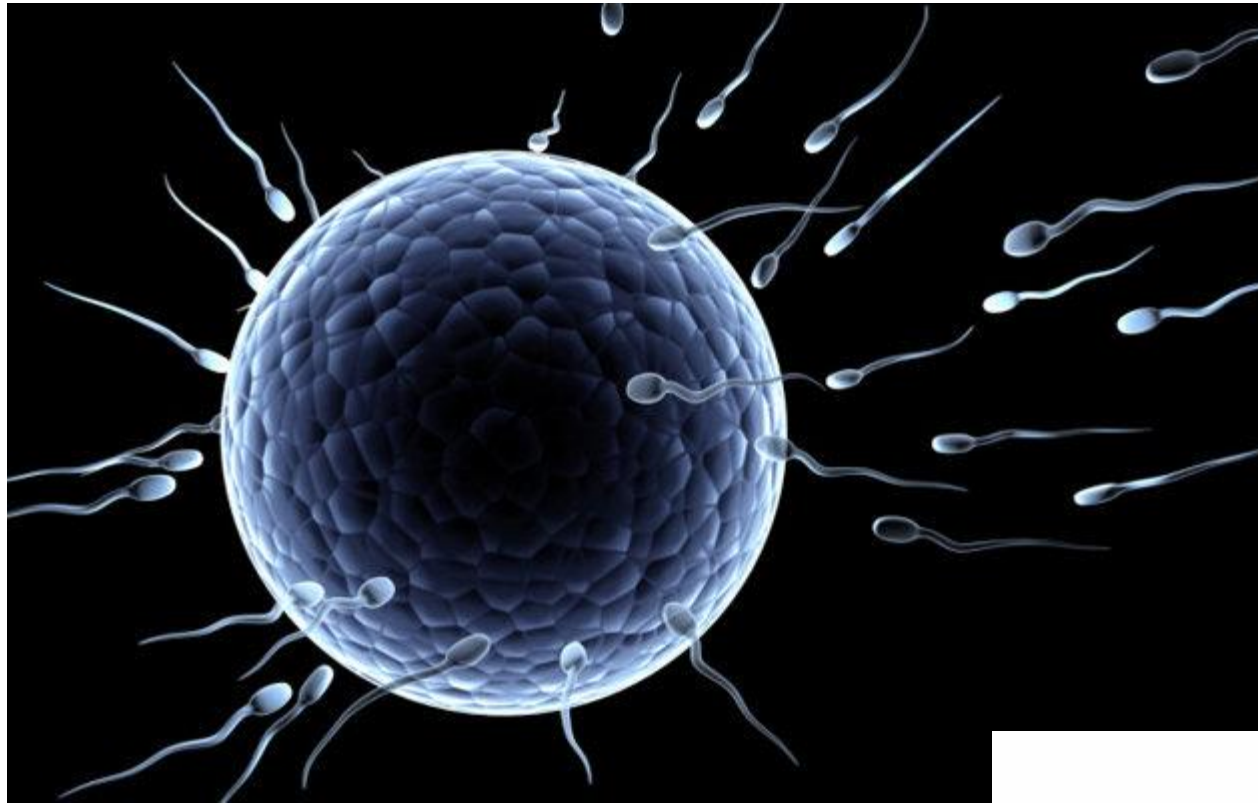
39-3 Reproductive system

- Male reproductive system
- FSH and LH stimulates release of testosterone
- Target cells all over body
- Facial and body hair, growth, deepening of voice
- FSH and testosterone make sperm develop
- Testes (in the scrotum), epididymis, vas deferens, urethra, penis

