NailKnowledge

INTRODUCTION TO SKIN

ESSENTIAL ANATOMY AND PHYSIOLOGY FOR THE BEAUTY INDUSTRY

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Introduction

This eBook explores the fascinating subject of skin, aiming to empower beauty therapists, nail professionals, and anyone interested in skin health with knowledge about its structure, function, and the multiple roles it plays in our well-being.

We understand that the terminology related to skin and its biology can sometimes be complex.

To aid in your comprehension, there is a comprehensive glossary at the end of the book. This will help you navigate any medical or biological terms that may be unfamiliar.

Armed with this knowledge, you will be better equipped to care for, nourish, and protect this essential organ.

By appreciating the roles of the skin and its appendages, you can provide more informed care to yourself and others, recognising signs that the body might be signalling through the skin.

The Importance of our Skin to our Bodies and our Health

How to care for, and protect, skin is essential knowledge for beauty therapists and nail professionals, and to do this successfully requires a deep understanding of skin, its functionality, defence mechanisms and how it reacts to the environment.

Skin is the largest organ of the human body. On its own, on average, it would weigh up to 4kgs and measure approximately 2 metres square.

There is no other organ in the human body responsible for so much, carrying out protective, immune, sensory, regulatory, and secretory functions.

It protects us from the environment, controls our temperature and provides us with our sense of touch and detects pain and heat.

Skin is involved in several essential functions for the body, producing vitamins and storing water and fat. It is essential for our body's health and is a fascinating part of human physiology.

Our Integumentary System

In biological terms, Skin is part of our integumentary system - our outer layer.

This system includes all the layers of skin, its associated glands, and appendages - structures that originate from the skin and have various functions - such as hair, and nails.

They are all connected and work together as a system.

Problems inside the body are frequently reflected outside the body, with skin and its appendages signalling to us about those changes with symptoms or unusual and often unhealthy conditions.

The Three Skin Layers: An Overview

Skin consists of three distinctive parts or layers:

- The hypodermis.
- The dermis.
- The epidermis.

The Hypodermis

The deepest layer of our skin is the hypodermis, also referred to as subcutaneous fat.

Consisting of fat cells and fatty tissues, the hypodermis is an energy store for the body.

It insulates the body from heat and cold and is a flexible cushion for all the internal organs, including bones and muscles.

There are a few parts in the body where the hypodermis and fat tissues are absent, for example, the scalp and underneath the nail bed.

Above the hypodermis, the next layer of skin is the dermis.

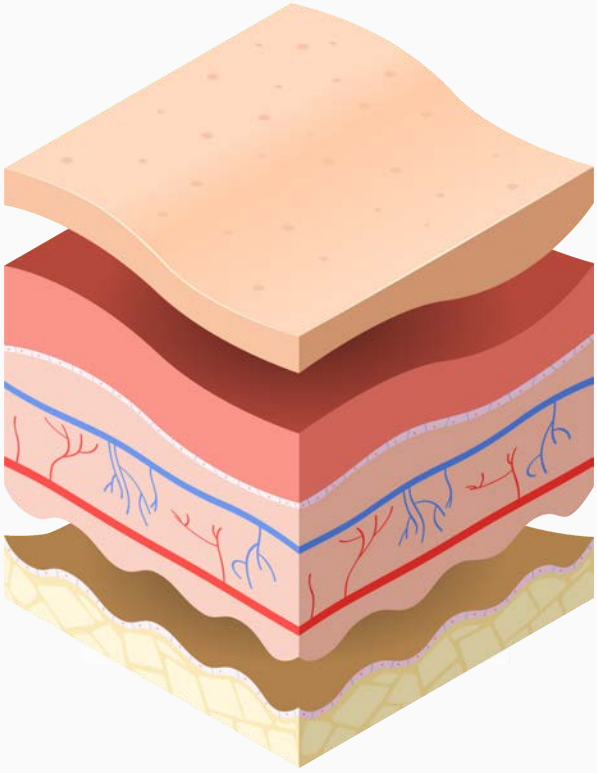

Figure 1: The three skin layers: hypodermis is the lowest skin layer, the dermis is in the middle, and the epidermis is on top. Each with unique properties and functions.

Figure 2: Fat tissue. Coloured image from a scanning micrograph.

The Three Skin Layers: An Overview

The Dermis

This is considered the most important layer of skin. It is living, connective tissue - the biological term given to tissue that connects or supports other tissue or organs.

You can think of dermis as the skin's control centre. It contains cells connected to the immune system, blood vessels, nerves, fibres made of collogen and elastin and an extracellular matrix, which visually looks like a hard watery gel.

The dermis is the home of sebaceous or oil glands, sweat glands, hair follicles and nails. There are some areas of the body where the dermis has no sebaceous glands or hair follicles, for example the palms of the hands and the soles of the feet.

Above the dermis is the epidermis.

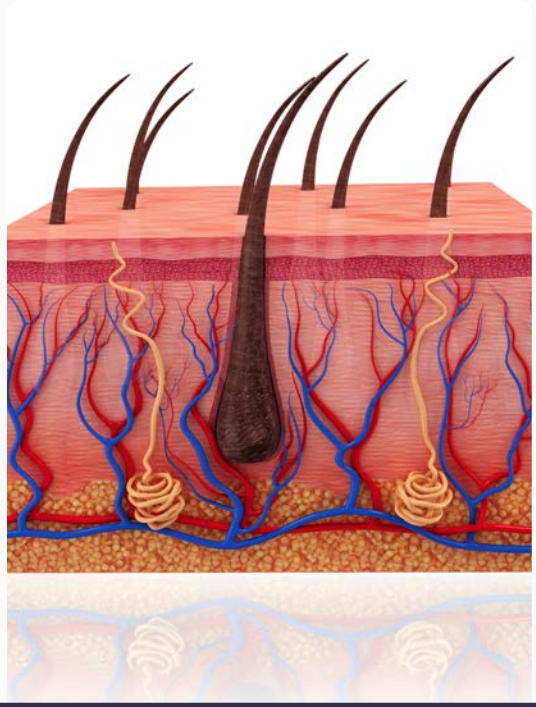

Figure 3: The dermis sandwiched between the hypdermis and the epidermis contains all the blood vessels and lymphatic system as well as sebaceous glands and hair follicles.

Figure 4: The palms and soles of the feet are hairless and contain no sebaceous glands - this helps with our grip.

The Three Skin Layers: An Overview

The Epidermis

This is the outer layer of the skin. The epidermis is structurally completely different from the dermis and is a complex of cellular and non-cellular barriers. If the dermis is the control centre, the epidermis is the border control of our body – a line of defence between the environment and our bodies.

The epidermis contains layers of cells called keratinocytes which are tightly packed to each other. These are the most predominant types of cells in the epidermis (around 90%) and created in a 'basal layer'; they move up to the very uppermost layer of the epidermis as they mature and die.

They play an important role protecting the body and as chemical factories producing essential lipids, proteins and other important compounds and building blocks of cells.

The epidermis is the front line of the whole immune system. The epidermis does not have blood vessels, or nerves, excluding some sensory nerve endings. The epidemis relies on the dermis to supply it with all nutrients.

The thickness of the epidermis varies. There are two main classes of skin – thick, hairless skin as found on the palms of the hands and the soles of the feet and thin, hairy skin which covers much of the rest of the body.

Those working in the beauty industry will probably work with both types of skin, so need to pay special attention to the differences between those two types, as it will determine our choice of a product, procedure or technique.

We will now examine two of these layers in detail – the dermis and the epidermis.

The Dermis

The dermis is the middle, thick layer of skin, and its health is critically important to the overall health of our skin.

The unique structure and functioning of the dermis is defined by the work of its most important cells – Fibroblasts.

Fibroblasts are amazing, versatile chemical producing cells that produce the materials needed to maintain the structure of the dermis.

Fibroblasts produce two main proteins in the dermis – collagen and elastin. These two proteins hold the skin layers together.

The collagen fibres, lay in a vertical direction through the dermis while elastin fibres are horizontal.

In-between the fibres a gel-like substance, called the extracellular matrix.

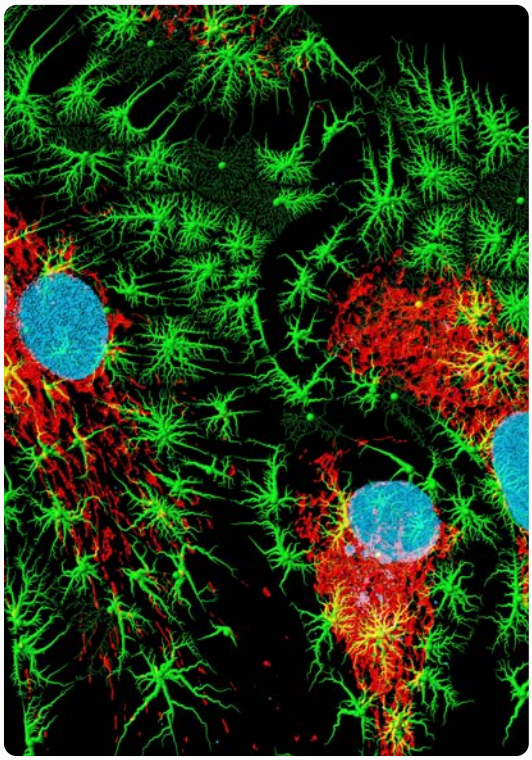

Figure 5: Highly magnified and colourised image of fibroblasts using a laser scanning microscope.

