London School of Massage

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Integumentary System (Skin)

At the end of this section you will understand and appreciate:

- Structure and function of skin
- Conditions affecting skin
- Structure and functions of nails
- How nail grows and conditions affecting its development
- Structure and function of hair
- Stages of hair growth
- Different types of body hair

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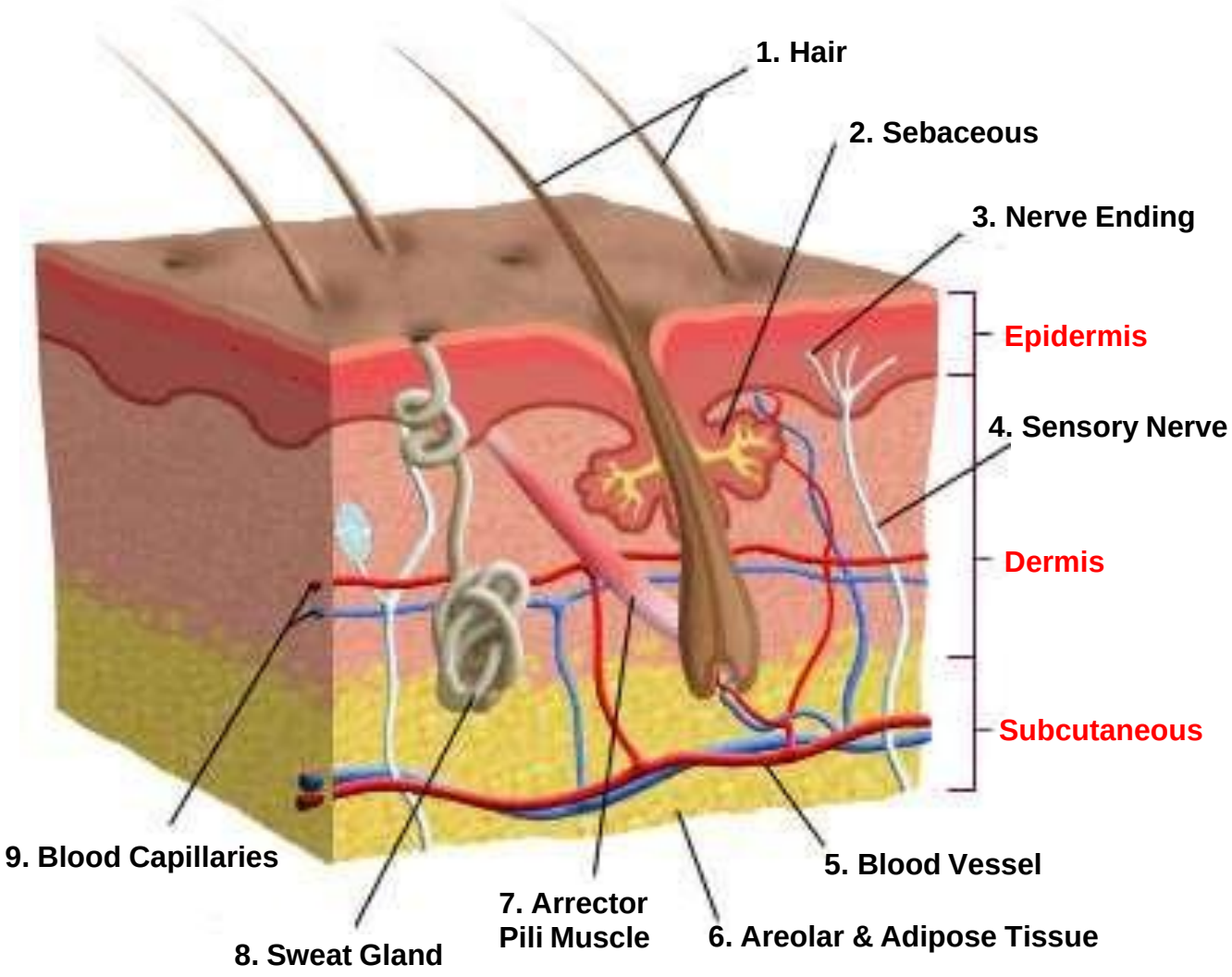
The Skin

The skin is the **LARGEST organ** in the body. Its thickness varies over the body being thin over the eye lid to thick on the soles and palms.

STRUCTURE OF THE SKIN

The skin can be divided in to two zones:

1. **Epidermis**
2. **Dermis**
3. **(Subcutaneous Layer)**



Structure of the Skin

THE EPIDERMIS (Outer Skin)

This consists of 5 layers. These are:

1. **Stratum <u>Corneum</u> (Surface layer)** - hardened cells. The cells of this layer are constantly being shed, a process called **DESQUAMATION**.

2. **Stratum <u>Lucidum</u> (Clear layer)** - De-nucleated cells. The membrane is more visible.

3. **Stratum <u>Granulosum</u> (Granular layer)** - Cells have a nucleus, but cell membranes are dying. **KERITINISATION** (laying down of keratin) takes place in this layer.

4. **Stratum <u>Spinosum</u> (Malpighian Layer**) - Cells are living and membranes are intact. Cells are capable of mitosis under friction or pressure.