39-3 Male Reproductive system

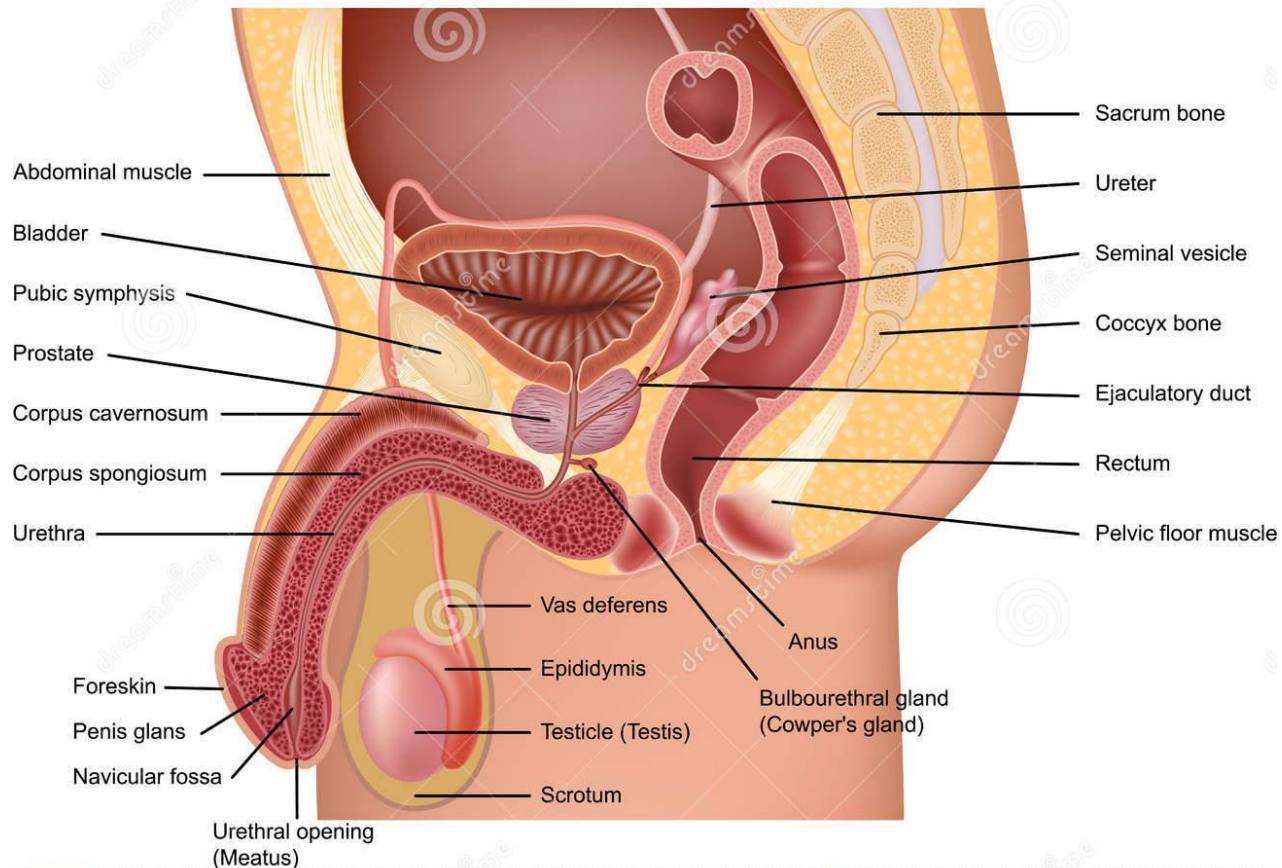
- Within testes are tiny tubules called seminiferous tubules, sperm produced here
- Sperm are derived from cells that undergo meiosis
- Move to epididymis where they mature and are stored in nutrient rich seminal fluid
- Then move through vas deferens to urethra
- Released through penis when autonomic NS causes ejaculation
- 2-6 ml semen contain 200-600 million sperm

