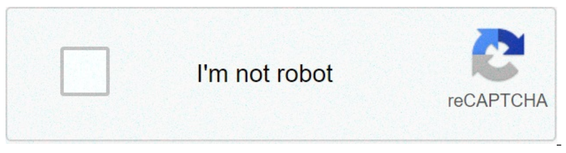

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List the components of the integumentary system

The integumentary system consists of the skin, hair, nails, glands, and nerves. Its main function is to act as a barrier to protect the body from the outside world. It also functions to retain body fluids, protect against disease, eliminate waste products, and regulate body temperature. In order to do these things, the integumentary system works with all the other systems of your body, each of which has a role to play in maintaining the internal conditions that a human body needs to function properly. Functions of the Integumentary System The integumentary system has many functions, most of which are involved in protecting you and regulating your body's internal functions in a variety of ways: Protects the body's internal living tissues and organs Protects against invasion by infectious organisms Protects the body from dehydration Protects the body against abrupt changes in temperature Helps dispose of waste materials Acts as a receptor for touch, pressure, pain, heat, and cold Stores water and fat How does the integumentary system work with other systems? Your body is a complicated system that consists of many subsystems that help to keep it functioning properly. These subsystems serve a variety of purposes and require needed materials to function properly, as well as means of communicating information to other parts of the body. Thus, the skin and other parts of the integumentary system work with other systems in your body to maintain and support the conditions that your cells, tissues, and organs need to function properly. The skin is one of the first defense mechanisms in your immune system. Tiny glands in the skin secrete oils that enhance the barrier function of the skin. Immune cells live in the skin and provide the first line of defense against infections. By helping to synthesize and absorb vitamin D, the integumentary system works with the digestive system to encourage the uptake of calcium from our diet. This substance enters the bloodstream though the capillary networks in the skin. Healthy functioning of your skin also is related to the digestive system because the digestion and assimilation of dietary fats and oils are essential for the body to be able to make the protective oils for the skin and hair. The integumentary system also works closely with the circulatory system and the surface capillaries through your body. Because certain substances can enter the bloodstream through the capillary networks in the skin, patches can be used to deliver medications in this manner for conditions ranging from heart problems (nitroglycerin) to smoking cessation (nicotine patches). The skin also is important in helping to regulate your body temperature. If you are too hot or too cold, your brain sends nerve impulses to the skin, which has three ways to either increase or decrease heat loss from the body's surface: hairs on the skin trap more warmth if they are standing up, and less if they are lying flat; glands under the skin secrete sweat onto the surface of the skin in order to increase heat loss by evaporation if the body is too hot; capillaries near the surface can open when your body needs to cool off and close when you need to conserve heat. Your skin plays a vital role in your body as regards the sense of touch. The nervous system depends on neurons embedded in your skin to sense the outside world. It processes input from your senses, including touch, and initiates actions based on those inputs. For example, when you stub your toe, nerve cells in the foot send signals up the leg, through the spinal cord, and up into the brain. The nerve cell connections in the brain sense these signals as pain. As well as interacting with the body systems as explained above, the integumentary system also contributes to numerous physiological processes, especially those involved in the regulation of the body's internal environment so as to maintain a stable condition. An example is provided by the way that the skin helps in temperature regulation by changes in the pattern of blood supply to the skin and by sweating, as mentioned above. © Copyright 1996-2013 5: The Integumentary System (Skin) Functions of the Integumentary System The Epidermis (thin outer layer of skin) The Dermis (thick inner layer of skin) Connective tissue and Membranes Roots, suffixes, and prefixes Cancer Focus Related Abbreviations and Acronyms Further ResourcesThis is the skin, and skin derivatives; (hair, nails, glands and receptors). The Integumentary system has many functions: Protects the body's internal living tissues and organs Protects against invasion by infectious organisms Protects the body