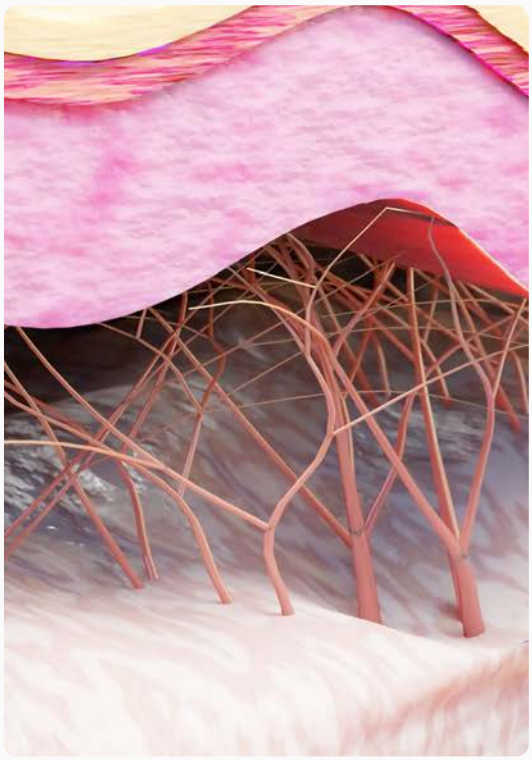

Figure 6: Collagen and elastin provide structural support to the skin layer. The fibres are embeeded within a watery gel-like substance.

Elastin as the name suggests provides skin with its elasticity and its ability to be stretched. As well as providing structural support, collagen can store a huge amount of water, essential for maintaining the health of the skin and the cells within it.

The normal function of the fibroblasts, the quality of the collagen fibres and their ability to hold water, are factors that define the healthy and beautiful condition of the skin and all skin appendages.

Sometimes under certain conditions such as aging, skin, or internal diseases, mechanical or chemical damage, the fibroblasts decrease collagen production, or the collagen fibres lose the ability to hold water due to changes in the protein's structure.

This leads to water loss, which in turn, affects all the normal physiological processes in the whole organ and may also affect many functions of the body.

There is more elastin than collagen in the areas where frequent skin stretching is essential. For example – the surfaces of the joints, especially the joints in hands and feet, elbows, and knees. The skin on those surfaces is always wrinkled and tends to be dry.

If we look at the back of the hand, you can see the skin is thin, easily stretched and has many wrinkles on the joints.

This type of skin requires special cosmetic care and treatment that will help to maintain the water content, which in turn, will keep the skin youthful. Areas such as the neck and the back of hands always show the first signs of aging.

The extracellular matrix is a hard, watery gel like substance that is produced by the Fibroblasts and contains all the building blocks of the collogen and elastin fibres, holds water, and other cells.

Structures and Systems Within the Dermis

Blood and Lymphatic Vessels

Blood and lymphatic vessels are abundant in the dermis layer of the skin. They bring nutrients to keep the skin healthy and functioning; drain unwanted fluids, dispose of waste, and play a very important role in the protection offered by the skin's immune system.

The arteries bring water, oxygen and all the essential substances to the dermis for the fibroblasts and other cells, while the veins take the waste substances and carbon dioxide away from the dermis.

The dermis has the largest population of the immune cells in the body. Immune cells are constantly wandering through the dermis and patrolling the space with only one purpose – to find accidental intruders or unknown chemicals or unexpected injury.

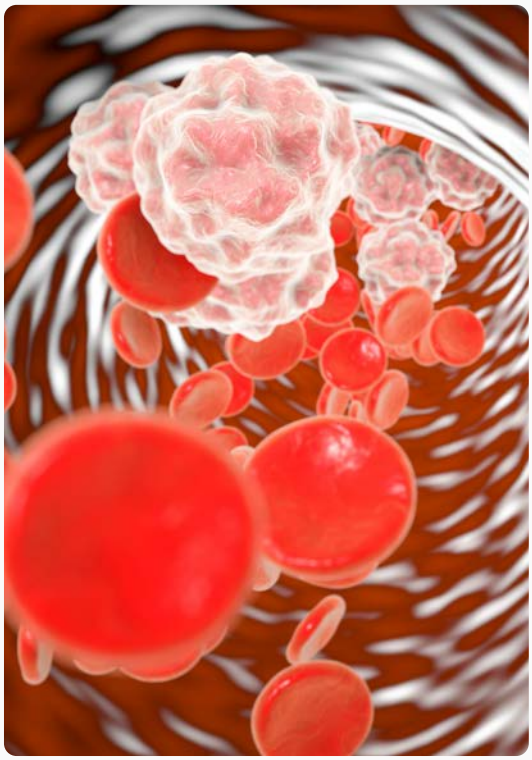

Figure 7: Red and white blood cells

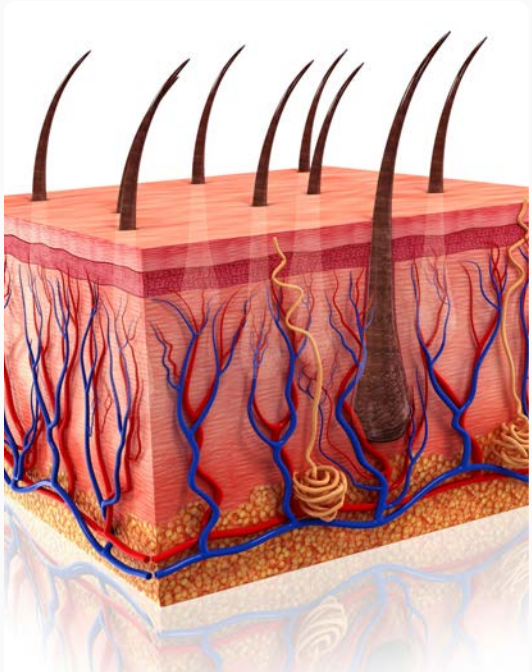

Figure 8: The dermis is home to all the major structures and systems needed for the health of the entire organ.

The lymphatic system is used by immune cells as a transportation system throughout the entire body.

In the hands part of the lymphatic system drains through tubes to the gatekeeper lymph nodes in the elbow and the armpit. The thumb, index finger and the back of the hand drain directly to the gatekeeper lymph nodes in the arm pits. In the feet, the lymph nodes drain through tubes to the gatekeeper lymph nodes in the groin.

Proper microcirculation of blood and lymphatic system is a key factor in skin health.

Sometimes, a simple and affordable procedure such as warming, and massage can help to enhance this microcirculation and consequently rejuvenate the skin and nails and keep the skin looking healthy and beautiful.

Nerves and Nerve Fibres

In the skin, the nervous system forms a dense network with nerve endings and sensorial receptors, which transfer sensations such as pain, touch, itchiness, pressure, temperature to the brain.

In return, the brain sends signals to the skin on how to react to the factors of external or internal environment – for example, creating goosebumps by making the hairs on your body stand up to trap more heat and provide additional insulation.

This network of nerves and nerve fibres creates the largest sensorial and receptive area in the body and is also considered as a part of its protective functionality.

Eccrine and Apocrine Glands

The skin has two types of major sweat glands: eccrine and apocrine. Both control of the body's heating system, preventing the body from overheating.

Typically, a person will have between two and four million sweat glands, and most are eccrine glands. Eccrine glands are found all over the body but in large numbers on the soles of the feet, palms of the hands to aid grip. Luckily there are no sebaceous glands in the same areas, as otherwise the hands and feet would be too slippery.

Apocrine glands are connected with hair follicles and are most abundant in the armpits and genital area and only really start their action following puberty. Sweat from apocrine glands does not evaporate as quickly and can smell, giving rise to body odour.

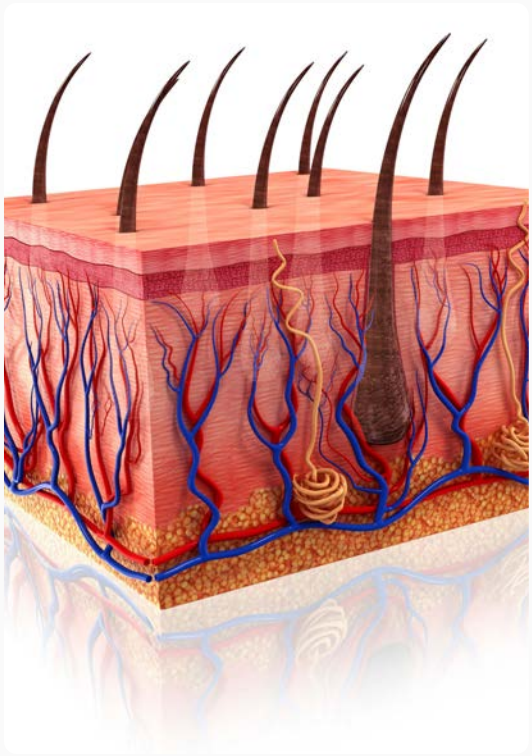

Figure 9: Two types of sweat glands are found in the human body and within the dermis - eccrine and apocrine glands.

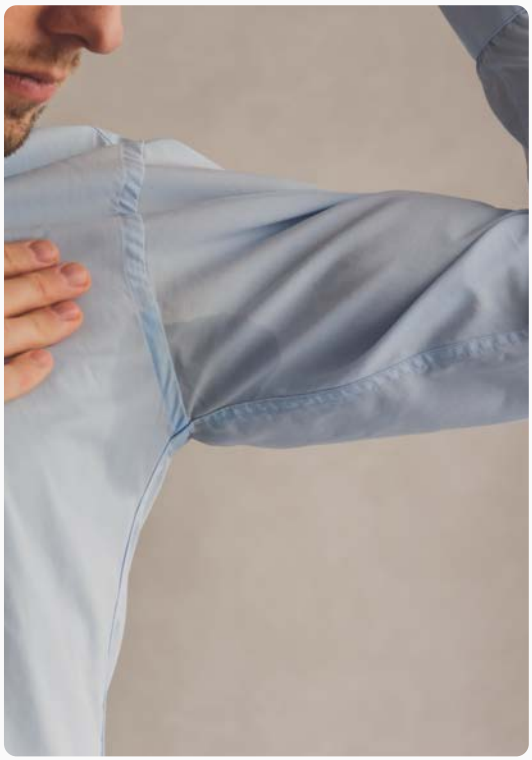

Figure 10: Apocrine glands found in the armpits and genital area, produce sweat which does not evaporate as quickly and can smell.

