Ministry of Higher Education and Scientific Research

College of health and medical techniques kufa

Dept.Asthetic and laser technique

Learning package in field of

Skin and hair biology

Presented to the 1st class students

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The first modular Unit

Layer of the skin

Histologically skin forms two distinct layers : the epidermis and underlying dermis

Layers of the Skin

The Epidermis

The epidermis is the outermost layer of the skin, and protects the body from the environment. The thickness of the epidermis varies in different types of skin; it is only .05 mm thick on the eyelids, and is 1.5 mm thick on the palms and the soles of the feet. The epidermis contains the melanocytes (the cells in which melanoma develops), the Langerhans' cells (involved in the

immune system in the skin), Merkel cells and sensory nerves. The epidermis layer itself is made up of five sublayers that work together to continually rebuild the surface of the skin:

The Basal Cell Layer

The basal layer is the innermost layer of the epidermis, and contains small round cells called basal cells. The basal cells continually divide, and new cells constantly push older ones up toward the surface of the skin, where they are eventually shed. The basal cell layer is also known as the stratum germinativum due to the fact that it is constantly germinating (producing) new cells.

The basal cell layer contains cells called melanocytes. Melanocytes produce the skin coloring or pigment known as melanin, which gives skin its tan or brown color and helps protect the deeper layers of the skin from the harmful effects of the sun. Sun exposure causes melanocytes to increase production of melanin in order to protect the skin from damaging ultraviolet rays, producing a suntan. Patches of melanin in the skin cause birthmarks, freckles and age spot**S.** Melanoma develops when melanocytes undergo malignant transformation.

Merkel cells, which are tactile cells of neuroectodermal origin, are also located in the basal layer of the epidermis.

The Squamous Cell Layer

The squamous cell layer is located above the basal layer, and is also known as the stratum spinosum or "spiny layer" due to the fact that the cells are held together with spiny projections. Within this layer are the basal cells that have been pushed upward, however these maturing cells are now called squamous cells, or keratinocytes. Keratinocytes produce keratin, a tough, protective protein that makes up the majority of the structure of the skin, hair, and nails.

The squamous cell layer is the thickest layer of the epidermis, and is involved in the transfer of certain substances in and out of the body. The squamous cell layer also contains cells called Langerhans cells. These cells attach themselves to antigens that invade damaged skin and alert the immune system to their presence.

The Stratum Granulosum & the Stratum Lucidum

The keratinocytes from the squamous layer are then pushed up through two thin epidermal layers called the stratum granulosum and the stratum lucidum. As these cells move further towards the surface of the skin, they get bigger and flatter and adhere together, and then eventually become dehydrated and die. This process results in the cells fusing together into layers of tough, durable material, which continue to migrate up to the surface of the skin.

The Stratum Corneum

The stratum corneum is the outermost layer of the epidermis, and is made up of 10 to 30 thin layers of continually shedding, dead keratinocytes. The stratum corneum is also known as the "horny layer," because its cells are toughened like an animal's horn. As the outermost cells age and wear down, they are replaced by new layers of strong, long-wearing cells. The stratum corneum is sloughed off continually as new cells take its place, but this shedding process slows down with age. Complete cell

turnover occurs every 28 to 30 days in young adults, while the same process takes 45 to 50 days in elderly adults.

The Dermis

The dermis is located beneath the epidermis and is the thickest of the three layers of the skin (1.5 to 4 mm thick), making up approximately 90 percent of the thickness of the skin. The main functions of the dermis are to regulate temperature and to supply the epidermis with nutrient-saturated blood. Much of the body's water supply is stored within the dermis. This layer contains most of the skins' specialized cells and structures, including:

Blood Vessels

The blood vessels supply nutrients and oxygen to the skin and take away cell waste and cell products. The blood vessels also transport the vitamin D produced in the skin back to the rest of the body.

Lymph Vessels

The lymph vessels bathe the tissues of the skin with lymph, a milky substance that contains the infection-fighting cells of the immune

system • These cells work to destroy any infection or invading

organisms as the lymph circulates to the lymph nodes.

Hair Follicles

The hair follicle is a tube-shaped sheath that surrounds the part of the hair that is under the skin and nourishes the hair.

Sweat Glands

The average person has about 3 million sweat glands. Sweat glands are classified according to two types:

Unit 2

Skin cells and their functions

The skin cells' functions include protecting the body from infection and injury, playing a role in maintaining a normal body temperature, and containing touch, temperature, pressure, and pain sensors that allow you to sense the outside world.

Keratinocytes are the most abundant cell in the epidermis, and they produce keratin, which makes skin tough and strong. Melanocytes produce melanin, which gives skin its color. Langerhans cells are immune cells that help to prevent and fight off skin infections. Merkel cells play a role in the transmission of light tough signals and are most abundant in the fingertips.