5. **Stratum <u>Germinativum</u>** (**Basal Layer**) - primary site of cell division (Mitosis). Layer contains melanin – produced by **<u>Melanocytes</u>**.

Takes 28 to 30 Days

It is estimated that the Epidermis is replaced every 28 - 30 days.

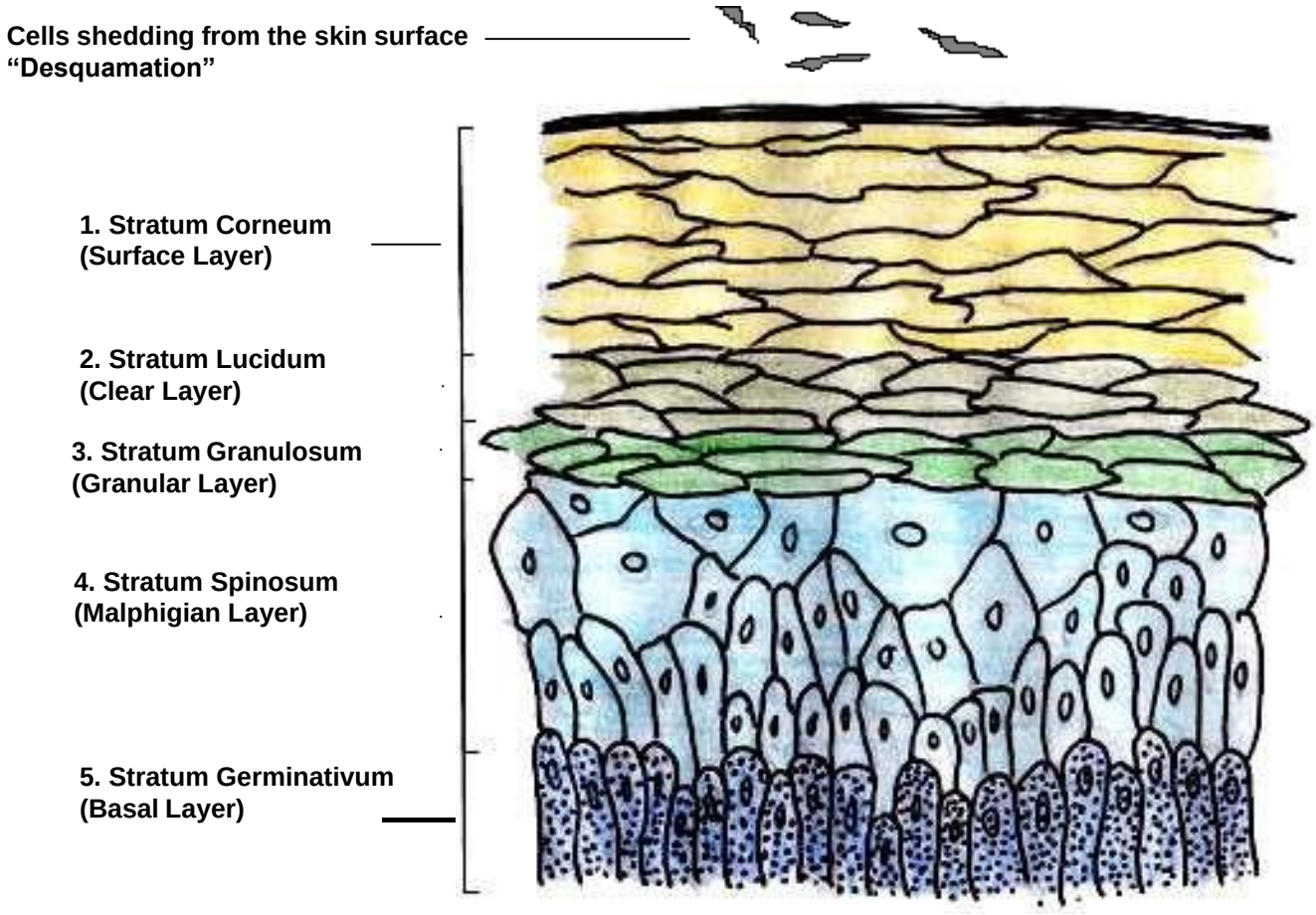


Diagram of the 5 layers of the Epidermis

THE DERMIS

The dermis consists of tough connective tissue as well as cells like **Fibroblasts, Mast Cells, Histeocytes & Leucocytes.** It contains:

1. **Blood** and **lymph** vessels: A fine network of blood vessels exists to provide the dermis with nutrients. The Epidermis has no direct blood supply.

2. **Sweat Glands**

   a) **Apocrine** - These excrete a **milky fluid** which results in body odour when it mixes with **bacteria** on the skin surface. Found in the axilla (armpit) and genital areas.

   b) **Eccrine** - Responsible for the **EXCRETION** of **water, urea, salt and toxins**. They are involved in the heat regulation of the body which helps maintain core body temperature at 36.8 C. They are found in all parts of the body, especially the palms of the hands, soles of the feet and in the axilla.