Both types are situated in the dermis and deliver their secretion, that is largely water, via pores that open onto the surface of the skin.

This evaporates and reduces skin temperature.

As well as regulating our temperature, sweat glands have an important role in maintaining the hydrolipid layer on our skin, protecting the skin from invading pathogens and transient microbiomes, which we will discuss later in this eBook.

Hair Follicles

Most of the skin on the human body has hair follicles. The exceptions are the palms of the hands, soles of the feet and the lips.

Depending on the area, hair plays different roles. It is mainly concerned with heat regulation and protection.

The hair follicle, which, as mentioned above, is part of the integumentary system and an appendage of the skin, has a lot of similarities to nails. Like nails, hair is created from modified skin cells that are keratinised into a very specific formation.

Connected to a hair follicle are apocrine glands, sebaceous glands and, on many areas of the skin, a tiny arrector pili muscle.

This tiny muscle is used when the autonomic nervous system needs to control heat loss or activates the 'fight or flight' reaction. It contracts and lifts the hair shaft to trap air and conserve heat, commonly seen as 'goose bumps' on the skin.

Sebaceous glands are also usually connected with a hair follicle. These secrete oily sebum that is essential to a healthy skin condition and like sweat glands, plays an important role in the hydrolipid protection layer.

Next, we will investigate epidermis and the role of keratinocytes.

The Epidermis

The epidermis is the paper-thin upper layer of skin, formed from several layers of keratinocyte cells, named for the keratin, a major protein in this layer of the skin that is produced during a cells' journey from the basal layer to finally becoming the stratum corneum.

Keratin is a tough, protective protein that makes up the majority of the structure of the epidermis, hair, and nails.

The structure of the entire epidermis is based on the lifespan of these keratinocytes.

Every distinct layer within the epidermis is a phase or stage in the development of the cell – as they go from newly created to mature.

These tiny cells provide a protective barrier. Each cell is capable of communicating with other cells and immune cells, using a special chemical signalling language, coordinating the skin's defence against any environmental invaders.

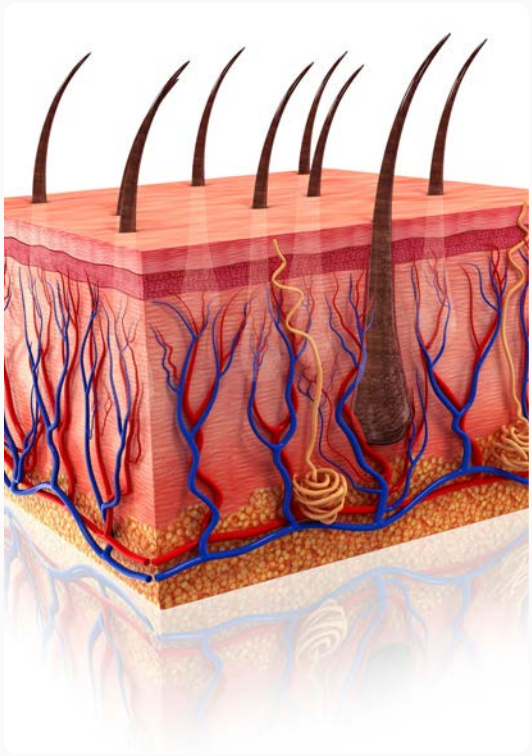

Figure 11: The epidermis is the top , thin layer of skin, above the dermis.

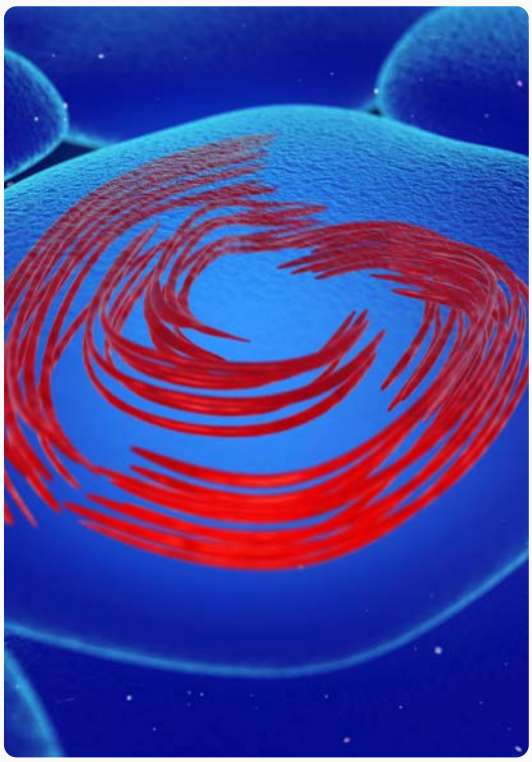

Figure 12: Illustration of a mature keratinocyte cell, filled with only keratin strands.

During their lifespan, the keratinocytes work as small laboratories where they manufacture keratin, lipids, and other important constituents that create and maintain the skin and provide some of its defensive protective capabilities. The lipids and all other components within the epidermis are produced in special microstructures within the keratinocytes during their maturing process.

The Basement Membrane and Basel Layer

The epidermis is separated from the dermis by a membrane called the basement membrane, which allows nutrients, blood and water through. This layer is strongly attached to other layers with desmosomes, which lock them into place.

This is similar to how nails plate layers attach to each other.

On top of the basement membrane is the basal layer of stem cells. This is a single layer of stem cells which produce the keratinocytes. Every skin keratinocyte is created by a stem cell in the basal layer. Stem cells constantly divide, to produce new keratinocyte cells.

The basal layer is extremely sensitive to the biological processes going on in the dermis, it is completely dependent on dermal microcirculations, water content from the dermis and the entire health of the dermis.

Changes in the dermis, negative or positive, make an impact on the epidermis and especially on the basal layer.

The epidermis does not have its own blood supply, sources of water or nutrient supply for the epidermal cells.

The epidermis receives everything it needs for living from the dermis via the basement membrane.

Water or nutrient shortage, damage or disease in the dermis will become visible signs in the epidermis. Dryness, peeling, redness, itching, and other skin symptoms we experience are possible signs of negative events in the dermis.

When the dermis is healthy and the dermal cells and proteins are normally functioning, the basal cells will divide normally. The basal layer is also known as the stratum germinativum since it is constantly germinating new cells.

When one single basal cell divides into two, the upper part of the cell, a daughter cell, moves up to the second layer of the epidermis while the lower part, the mother cell, remains attached to the basal membrane. The basal cell layer also contains cells called melanocytes.

Melanocytes produce the skin colouring or pigment known as melanin, which gives skin its tan or brown colour and helps protect the deeper layers of the skin from the harmful effects of the sun.

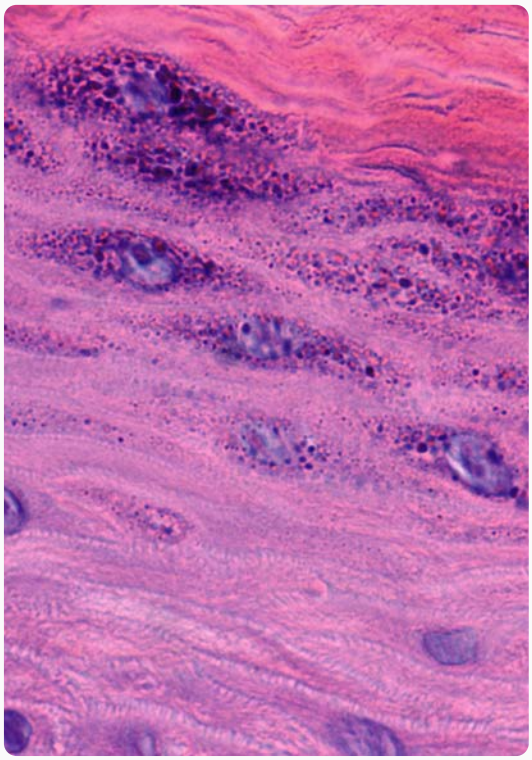

Figure 13: Microcopic view of the transtion between different layers within the epidermis.

The more active melanocytes are, the darker our skin becomes.

Sun exposure causes melanocytes to increase production of melanin to protect the skin from damaging ultraviolet rays, producing a suntan. Patches of melanin in the skin cause birthmarks, freckles, moles and age spots.

Stratum Spinosum

The daughter cells, produced in the basal layer, create the Stratus Spinosum or Prickle cell layer. Sitting just above the basal layer. This layer has several rows of young keratinocytes. They still receive all they need for living from the basement membrane and the dermis via diffusion of water.

The name of the layer – Spinous or Prickle cell layer comes from the shape of the cells in this layer – they look spiky because of the desmosomes, the unique spiky bonding structures which join the keratinocytes together and help to keep the layer uniform.

This is the thickest layer of the (normal) epidermis and is involved in the transfer of certain substances in and out of the body.

This layer contains Langerhans cells, which are crucial immune cells. They traverse our skin layers, attaching to any biological invaders —such as germs or bacteria—that penetrate through damaged or diseased skin. Upon encountering these threats, they signal the body's immune system to respond and defend against possible infection.

Important biological processes begin in this layer as the young keratinocytes begin the process of biological synthesis. Structures inside the cells start to build the components which will form the upper protective skin barriers.

When the oldest cells of the spinous layer begin to lose their desmosomes, they reach the next layer – the Granular cell layer or Stratum Granulosum.