39-3 Male Reproductive system



39-3 Male Reproductive system

Male Reproductive System



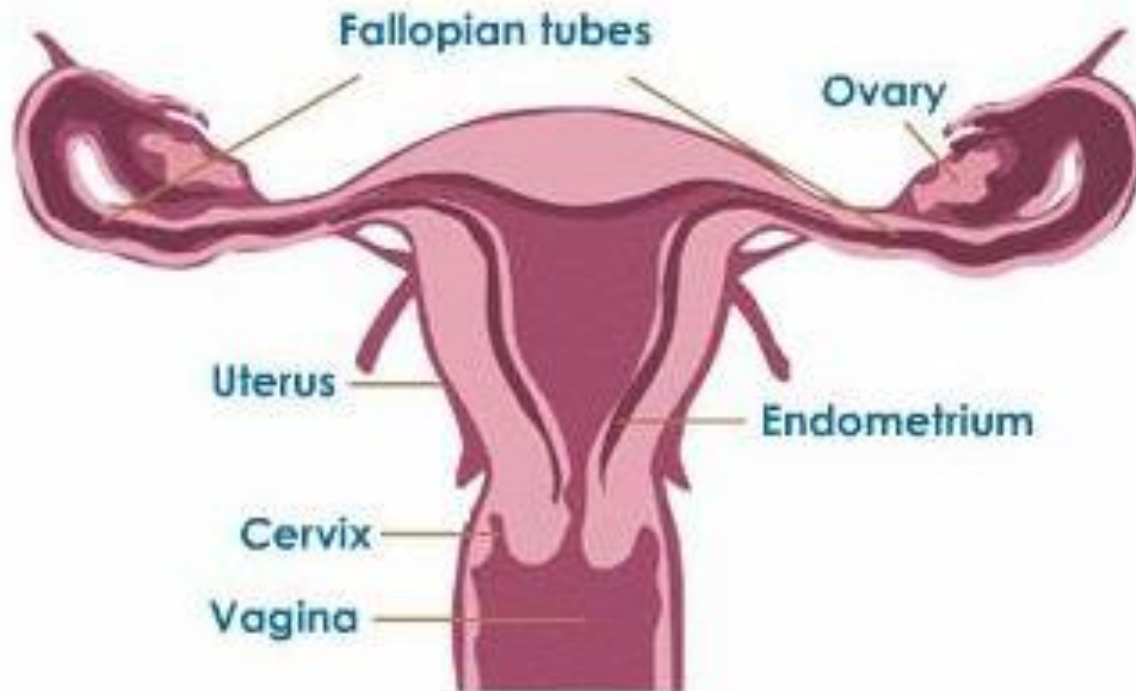
39-3 Female Reproductive system

- FSH and LH stimulate production of estrogen in ovaries
- Target organs all over body
- Maturation of reproductive system, widening of hips, breasts
- Ovaries, fallopian tubes, uterus and vagina
- Produces eggs and prepares body to nourish developing embryo
- One ovum (egg) produced per month

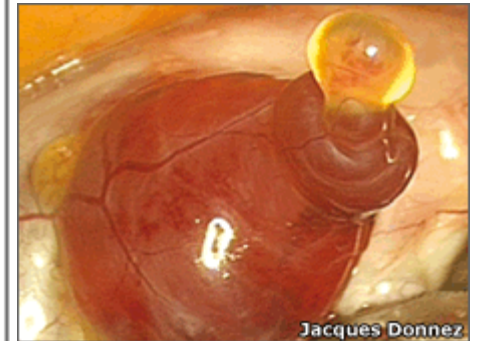
39-3 Female Reproductive system

- Development of egg
- Occurs in primary follicles in ovary-400,000 per ovary
- Cells in follicles help egg develop
- Egg released into fallopian tube during ovulation
- 400 eggs released in a lifetime
- Egg first undergoes meiosis when stimulating by FSH-forms 1 egg and 3 polar bodies
- Egg can be fertilized in fallopian tube, then goes to uterus

39-3 Female Reproductive system



Female Reproductive System Seen from the Front



39-3 Menstrual Cycle

- Egg develops and is released
- Mensis=month
- Controlled by hormones and negative feedback mechanisms
- 4 phases
- Follicular-estrogen low, hypothalamus produces hormone that goes to pituitary
 - Pituitary produces FSH and LH, which travel to ovaries
 - Makes cells surrounding egg produce estrogen which thickens lining of uterus
 - 10 days