Cells of the epidermis: The epidermal cells include keratinocytes, melanocytes, and Langerhans and Merkel cells (see Image. Cells of the Epidermis). Keratinocytes are the predominant cells of the epidermis, originating from the basal layer. These cells produce keratin and lipids essential for forming the epidermal water barrier. Keratinocytes also contribute to calcium regulation by enabling UVB light absorption in the skin, which is critical for vitamin D activation. Melanocytes derive from neural crest cells and primarily synthesize melanin, the main skin pigment component. These cells are found between stratum basale cells. UVB light stimulates melanin secretion, protecting against further UV radiation exposure and acting as a built-in sunscreen. Melanin forms during the conversion of tyrosine to dihydroxyphenylalanine by the enzyme tyrosinase. Melanin then travels from cell to cell, relying on the long processes connecting the melanocytes to the neighboring epidermal cells. Melanin granules from melanocytes transit through the lengthy processes to the cytoplasm of basal keratinocytes. This transfer occurs through cytocrine secretion, where keratinocytes phagocytose the tips of melanocyte processes.

Langerhans cells are dendritic cells that act as the skin's first-line cellular immune defenders and are crucial for antigen presentation. Special stains allow visualization of these cells in the stratum spinosum. Langerhans cells are of mesenchymal origin, derived from CD34-positive bone marrow stem cells, and are part of the mononuclear phagocytic system. These cells contain Birbeck granules and tennis racket-shaped cytoplasmic organelles. Langerhans cells express major histocompatibility complex (MHC) I and MHC II molecules, uptake antigens in the skin, and transport them to the lymph nodes. Merkel cells are oval-shaped modified epidermal cells found in the stratum basale, directly above the basement membrane. These cells serve as mechanoreceptors for light touch and are found in the palms, soles, and oral and genital mucosa, with the highest concentration in the fingertips. Merkel cells bind to adjoining keratinocytes through desmosomes and contain intermediate keratin filaments. The cell membranes of Merkel cells interact with free nerve endings in the skin.

Dermis

The dermis is connected to the epidermis by the basement membrane. The dermis consists of 2 connective tissue layers, papillary and reticular, which merge without clear demarcation. The papillary layer is the upper dermal layer, which is thinner and composed of loose connective tissue that contacts the epidermis. The reticular layer is the deeper layer, which is thicker and less cellular. This layer consists of dense connective tissue composed of collagen fiber bundles. The dermis houses the sweat glands, hair, hair follicles, muscles, sensory neurons, and blood vessels.

Hypodermis

The hypodermis, also known as the subcutaneous fascia, is located beneath the dermis. This layer is the deepest skin layer and contains adipose lobules, sensory neurons, blood vessels, and scanty skin appendages, such as hair follicles.

Functions

The skin's comprehensive roles highlight its complexity and importance in maintaining overall health and well-being. These roles are discussed below.[8][9]

Barrier function: The skin has multiple protective roles, acting as a barrier against various external threats. The skin shields the body from excessive water loss or absorption, invasion by microorganisms, mechanical and chemical trauma, and UV light damage. The cell envelope establishes the epidermal water barrier, a layer of insoluble proteins on the inner surface of the plasma membrane. This barrier is formed through the cross-linking of small proline-rich proteins. Larger proteins such as cystatin, desmoplakin, and filaggrin contribute to the barrier's robust mechanics. The lipid envelope is a hydrophobic layer attached to the outer surface of the plasma membrane. Keratinocytes in the stratum spinosum produce keratohyalin granules and lamellar bodies containing a mixture of glycosphingolipids, phospholipids, and ceramides assembled within Golgi bodies. The contents of lamellar bodies are then secreted through exocytosis into the extracellular spaces between the stratum granulosum and corneum.

Unit 3

Skin proteins and molecule

Protein molecular structure is divided into four levels that ultimately give the protein its final, three dimensional form, or conformation. Proteins are made from the monomer, amino acids, carbon based building blocks that make up proteins. Overall, there are 20 different amino acids and the unique combination and organization gives each protein its structure and function.

Primary Structure

The primary structure of a protein is the specific number and order of amino acids that make up the protein chain, called a polypeptide, a simple protein molecule. The individual amino acids are linked together with a peptide bond between the carboxyl group of one amino acid and the amine group of another. Amino acids are assembled into polypeptide chains during translation at the ribosome. Here, a ribosome reads the mRNA message and works with transfer RNA (tRNA) to bring the correct amino acids and catalyze the dehydration reaction to form the peptide bond.