Stratum Granulosum

The granular layer is called this because the cells of this layer have accumulated three essential components for building the outer layer of skin – water, lipids, and keratin.

These build up within the cells and look like granules in the cells under a microscope – hence the name – Stratum Granulosum.

These cells are still living cells because their nuclei are still present at this stage.

When the cells of the granular layer become older and mature, they continue to move up towards the Stratum Corneum.

Stratum Lucidum

In the thicker epidermis of the soles of the feet and palms of the hands just underneath the Stratum Corneum, there is a "translucent" layer, the Stratum Lucidum, which is added to the bottom part of the Stratum corneum.

It is this layer that brings the additional thickness to the epidermis in these special areas. It is not found in the "thin" type of skin that covers the rest of our body.

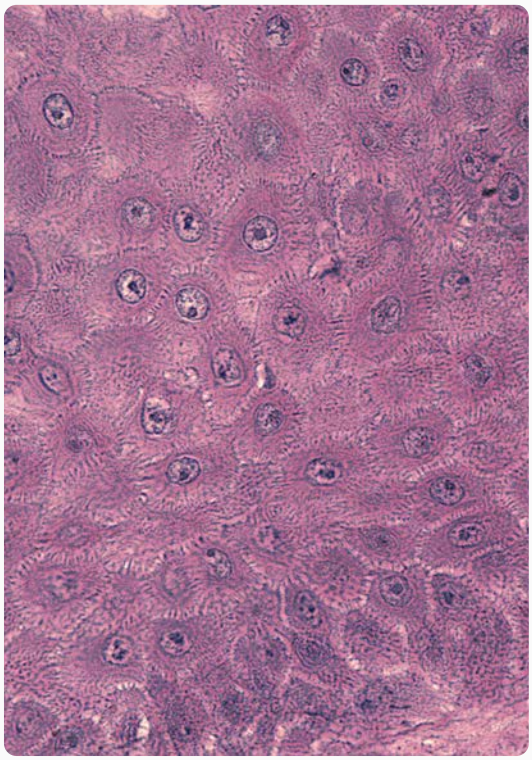

Figure 14: Microcopic view of the Stratum Spinosum with desmosones connecting the cells together.

It is only found at the soles of our feet and the palms of our hands.

This is another one of the unique features in these areas along with the lack of hair follicles and sebaceous glands in the dermis of the palms and soles.

Stratum Corneum

As the keratinocytes move further towards the surface of the skin, they get bigger and flatter and adhere together, and then eventually die, their nuclei disappearing, and the space within the cell fill mostly with keratin and lipids.

The lipids extrude into the space between keratinocytes – the intercellular space – leaving the keratin and water-retaining chemicals inside the cell.

These water-retaining chemicals are the natural moisturising factor which we will examine later in this eBook.

This doesn’t happen in psoriasis and is the reason why psoriatic cells look flaky and dry.

Despite the death of the nucleus within cell, the keratinocytes now begin to play their final role, as a highly protective keratin-lipid mass in the epidermis.

Once the biochemical processes conclude, the keratinocytes and lipids come together to create a structure similar to a brick wall solidified with intercellular cement.

This acts as the body's fortified boundary, with the Stratum Corneum housing dedicated immune cells that vigilantly protect our body's outer layer.

This wall of non-living keratinocytes stuck together by intercellular lipid cement – protects the surface of the body from water, air, detergents, microorganisms, pathogens, and friction etc.

All those different factors eventually destroy and decompose the lipids and the old non-living keratinocytes lose their connection with other keratinocytes. They get disconnected from the skin structure and are lost, to be replaced by new keratinocytes and new lipids. This never-ending process continues all throughout our life.

The quality of the building materials determines the quality of the wall, and the quality of the entire Stratum Corneum, and therefore the defensibility of the whole body from external dangers. When the quality is weakened, the skin barrier can become extremely fragile and accessible for intruders – harsh chemicals, microbes, viruses, bacteria, and UV radiation.

When this occurs, the immune system starts to defend us, and the epidermal basal layer goes into overdrive producing more and more keratinocytes to eventually reinforce the weakened area.

Lipids

Lipids are an essential constituent of the epidermal barrier – the cement in our brick wall.

Lipids are a large group of organic chemicals that have one property in common – all of them are incompatible with water.

They do not dissolve in water or water-soluble compounds under normal conditions – so they form a waterproof cement for the skin barrier.

There are three different groups of lipids found in the epidermis: Fatty Acids, Ceramides and Cholesterol.

Fatty Acids

Fatty acids are important for the entire body. Stearic, Palmitic and some other fatty acids are a part of many structures within the body, not least the skin.

Many fatty acids can form secondary lipids, which are known as triglycerides, or oils and fats.

The triglycerides are built from three fatty acids that are bound together by one molecule of glycerine.

All edible oils are mixtures of triglycerides – olive oil, sunflower oil, canola oil, etc.

Such cosmetic oils as avocado oil, apricot oil and many others are also triglycerides which explains why they are so compatible with the skin and nails.

Ceramides

Another complex type of epidermal lipids are the ceramides, which are also found in all quality cosmetics as active and incredibly good ingredients.

Ceramide molecules have two parts - a molecule head which has an affinity to water (water loving part) while another part, a long tail, has affinity to oil. When the mixture of lipids is extruded out of the cell, they form bilayers in the intercellular space. The molecule tails that are oil loving meet other oil loving molecule tails. So, the lipids become arranged in the form of long lamellar structures that consist of two shields of molecules

Cholesterol

Another essential lipid in the epidermis that plays the leading role in building the highly organised lipid structures is cholesterol and its derivatives.

Cholesterol is one of the most essential chemicals in our body, and as with other sterols plays a role in our hormonal regulations, enzymes, and many other functions. Cholesterol can only be synthesised in animal organisms.

Plants cannot synthesise cholesterol. Cholesterol is essential for your entire body, and only an excessive amount of this lipid produced by the cells can be dangerous and even lead to death.

These lipids have the ideal protective properties. They have different levels of fluidity- from liquid to solid - but they build an almost impermeable and waterproof shield over our bodies.

Sebum

There is one other source of lipids on the top of the skin – the sebaceous glands – the part of the integumentary system and one of the skin appendages.

The sebaceous glands secrete a fatty waxy substance – sebum - that lubricates the surface of the skin.

This composition of sebum is complex and rich with squalene, triglycerides, fatty acids, and fluid waxes.

When the keratin cell flakes eventually slough off from the surface, the remains of the intercellular lipid bilayers mix with secreted sebum along with the fluid from the sweat glands to form a special invisible hydrolipid layer of the skin - the so-called hydrolipid mantle.

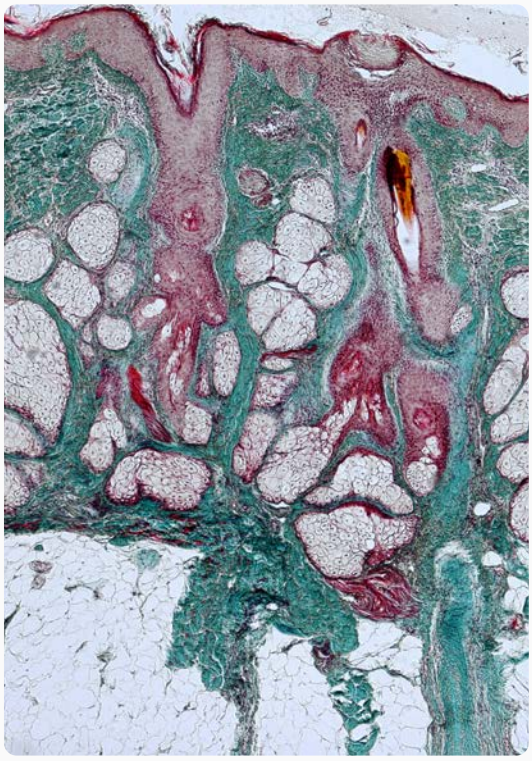

Figure 15: Microcopic, colourised view of the sebacous glands within the skin

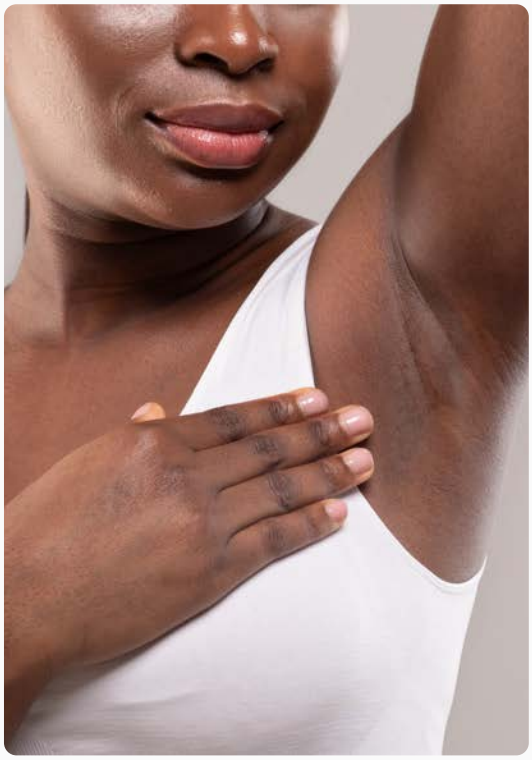

Figure 16: Sweat and sebum form the hydrolipid mantle - a protective coating to the epidermis.

Compounds and Chemicals Within and on the Epidermis

Water

Water is one of the most important compounds in the human body, and probably the most important compound on earth, sustaining all living organisms from the single-celled bacteria to humans.

All the body's vital functions and biochemical reactions are only feasible in the presence of water. It is key to homeostasis – which is a biological term for maintaining the steady internal, physical, and chemical conditions inside our bodies.