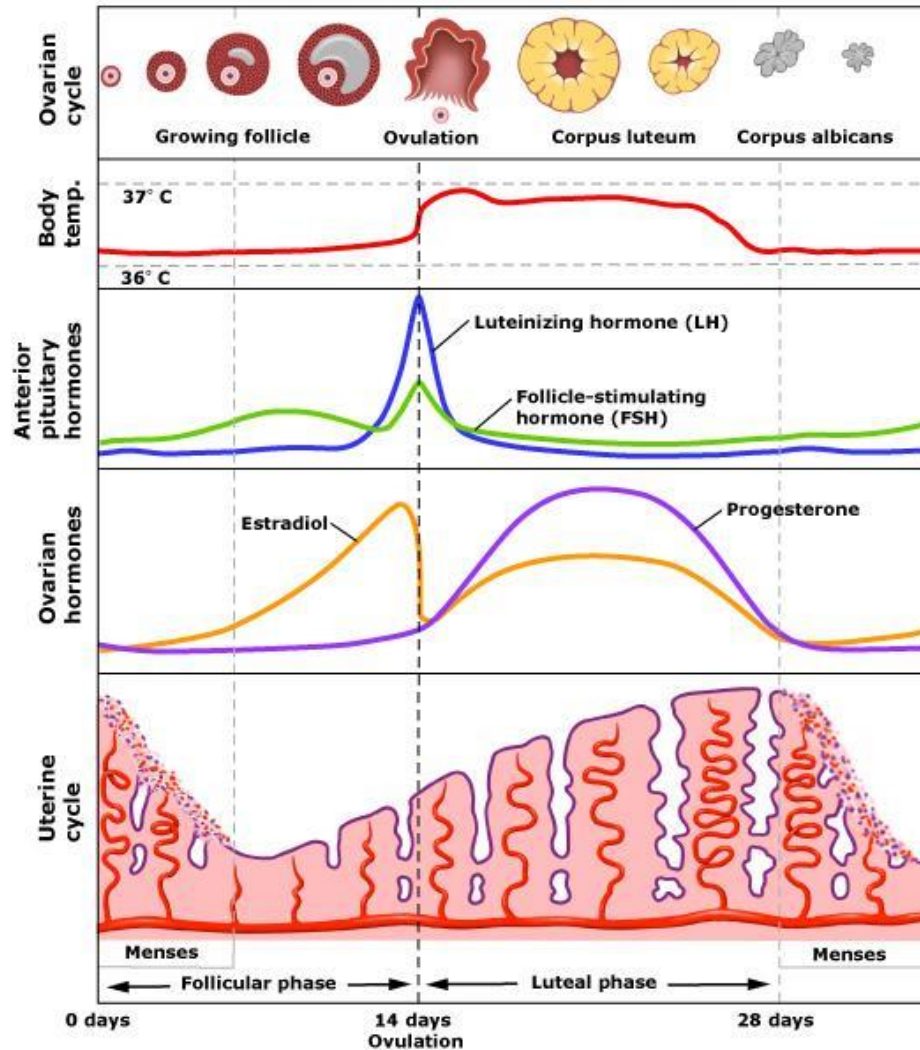
39-3 Menstrual Cycle

- Ovulation
 - 3-4 days
 - Hypothalamus send releasing hormone to pituitary which produces FSH and LH
 - Egg released into fallopian tube
- Luteal phase
 - Begins after egg released
 - Ruptured follicle becomes corpus luteum which releases estrogen and progesterone, finishes preparing lining of uterus
 - During first 2 days are highest chance of fertilization (10-14 days after end of last menstrual cycle)
 - If egg is fertilized will start to divide, then implant in uterus

39-3 Menstrual Cycle

- Menstruation
- After 2-3 days after ovulation, if egg not fertilized, passes through uterus without implantation
- Corpus luteum disintegrates
- Less estrogen and progesterone produced
- Lining of uterus detaches
- After menstruation ends, cycle begins again

39-3 Menstrual Cycle



39-4 Fertilization and Development

- Fertilization-sperm joins egg to make a zygote
- Divides until 8 cells in fallopian tube, then implants in uterus
- 50 cell stage-morula
- Becomes a hollow blastocyst, then attaches to uterus (6-7 days after fertilization)-implantation