The primary structure is important because the location of different amino acids will ultimately determine the shape, and thus the function of the protein. For example, hydrophobic amino acids do not like to come in contact with the aqueous environment of the cell. Thus, upon folding the location of these amino acids in the polypeptide chain will be hidden, thus giving the protein a unique structure.

Primary structure is so important that a single change to the amino acids can alter the entire function of the protein. For example, sickle cell anemia is a blood disorder that is caused by a point mutation in the protein hemoglobin. It switches a hydrophilic amino acid for a hydrophobic amino acid, glutamic acid for valine. This causes multiple molecules of hemoglobin to stick together and the proteins to bunch together in the red blood cells. Hydrophobic amino acids do not like to be exposed to the aqueous environment of the cell, so the valine amino acids stick to others, creating hemoglobin molecules that are bunched together. This causes the sickling shape of the red blood cells, causing them to get caught in smaller blood vessels in the body.

Unit 4

Introduction to hair structures

Different types of hair

Aside from a few places, like the palms of our hands or the soles of our feet, the entire surface of our body has hair on it. The two main types of hair are the shorter and thinner "vellus" hairs (peach fuzz) found on the body and the longer and thicker "terminal" hairs. Examples of terminal hairs include the hair on your head, facial hair, eyelashes, eyebrows, pubic hair, chest hair and belly hair.

How much of each hair type you have varies from person to person and also depends on your age and sex. Children's bodies mostly have vellus hair, for instance. About 30 percent of the body's surface is covered with terminal hair in women, compared to about 90 percent in men.

Hair structure

Each hair has a hair shaft and a hair root. The shaft is the visible part of the hair that sticks out of the skin. The hair root is in the skin and extends down to the deeper layers of the skin. It is surrounded by the hair follicle (a sheath of skin and connective tissue), which is also connected to a sebaceous gland.

Each hair follicle is attached to a tiny muscle (arrector pili) that can make the hair stand up. Many nerves end at the hair follicle too. These nerves sense hair movement and are sensitive to even the slightest draft.

At the base of the hair, the hair root widens to a round hair bulb. The hair papilla, which supplies the hair root with blood, is found inside the bottom of the hair bulb. New hair cells are constantly being made in the hair bulb, close to the papilla.

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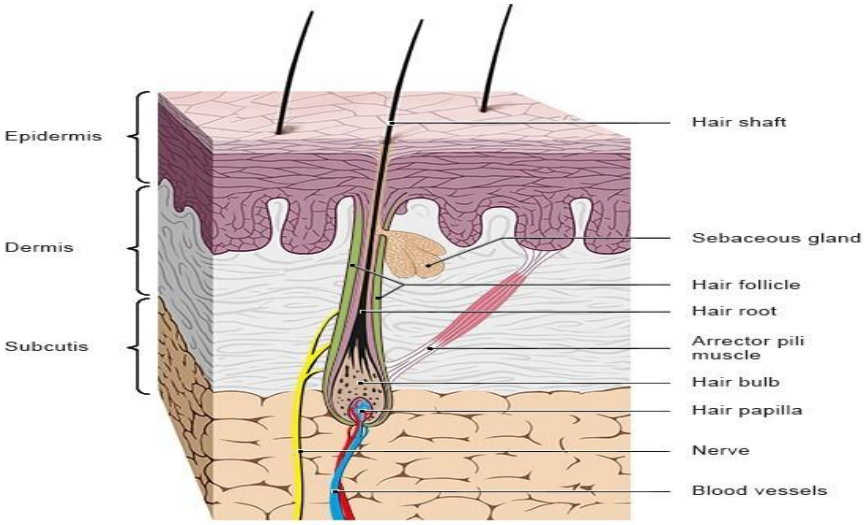

Unit 5

Components of hair shaft

Below the epidermis, it is part of a living hair follicle that enlarges at the base and forms the hair bulb. The hair shaft comprises a cortex, surrounding cuticle cells, and sometimes a central medulla found in thicker hair.

Hair Anatomy

The human hair is composed of three main parts: the hair shaft, the hair bulb, and the hair follicle. The hair shaft is the visible part of the hair that extends from the scalp to the tip of the hair. The hair bulb is the base of the hair shaft and is located at the bottom of the hair follicle, which is a tubular structure that surrounds and supports the hair shaft. The sebaceous gland is a small gland that produces sebum, an oily substance that lubricates and protects the hair. For more info, you can read about the hair growth cycle

The Hair Bulb

The hair bulb is located at the bottom of the hair follicle and is responsible for producing new hair cells. The cells in the hair bulb divide rapidly and push the older cells up the hair follicle. As the cells move up the follicle, they harden and become keratinised. The sebaceous gland is

attached to the base of all hair follicles and produces sebum, an oily substance that lubricates and protects the hair.