Any deficiency of these simple molecules can lead to disease or death.

Water constitutes 60% of an average adult human and up to 75% of a newborn.

The brain, liver or kidneys contain 83-85% of water, while bones contain about 22%. The human skin maintains about 65% and healthy, normal fingernails – 18%.

It is an interesting fact – when the level of water drops to 15-16%, nails become brittle, which in turn may lead to more complicated conditions and nail diseases.

This internal water content directly affects the nail's flexibility. The lower the water content, the more rigid the nail becomes.

One of the important protective roles of the skin and the epidermis is holding and retaining water in the body to maintain all its vital functions.

This is why all medical advice and skin specialists recommend a good intake of water daily to maintain the protective role of the skin but also the whole human body.

Water is essential for the normal functioning of the skin.

It is the active ingredient of many cosmetic products, including the professional cosmetic preparations.

The main water source for all cells in the epidermis is the dermis with its developed chain of blood vessels.

Partially, the water can be absorbed from the skin surface too, but it is an inefficient source.

We refer to water on the surface of the skin as partially unbound water, and water within the body tissues as bound water.

Unbound water tends to evaporate quickly while bound water remains retained by water retaining molecules.

The easiest way to describe the difference is that 'unbound' water is water that will easily evaporate so is unlikely to 'bind' with proteins, including keratin.

'Bound' water is that which is present within the blood capillaries and is under a certain pressure and will not easily evaporate. This is the water that skin will use to keep itself healthy and flexible.

As water evaporates quickly from the surface of our skin, our bodies need some tools to maintain the water balance in all tissues of our body.

The most important tools that keep water in the skin are the collagen fibres in the dermis and a blend of humectants called the Natural Moisturising Factor, found primarily in the epidermis but also to a degree in the dermis.

Natural Moisturising Factor

The Natural Moisturising Factor or NMF is not a single chemical but a collection of different water-binding molecules, or humectants. There are many different components of NMF, all of which are by-products or waste products from protein metabolism and created within the keratinocyte cell. This includes:

- Amino and lactic acids
- Sodium pyrrolidone carboxylic acid or sodium PCA
- Urea and uric acid
- Salts
- Ammonia
- Citric acid
- Sugars

These compounds can keep hold of water molecules to avoid fast evaporation from the skin's surface, draw water into the skin to maintain hydration and help the epidermis maintain its strong barrier against harmful microorganisms by sustaining the hydrolipid barrier.

When you discover the skin manufactures its own moisturiser, it makes you realise just how amazing the human body is.

Many components of NMF are used in cosmetics and moisturisers as active ingredients, due to their water-binding properties and ability to hydrate skin.

Reducing Water Loss from the Skin

Despite the excellent water retaining ability of the different chemicals within the epidermis and dermis, water slowly evaporates from the skin surface. This process cannot be stopped completely.

Figure 17: Water is an essential component for the overall health of our body and skin.

Figure 18: Water evaporation from the skin can be slowed but not completely stopped.

Compounds and Chemicals Within and on the Epidermis

The resources of water are continuously replenished with food and drinks to maintain the water balance and with a blood flow delivered to the skin and nail structures.

Water evaporation is known in dermatology and cosmetology as the trans-epidermal water loss or shortly as TEWL.

This is one of the most important physiological indexes that shows the overall skin condition and the state of the skin health and the skin barriers, because of water's importance for all the processes in this organ.

It can be measured with special equipment called as Trans epidermal water loss meter.

Water loss is also taking place in the fingernails but has its own name – trans-ungual water loss or TUWL. It also can be measured with a special equipment.

Higher rates of TEWL or TUWL can signal affected or damaged skin or nail barriers or the presence of skin or nail diseases including permanent or chronic conditions such as Atopic dermatitis, eczemas, psoriasis, traumatisation, allergies, infections and many other disorders.

Low or normal rates of TEWL can be achieved with topical remedies or moisturising cosmetic products.

Often, the initial stages of different skin pathologies can be prevented by controlling the TEWL or TUWL. In order to control water loss or prevent it professionals uses different approaches, which are often combined to reach the positive results of the topical treatment.

We can control the TEWL by using occlusion and occlusives. In simple terms, this means blocking so, in this context, blocking the water loss, for example creating tiny thin films on the skin which physically prevent the water evaporation; so, water is locked into the epidermis.

Occlusives

Occlusives work almost immediately and are widely used in cosmetology. Occlusive emollients include mineral oils, petrolatum, paraffins, silicones. The golden standard in the skin moisturisation is mineral oils and paraffins, which give the best moisturising effect.

They can also keep unwanted chemicals out so are often used a general protective barrier in some creams.

There are plenty of modern semi-occlusive ingredients that are employed in dermatology and cosmetics, most of them belong to lipids, either natural or synthetic origin.

Hyaluronic acid and its salts are popular among professionals due to their ability to create the thinnest film on the skin. It creates the semi-occlusive sheath, and its huge molecules retain enormous volumes of water and consequently prevents natural water loss.

A major constituent of the dermis, Hyaluronic acid does not penetrate the epidermis due to its large molecular weight. However, it works efficiently on the top of the skin.

The nail industry uses plenty of occlusives – nail varnishes, gel polishes, gels and acrylics - which create an occlusive film on the fingernails. Individuals may notice that their nails grow faster and become much better after their use due to improved moisturisation.

Some clients, if they have been wearing a coating for a while may think that their nails feel thinner upon removal. If removal has been carried out correctly and the nail plate has not been overly filed before an application, the nails are not thinner.

They are just more flexible due to the added moisture content within their structure. Within a few hours the excess moisture will have evaporated, and the nails will return to normal hydration levels.

Humectants

Humectants are small molecules that can bind water and retain it for a long time. They penetrate the epidermis and are often called “true” moisturisers, because they keep water in the epidermis without physical prevention of water loss. All the components of NMF are humectants and as we have mentioned already, they are often used as active ingredients in the moisturising products.

The most popular and efficient components are Urea, Lactic acid and its salts – lactates, citrates, Sodium PCA, sugars and sugar alcohols along with several amino acids.

Besides those components, alcohols and sugar alcohols such as Glycerol, which is known as Glycerine, Propylene glycol, Butylene glycol, Sorbitol, Xylitol and others also ensure a great level of moisturisation.

As mineral oils and petroleum jelly are the golden standard among occlusives, Glycerine and Urea are the golden standards among humectants.

The Microbiome and Hydrolipid Barrier

Our skin is a reinforced fortress. A brick-and-mortar structure of keratinocytes and lipids. As well as these physical barriers - the outside walls of this fortress have two additional beneficial features.

Firstly, our skin is home to millions of bacteria, fungi and viruses that compose the skin’s microbiome. Thousands of different types of bacteria and fungi live on the surface of the skin. We have our own ‘resident microbiome’, and we encounter ‘transient microbiome’ from other people or animals around us.

The types vary depending on what area of the skin they are found. Like in our gut, many of these are good microbes, protecting the skin, but some are not so good.

Compounds and Chemicals Within and on the Epidermis

As well as the microbiome on the skin, there is the hydro-lipid mantle or barrier, also known as the acid mantle. This is mainly sweat, sebum and other lipids that form an invisible barrier - an antibacterial cream created by our own bodies. It provides protection for the skin and helps fight the unwanted pathogens.

This mantle is naturally slightly acidic at 4.2-4.7 on the pH scale (below 7 is acidic; above 7 is alkaline). The acidic pH works as a natural antiseptic against most pathogenic microorganisms.

pH is different for the skin and nail plates. The skin's pH is 4.2-4.7 while for fingernails nails the pH is 5.2-5.7 and for the toenails – 6.0-6.5 respectively, which is close to the neutral pH.

The less acidic nature of our toenails is why they have a higher susceptibility to fungal infections.

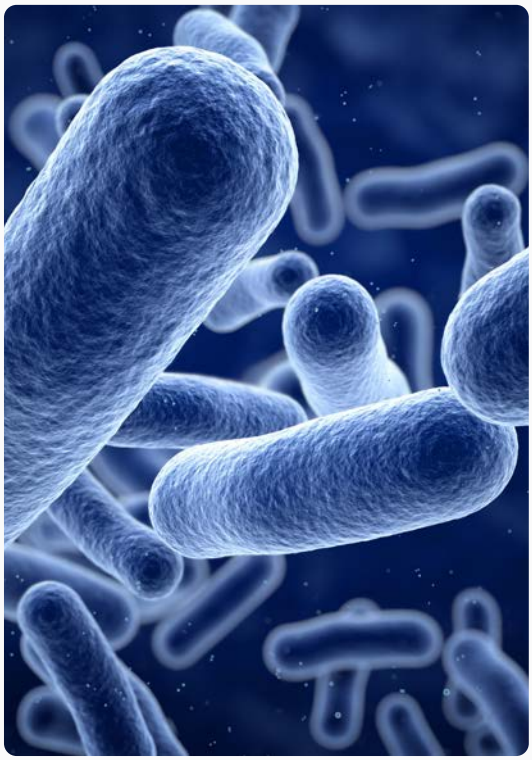

Figure 19: Skin's acidic pH forms another barrier against outside threats such as bacteria and pathogens.

Figure 20: Toenails are more susceptable to fungus due to their more neutral PH.

It is interesting that any skin or nail diseases, especially infectious conditions change the normal pH of the epidermis and nails. For example, the pH of mycotic toenails can become alkaline – 7.2 and up to 8 and sometimes higher, which is good for the mycotic cells, but bad for the toenails which lose even more of their defensive capability.

All these facts explain why many acidic ingredients are employed in formulations of the professional nail products to maintain acidic pH and for better prevention of all sorts of skin and nail infections.