from dehydration Protects the body against abrupt changes in temperature Helps dispose of waste materials Acts as a receptor for touch, pressure, pain, heat and cold Stores water, fat, and vitamin D. The skin has two main layers, the epidermis and the dermis: The Epidermis (thin outer layer of skin)The Epidermis itself is made up of many layers. The basale stratum is the only layer capable of cell division 'pushing up' cells to replenish the outer layer which is constantly shedding dead cells. The Epidermis does not contain blood vessels (non-vascular). It contains the pigment melanin which gives skin colour and allows the skin to tan, uneven distribution of melanin causes 'freckles'. The protein keratin stiffens epidermal tissue to form finger nails. Nails grow from a thin area called the 'NAIL MATRIX', growth of nails is about 1 mm per week on average. The lUNULA is the crescent shaped area at the base of the nail, this is a lighter colour as it mixes with the matrix cells. The epidermis.contains different types of cells, the most common are; squamous cells which are flat, scaly cells on the surface of the skin, basal cellswhich are round cells, and melanocytes which give the skin its colour. The epidermis also contains Langerhan's cells, these are formed in the bone marrow and then migrate to the epidermis. They work in conjunction with other cells to fight foreign bodies as part of the body's immune defense system. Granstein cells play a similar role.The Dermis (thick inner layer of skin)The dermis consists of blood vessels, connective tissue, nerves, lymph vessels, glands, receptors, hair shafts. The dermis has two layers, the upper papillary and lower reticular layers. The Papillary is the upper layer of the dermis, it has ridges and valleys causing finger prints. It contains receptors which communicate with the Central Nervous System, these include touch, pressure, hot, cold and pain receptors. These are not evenly distributed over the body, for example there are more on the lips and finger tips making them more sensitive. The reticular layer is made of dense elastic fibers (connective tissue), this houses hair follicles, nerves, and certain glands. The dermis contains several important glands. The sebaceous glands located near the hair follicles secrete oil to keep skin and hair soft and moist. The sudorferous glands secrete sweat to regulate temperature and are located under the dermis with ducts to the surface. The ceruminous glands secrete wax to stop dust entering the ear. HAIR There is hair on every part of body (except palms and soles), this helps maintain body temperature. Eye lashes filter out harmful particles. Hair grows from follicles that contain the lower shaft and root of the hair. The hair shaft projects through the dermis and epidermis and is kept soft by the sebaceous glands. Hair colour is determined by the concentration of melanin. There are tiny muscles attached to the follicles (arrector pili), when cold or frightened these tighten forming 'goose pimples'. Anatomy of a skin. Short animation narrated by Dannishi. Source: tissue and MembranesThese are not necessarily part of the Integumentary System, and are general to many of the other systems of the body. Connective tissues support and protect the body's organs, and bind organs together. They usually are highly vascular (rich blood supply) and contain fibres. There are many types of connective tissue, for example loose connective tissue occurs around organs and attaches the skin to the underlying tissues. Dense connective tissues are tougher, for example tendons attach muscles to bones. Membranes Mucous membranes line a body cavity that opens directly to the exterior, preventing the cavity from drying out e.g. in the mouth. Serous membranes line a body cavity that does not directly open to the outside, and provide lubrication so that organs can move more easily e.g. the pleura is a membrane that lines the thoracic cavity and protects the lungs. Roots, suffixes, and prefixesMost medical terms are comprised of a root word plus a suffix (word ending) and/or a prefix (beginning of the word). Here are some examples related to the Integumentary System. For more details see Chapter 4: Understanding the Components of Medical Terminology componentmeaningexample CUT-skin subcutaneous layer = layer below the skin DERMA-skin dermatology = study of the skin and its diseases EPI-upon epidermis = layer above the dermis LIPO-fat lipoatrophy = atrophy of fat below the skin MELAN-black melanin = the black pigment in the skin ONYCH-nail onychectomy = excision of a nail PACHY-thick pachyderma = abnormal thickening of skin SCLERO-hand / tough scleroderma = chronic hardening of the skin SUDOR-sweat sudorific = an agent that promotes sweat -ITISinflammation