

The Endocrine System,
The Neuromuscular
System,
The Skeletal System,
The Integumentary
System,
and The Reproductive
System

The Endocrine System

- Responsible for regulating functions in the body (blood production, appetite, sleep cycle, growth, brain functioning, response to stress etc)
- Involved in secreted hormones
- Hormones are signals that tell organs to perform certain functions
- Glands associated with the endocrine system = Adrenal, Pineal, Pituitary, Thymus, Thyroid, and Parathyroid
- Organs associated with the endocrine system = Ovaries, Testes, and Pancreas
- Hypothalamus is the part of the brain that controls the pituitary gland (pituitary gland is right below the hypothalamus), link between nervous and endocrine systems
- Pineal gland is in the middle of the brain
- Adrenal gland are on the kidneys
- Thyroid and Parathyroid glands are on the neck. Thyroid is butterfly shaped. Point of attachment of the two lobes of the thyroid is the isthmus. Parathyroid = 4 small glands on the posterior aspect of the thyroid.

- Pancreas releases:

- insulin, sucks out glucose from the bloodstream (targets liver)
- glucagon, breaks down stored glycogen to raise blood sugar (targets liver)
 - Type 1 diabetes happens with an overactive immune system, the body attacks cells in the pancreas that make insulin
 - Type 2 diabetes (or insulin resistance) happens as a result of chronic high blood sugar levels.

-Pineal gland releases:

- Melatonin, regulates sleep cycle

-Adrenal gland releases

- Epinephrine, fight/flight response, raises heartbeat, metabolism, muscle strength, and blood pressure. Released in response to stress

-Hypothalamus released inhibiting/releasing hormones to the pituitary gland

-Pituitary gland releases:

- Growth hormone, stimulates growth in the muscles and bones
- Luteinizing hormone, stimulates production of sex hormones, stimulates ovulation
- Thyroid Stimulating Hormone (TSH) targets the thyroid, stimulates thyroid hormones
- Follicle Stimulating Hormone (FSH), egg development in the ovaries, maturation of sperm cells and ovarian follicles
- Prolactin, stimulates production of milk in the mammary glands
- *Oxytocin secreted by the posterior pituitary gland stimulates uterine contractions during childbirth
- *ADH (Anti-diuretic hormone), increases water retention in the kidneys and blood vessels

* Hormones are produced in the hypothalamus and stored/released by posterior pituitary

-Thyroid releases:

- Thyroxine, stimulates metabolism

- Increase of Estrogen and testosterone production during puberty leads to secondary sex characteristics

- activation of the neuroendocrine system = when nervous system and endocrine system work together

The Neuromuscular System

- Controls involuntary and voluntary movement by integrating muscles and nerves (each muscle fiber is connected to a nerve fiber)
- Nerve send and receive signals from the central nervous system (brain and spinal cord)
- Impulses are transferred between nerve cells via neurotransmitters into the synapse from the axon terminal.
- Afferent nerves send information from organs/tissues to the central nervous system (sensory nerves)
- Efferent nerves send information from the central nervous system to the organs/tissues (motor nerves)
- Autonomic nervous system handles automatic/involuntary functions, like controlling heart rate, digestion, blood pressure, breathing, etc
- Somatic nervous system is in charge of voluntary function/movement (running, walking, making a thumbs up)
- Three types of muscles are:
 - cardiac (striated and branched, involuntary movement)
 - skeletal (striated and cylindrical, voluntary movement)
 - smooth (non-striated and spindle shaped, involuntary movement)
- The sarcomere is the contractile unit of the muscle fiber, made up of myofibrils
- Actin = thin filaments
- Myosin = thick filaments
- Muscle contraction happens when actin and myosin are pulled together
- The two basic muscle movements are contraction and relaxation