The microbiome and mantle work together to provide an additional defence and protection to that offered by the wall of keratinocytes and lipids.

When there is damage to any of these elements, or any altering, minor or major to the skin structures, cells, intercellular lipids, microbiome, hydro-lipid mantle, normal skin pH, levels of hydration, changing in the local homeostasis or infiltration of the alien microorganisms or any chemicals, including those that we tend to consider as “good” or “useful” for the skin.

We experience hundreds of barrier damages every single day. Most of them are so insignificant that we don’t even feel the signs of inflammatory response and the skin counteracts them successfully and swiftly itself.

For instance, barrier damage takes place every time we wash our hands with a soap – in this case we damage at least two skin barriers. We remove the hydro-lipid mantle along with microorganisms, bad or good ones.

We have the same process when we use alcohol-based antiseptics. When soap or antiseptics used sparingly, we do not observe any signs of inflammation, because the epidermis quickly recovers hydro-lipid mantle, and our microorganisms regain their quantity on the skin.

Nevertheless, when we overuse these cleaning preparations, the continuing and frequent barrier disruption happens, and the signs of the inflamed skin become visible.

Skin Problems: Inflammation

Inflammation is part of the body's defence mechanism and takes place during any disease or condition either systemic or local. Understanding it is not only important to the nail professional and beauty therapist, but the entire medical community.

There are five cardinal signs of inflammation:

- Redness (erythema)
- Heat
- Swelling
- Pain
- Loss of function

Any inflammation, insignificant or severe and chronic develops through several stages:

Inflammatory Response - Damaged cells start to release special signalling molecules called proinflammatory cytokines - which causes the dilation of the arteries in order to bring more blood to the place where damage has occurred. Immune system cells are delivered together with the intense blood flow– it is like the movement of the military units to where they are needed on the battlefield.

The dilated blood vessels create three first signs of inflammation – redness, heat and swelling.

The fourth sign, which is pain, also often manifests because the proinflammatory cytokines hit the multiple nerve endings in the skin.

Immune cells also release proinflammatory cytokines and many others too to fight the unexpected intrusion.

In the case with the pathogen microorganisms, immune cells produce killing molecules to attack and kill the bacterial or fungal cells.

Repair and Regeneration - when the battle comes to an end and the cause of inflammation is eliminated, some immune cells are dying right at the battlefield while others leave the place of inflammation. Many of them begin to generate anti-inflammatory cytokines – they inform cells that the battle is won, and everything is ready for regeneration. Anti-inflammatory mediators contain healing properties for the damaged tissues. This stage of inflammation is called Repair and Regeneration.

Remodelling and Maturation - the recently damaged tissues continue to recover and repair their cellular structure. In the epidermis, the basal cells intensely divide while in the dermis, fibroblasts actively produce new collagen. The healing process continues at all levels through the skin until the full recovery and return to normal function of the disrupted area of skin, muscle or organ is complete.

In the skin, all three stages of the inflammatory process continue for anything between 25-45 days from the moment of injury to complete recovery. The speed of recovery depends upon the state of immune, nervous, endocrine systems, age, sex, severity of the injury and many other secondary factors.

It is important to keep in mind that the healing abilities of our body is powerful but not endless.

When injury takes place frequently, skin doesn't have enough time to recover completely. Repeated damage sustains the incomplete inflammatory process, and, in this case, the acute and short-term inflammation transforms into the condition of chronic inflammation, which in turn leads to complicated conditions and diseases.

In the case with fingernails, chronic inflammation can end with a loss of function in the matrix and sometimes loss of the entire nail unit.

Skin Lesions

Many inflammatory reactions are activated by keratinocytes in the epidermis.

However, if the injury is severe or the type of pathogenic organisms are too aggressive, the inflammation occurs in the dermis and can involve large amounts of the surrounding tissue.

In this case all major signs of inflammation emerge and become visible – Redness, swelling, heat, pain and loss of function. Since all of the component parts of the dermis, and sometimes the epidermis, are involved in the inflammatory process, those structures can also be damaged or injured too, and their normal appearance alters along with their ability to function normally.

The inflammatory reaction along with structurally altered dermal components appear visually as skin lesions.

The initial and correct determination of the skin lesions or skin conditions is one of the basic professional skills not only reserved for medical professionals. A skilled aesthetician specialist, who works with the skin and/or its appendages, should also recognise the difference.

This skill is important to avoid the possible negative consequences that may follow many cosmetic procedures and services. Any signs of inflammatory diseases should lead you to refuse service and refer your clients to a medical doctor.

Determining the presence of the skin lesions starts with skin observation and evaluation.

You need simple and affordable tools to conduct the proper evaluation of the skins surface.

Optimal examination of the skin is best achieved in a well-lit room. A hand lens and side-lighting or magnifying lamp are useful aids in the assessment of skin texture and small discrete lesions.

Some advanced cosmeticians and aesthetic professionals use a dermatoscope – the most important tool for dermatologists.

The initial evaluation helps to determine the following aspects:

- Skin's texture and colour
- The level of moisturisation
- The type of skin – normal, dry, etc
- The presence or lack of continuing skin care
- The presence of cutaneous lesions
- The skin barriers alterations
- The signs of inflammatory reactions
- The results of the previous cosmetic treatment

Types of Skin Lesions: Primary Lesions

All skin lesions can be divided into two major groups – primary lesions and secondary lesions that evolve from the primary skin lesions.

Papule

A papule is a small solid elevation of skin, less than 0.5 cm in diameter, but it can involve the dermal structures.

Papules can be a sign of multiple skin diseases. Only dermatologists can diagnose the source of this condition.

Figure 21: Papules and pustules on the face due to acne.

Plaque

This is an elevated area of skin greater than 2 cm in diameter. However, it rarely affects the dermis and usually evolves in the epidermis.

The presence of plaques is often the leading symptom of psoriasis.

Figure 22: Plaques on the skin. A familar sign of psoriasis.

Macule and Patch

These are very similar superficial lesions, but they are different in size. In fact, the patch is a large macula, which is greater 0.5cm in diameter. Macules and patches may be signalling changes in the pathological pigmentation in the skin, which in turn may be a sign of such malignant diseases as skin cancer and melanoma.

Figure 23: Macule indicate a change in pigmentation which may be a sign of other diseases or conditions.

Vesicles and Bulla

These may also look alike, but they are quite different lesions. Vesicles usually don't go beyond the epidermis while bullas may contact and engage the dermal structures.

Vesicles are well known among those clients who often suffer from herpes simplex, which is a red flag for a nail technician or aesthetician because the cosmetic procedure may induce the viral infection spreading.

Pedicure specialists know bullas or "blisters" as the latter are often formed in soles of the feet or palms of the hands because of severe skin friction from shoes or tools.

Infectious vesicles include:

Abscess

An abscess is a collection of pus in a cavity, it is usually more than 1 cm in diameter. Abscesses usually belong to nodules, but the term 'bulla' is sometimes used to describe a pus-filled blister that is situated on top of the skin rather than within it.

Figure 24: Abscess on the skin, characterised by a localized swelling that is filled with pus.

Pustule

This is a visible accumulation of pus in the skin in a form of vesicle.

Furuncle and Carbuncles

Furuncle is infectious lesion of a single hair follicle and surrounding soft tissues. Another form of furuncle is carbuncle, which is an infection of a group of hair follicles.

Infectious lesions are a red flag and should result in service refusal.

Figure 26: Pustules are a common siymptom of acne.

Figure 27: Furnuncles are infected hair follicles.

Nodules

Nodules are represented by a solid mass in the skin, usually greater than 0.5 cm in diameter, in both width and depth, which can be seen to be elevated (exophytic) or can be palpated (endophytic). Nodules are in the dermis, and they require a medical consultation before any cosmetic procedure can takes place.

Figure 28: Nodules are a solid mass on the skin.

Papilloma

This is a skin lesion that has a form of projection (protrusion or lump) from the skin. They are also known as warts. Papilloma is often a sign of viral infection and requires a visit to a doctor.

Figure 29: Papilloma can appear as small, raised bumps with a rough surface.

Vascular Lesions

Vascular lesions include ecchymosis or bruise and hematoma when blood effuses (leaks or seeps) into the skin or other tissues directly from the blood vessels when the latter get severely damaged.

When the vascular dilation occurs, erythema or redness can often be observed. Erythema is most often the sign of allergic reactions and other eczemas and dermatitis.

Figure 30: Vascular lesions, such as ecchymosis or bruising, occur when blood escapes and forms a hematoma.

Types of Skin Lesions: Secondary Lesions

Secondary lesions always evolve from primary lesions. Among the many secondary types of skin lesions, the following are of interest for cosmetic professionals.

Ulcer

An Ulcer is an area of skin from which the whole of the epidermis and a part of the dermis has been lost. Ulcers may extend into subcutaneous hypodermis, and often heal with scarring.

Figure 31: Ulcers are secondary lesions that can reach deep into the lower layers of skin.

Scars

These are the results of the healing process when the dermal structures are involved in inflammation. The scar is a fibrous tissue that substitutes the normal living structures in the dermis.

Figure 32: Scars form after some injury or trauma as part of the healing process.

Epidermal Keratinous Lesions

These include three major types: Scales, Keratosis and Crusts.

Scale

Scale is a flake that arising from the stratum corneum. Scales may be seen on the surface of many primary lesions (e.g., macules, patches, nodules, scales and raised plaques, etc).

Figure 33: Scales are typically seen on top of primary lesions.

Keratosis and Hyperkeratosis

Keratosis is a horn-like thickening of the stratum corneum and consists of many dense and solid keratinocytes. Keratosis acts as a protective shield as we sometimes see on feet like callosities (callus).

Hyperkeratosis is the term used for the thickening of the stratum corneum under the nail plate, resulting in the nail lifting.