dermatitis = inflammation of the skin -OMAtumour melanoma = black coloured skin tumour -OSIScondition / disease dermatophytosis = a fungal infection of the skin Cancer Focus Overview of Skin Cancer Skin cancer is the most common type of cancer and accounts for half of all new cancers in Western populations. It occurs more often in people with light coloured skin who have had a high exposure to sunlight. The two most frequent types of skin cancer are Basal Cell Carcinomas and Squamous Cell Carcinoma (often grouped under "non-melanoma skin cancer"). The third most frequent skin cancer is Melanoma, this is a malignancy of the cells which give the skin it's colour (melanocytes). In addition there are a number of other, less common cancers starting in the skin including Merkel cell tumours, cutaneous lymphomas, and sarcomas (see the pages on sarcoma and lymphoma in this guide). Internet Resources for Skin Cancer Melanoma Melanoma is a malignancy of the skin in which melanocytes (the cells which give the skin it's colour) become cancerous. Melanoma occurs most frequently in white people, and is rare in people with dark skin; it is usually found in adults, though occasionally melanoma may develop in children and adolescents. Over exposure to sunlight can cause skin changes which can lead to melanoma. Half of all melanomas are thought to arise in a benign (non-cancerous) pigmented nevus (a mole). Moles are very common and normally change only slightly over time; however in melanoma there may be a more rapid increase in size - symptoms include a darker or variable discoloration, itching, and possibly ulceration and bleeding. Internet Resources for Melanoma Basal Cell Carcinoma (BCC) This is where the basal cells become cancerous; basal cells are found in the epidermis (the outermost layer of skin). This is the most common type of skin cancer which is usually highly curable when detected early. Internet Resources for Basal Cell Carcinoma Squamous Cell Carcinoma (SCC) A type of skin cancer arising in squamous cells (the flat, scaly cells on the surface of the skin). Cure rates are very hight when detected and treated early. Internet Resources for Squamous Cell Carcinoma (skin) Merkel cell cancer Merkel cell cancer (also known as trabecular cancer, or neuroendocrine cancer of the skin) is a rare type of malignancy developing on or just beneath the skin. These tumours can develop at any age, but the peak incidence is between ages 60 - 80. They are more frequent in white people, the most common sites of diseases are the face or scalp and other areas of high sun exposure. Internet Resources for Merkel Cell Cancer Related Abbreviations and Acronyms BCCBasal Cell Carcinoma LMMLentigo Maligna Melanoma MMMalignant Melanoma NBCCSNevoid basal cell carcinoma syndrome NMNodular Melanoma NMSCNon Melanoma Skin Cancer SCSubcutaneous SCCSquamous Cell Carcinoma SSMSuperficial Spreading Melanoma UVRUltra Violet Radiation Further Resources (4 links) Integumentary System OverviewYouTubeLecture by 'bullharrier' Skin - Self Test questions WebAnatomy, University of MinnesotaTest your anatomy knowledge with these interactive questions. Includes different question types and answers. Skin (Integumentary System) University of Pennsylvania Health SystemDetailed guide with diagrams, from the ADAM Body Guide. The Integumentary System Rapid Learning CenterDetails of the layers and sub-layers of skin. This guide by Simon CotterillFirst created 4th March 1996Last modified: 1st February 2014 Art for All Eras This is Maud Stevens Wagner, a tattoo artist who is pictured in Figure \(\PageIndex{1}\). Maud was pictured in 1907. Clearly, tattoos are not just a late 20th and early 21st-century trend. They have been popular in many eras and cultures. Tattoos literally illustrate the biggest organ of the human body: the skin. The skin is very thin, but it covers a large area — about 2 m2 in adults. The skin is the major organ in the integumentary system. Figure \(\PageIndex{1}\): Maud Stevens Wagner In addition to the skin, the integumentary system includes the hair and nails, which are organs that grow out of the skin. Because the organs of the integumentary system are mostly external to the body, you may think of them as little more than accessories, like clothing or jewelry, but they serve vital physiological functions. They provide a protective covering for the body, sense the environment, and help the body maintain homeostasis. The skin is remarkable not only because it is the body's largest organ. It is remarkable for other reasons as well. The average square inch of skin has 20 blood vessels, 650 sweat glands, and more than a thousand nerve endings. It also has an incredible 60,000 pigment-producing cells. All of these structures are packed into a