Systems of the human body pdf

Author: Jana Vasković MD • Reviewer: Nicola McLaren MSc Last reviewed: August 02, 2022 Reading time: 23 minutes Digestive system - anterior view. The human body is a biological machine made of body systems; groups of organs that work together to produce and sustain life. Sometimes we get lost while studying about cells and molecules and can't see the forest for the trees. It can be helpful to step back and look at the bigger anatomical picture. This topic page will provide you with a quick introduction to the systems of the human body, so that every organ you learn later on will add a superstructure to the basic concept you adopt here. Key facts about the human body systems System of organs A group of organs that work together to perform one or more functions in the body. Musculoskeletal system Mechanical support, posture and locomotion Cardiovascular system Transportation of oxygen, nutrients and hormones throughout the body and elimination of cellular metabolic waste Respiratory system Exchange of oxygen and carbon-dioxide between the body and air, acid-base balance regulation, phonation. Nervous system Initiation and regulation of vital body functions, sensation and body movements. Digestive system Mechanical and chemical degradation of food with purpose of absorbing into the body and using as energy. Urinary system Filtration of blood and eliminating unnecessary compounds and waste by producing and excreting urine. Endocrine system Production of hormones in order to regulate a wide variety of bodily functions (e.g. menstrual cycle, sugar levels, etc) Lymphatic system Draining of excess tissue fluid, immune defense of the body. Reproductive system Production of reproductive cells and contribution towards the reproduction process. Integumentary system Physical protection of the body surface, sensory reception, vitamin synthesis. The skeletal system is composed of bones and cartilages. There are two parts of the skeleton; axial and appendicular. The axial skeleton consists of the bones of the head and trunk. The appendicular skeleton consists of the bones within the limbs, as well as supporting pectoral and pelvic girdles. There are 206 bones in an adult human body. The place at which two bones are fitted together is called the joint or articulation. Joints are supported by cartilages and reinforced with ligaments. Functions of the skeletal system are mechanical support, movement, protection, blood cell production, calcium storage and endocrine regulation. Elements of the skeletal system are adjusted to the function of the body part they support. Thus, the anatomy of bones, joints and ligaments is studied topographically, as the bones of the; head and neck, thorax, abdomen, upper and lower limbs. Get started with skeletal system anatomy by checking out the study unit and custom quiz below. Skeletal system Explore study unit Custom quiz: Skeletal system Start quiz The muscular system consists of all the body muscles. There are three muscle types; smooth, cardiac and skeletal muscles. Smooth muscle is found within walls of blood vessels and hollow organs such as the stomach or intestines. Cardiac muscle cells form the heart muscle, also called the false. Skeletal muscles attach to the bones of the body.Among these three, only skeletal muscles can be controlled consciously and enable us to produce body movement, while the function of other two muscle types is regulated by the autonomic nervous system and is absolutely unconscious. Histologically, skeletal and cardiac muscle fibers are arranged in a repetitive fashion giving a striped appearance, hence are called striated muscle. Smooth muscle does not contain repetitive sarcomeres, thus is non-striated muscle. Learn all about the muscular system in the study unit below, or consolidate what you already learned with our fully customizable quiz. Muscular system Explore study unit Custom quiz: Muscular system Start quiz The cardiovascular system is comprised of the heart and the circulatory system of blood vessels. The heart is composed of four chambers; two atria and two ventricles. Blood enters the heart through the upper chambers of the left and right atria and exits via the left and right ventricles. Heart valves prevent the backflow of blood. The heart acts as a two-way pump. The right side of the heart pumps deoxygenated blood into the pulmonary circulation of the lungs, where the blood is reoxygenated again. While the left side of the heart simultaneously pumps oxygenated blood into the systemic circulation, distributing it to the peripheral tissues. The regular pumping, or heartbeat, is controlled by the conduction system of the heart. The circulatory system, also called the vascular system, consists of arteries, veins and capillaries. They all comprise a continuous network of vessels which act to carry blood around the body. Blood leaves the heart via arteries, these progressively reduce in size to continue as smaller arterial vessels called arterioles. Arterioles end in a web of even smaller vessels called capillaries. The exchange of gases and nutrients occurs through the capillary walls. Cardiovascular system - diagram. Small veins, called venules, leave from capillaries and gradually increase their lumen on the way to the heart to end as veins. There is a certain histological difference between arteries and veins, but their main functional difference reflects the direction in which they conduct blood: the arteries convey blood from the heart to the periphery, whereas the veins convey blood from