Figure 34: Keratosis refers to a thickening of the uppoer skin layer.

Crust

Crust may look like a scale but is composed of dried blood or tissue fluids. Crusts temporarily cover the wounds, skin injuries, fissures, or other lesions and thus they help in healing.

Figure 35: Crust provides a protective cover over injuries and wounds to provide support in the healing process.

Some skin disorders may be represented by only one lesion, while many others are a complex mix of primary and secondary lesions, which often proves that the disease may be chronic, e.g., psoriasis or atopic dermatitis.

Please, remember that several professional cosmetic procedures may lead to lesion manifestations, because those procedures or techniques employ the controlled inflammation in the skin.

Thus, in this case the appearance of lesions are natural and transient consequences of the controlled and limited skin damage.

At the same time, some invasive procedures such as an e-file manicure may lead to long term and chronic inflammatory complications and the lesions or nail conditions appear too late to prevent unpleasant outcomes.

Skin Conditions

We will now look at the different skin disorders and infections and how they present on the skin.

The most common skin condition is Eczema. Eczema is an acute reaction of the skin to various stimuli, some of which are still unknown.
The term Eczema is used interchangeably with Dermatitis which literally means “inflammation of the skin”.

We will look at three types – Contact Dermatitis, Allergic Dermatitis and Psoriasis - before looking at different causes of Skin Infections.

Contact Dermatitis

This type of inflammatory disorder is caused by irritants directly affecting the skin’s barrier function. Among many irritants that can cause it, the most significant include water and its solutions, detergents and solvents, abrasives and frictional irritants, such chemicals as acids and alkali.

Contact dermatitis can present in all different types of skin lesions from papules to rashes and ulcers and can emerge on any part of the body. Very often, contact dermatitis cannot be distinguished from allergic or infectious dermatitis like, for example, fungal infections.

Figure 36: Severe contact dermatitis.

Allergic Dermatitis

This type of dermatitis, unlike the contact dermatitis is caused by allergens, not irritants, and is the immune response to a potential allergen.

The symptoms of the allergic dermatitis may look exactly like other types of dermatitis.

This makes the differentiation of the allergic reaction from other types of dermatitis challenging and difficult. The identification and removal of the offending allergen is the primary objective and key to effective treatment, doing so clears up the dermatitis and stops the inflammatory reaction.

Repeated and frequent contact with allergens or irritants may lead to chronic dermatitis while the symptoms of the reaction may worsen with each new contact. Barrier creams, highly efficient modern emollients and moisturisers help to recover the skin barriers and promote the healing process.

Repeated and frequent contact with allergens or irritants may lead to chronic dermatitis while the symptoms of the reaction may worsen with each new contact. Barrier creams, highly efficient modern emollients and moisturisers help to recover the skin barriers and promote the healing process.

Figure 36: Allergic dermatitis.

The special specific treatments in a form of anti-inflammatory, immunosuppressive or antihistamine medications can only be prescribed by physicians and medical practitioners.

Psoriasis

Psoriasis is a non-infectious inflammatory disorder characterised by itchy plaques with silvery/white or grey scales on top of the lesions. The disease emerges at any age and in severe cases may also involve joints, scalp, hair and /o nails.

This disease is caused by a malfunction in the immune system which causes the epidermal basal cells to multiply up to 10 times faster than normal.

The rapid turn-over makes epidermis build up into plaques. The granular layer is absent, and the cell nuclei remain in the keratinocytes even in the top layer of the skin. Unfortunately, there is no cure, but there are topical and systemic treatments.

Figure 37: Psorasis with plaques on the skin.

Skin Infections

Less common than the different types of dermatitis and eczema, are skin infections. Despite the wide range of the newest antibiotics and antiseptics, skin infections are still on the rise. All skin infections are caused by microorganisms from one of, or a combination of, 3 different groups: bacteria, fungi and viruses.

Symptoms may vary from one pathogen to another, but all of them are potentially dangerous and even life threatening. Some are signs of other systemic issues. Many follow a fracture, tear or wound in the skin barrier.

Bacterial Infections

These usually cause severe and acute inflammation with all the signs of classical inflammation, including redness (erythema), pain and changes in or to the skin.

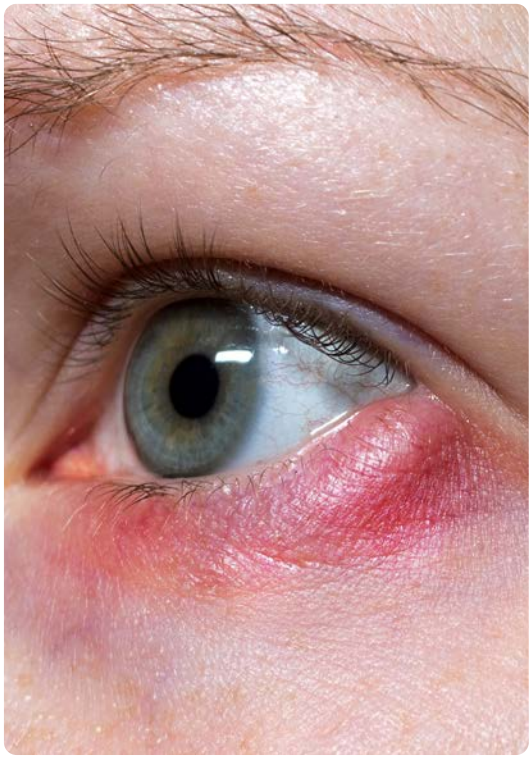

Figure 38: Inflammed skin due to bacterial infection.

Many bacterial infections are fast spreading through the soft tissues, while others may only spread through a limited portion of the skin or skin appendages – for example, pseudomonas aeruginosa – the bacteria that is a cause of “greenies” in or on the nail plate.

Figure 40: Nonbilious impetigo a bacterial infection of the skin.

Fungal Infections

Fungal infections in humans are common. Fungi may attack both living and non-living cells that are rich in keratin – hairs, nails and/or the stratum corneum.

The most common skin fungal infections are confined to the stratum corneum; however, sometimes a deeper infection can occur especially in immune compromised patients. Common fungal infections include athletes’ foot and yeast infections.

Figure41: Severe fungal nail infection.

Viral Infections

Unlike bacteria and fungi, viral particles can only attack living cells because they are essential for their continuing existence.

There are many types of viruses that are harmless for humans while some others may cause life treating conditions, including those with skin manifestations. To be able to reproduce, viruses enter cells, altering the DNA to manufacture new viral DNA or RNA.

When the viral units are mature, thousands of them transition through the cell membrane and disperse to attack new or other living cells.

Common types of viral infections include warts and herpes simplex.

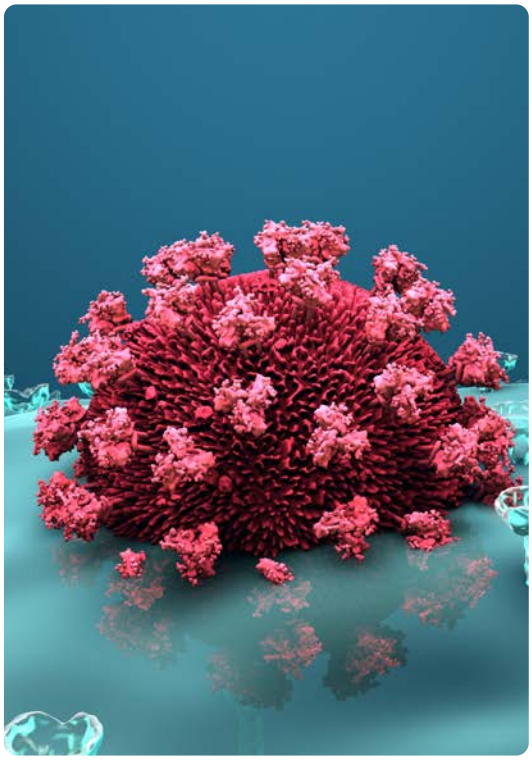

Figure 42: A virus cell infecting a cell.

Summary

Each layer of your skin works together to protect your body.

The hypodermis or subcutaneous layer is the lowest layer of skin. It is largely the area where fat is stored.

This is used as a protective ‘cushion’ for other internal structures, it helps regulate internal heat and is storage for essential energy reserves.

The upper layer is the epidermis. This is a thin cover over the dermis and provides protection from the environment and infections.

The dermis is the middle layer, the thickest and is the heart of the skin system, controlling blood flow, and growing skin appendages or skin derivatives such as hair.

The dermis structure provides strength and flexibility with collagen and elastin fibres holding it together.

It contains blood vessels which help maintain your epidermis by transporting nutrients and lymphatic vessels to transport waste and immune cells.

Nerve endings in your dermis allow you to feel pressure, pain, heat, cold and itchiness.

Your dermis contains hair follicles, which produce hair all over your skin, except the palms of your hands and the soles of your feet.

Your dermis contains sweat glands, which helps control your body temperature and sebaceous glands, which keep your skin and hair hydrated and shiny.

Together with your other layers of skin, your dermis protects your skeletal system, organs, muscles, and tissues from harm.

The epidermis is made up of multiple layers of keratinocytes, produced in the basal layer, these cells mature, building different chemicals within the cells.

Summary

As these cells near the end of their cycle, they move up to the top layer of the skin, the stratum corneum, where they form the wall of outer defenses.

The lipids created within the keratinocytes leach out to form a cement between the keratin-rich keratinocytes. The hard, solid keratin forms the bricks while the moisturising chemicals within the cell, retain water. This outer layer shields us from the environment around us.

The epidermis has many functions. Keeping us hydrated. Protecting the body from ultraviolet radiation, pathogens (bacteria, viruses, fungi and parasites) and chemicals.