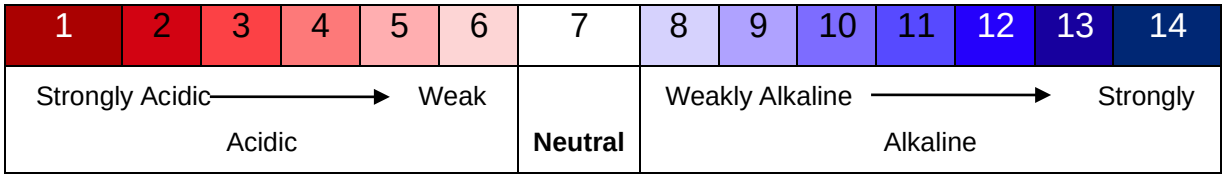
   Freshly produced sweat is sterile and inoffensive, but its decomposition by bacteria gives rise to its odour.

3. **Sebaceous glands** - Found in all parts of the body, esp. the **face**, **scalp** and **groin**. They secrete sebum (oily) into the hair follicle. This keeps it soft and pliable. It also provides some waterproofing and acts as an **antibacterial** and **antifungal** agent.

   ACID MANTLE: Sebum + Perspiration → Moisturiser + barrier against bacteria

   The pH of the skin **inhibits** bacterial growth and is between pH 4.5 – 5.6

   The pH is a scale used to measure the **ACIDITY** & **ALKALINITY** of a substance.



4. **Arrector Pili** - This is a **smooth** muscle attached to the hair follicle. The muscle contracts in times of cold / (fear) making the hair stand up. This traps air and prevents **heat** loss from the body.

5. **Sensory Nerves** - These are present in the skin and alert the brain to HEAT, COLD, PRESSURE, PAIN etc

SUBCUTANEOUS LAYER

SUBCUTANEOUS FAT - Provides **protection**, **insulation** and **storage**
The skin in maintaining temperature control relays information to the **HYPOTHALAMUS** in the brain. This houses the thermostatic control of the body and helps regulate body temperature.

THE FUNCTIONS OF THE SKIN

The functions of skin can be remembered as **"SHAPES VM"**

	Function	Description
S	***Secretion***	**Sebum** is a fatty substance secreted from the sebaceous gland on to the skin's surface. It keeps the skin supple and helps to waterproof it.
H	***Heat Regulation***	It is important for the body to have a constant internal temperature of 36.8 °C. The skin helps to maintain this temperature by: **Vasoconstriction**: This is the constriction of blood vessels in the skin and occurs when the body becomes cold. The blood vessels constrict reducing the flow of blood through the capillaries. Heat lost from the surface of the skin is therefore reduced. **Vasodilation**: This is the dilation of blood vessels in the skin and occurs when the body becomes too hot. The capillaries expand and the blood flow increases; this allows heat to be lost from the body by radiation. **Goose Bumps:** Contraction of the arrector pili muscle when we are cold causes the hairs to stand on end, keeping a layer of warm air close to the body. This contraction causes the skin to pucker giving the appearance of goose bumps. **Shivering** helps to warm the body as the contraction of the muscles produces heat within and increases internal temperature. **Sweating** from the production of sweat from eccrine glands helps cool the body as heat is lost when water evaporates from the skin.
A	***Absorption***	The skin is largely waterproof and absorbs very little, although certain substances are able to pass through the basal layer. Essential oils can pass through the hair follicles and into the bloodstream. Certain medications such as hormone replacement therapy can be given through patches placed on the skin. Ultraviolet rays from the sun are also able to penetrate through the basal layer
P	***Protection***	The skin protects the body by keeping harmful bacteria out and provides a covering for all the organs inside. It also protects underlying structures from the harmful effects of ultraviolet (UV) light. The other functions of the skin also help to protect the body **ACID MANTLE:** This is an acidic layer formed on the skin by: Sebum + Perspiration ⟶ Moisturiser + barrier against bacteria.
E	***Excretion***	Eccrine glands excrete sweat on to the skin's surface. Sweat consists of water, toxins and salts.
S	***Sensation***	The skin contains sensory nerve endings that transmit messages to the brain like **touch**, **temperature** and **pain**. These help us to respond to our surroundings as well as feel objects and their shapes.
V	***Vitamin D Formation***	UV rays from the sun penetrate through the skin's layers and activate a chemical found in the skin called **ergosterol**, which changes into vitamin D. Vitamin D is essential for healthy bones and deficiency can cause rickets, a condition in which the bones malformed. Vitamin D is also known as **7 – dehydro-cholesterol**
M	***Melanin Production***	Melanin is produced by **Melanocytes** in the Stratum Germinativum (Basal Layer) of the epidermis. This gives skin its colour and protects from the harmful rays of the sun / ultra violet (UV) light.

SKIN TYPES

Skin types vary from person to person and can be described as being normal, dry, oily, combination, sensitive, dehydrated or mature.

- **Normal**

This skin type will look healthy, clear and fresh. It is often seen in children, as external factors and ageing have not yet affected the condition of the skin, although the increased activity of hormones at puberty may cause the skin to become greasy. A normal skin type will look neither oily nor dry and will have a fine, even texture. The pores are small and the skin's elasticity is good so it feels soft and firm to the touch. It is usually free of spots and blemishes.

- **Dry**

This skin type is thin and fine and dilated capillaries can often be seen around the cheek and nose areas. The skin will feel and look dry because little sebum is being produced and it is also lacking in moisture. This skin type will often tighten after washing and there may be some dry, flaky patches. There will be no spots or comedones (blackheads) and no visible open pores. This skin type is prone to premature wrinkling, especially around the eyes, mouth and neck.

