

## Clinical update: Skin

The skin is a functional system of tissues and cells that provides protection from the external environment. The skin is comprised of two main layers - the epidermis and dermis - with subcutaneous tissue beneath.

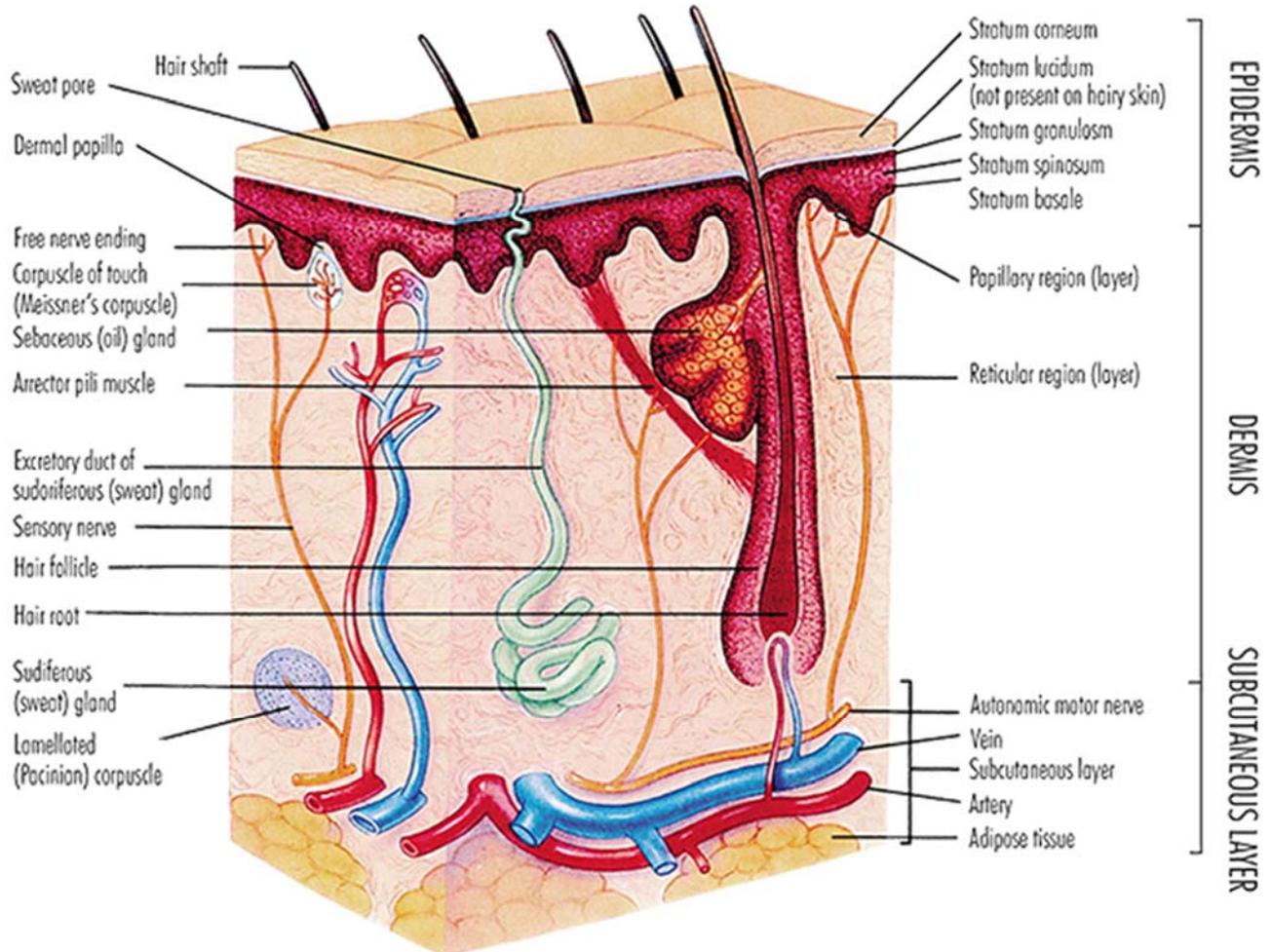


Figure 1 - Structure of the skin

### Epidermis

The epidermis is the thin outer layer that is composed of stratified squamous epithelium. There are four different types of cells found in the epidermis:

- keratinocytes
- melanocytes
- Langerhans cells
- Merkel cells

The epidermis is organised into four sublayers or strata:

- stratum basale (basal layer)
- stratum spinosum (spinous layer)
- stratum granulosum (granular layer)
- stratum corneum (keratinised or horny layer)

Newly formed cells in the stratum basale move up towards the surface of the skin pushing old cells upwards. The old cells rise to the surface accumulating keratin as they move. The old cells die, flatten out

and overlap to form a tough membrane on the outer surface of the epidermis. Eventually these cells are shed off as calluses or collections of dead skin and are replaced by underlying cells that also become filled with keratin. This process is known as keratinisation and takes between two and four weeks to complete.

## Dermis

The dermis, located beneath the epidermis, is considerably thicker because it is composed of connective tissue containing elastic fibres (elastin) and protein fibres (collagen). The elastin and collagen fibres give the skin pliability but are resistant to stretching. The dermis contains hair follicles, nails, sweat glands, sebaceous glands, blood vessels and nerves.

The two sublayers of the dermis are:

- Papillary layer - a thin layer of loose connective tissue that lies beneath the epidermis. It contains capillaries that nourish the epidermis.
- Reticular layer - a dense layer of connective tissue that consists of elastin and collagen fibres.

Elastin and collagen fibres give the skin pliability. Ageing, hormones and ultraviolet rays cause degeneration of elastin and collagen fibres, resulting in wrinkles and sagging of the skin.

## Subcutaneous tissue

The subcutaneous tissue, also called the superficial fascia or hypodermis, is found beneath the dermis. Subcutaneous tissue consists of adipose (fat) and connective tissue and accommodates large blood vessels and nerves. Fibres in the dermis extend downwards into the subcutaneous tissue connecting the skin to it. In turn, the subcutaneous tissue connects to underlying muscles, bones and tissue.

## Skin functions

The primary functions of the skin are:

- protection
- regulation of body temperature
- excretion
- detection of stimuli
- synthesis of vitamin D
- blood reservoir

## Protection

The skin, as a physical barrier to the external environment, protects the body from injury, infection, loss or gain of bodily moisture and UV radiation. The skin's layers of cells provide a protective barrier to underlying body tissues and organs against abrasion and other injuries. Lipid secretions produced by the sebaceous glands assist in preventing loss and gain of bodily moisture. Sebaceous glands in the dermis secrete sebum to lubricate the hair and repel water from the skin. Protection against UV radiation is provided by melanocytes. These pigment-forming cells located at the base of the epidermis produce melanin. Melanin absorbs UV light to protect the epidermis and dermis from the harmful effects of UV light. Exposure to ultraviolet rays stimulates the melanocytes to produce extra melanin resulting in tanned skin.

## Regulation of body temperature

The skin plays a significant role in maintaining body temperature. Sweat glands and blood vessels act as temperature regulators of the skin. Changes in body temperature are detected by receptors in the skin that send nerve impulses to the brain, which respond by sending output nerve impulses back to the sweat glands and the blood vessels. Perspiration is constantly produced by sweat glands. The amount of perspiration sweat glands release is determined by changes in body temperature. An increase in body temperature causes sweat glands to produce perspiration more rapidly. A decrease in body temperature causes sweat glands to produce perspiration less rapidly. Blood vessels in the skin dilate or constrict to assist in maintaining body temperature. When body temperature rises, blood vessels dilate increasing blood flow through the skin, allowing heat to radiate into the external environment. A lowered body

temperature causes blood vessels to constrict decreasing blood flow through the skin, minimising radiation of heat into the external environment.

### Excretion

Sweat glands play a small part in the removal of wastes, such as nitrogen, sodium and salt, from the bloodstream. These wastes are present in perspiration secreted by the sweat glands.