As well as keratinocytes in the epidermis there are also melanocytes that give your skin its pigment, known as melanin, and Langerhans cells which prevents invaders (transient or resident) on your skin from getting into your skin.

Water is essential for life and the health and quality of our skin.

The body prevents excessive water loss by using the chemical properties of several different acids, sugars and proteins. This special complex of water binding molecules is produced by keratinocytes.

Most of them are the derivatives and the waste compounds of the metabolism of keratin – this is complex mix of chemicals is called the Natural Moisturising Factor.

We can reduce water loss by using occlusives to cover the skin in a coating that prevents water from escaping. These include petroleum jelly and mineral oils, which sit upon the upper layers of the epidermis.

We can use humectants, such as Urea, water-retaining molecules which can easily penetrate the epidermis to provide an extra moisturising effect.

Summary

The skin has two additional protective features, a rich microbiome of protective microorganisms and an acid mantle – the hydrolipid barrier which attacks invaders and shields us from pathogens and bacteria.

There are five specific signs of inflammation

- Redness
- Heat
- Swelling
- Loss of function
- Pain

Inflammation goes through three stages

- inflammatory response
- repair and recovery
- remodeling and maturation

All skin lesions can be divided into two major groups – primary lesions and secondary lesions that evolve from the primary skin disturbances.

There are two major groups of skin disorders - Eczema and dermatitis disorders / and skin infections

Eczema and dermatitis disorders are caused by a reaction to irritants or allergens and are a defense response of the immune system.

Skin infections are caused by bacteria, fungi, and viruses.

Glossary

Abscess

A collection of pus in a cavity, usually more than 1 cm in diameter. Sometimes referred to as a pus-filled blister on the skin's surface.

Allergic dermatitis

Dermatitis caused by allergens, marking an immune response. Symptoms can resemble other forms of dermatitis.

Apocrine Glands

Type of sweat gland associated with hair follicles, primarily found in the armpits and genital area.

Arrector Pili Muscle

Tiny muscles connected to hair follicles that cause the hair to stand erect, resulting in goosebumps.

Arteries

Blood vessels that carry oxygen-rich blood from the heart to the rest of the body.

Bacteria

One of the three microorganism groups causing skin infections, which can lead to inflammation and various skin conditions.

Basal Layer (Stratum Germinativum)

The deepest layer of the epidermis, where new skin cells are produced.

Basement Membrane

A layer that separates the epidermis from the dermis, allowing the transfer of nutrients and other substances.

Blood and Lymphatic Vessels

The network of tubes responsible for transporting blood and lymph throughout the body.

Ceramides

Complex epidermal lipids present in quality cosmetics. They have water-loving heads and oil-loving tails and form bilayers in intercellular space.

Cholesterol

Essential lipid in the epidermis crucial for building organised lipid structures. It plays roles in hormonal regulations, enzymes, etc. Only synthesised in animal organisms.

Collagen

A protein in the dermis produced by fibroblasts that provides structural support and can store a significant amount of water.

Contact dermatitis

An inflammatory disorder caused by irritants directly affecting the skin's barrier function.

Crust

Appears similar to a scale but is made up of dried blood or tissue fluids. Temporarily covers wounds or injuries aiding healing.

Dermis

The middle layer of skin. It is living, connective tissue that acts as the skin's control centre containing blood vessels, immune cells, and more.

Desmosomes

Specialised structures that join cells together.

Eccrine Glands

Type of sweat gland that aids in cooling the body through evaporation and is most commonly found throughout the body.

Eczema

An acute skin reaction to various stimuli. Also known as Dermatitis, which means "inflammation of the skin".

Elastin

A protein in the dermis that provides the skin with its elasticity and ability to stretch.

Epidermis

The outermost layer of the skin that serves as the primary defensive barrier between the body and the environment.

Erosion

A superficial ulcer marked by a loss of epidermis but doesn't involve the dermis.

Erythema

Redness of the skin resulting from inflammation, often seen in bacterial infections.

Extracellular Matrix

A gel-like substance in the dermis produced by fibroblasts that contains the building blocks of collagen and elastin fibres and helps retain water.

Fatty Acids

Important for the entire body and are part of many structures, including the skin. They can form secondary lipids known as triglycerides or oils and fats.

Fibroblasts

Cells in the dermis that produce materials needed to maintain the structure of the dermis, including collagen and elastin.

Fissure

A crack in the skin affecting both epidermis and dermis. Often found on soles, palms, or thickened skin.

Fungi

A group of microorganisms that can infect both living and non-living keratin-rich cells, leading to various fungal skin conditions.

Furuncle and Carbuncles

Furuncle affects a single hair follicle and surrounding tissues. A carbuncle affects a group of hair follicles.

Hair Follicle

The skin organ that produces hair.

Herpes Simplex

A viral disease-causing painful blister on the skin or mucous membranes, commonly known as cold sores or genital herpes.

Hydrolipid Mantle

A special invisible layer on the skin's surface formed by the mix of intercellular lipid bilayers, sebum, and fluid from sweat glands.

Hypodermis

The deepest layer of skin, also referred to as subcutaneous fat. It acts as an energy store and insulates the body from heat and cold.

Immune Compromised

Describes individuals whose immune system is not functioning optimally, making them more susceptible to infections.

Integumentary System

The body's layer covering that includes all the layers of the skin, its associated glands, and appendages such as hair and nails.

Keratin

A tough, protective protein found in skin, hair, and nails.

Keratinocytes

Skin cells primarily located in the epidermis, playing crucial roles in skin protection and formation. Responsible for producing keratin.

Keratosis

A horn-like thickening of the stratum corneum comprised of dense, solid keratinocytes. Acts as a protective shield.

Langerhans Cells

Immune cells located in the skin, which play a role in the body's defence against pathogens.

Lipids

Essential components of the epidermal barrier, acting like cement in a brick wall. They don't dissolve in water. Three primary types are Fatty Acids, Ceramides, and Cholesterol.

Lymphatic System

The body's network of vessels and nodes that transport and filter lymph fluid containing antibodies and white blood cells.

Macula and Patch

Superficial lesions differing in size. The patch is a large macula, greater than 0.5cm in diameter. They can signal changes in pathological pigmentation.

Melanin

The pigment that gives skin its colour and protects it from harmful UV radiation.

Melanocytes

Cells that produce melanin, the pigment responsible for skin, hair, and eye colour.

Microcirculation

The circulation of blood in the smallest blood vessels.

Natural Moisturising Factor (NMF)

A collection of water-binding molecules or humectants, made of components like amino acids, lactic acids, urea, etc., produced by the skin, acting as natural moisturisers.

Nervous System

The network of nerve cells and fibres that transmits nerve impulses between parts of the body.

Nodules

Solid masses in the skin, typically larger than 0.5 cm in both width and depth. They are present in the dermis.

Papilloma

A skin lesion in the form of a projection. Also known as warts, often indicating a viral infection.

Papule

A small solid elevation of skin, less than 0.5 cm in diameter, that can involve the dermal structures. It can be a sign of multiple skin diseases.

Pathogen

A bacteria, virus, or other microorganism that can cause disease.

Plaque

Elevated area of skin greater than 2 cm in diameter. It rarely affects the dermis. Often indicates psoriasis.

Pseudomonas Aeruginosa

A type of bacteria responsible for certain infections like "greenies" in or on the nail plate.

Psoriasis

A non-infectious inflammatory disorder. It is characterised by itchy plaques with silvery or grey scales on top. Caused by rapid cell multiplication.

Pustule

A visible accumulation of pus in the skin in vesicle form.

Scale

A flake arising from the stratum corneum. Can appear on various primary lesions.

Scars

Result from the healing process when dermal structures are involved. Comprised of fibrous tissue replacing normal dermal structures.

Sebaceous Glands

Part of the integumentary system, secreting a fatty waxy substance called sebum that lubricates the skin's surface.

Skin

The largest organ of the human body responsible for various functions like protection, immunity, sensory responses, and more.

Skin Infections

Infections that target the skin, less common than dermatitis and eczema but can be potentially dangerous and life threatening.

Stratum Corneum

The outermost layer of the epidermis. As keratinocytes move towards this surface, they fill with keratin and lipids and play a protective role, resembling a brick wall solidified with intercellular cement.

Stratum Granulosum

A layer of the epidermis characterised by granules within cells, which contain water, lipids, and keratin. These cells are still living, as their nuclei are present.

Stratum Lucidum

A translucent layer found in thicker epidermis, specifically under the Stratum Corneum in areas like the soles and palms. It adds extra thickness but is not present in thinner skin.

Stratum Spinosum (Prickle cell layer)

A layer of the epidermis containing young keratinocytes.

Ulcer

An area of skin where the whole of the epidermis and part of the dermis has been lost. May extend into the subcutaneous hypodermis.

Vascular lesions

Involves blood effusing into skin/tissues due to damaged vessels. Includes ecchymosis (bruise) and hematoma. Includes erythema.

Veins

Blood vessels that carry deoxygenated blood back to the heart.

Vesicles and Bulla

Vesicles are in the epidermis, whereas bullas may engage dermal structures. Vesicles are related to herpes simplex; bullas/blisters form due to skin friction.

Viral DNA or RNA

The genetic material of viruses, which can be inserted into host cells to reproduce and produce new viral units.

Viruses

Infectious agents that require living cells for their reproduction, causing various diseases including those with skin manifestations.

Warts

Common viral skin infections, usually harmless, caused by certain strains of human papillomavirus (HPV).

Water

An essential compound for life and vital for human body functions. The body, including the skin, requires a balanced water level to maintain its functions.

Yeast Infections

Infections caused by a fungus called Candida, often affecting moist areas of the body.

Vitaly Solomonoff

Vitaly Solomonoff is a qualified dermatologist and cosmetic chemist with over 30 years' experience in the cosmetic and nail industry.

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