- **Oily**

This skin type will look shiny, dull and slightly yellowish (sallow) in colour because of the excess sebum production. Oily skin is coarse, thick and will feel greasy. Enlarged pores can be seen; these are due to the excess production and build-up of sebum. Open pores can let in bacteria, which cause spots and infections. Blocked pores often lead to comedones (blackheads). Oily skin tends to age more slowly, as the grease absorbs some of the UV rays and so can protect against its damaging effects. The sebum also helps to keep the skin moisturised and prevents drying.

- **Combination**

With this skin type there will be areas of dry, normal and greasy skin. Usually the forehead, nose and chin are greasy and are known as the T zone. The areas around the eyes and cheeks are usually dry and may be sensitive.

- **Young**

Young skin can usually be recognised as smooth, unblemished, wrinkle free and vibrant.

- **Mature**

This skin type is dry as the sebaceous and sweat glands become less active. The skin may be thin and wrinkles will be present. There are usually dilated capillaries, often around the nose and cheek areas. The bone structure can become more prominent as the adipose and supportive tissue become thinner. Muscle tone is often poor so the contours of the face become slack. Because of the poor blood circulation, waste products are removed less quickly so the skin may become puffy and pale in colour. Liver spots may appear on the face and hands.

SYMPTOMS OF SKIN DISEASES

General:

- Itching
- Redness
- Scratching
- Discolouration
- Blistering
- Pustules

SKIN CANCERS

There are 3 types of skin cancers which are caused by excessive exposure to **SUNLIGHT**.

Name	Description	
Basal Cell Carcinoma	Occurs on exposed parts of the skin, especially: **1. Nose** **2. Eye Lid** **3. Cheek**	
Squamous Cell Carcinoma	Squamous cells are those found on the surface of the body, on the top layer of skin. ▪ Caused by **SUNLIGHT**, **CHEMICALS** or **PHYSICAL IRRITANTS** ▪ Start small, grow rapidly, becoming raised.	
Malignant Melanoma	▪ Tumour of **MELANOCYTES** ▪ Usually develop a previously benign mole ▪ Start very small, become larger, bleed and spread	

EFFECTS OF MASSAGE ON SKIN

1. Improves skin look and quality by improving drainage
2. Improves skin circulation by vasodilation of surface blood capillaries
3. Increases of sweat thereby eliminating wastes from the body
4. Desquamation is increased thereby making the skin look fresh
5. Increase skin elasticity

DISORDERS AND DISEASES OF THE SKIN

Condition	Description	Picture
CONGENITAL		
Eczema	• Found all over the body but most often on the inside of the knee (in the popliteal space) and elbow joints, on the face, hands and scalp. • The skin becomes extremely dry and itchy causing great discomfort. • Skin has scaly dry patched with bleeding at points. Not contagious.	
Psoriasis	Chronic inflammatory skin disease characterised by red patches covered with silvery scales that are constantly shed. Size of scales varies from minute spots to quite large sheets of skin. Points of bleeding may occur beneath scales. Affects whole body or specific areas like face ad scalp. Not infectious.	
BACTERIAL		
Acne Vulgaris	Normally caused by hormonal imbalances which increase sebum production leading to blocked glands and infection. The skin has a shiny, sallow appearance with papules pustules and comedones. It is prone to open pores. Where pustules have cleared they often pitting and scarring. The main sites for infection are the face, back, chest and shoulders. Not contagious.	
Acne Rosacea	Gives a flushed reddened appearance. Occurs on the face, this condition can be aggravated by anything causing vasodilation – heat, sunshine, spicy food, alcohol, cold. Affects both men and women especially menopausal women. Not related to acne vulgaris. Not contagious	
Impetigo	A bacterial infection causing thin-rooted blisters which weep and leave a thick yellow crust. Highly contagious	
Folliculitis	Bacterial infection of the pilo-sebaceous duct (sebaceous gland hair follicle) causing inflammation common in adolescence. Possible link to acne vulgaris.	
Boils	A bacterial infection of the skin, causing inflammation around a hair follicle.	

Viral		
Warts	A small horny tumour found on the skin often on finger and thumbs. Caused by a viral infection. Highly contagious	
Verruca	These are warts found on the feet. Highly contagious.	
Herpes Simplex	A viral infection commonly known as cold sores; not confined to the mouth, can spread over the face and other parts of the body. Appears as small blisters which if left alone dry up leaving a crust which falls off. Highly contagious when active.	
Herpes Zoster	A viral infection commonly known as shingles. Adult form of chicken pox. Usually affects spinal nerves and one side of the thorax. Highly infectious.	
Fungal		
Tinea Corporis, **Tinea Pedis**	Infections which attach themselves to keratinised structures like the skin. Tinea corporis is commonly known as ringworm and can be found anywhere on the body. Tinea pedis is commonly known as athlete's foot.	
Candida	Yeast infections which skin vaginal and oral regions.	