39-4 Fertilization and Development

- Gastrulation-blastocyst cells start to organize into layers

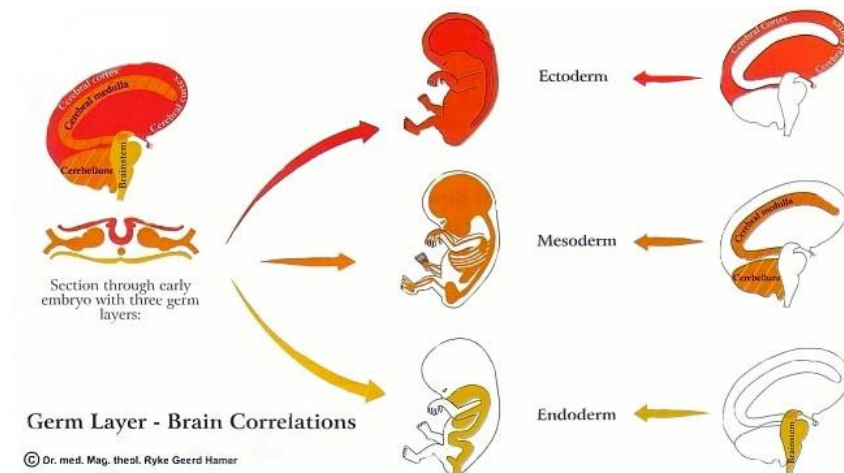
- Ectoderm

- Mesoderm

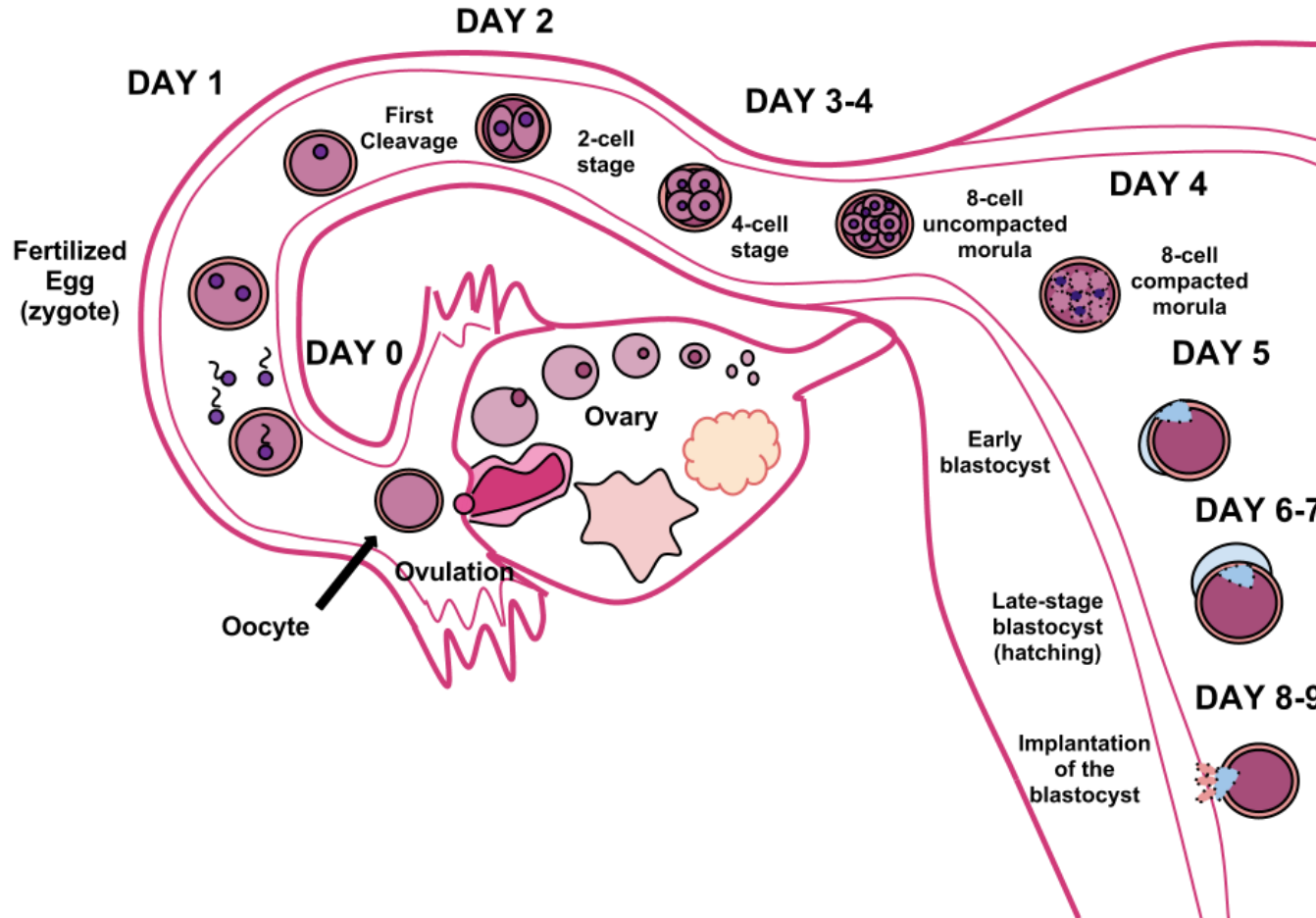