The Skeletal System

- Responsible for movement, protection, storage of calcium, phosphate, and fat
- Bones make blood and immune cells
- Major bones in the body
 - cranium = head, protects your brain
 - mandible = jaw
 - Ribs = protect your heart
 - Spinal cord
 - 7 cervical
 - 12 thoracic
 - 5 lumbar
 - Coccyx, Sacrum
 - Clavicle = collarbone
 - Scapula = shoulderblade
 - pelvis = hipbone
 - metacarpals/carpals = hand bones
 - metatarsals/ tarsals = foot bones
 - calcaneus = heel
 - phalanges = fingers/toes
 - femur = thigh bone
 - tibia and fibula = leg bones
 - patella = kneecap
 - humerus, radius, ulna = arm bones

Relaxing muscle = antagonist,
contracting muscle = prime mover

Long bones = radius, tibia, femur, humerus, radius, ulna etc

Short bones = carpals, tarsals, etc

Flat bones = ribs

irregular bones = skull, pelvic bone

Joints = where bone meets bone, bones are attached by ligaments

- Cartilage prevents bones from grinding together
- Synovial joints allow for movement
- some joints are immovable (like bones of the cranium)

Periosteum = outer covering of bones that contain nerves + blood vessels

Osteon = cylindrical, tree-trunk like structures inside periosteum, functional unit of compact bone

Osteocyte = bone cell, mature osteoblast, housed in lacunae

Osteoblast = makes bone, mononuclear

Osteoclast = breaks down bone, multinuclear

Ossification = bone growth

Osteoporosis = weak/brittle bones, happens when osteoclasts work faster than osteoblasts

Arthritis = damaged cartilage between bones, causes bones to grind together

Osteogenesis Imperfecta (brittle bone disease) = genetic defect in collagen matrix

Tendon = where muscle meets bone

The Integumentary System

- Provides a barrier between body and outside (skin) *PROTECTION*
- Prevents body from drying out
- Excretes water, minerals (sodium), sweat (produced by sebaceous glands)
- Interaction between body and environment (sensory nerves)
- Produced vitamin D when exposed to sunlight
- Thermoregulation

Epidermis = outer layer (location of melanocytes, gives skin its pigment, protects skin from the sun's UV rays), waterproof surface. 4 (sometimes 5) layers of the epidermis

Dermis = middle layer (location of nerve endings, hair follicles, collagen, sweat glands, blood vessels)

Hypodermis = innermost layer

Accessory structures of the integumentary system are hair and nails

Layers of the epidermis (going from superficial to deep)

- stratum corneum
- stratum lucid (only on thick skin)
- stratum granulosum
- stratum spinosum
- stratum basale

The Reproductive System

- Female reproductive role = generate female gamete cell (egg) and incubate fetus (pregnancy)
- Consists of ovaries, Fallopian tubes, cervix, uterus, vagina. Eggs mature in the ovaries, and travel down the Fallopian tubes. Fallopian tubes are the sites of fertilization, and are connected to the uterus, which is where the fertilized egg implants. The cervix is the opening to the uterus, the vagina is the canal that starts outside of the body and ends at the cervix.
- Luteinizing Hormone releases egg from ovaries
- Estrogen makes egg mature in Graafian follicle of the ovary, causes uterine lining to thicken
- Corpus Luteum = empty Graafian follicle

- male reproductive role = generate male gamete cell (sperm), deliver them to the female reproductive system
- Consists of vas deferens, urethra, testes, penis, prostate, seminal vesicles, scrotum.
- Testes = primary male reproductive organ. Sperm is produced in the testes, seminal vesicles and prostate provide the lubricating and nourishing fluid for sperm. The vas deferens is a tube that connects to the urethra, where sperm is ejected. Scrotum houses the testes, keeping testes close to the body to keep them warm when the outside environment is cold, and loosens to keep them away from the body when it is too warm.
- Follicle Stimulating Hormone = hormone that initiates puberty
- Luteinizing Hormone = signals testes to produce testosterone
- LH + FSH = sperm production