Parasite Infections		
Pediculosis Capitis, Corporis, Pubis	The infestation with lice resulting in severe itching. This can occur on the head (capitis), body (corporis) and pubic (pubis) areas.	
Scabies	A contagious skin disease caused by the itch mite; characterised by persistent itching and skin irritation.	
Pigment Disorders		
Albinism	Complete lack of melanocytes resulting in lack of pigmentation in skin, hair and eyes. Suffers have poor eyesight and extreme ultraviolet sensitivity. This is an inherited condition.	
Vitiligo	A complete loss of colour in well-defined areas of the face and limbs. A form of leucoderma (an abnormal whiteness of the skin due to absence of pigmentation); begins in large patches but may converge to form fairly large areas; most obvious in darker skins.	
Chloasma	Butterfly mask often caused by pregnancy and the contraceptive pill; a pigmentation condition involving the upper cheeks, nose and occasionally forehead. Discolouration usually disappears spontaneously at the end of the pregnancy.	
General Disorders		
Broken Capillaries	Dilated capillaries on a fin skin texture often affecting large areas of the face. The skin responds fiercely to stimulation and permanent dilated vessels are apparent, particularly on the upper cheeks and nose. Ruptured blood vessels assume a line like appearance in surface tissues and can become bulbous and blue in colour due to the congestion in the blood vessels of the area	
Urticaria – Hives, nettle rash	Often an allergic reaction. Characterised by wheals or welts of pinkish colour produced by extreme dilation of capillaries. Very itchy. Can lead to secondary infection by bacteria through scratching.	

Comedones	Commonly known as blackheads, these are caused by a build up of sebaceous secretions which have been trapped in the hair follicles and subsequently dried out and hardened. The colour comes from oxidation. Common in puberty	
Dermatitis	An allergic inflammation of the skin characterised by erythema- redness of the skin, itching and various skin lesions. Commonly known as contact dermatitis, there are many causes including plants, drugs, clothing, cosmetics and chemicals. Not contagious	
Xanthoma	Is a deposit of yellowish cholesterol-rich material in tendons and other body parts.	
Methicillin-resistant Staphylococcus Aureus (MRSA)	A serious and potentially fatal infection caused by staphylococcus aureus bacteria that is resistant to the broad spectrum antibiotics commonly used to treat it.	

Sudiferous Gland (sweat gland) Disorders	
Bromidrosis/ Osmisdrosis	Fetid or foul smelling perspiration, which is caused by decomposition of the sweat and cellular debris by the action bacteria and yeast.
Anhidrosis	The reduced ability or inability to sweat.
Hyperhidrosis	Is the condition characterised by abnormally increased perspiration.

NAIL STRCUCTURE

The nail, which covers the ends of the fingers and toes, is composed of keratinised cells and functions to protect the ends of the digits against knocks and hits.

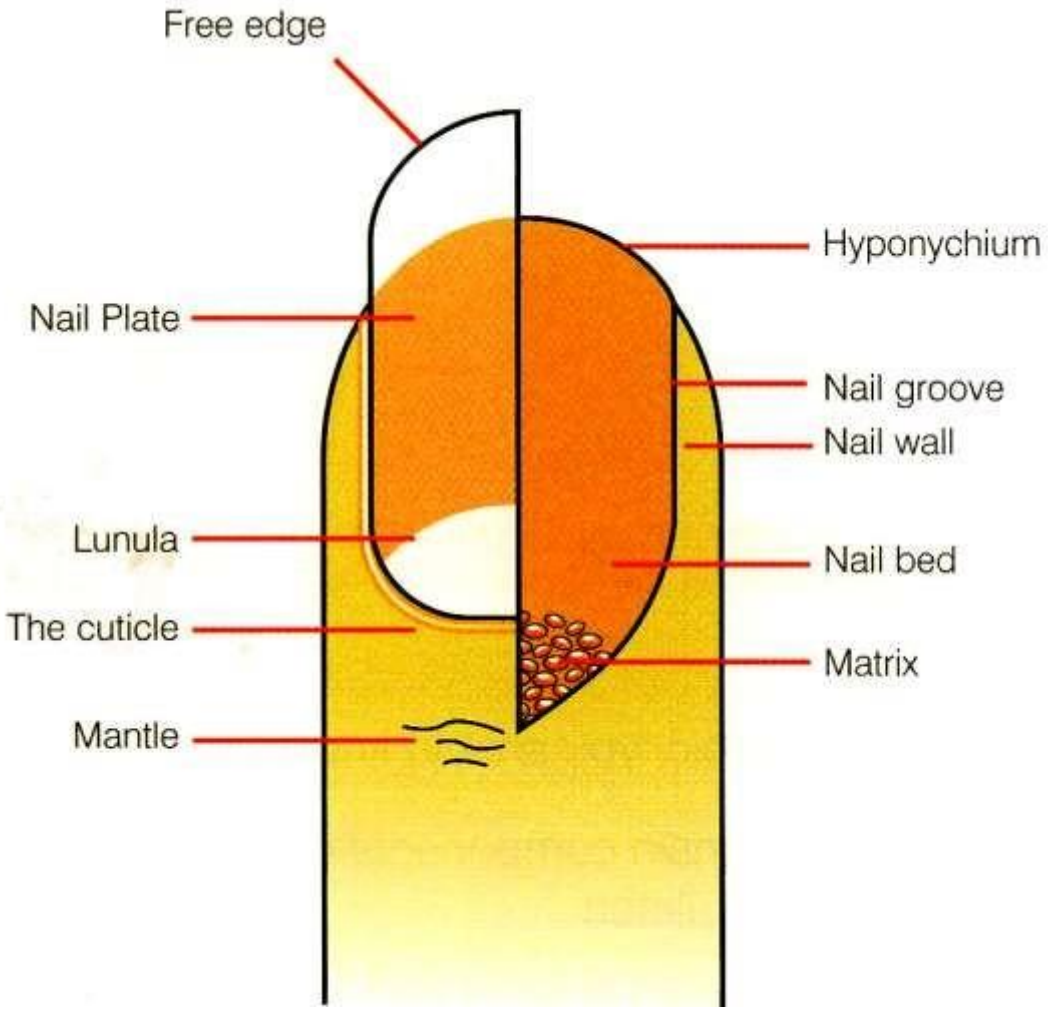


Diagram of a Nail Bed

NAIL STRUCTURE FUNCTIONS

Part	Function
Free Edge	The free edge of the nail is the part extending beyond the end of the skin of the fingertip.
Hyponychium	The hyponychium forms a seal between the free edge of the nail and the skin of the fingertip.
Paronychium	The paronychial edge or peronichium is the skin that overlaps the sides of the nail. The peronichium is the site of paronichia infections, hangnails and ingrowing nails.
Eponychium	The eponychium forms a seal between the skin and the nail plate that protects the underlying matrix from infection
Nail plate	What we commonly call the fingernail is actually the nail plate, a protective shield of translucent keratin for the nail bed beneath. Grooves in the underneath of the plate help to hold it to the nail bed. While the nail plate is actually translucent, the blood vessels beneath it give it a pink appearance.
Cuticle	It protects the matrix from infection.
Nail Bed	As the matrix produces new cells, pushing the nail forward, the nail moves along the nail bed, which adds cells to the underside of the nail, thickening and strengthening it as it grows. The nail bed contains the blood vessels (which, seen through the translucent nail plate, give the nail its colour), the nerves that provide sensation and melanocytes. The nail bed lies directly beneath the nail plate. Both have grooves, which dovetail into each other, holding the nail plate in place as it grows forward.
Nail folds	The nail folds are the folds in the skin which protect the matrix, and in which the edges of the nail plate sit. The root of the nail is protected by the proximal nail fold and the edges by the lateral nail folds.
Matrix	The matrix is where the cells of the nail plate and nail bed are produced. It lies mostly beneath the nail and the nail bed with only the tip of the root visible through the nail plate as the lunula. The matrix produces keratin cells for the nail plate and bed, pushing older cells forward along the finger or toe as it does so.
Mantle	Deep fold of skin at the base of the nail before the cuticle.
Lunula	The half moon on our fingernails, or lunula, is actually the visible front end of the germinal matrix extending underneath the nail plate. The prominence of the lunula varies from person to person, and is normally most visible on the thumbnails. The shape of the lunula is reflected in the natural shape of the free edge of the nail.
Nail wall	The folds of skin which overlap the sides of the nail plate for protection.

HOW NAILS GROW

Nail growth rate varies, but may be up to 3 mm per week for fingernails and 1 mm for toenails, with the whole fingernail being replaced two or three times per year and the toenail every year to 18 months. The growth rate peaks in our early teens and then reduces with age, but it may increase again during pregnancy, the summer, or while we sleep

FACTORS AFFECTING NAIL GROWTH

Nail growth and health can be affected by a range of factors, including:

Health - the shape, integrity and colour of the nail can be affected by diseases of the lung, heart, kidney, liver or thyroid.

Age - the growth rate of both fingernails and toenails slows as we get older, and the protein in the nail becomes more brittle and prone to splitting.

Diet - while serious vitamin or mineral deficiencies may affect the nails, diet does not generally cause abnormal nail changes, except in cases of severe malnutrition.

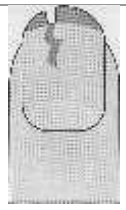
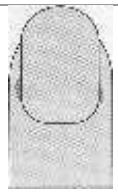
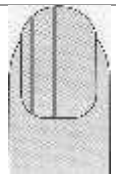
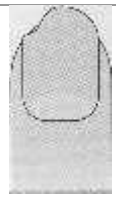
Medication - medication may affect the rate at which fast-growing cells in the body reproduce

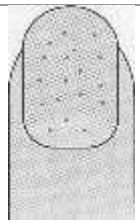
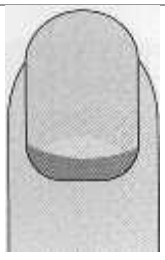
Climate - blood increases in hotter climates thereby increasing nail growth.

Damage - if the matrix is damaged nail growth can be affected or retarded.

Lifestyle - environmental factors, e.g. hands in water, or chemical solutions.

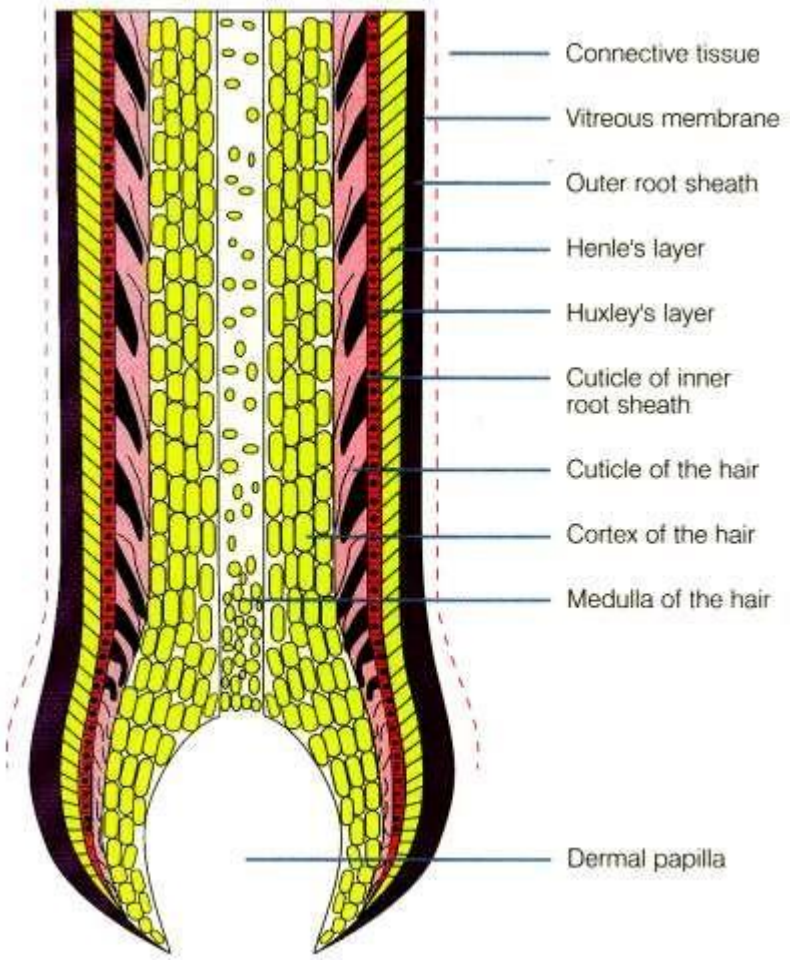
DISORDERS AND DISEASES OF THE NAILS

Condition	Description	Picture
Beau's line	Horizontal ridges found on a nail Possibly the result of ill health.	
Blue nail/ Discoloured nail	May be caused by poor circulation, anaemia or a heart problem.	
Dry/Brittle nails	Poor blood supply, caused by anaemia, illness or use of over- strong detergents removing natural oils, has dried the nails making them brittle, with a tendency to break easily.	
Hang nail	The cuticle has split as it has adhered to the nail plate and cannot continue to move forward with the growth of the nail, causing the cuticle to split leaving it prone to infection.	
Vertical ridges	Possibly the result of ill health.	
Koilonychia (Spoon Shaped Nail)	An abnormal growth causes the nail to splay at the sides, with a depression in the middle. It can be hereditary or due to a type of anaemia or overactive thyroid. If possible, the underlying cause should be treated medically.	
Lamella dystrophy (Flaking)	Flaking can be due to biting, incorrect or severe hand and nail treatments, lengthy exposure to hot water or harsh chemicals, or to general ill health.	
Leuconychia (White Spots)	This is a common condition generally caused by an injury to the nail matrix, allowing an air pocket to form.	
Onychophagy (Bitten Nails)	Nail biting reduces the size of the nail so it eventually has no free edge. The nails look ragged and the fingertips sore, increasing chances of infection or hangnails. The condition will only clear up when the biting stops.	

Onychatrophia (Nail becoming smaller)	As it becomes smaller, the nail becomes opaque and ridged and sometimes wastes away completely. It is usually caused by injury under the nail, nervous disorders or disease and manicures are not advised. The nail should be protected from products such as detergents	
Onychocryptosis (In-growing Nail)	Most often affecting the big toe, the side of the nail plate grows into the flesh of the nail wall. In growing nails are usually caused by incorrect cutting or filing too far down the sides, ill-fitting shoes or neglect. They can be very painful and inflamed with swelling and pus.	
Onychigryphosis (Enlarged Nail with increased curve)	Similar to claw nail; the nail plate has thickened and curved over due to an increase in the horny cells of the nail plate. This is a common complaint in older people, especially if combined with ill-fitting shoes or neglect.	
Pitting	Pitting is a sign of an underlying problem, such as dermatitis or psoriasis.	
Whitlow	A whitlow or felon is an infection of the tip of the finger.	
Onychauxis (Excessive Thickening)	The nail plate has thickened and in some cases discoloured, usually due to internal disorders, infection, damage below the nail, or to constant rubbing (for instance by a badly fitting shoe).	
Pterygium (Overgrowth of the cuticle)	The cuticle has a hardened growth, which has grown over and stuck to the nail plate. Treat by softening the cuticle with oil or paraffin wax, and then gently pushing it back and removing the excess cuticle carefully with nail clippers.	

HAIR STRUCTURE

A **hair follicle** is the root of the hair, which is located in the lower part of the dermis. It is also connected to the arrector pili muscle.
Hair is better known as the hair shaft and is the part inside of the hair follicle that comes out through the very top layer of skin.



Longitudinal Section of a Hair Bulb & Shaft

The Hair is made up of three layers:

PART	FUNCTION
Cuticle	Outer part of the hair and consists of a single layer of scale-like cells. These cells overlap rather like tiles on a roof. No pigment is contained within this layer.
Cortex	Lies inside the cuticle and forms the bulk of the hair. It contains melanin, which determines the colour of the hair. The cortex helps to give strength to the hair.
Medulla	Inner part of the hair and is not always present. Air spaces in the medulla determine the colour tone and sheen of the hair because of the reflection of light.

The Hair Follicle consists of:

	FUNCTION
Inner Root	This includes the cuticle which interlocks with the cuticle of the hair, Huxley's layer (2 cells thick) and Henle's layer (1 cell thick). **Note: Huxley's layer is deep to Henle's layer.**
Outer Root	This forms the follicle wall and is a continuation of the growing layer of the epidermis of the skin.
Vitreous Membrane	This separates the connective tissue from the outer root sheath.
Connective Tissue	This surrounds both the follicle and the sebaceous gland providing both the sensory supply and blood supply.
Dermal Papilla	Supplies the follicle with blood and nourishment required for growth.

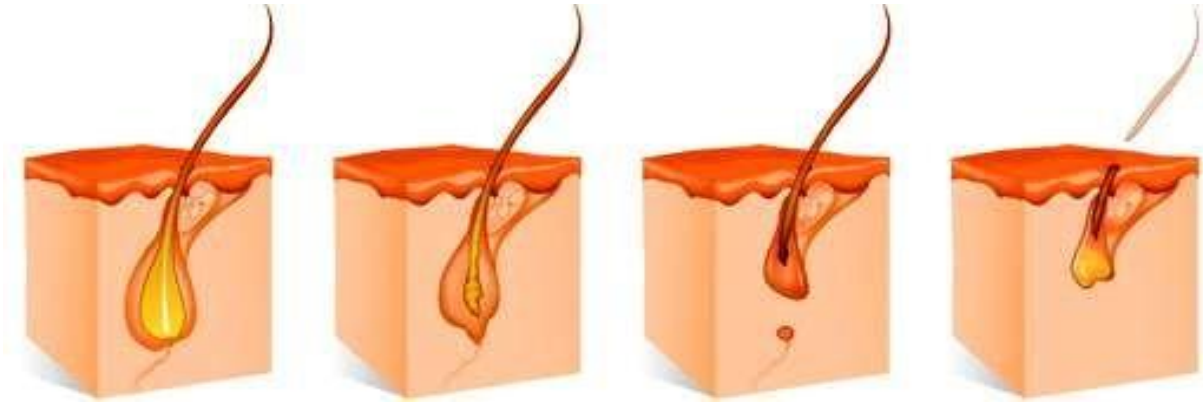
STAGES OF HAIR GROWTH

It takes up to seven years for the fully-grown terminal hair to be shed and be replaced by a new hair. The hair grows in stages known as ***anagen***, ***catagen*** and ***telogen***. All hairs will be at different stages of growth at any one time.

The **Anagen** stage is the active growing stage. It lasts from a **few weeks up to several years** and accounts for **85 per cent** of hairs at any one time. The hair bulb surrounds the nutrient giving dermal papilla and a hair begins to grow from the matrix in the bulb. The anagen stage ends when the hair begins to separate from the dermal papilla and so no longer receives nutrients.

Catagen is the transitional stage and lasts for about **two weeks**. Only **1 per cent** of hairs will be at this stage. The hair is now fully grown and cell division has stopped. The hair has separated from the papilla and the follicle begins to shrink.

Telogen is the stage at which the hair rests, and lasts for about **3-4 months**. About **14 per cent** of hairs will be at this stage. The resting hair will either fall out or be pushed by a new hair growing beneath it.



Anagen	***Catagen***	***Telogen***	***Return to Anagen***
Weeks – months	*approx. 2 weeks*	*3-4 months*	
85%	*1%*	*14%*	

Diagram showing different stages of hair growth

DIFFERENT TYPES OF HAIR GROWTH

There are different types of hair growth:

Lanugo hair is the hair found on the **foetus** and is usually shed by about the eighth month of pregnancy.

Vellus hair is soft and downy and is found **all over the body** except on the palms and soles of the feet.

Terminal hair is longer, coarser and the follicles are deeper than vellus hair. These hairs can be found on the **head, eyebrows**, **eyelashes**, **under the arms** and in the **pubic region.**

DISORDERS AND DISEASES OF THE HAIR

Condition	Description	Picture
Alopecia	Alopecia is the general medical term for hair loss. There are many types of hair loss with different symptoms and causes.	
Androgenic Alopecia	Androgenetic alopecia is a common form of hair loss in both men and women. In men, this condition is also known as male-pattern baldness. Hair is lost in a well-defined pattern, beginning above both temples. Over time, the hairline recedes to form a characteristic "M" shape. Hair also thins at the crown (near the top of the head), often progressing to partial or complete baldness.	
Hirsutism	Hirsutism is the excessive hairiness on women in those parts of the body where terminal hair does not normally occur or is minimal — for example, a beard or chest hair.	
Sycosis Barbae	An inflammation of hair follicles of skin that has been shaved. Treatment includes light and infrequent shaving, topical and systemic antibiotics, and daily plucking of infected hairs. Also called barber's itch, sycosis vulgaris.