the periphery to the heart. There are three separate circuits to the circulatory system. The pulmonary circulation which carries blood between the heart and the lungs; The coronary circulation which supplies blood to the muscle of the heart; And the systemic circulation which carries blood to the rest of the body. Major arteries within the systemic circulatory system are the aorta and its branches, while the main representatives of the veins are the superior vena cava and inferior vena cava. Learn everything about the heart, arteries and veins faster with our cardiovascular system diagrams, quizzes and free worksheets. Major functions of the cardiovascular system include transportation of oxygen, nutrients and hormones throughout the body within the blood, and as well as eliminating carbon dioxide and other metabolic waste. Learn more about the major arteries, veins and nerves of the body with Kenhub resources! The respiratory system consists of a series of organs; the nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles and lungs (alveoli). The nasal cavity and pharynx are together called the upper respiratory system, while the remainder of the organs comprise the lower respiratory system. Respiratory system diagram. Respiratory system organs, with the exception of the alveoli, function to conduct air into the lungs aided by the muscles of respiration (mainly the diaphragm and intercostal muscles). Once air is in the lungs it enters alveoli (the site of gas exchange) and interacts with blood transported by the pulmonary circulation. Here carbon dioxide is removed from, and oxygen returned to, the blood. Thus the major respiratory system function is to bring oxygen into the body and expel carbon dioxide. Fortify your knowledge about the respiratory system with this content we have prepared for you. Nervous system controls how we interact with and respond to our environment, by controlling the function of the organs in our other body systems. The nervous system organs are the brain, spinal cord and sensory organs. These are connected by neurons, which act to transmit neural signals around the body. Nervous system - an overview. Morphologically and topographically, the nervous system is divided into the central (CNS) and peripheral (PNS) nervous systems. Whilst functionally, the nervous system is considered as two parts; the somatic (SNS) or voluntary nervous system, and the autonomic (ANS) or involuntary nervous system. The central nervous system definition is that it receives information from the body's environment and generates instructions, thereby controlling all the activities of the human body. This two-way information flow into, and out of, the CNS is conveyed by the peripheral nervous system. The CNS consists of the brain and spinal cord. The brain is placed within the neurocranium, and is formed from the cerebrum, cerebellum and brainstem (pons and medulla oblongata). The central parts of the CNS are occupied by spaces called ventricles filled with cerebrospinal fluid (CSF). The spinal cord is placed within the vertebral column. The spinal canal extends through the central part of the spinal cord. It is also filled with CSF and it communicates with the ventricles of the brain. The CNS is made of neurons and their processes (axons). Gray matter is made of neuron cell bodies, it is found in the cerebral cortexand the central portion of the spinal cord. White matter is made of axons, which combine and build neural pathways. The gray matter is where the instructions generate, while the white matter is the path through which the instructions travel toward the organs. The peripheral nervous system definition is that it conducts information from the CNS to the target tissues, and from the target tissues to the CNS. It consists of nerves and their ganglia. Nerves that carry information from peripheral sense organs (for example eye, tongue, nasal mucosa, ear, skin) to the CNS are called the ascending, afferent or sensory nerve fibers. Fibers that carry information from the CNS to the periphery (muscles and glands) are the descending, efferent, motor or secretory nerve fibers. A ganglion is a cluster of neural tissue outside of the CNS, made of neuronal cell bodies. Ganglia can be both sensory and autonomic. Sensory ganglia are associated with spinal nerves and some cranial nerves (V, VII, IX, X). Peripheral nerves emerge from the CNS. There are 12 pairs of cranial nerves which arise from the brain, and 31 pairs of spinal nerves which extend from the spinal cord. Cranial nerves are named I to XII, determined by their skull exit location (anterior to posterior). Spinal nerves are divided into 8 cervical, 12 thoracic, 5 lumbar, 5 sacral and 1 coccygeal nerve, depending on vertebral level from which they arise. In certain areas of the body peripheral nerves interconnect, creating neural networks called plexuses. Notable plexuses are the: Cervical plexus (C1-C4) – innervates the back of the head, some neck muscles, pericardium and diaphragm via greater auricular, transverse cervical nerve, lesser occipital, supraclavicular, and phrenic nerves. Brachial plexus (C5-T1) – innervates the upper limb with nerves such as median, ulnar, radial, musculocutaneous and axillary nerve. Lumbar plexus (L1-L4) – innervates the muscles and the skin of the abdomen and pelvis, as well as thigh muscles via iliohypogastric, ilioinguinal, genitofemoral, lateral femoral cutaneous, obturator, femoral nerves. Sacral plexus (S1-S4, with branches from L4, L5) – innervates the muscles and skin of parts of the