stack of cells that is just 2 mm thick, or about as thick as the cover of a book. Although the skin is thin, it consists of two distinct layers, the epidermis and dermis, as shown in Figure \(\PageIndex{2}\). Figure \(\PageIndex{2}\): The epidermis is the thinner outer layer of skin which is composed of tightly packed epithelial cells. The dermis is the thicker inner layer of skin that contains structures such as blood vessels, hair follicles, and sweat glands. The outer layer of skin is the epidermis. This layer is thinner than the inner layer, the dermis. The epidermis consists mainly of epithelial cells, called keratinocytes, which produce the tough, fibrous protein keratin. The innermost cells of the epidermis are stem cells that divide continuously to form new cells. The newly formed cells move up through the epidermis toward the skin surface, while producing more and more keratin. The cells become filled with keratin and die by the time they reach the surface, where they form a protective, waterproof layer. As the dead cells are shed from the surface of the skin, they are replaced by other cells that move up from below. The epidermis also contains melanocytes, the cells that produce the brown pigment melanin, which gives skin most of its color. Although the epidermis contains some sensory receptor cells, called Merkel cells, it contains no nerves, blood vessels, or other structures. The dermis is the inner and thicker layer of skin. It consists mainly of tough connective tissue and is attached to the epidermis by collagen fibers. The dermis contains many structures, as shown in the figure above, including blood vessels, sweat glands, and hair follicles, which are structures where hairs originate. In addition, the dermis contains many sensory receptors, nerves, and oil glands. The skin has multiple roles in the body. Many of these roles are related to homeostasis. The skin's main functions include preventing water loss from the body and serving as a barrier to the entry of microorganisms. Another function of the skin is synthesizing vitamin D, which occurs when the skin is exposed to ultraviolet (UV) light. Melanin in the epidermis blocks some of the UV light and protects the dermis from its damaging effects. Another important function of the skin is helping to regulate body temperature. For example, when the body is too warm, the skin lowers body temperature by producing sweat, which cools the body when it evaporates. The skin also increases the amount of blood flowing near the body surface through vasodilation (widening of blood vessels), bringing heat from the body core to radiate out into the environment. Hair is a fiber that is found only in mammals. It consists mainly of keratin-producing keratinocytes. Each hair grows out of a follicle in the dermis. By the time the hair reaches the surface, it consists mainly of dead cells filled with keratin. Hair serves several homeostatic functions. Head hair is important in preventing heat loss from the head and protecting its skin from UV radiation. Hairs in the nose trap dust particles and microorganisms in the air and prevent them from reaching the lungs. Hair all over the body provides sensory input when objects brush against it or it sways in moving air. Eyelashes and eyebrows protect the eyes from water, dirt, and other irritants. Fingernails and toenails consist of dead keratinocytes that are filled with keratin. The keratin makes them hard but flexible, which is important for the functions they serve. Nails prevent injury by forming protective plates over the ends of the fingers and toes. They also enhance sensation by acting as a counterforce to the sensitive fingertips when objects are handled. In addition, fingernails can be used as tools. The skin and other parts of the integumentary system work with other organ systems to maintain homeostasis. The skin works with the immune system to defend the body from pathogens by serving as a physical barrier to microorganisms. Vitamin D is needed by the digestive system to absorb calcium from food. By synthesizing vitamin D, the skin works with the digestive system to ensure that calcium can be absorbed. Most immune cells, such as B and T cells have Vitamin D receptors. Vitamin D levels in the body are associated with autoimmune diseases and immune deficiencies. To control body temperature, the skin works with the cardiovascular system to either lose body heat or conserve it through vasodilation or vasoconstriction. To detect certain sensations from the outside world, the nervous system depends on nerve receptors in the skin. You already know that a trip to be beach could result in a nasty sunburn. Check out this video to learn more about the different types of sunscreen and why they should be used daily: