**Integumentary system**:

The **integumentary system** is the [organ system](http://en.wikipedia.org/wiki/Organ_system) that protects the body from various kinds of damage, such as loss of water or abrasion from outside. The system comprises the [skin](http://en.wikipedia.org/wiki/Skin) and its appendages (including [hair](http://en.wikipedia.org/wiki/Hair), [scales](http://en.wikipedia.org/wiki/Scale_(zoology)), [feathers](http://en.wikipedia.org/wiki/Feathers), [hooves](http://en.wikipedia.org/wiki/Hoof), and [nails](http://en.wikipedia.org/wiki/Nail_(anatomy))). The integumentary system has a variety of functions; it may serve to waterproof, cushion, and protect the deeper tissues, excrete wastes, and regulate [temperature](http://en.wikipedia.org/wiki/Core_temperature), and is the attachment site for [sensory receptors](http://en.wikipedia.org/wiki/Sensory_receptor) to detect pain, sensation, pressure, and temperature. In most terrestrial vertebrates with significant exposure to sunlight, the integumentary system also provides for [vitamin D](http://en.wikipedia.org/wiki/Vitamin_D) synthesis.

**Structure:**

The skin is the largest organ in the body. In humans, it accounts for about 12 to 15 percent of total body weight and covers 1.5-2m2 of surface area.  It distinguishes, separates, and protects the organism from its surroundings. Small-bodied invertebrates of aquatic or continually moist habitats [respire](http://en.wikipedia.org/wiki/Respiration_(physiology)) using the outer layer (integument). This gas exchange system, where gases simply diffuse into and out of the [interstitial fluid](http://en.wikipedia.org/wiki/Interstitial_fluid), is called **integumentary exchange**.

The human skin (integument) is composed of a minimum of three major layers of tissue: the [epidermis](http://en.wikipedia.org/wiki/Epidermis_(skin)); [dermis](http://en.wikipedia.org/wiki/Dermis); and [hypodermis](http://en.wikipedia.org/wiki/Hypodermis). The epidermis forms the outermost layer, providing the initial barrier to the external environment. Beneath this, the dermis comprises two sections, the papillary and reticular layers, and contains connective tissues, vessels, glands, follicles, hair roots, sensory nerve endings, and muscular tissue.

The deepest layer is the hypodermis, which is primarily made up of [adipose tissue](http://en.wikipedia.org/wiki/Adipose_tissue). Substantial collagen bundles anchor the dermis to the hypodermis in a way that permits most areas of the skin to move freely over the deeper tissue layers.

**Epidermis**

This is the top layer of skin made up of [epithelial cells](http://en.wikipedia.org/wiki/Epithelial_cells). It does not contain blood vessels. Its main function is protection, absorption of nutrients, and homeostasis. In structure, it consists of a keratinized stratified [squamous epithelium](http://en.wikipedia.org/wiki/Squamous_epithelium" \o "Squamous epithelium) comprising four types of cells: [keratinocytes](http://en.wikipedia.org/wiki/Keratinocytes" \o "Keratinocytes),[melanocytes](http://en.wikipedia.org/wiki/Melanocytes), [Merkel cells](http://en.wikipedia.org/wiki/Merkel_cells), and[Langerhans' cells](http://en.wikipedia.org/wiki/Langerhans%27_cells). The major cell of the epidermis is the keratinocyte, which produces keratin. [Keratin](http://en.wikipedia.org/wiki/Keratin) is a fibrous protein that aids in protection. Keratin is also a waterproofing protein. Millions of dead keratinocytes rub off daily. The majority of the skin on the body is keratinized, meaning [waterproofed](http://en.wikipedia.org/wiki/Waterproofed). The only skin on the body that is non-keratinized is the lining of skin on the inside of the mouth. Non-keratinized cells allow water to "stay" atop the structure.

The protein keratin stiffens epidermal tissue to form [fingernails](http://en.wikipedia.org/wiki/Fingernail). Nails grow from thin area called the [nail matrix](http://en.wikipedia.org/wiki/Matrix_(nail)); growth of nails is 1 mm per week on average. The [lunula](http://en.wikipedia.org/wiki/Lunula_(anatomy)" \o "Lunula (anatomy)) is the crescent-shape area at the base of the nail, this is a lighter color as it mixes with the matrix cells.

**Dermis:**

The dermis is the middle layer of skin, composed of dense irregular connective tissue and [areolar connective tissue](http://en.wikipedia.org/wiki/Loose_connective_tissue" \o "Loose connective tissue) such as collagen with [elastin](http://en.wikipedia.org/wiki/Elastin" \o "Elastin) arranged in a diffusely bundled and woven pattern. The dermis has two layers. One is the papillary layer which is the superficial layer and consists of the areolar connective tissue. The other is the reticular layer which is the deep layer of the dermis and consists of the dense irregular connective tissue. These layers serve to give elasticity to the integument, allowing stretching and conferring flexibility, while also resisting distortions, wrinkling, and sagging. The dermal layer provides a site for the endings of blood vessels and nerves. Many [chromatophores](http://en.wikipedia.org/wiki/Chromatophores" \o "Chromatophores) are also stored in this layer, as are the bases of integumental structures such as [hair](http://en.wikipedia.org/wiki/Hair), [feathers](http://en.wikipedia.org/wiki/Feathers), and [glands](http://en.wikipedia.org/wiki/Glands)

**Hypodermis**

The hypodermis is the innermost and thickest layer of the skin. It invaginates into the dermis and is attached to the latter, immediately above it, by collagen and elastin fibres. It is essentially composed of a type of cell specialised in accumulating and storing fats, known as adipocytes. These cells are grouped together in lobules separated by connective tissue.

**Functions**

* Protect the body’s internal living [tissues](http://en.wikipedia.org/wiki/Tissue_(biology)) and organs
* Protect against invasion by [infectious](http://en.wikipedia.org/wiki/Infection) organisms
* Protect the body from [dehydration](http://en.wikipedia.org/wiki/Dehydration)
* Protect the body against [abrupt changes](http://en.wikipedia.org/wiki/Weather) in [temperature](http://en.wikipedia.org/wiki/Temperature), maintain [homeostasis](http://en.wikipedia.org/wiki/Homeostasis)
* Help [excrete](http://en.wikipedia.org/wiki/Excretion) waste materials through [perspiration](http://en.wikipedia.org/wiki/Perspiration)
* Act as a receptor for touch, pressure, pain, heat, and cold (see [Somatosensory system](http://en.wikipedia.org/wiki/Somatosensory_system" \o "Somatosensory system))
* Protect the body against [sunburns](http://en.wikipedia.org/wiki/Sunburn) by secreting melanin
* Generate [vitamin D](http://en.wikipedia.org/wiki/Vitamin_D) through exposure to [ultraviolet](http://en.wikipedia.org/wiki/Ultraviolet) [light](http://en.wikipedia.org/wiki/Light)
* Store [water](http://en.wikipedia.org/wiki/Water), [fat](http://en.wikipedia.org/wiki/Fat), glucose, and [vitamin D](http://en.wikipedia.org/wiki/Vitamin_D)
* Maintenance of the body form
* Formation of new cells from stratum germanium to repair minor injuries
* Protect from [UV](http://en.wikipedia.org/wiki/UV) rays.