pelvis, posterior thigh, lower leg and foot via the following nerves; gluteal, sciatic, posterior femoral cutaneous, pudendal, nerve to piriformis, nerve to obturator internus, and nerve to quadratus femoris. The somatic nervous system (SNS) and autonomic nervous system (ANS) are divisions of the peripheral nervous system, with information conveyed through the cranial and spinal nerves. The somatic nervous system definition is that it allows voluntary control over our movements and responses. It conveys sensory and motor information between the skin, sensory organs, skeletal muscles and the CNS; establishing communication of the human body with its environment and response to outside stimuli. Major somatic peripheral nerves include the median nerve, sciatic nerve and femoral nerve. The autonomic nervous system definition is that it controls all the internal organs unconsciously, through the associated smooth muscle and glands. Functionally, the ANS is divided into sympathetic (SANS) and parasympathetic (PANS) autonomic nervous systems. The sympathetic nervous system definition is informally known as producing the „flight or fight" state as it is the part of the ANS which is mostly active during stress.PANS dominates during rest, and is more active in „rest and digest" or „feed and breed" activities. The centers of SANS and PANS are within the brainstem and spinal cord, and they communicate with SANS and PANS ganglia located throughout the body. Note that there isn't any pure SANS or pure PANS nerve, instead their fibers are added to the specific somatic nerves, making them mixed. The digestive system function is to degrade food into smaller and smaller compounds, until they can be absorbed into the body and used as energy. It consists of a series of gastrointestinal tract organs and accessory digestive organs. Digestive system diagram The digestive system organs spread from the mouth to the anal canal. So it's actually a tube consisting of the mouth, pharynx, esophagus, stomach, small intestine, large intestine, and anal canal. Accessory digestive organs assist with the mechanical and chemical food breakdown, these are the tongue, salivary glands, pancreas, liver and gallbladder. Master the digestive system anatomy starting with this study unit and custom quiz: Urinary system is a body drainage system comprised of the group of organs that produce and excrete urine. It consists of the kidneys, ureters, urinary bladder and urethra. Kidneys are paired bean-shaped organs placed retroperitoneally. The kidneys have a rich blood supply provided by the renal artery. Nephrons within the kidneys filter the blood that passes through their web of capillaries (glomerulus). The blood filtrate then passes through a series of tubules and collecting ducts, eventually forming the final ultrafiltrate, urine. Urine passes into the ureters, tubes of smooth muscle that convey urine from the kidneys to the urinary bladder. The bladder is a hollow muscular organ that collects and stores urine before disposal by urination (micturition). Functions of the urinary system include; elimination of body waste, regulation of blood volume and blood pressure, regulation of electrolyte levels and blood pH. Get started with the urinary system with these resources: Kidneys Explore study unit Custom quiz: Urinary system Start quiz The endocrine system is a collection of specialised organs (endocrine glands) scattered throughout the body that act to produce hormones. The main organs of the endocrine system can be seen in the diagram below. Organs of the endocrine system diagram With regards to the endocrine system function; hormones produced by the endocrine system act to regulate a wide variety of bodily functions, such as triiodothyronine which regulates metabolism, or estrogen and progesterone which regulate the menstrual cycle. Endocrine glands secrete hormones directly into the circulatory system to regulate the function of distant target organs. We have you covered with everything you need to know about the endocrine system here. The lymphatic system is a network of lymphatic vessels that drains excess tissue fluid (lymph) from the intercellular fluid compartment, filters it through lymph nodes, exposes it to lymphocytes (white blood cells) of the immune system and returns the fluid to the circulatory system. The lymphatic system consists of lymph, lymphatic plexuses, lymphatic vessels, lymph nodes and lymphoid organs. The lymphatic system function is to; convey and eliminate toxins and waste from the body; recirculate proteins; and defend the body from microorganisms. Lymphatic system diagram Lymph is a watery tissue fluid with a similar consistency to blood plasma. It starts as interstitial fluid which occupies the spaces between cells. Excess fluid is picked up by lymphatic capillaries and transported through lymphatic plexuses into lymphatic vessels, filtering through lymph nodes along its journey. Superficial lymphatic vessels are found in the subcutaneous tissue alongside veins. They drain into deep lymphatic vessels that follow the arteries. Lymphatic vessels empty into larger lymphatic trunks, which unite to form one of the two main collecting ducts; the thoracic duct and the right lymphatic duct. The thoracic duct begins at the cisterna chyli, collecting lymph from the left side of head, neck and thorax, left upper limb, abdomen and both lower limbs and draining it into the left venous angle (junction of the left internal jugular and left subclavian veins). The right lymphatic duct drains the rest of the