### Detection of stimuli

Nerve endings in the epidermis and dermis are called receptors. Receptors perform an important sensory function as they detect stimuli in the external environment. They are specifically designed to respond to temperature, pressure, pain or touch. Some areas of the body have more receptors than others, for example, the fingertips have a vast number of touch receptors, which makes them extra sensitive. Pain receptors are evenly distributed all over the skin and are crucial in preventing injury. The detection of other sensations such as wetness, softness and sharpness are caused by stimulation of different types of receptors at the same time.

### Synthesis of vitamin D

Vitamin D is an essential precursor to calcitriol, a hormone required for calcium absorption and bone development. While vitamin D may be obtained through diet, ninety percent of vitamin D is produced in the skin. Only a small amount of UV exposure is required for vitamin D production.

### Blood reservoir

Skin serves as a blood reservoir as it contains many blood vessels. The blood vessels supply nutrients to the cells in the basal layer and also remove waste products.

### Skin facts

- The skin of an average adult weighs about 4 kilograms
- Adult skin surface area is approximately 2 square metres
- Skin cells replace themselves every 28 days
- Old skin cells make up the majority of household dust
- About 70% of skin is water

### Accessory structures

Accessory structures of the skin include:

- hair
- sebaceous glands
- exocrine glands
- sweat glands
- nails

### Healing properties

Skin has exceptional self-healing properties, especially when only the epidermis is damaged. When injury damages the dermis healing can be achieved if the injured area is in a region of the body with a rich blood supply. Deeper wounds that penetrate to underlying tissue heal by scar formation. Scar tissue is deficient in infection resisting and metabolic functions of healthy skin.

Granulation tissue - newly growing capillaries and connective tissue form granular projections on the surface of ulcers or healing wounds.

Scar tissue - dense fibrous contracted connective tissue that has formed over a healed wound. Scar tissue is also referred to as cicatricial tissue.

Keloid scar - raised red or pink fibrous scar tissue that is the result of excessive tissue repair at the edges of a wound or incision. Keloid scars are more common in people with dark pigmented skin compared to fair skin.

## SunSmart UV Alert

The SunSmart UV Alert is a tool you can use to protect yourself from ultraviolet (UV) radiation. It lets you know the time during that day you need to be SunSmart. The Alert is issued by the Bureau of Meteorology when the UV index is forecast to reach 3 or above. At that level, it can result in damage to your skin and lead to skin cancer.

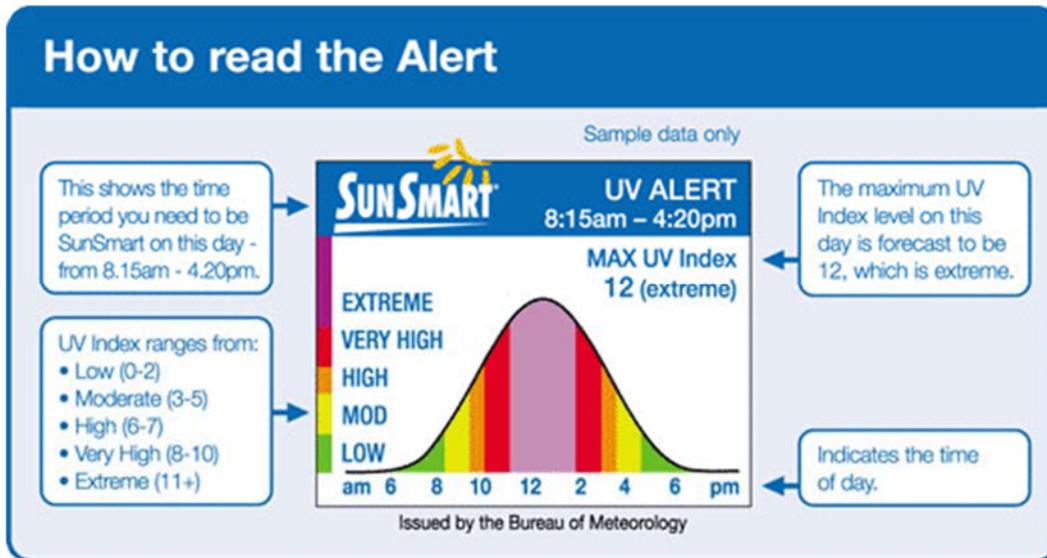


Figure 2 - How to read the alert

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