- Endoderm

- Primary germ layers

- Blastocyst produces membranes that surround and protect embryo, amnion and chorion



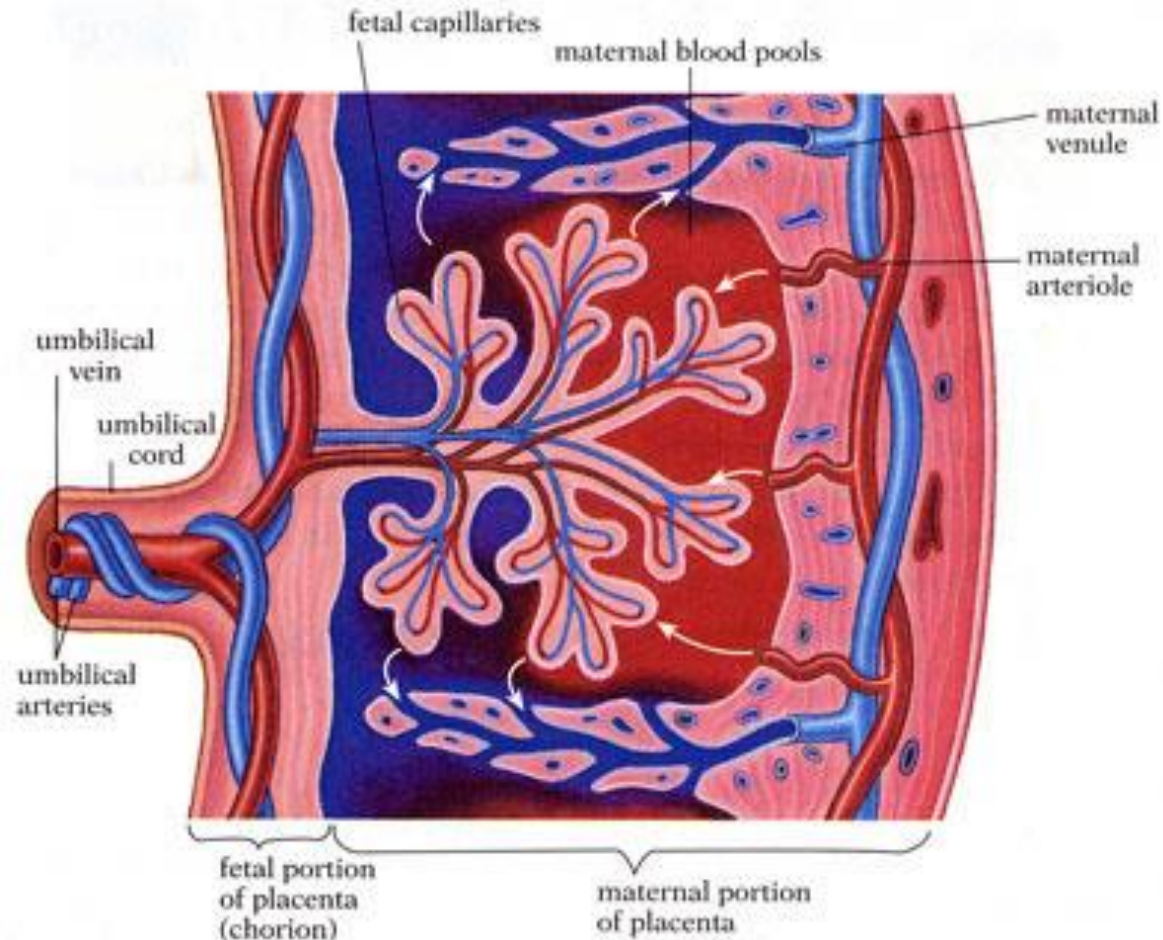
39-4 Fertilization and Early Development



39-4 Development

- By end of third week, NS and digestive systems start to develop
- Chorion grows into placenta
- Fetal and mother's blood are kept separate but pass near each other so that gases, nutrients and waste can diffuse (respiration, nourishment and excretion)

39-4 Development



39-4 Development

- After 8 weeks embryo becomes a fetus
- By three months most of tissues and organs are formed, including umbilical cord

Development of a human embryo

- <https://www.youtube.com/watch?v=UgT5rUQ9EmQ>
- http://www.babycenter.com/2_inside-pregnancy-early-fetal-development_10354436.bc

39-4 Later Development

- By months 4-6, tissues and organs become more complex
- After 6 months, fetus can survive outside placenta, but lungs are not fully developed until 8 months

39-4 Later Development

Normal Fetal Growth

12 weeks

The fetus is 7 cm to 9 cm in length and weighs 28 g.
Fingers and toes are distinct.
Placenta is complete.
Fetal circulation is complete.
Organ systems are complete.



28 weeks

The fetus is 35 cm to 38 cm in length and weighs 1,200 g.
Skin is red.
Pupillary membrane disappears from eyes.
The fetus has an excellent chance of survival.
Eyes open and close.



16 weeks

The fetus is 10 cm to 17 cm in length and weighs 55 g to 120 g.
Sex is differentiated.
Rudimentary kidneys secrete urine.
Heartbeat is present.
Nasal septum and palate close.



32 weeks

The fetus is 38 cm to 43 cm in length and weighs 1,500 to 2,500 g.
Fetus is viable.
Eyelids open.
Fingerprints are set.
Vigorous fetal movement occurs.



20 weeks

The fetus is 25 cm in length and weighs 223 g.
Lanugo covers entire body.
Fetal movements are felt by mother.
Heart sounds are perceptible by auscultation.



36 weeks

The fetus is 42 cm to 49 cm in length and weighs 1,900 g to 2,700 g.
Face and body have a loose wrinkled appearance because of subcutaneous fat deposit.
Lanugo disappears.
Amniotic fluid decreases.



24 weeks

The fetus is 28 cm to 36 cm in length and weighs 680 g.
Skin appears wrinkled.
Vernix caseosa appears.
Eyebrows and fingernails develop.



40 weeks

The fetus is 48 cm to 52 cm in length and weighs 3,000 g.
Skin is smooth.
Eyes are uniformly slate colored.
Bones of skull are ossified and nearly together at sutures.



39-4 Later Development

- <https://www.youtube.com/watch?v=RS1ti23SUSw>

39-4 Birth

- Hormone oxytocin is released from pituitary gland to start contractions of uterus
- Cervix (opening of the uterus) widens or dilates
- Baby usually born head first (if not, breach)
- Placenta is expelled after baby born
- Prolactin is released from pituitary to produce milk in breast tissue

39-4 Birth

- Multiple births
- 2 eggs released in one menstrual cycle (fraternal twins)
- One zygote splits in two (identical twins)

39-4 Early childhood development

- Infancy-up to 12 months
 - Rapid growth and development, coordination of movement, teeth
- Childhood- 1-13 years
 - Language acquired, motor skills refined, personality and social skills develop
- Adolescence-puberty-adulthood
 - Sex hormones, growth, continued personality development

39-4 Adulthood

- Highest level of physical strength and development between 25-35
- Then physiological signs of aging begin
 - Mental and physical function
 - Reproductive capacity declines for females
 - Good health, diet and exercise important!