body and empties into the right venous angle. From the venous angles, cleaned lymph is returned to the circulatory system, rejoining with the fluid of the blood. Note that the central nervous system was previously thought to have no lymphatic vessels. However, recent research has shown its lymph is drained by lymph vessel-like structures found in the meninges. Lymphatic system organs are divided into primary and secondary organs. Primary lymphatic organs produce lymphocytes and release them into lymphatic vessels. The two primary lymphoid organs are the thymus and red bone marrow. Secondary lymphatic organs include lymph nodes, tonsils, appendix and spleen. Lymph nodes are masses of lymphocyte containing lymphoid tissues, attached to lymphoid vessels. Lymph nodes function to filter cellular debris, foreign pathogens, excess tissue fluid, and leaked plasma proteins. There are aggregations of lymph nodes at key points around the body (cervical, axillary, tracheal, inguinal, femoral, and deep nodes related to the aorta). The reproductive system, or genital system, is a system of internal and external sex organs which work together to contribute towards the reproduction process. Unlike other systems of organs, the genital system has significant differences among sexes. The external female sex organs, also known as the genitals, are the organs of the vulva (the labia, clitoris, and vaginal opening). The internal sex organs are the ovaries, fallopian tubes, uterus and vagina. The vulva provides an entry to, and protection, for the vagina and uterus, as well as the proper warmth and moisture that aids in its sexual and reproductive functions. In addition, it is important for the sexual arousal and orgasm in females. The vagina is the canal leading from the outside of the body to the cervix (neck) of the uterus. Ovaries secrete hormones and produce egg cells, which are transported to the uterus fallopian tubes. The uterus provides protection, nutrition, and waste removal for the developing embryo and fetus. In addition, contractions in the muscular wall of the uterus contribute to pushing out the fetus at the time of birth. The external male sex organs are the testes and penis, while the internal are the epididymis, vas deferens and accessory glands. Functionally, they can be grouped into three categories.The first category is for sperm production (the testes), and storage (epididymis). The second category organs produce ejaculatory fluid; the vas deferens and the accessory glands (seminal vesicles and prostate). The final category is those used for copulation and deposition of the sperm, these include the penis, urethra and vas deferens. The integumentary system is the set of organs that forms the external covering of the body. It includes the skin, skin appendages, sweat glands and sensory receptors. Integumentary system diagram. The skin is the largest organ of the body. It has three layers; epidermis, dermis and hypodermis. The epidermis is a thick keratinized epithelium made of multiple cell layers. Underneath the epidermis is the dermis, a layer of connective tissue that contains blood vessels and nerves that supply the skin. The underlying fascia, also called the hypodermis, consists of fat, connective tissue and skin appendages (hair, nails, sebaceous and sweat glands).The integumentary system functions are various. It forms a continuous layer that protects the body from various damaging events, such as external injuries, loss of water and heat, and the carcinogenic effects of UV rays. It also excretes waste, contains sensory receptors to detect pain, sensation, pressure, and temperature, and provides for vitamin D synthesis. Go through these resources to reinforce your knowledge of the skin: All content published on Kenhub is reviewed by medical and anatomy experts. The information we provide is grounded on academic literature and peer-reviewed research. Kenhub does not provide medical advice. You can learn more about our content creation and review standards by reading our content quality guidelines. References: Haines, D. E., Mihailoff, G. A. (2018). Fundamental neuroscience for basic and clinical applications. Philadelphia, PA: Elsevier. Moore, K. L., Dalley, A. F., & Agur, A. M. R. (2014). Clinically Oriented Anatomy (7th ed.). Philadelphia, PA: Lippincott Williams & Wilkins. Netter, F. (2019). Atlas of Human Anatomy (7th ed.). Philadelphia, PA: Saunders. Standring, S. (2016). Gray's Anatomy (41tst ed.). Edinburgh: Elsevier Churchill Livingstone. Tamura, R., Yoshida, K., & Toda, M. (2019). Current understanding of lymphatic vessels in the central nervous system. Neurosurgical Review, 43(4), 1055–1064. ... Article, review and layout: Jana Vaskovic Nicola McLaren Illustrations: Digestive system (anterior view) - Begoña Rodriguez Skeletal system (an overview) - Irina Münstermann Cardiovascular system (a diagram) - Begoña Rodriguez Respiratory system (a diagram) - Begoña Rodriguez Nervous system (an overview) - Begoña Rodriguez Cranial nerves (a diagram) - Paul Kim Digestive system (a diagram) - Begoña Rodriguez Organs of the endocrine system (a diagram) - Begoña Rodriguez Lymphatic system (a diagram) - Begoña Rodriguez Integumentary system (a diagram) - Paul Kim Human body systems: want to learn more about it? Our engaging videos, interactive quizzes, in-depth articles and HD atlas are here to get you top results faster. What do you prefer to learn with? "I would honestly say that Kenhub cut my study time in half." – Read more. 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