The Hair Follicle

The human hair follicle is a tubular structure that surrounds and supports the hair shaft. The cells in the hair follicle divide rapidly and produce new hair cells. As the cells move up the follicle, they harden and become keratinised. The sebaceous gland is attached to the base of the hair follicle and produces sebum, an oily substance that lubricates and protects the hair.

The Hair Shaft

hair shaft structureIt is made up of three layers: the medulla, cortex, and cuticle.

The medulla is the innermost layer and is composed of cells that are filled with air.

The cortex is the middle layer and is composed of cells that contain keratin, a protein that gives strength and flexibility to the hair.

The cuticle is the outermost layer and consists of overlapping scales that protect the inner layers of the hair.

The Cuticle Layer

The cuticle is the outermost layer of the hair shaft. It is made up of cells that overlap each other like shingles on a roof. The cuticle protects the

inner layers of the hair shaft from damage •

The Cortex Layer

The cortex layer is the middle layer of the hair shaft. It is made up of cells that are tightly packed together. The cells in the cortex layer are filled with a protein called keratin. The cortex layer gives the hair its strength and elasticity.

The Medulla layer

The medulla is the innermost layer of the hair shaft and is made up of a spongy, soft tissue. It is responsible for giving the hair its strength and elasticity.

The Roles of Melanocytes and Keratinocytes

The role of melanocytes is to produce melanin, which is responsible for the hair colour. Keratinocytes are cells that make up the hair shaft. The melanocytes inject pigments into the keratinocytes of the new hair shaft, which determines the colour of the hair. The colour lasts during the hair cycle, from when the hair is first growing to when it falls out.

Unit 6

Hair growth cycle

Hair growth occurs in a continuous process characterized by four phases: anagen, growth; catagen, regression; telogen, rest; and exogen, shedding. Individual hair follicles cycle independently, with each hair follicle undergoing ten to thirty cycles Hair grows in four distinct stages. The final stage involves the shedding of old hair, making room for new hair growth. Certain conditions can disrupt these stages.

The growth and loss of hair may seem like a simple process, but the hair growth cycle actually involves four distinct phases. These stages of hair growth have been studied in great depth to better understand how hair

grows and what might be done to prevent or treat premature hair loss •

The first three phases — anagen, catagen, and telogen — cover the growth and maturation of hair and the activity of the hair follicles that produce individual hairs. During the final, or exogen, phase, “old” hair sheds, though usually, a new hair is getting ready to take its place.

Each phase has its own timeline, which can be affected by age, nutrition, and overall health. That means you can take steps along the way to help ensure that your hair follows a healthy growth cycle. Read on to learn more.

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Unit 7

Skin barrier function

The skin barrier is important to human life. Physically, it protects from external threats such as infectious agents, chemicals, systemic toxicity and allergens. Internally, the skin helps to maintain homeostasis and protects from enhanced loss of water from the body.

Skin as a barrier

Skin is the largest organ of the human body and comprises three major layers; epidermis, dermis, and subcutis

[see Structure of normal skin].

One vital function of the skin is to form an effective barrier between the organism and the environment. It maintains an ‘inside-outside’ barrier regulating water loss, and an ‘outside-inside’ barrier protecting the organism from external harm, including mechanical, chemical, and microbial.

Epidermal barrier functions

Skin structures with physical barrier functions

Stratum corneum

The outermost layer of the epidermis is the stratum corneum, which consists of dead dried-out cells called corneocytes

in a bricks-and-mortar arrangement.

A key barrier function of the epidermis is to control diffusion of molecules across the skin; transepidermal water loss (TEWL) from inside to outside, and chemicals from the outside environment to inside. Diffusion through the epidermis can be via one of two routes: intracellular through the epidermal lipid matrix, or transcellular across the corneocytes. The rate of diffusion across the stratum corneum is influenced by:

The unique lamellar organisation of the lipid matrix and its interaction with protein components of keratinocytes

, including tight junctions and scaffolding proteins

The diffusion path length which is determined by the thickness of the stratum corneum, numbers of layers of corneocytes, their size, and their cohesion.

Unit 8

Skin hydration and transepidermal water loose

What is transepidermal water loss?

While it might sound technical, TEWL is simply a natural process where water evaporates from the surface of your skin. It's also a key indicator of how well your skin barrier is working. Your body is about 60% water, and nearly a third of that is in your skin — your body's largest organ. Every day, a bit of that water is lost through TEWL.

Albert explains: "This process refers to the amount of water that evaporates from the top layer of the skin, known as the stratum corneum." The stratum corneum — your skin's outermost layer — acts like a shield, keeping moisture in and protecting you from external stressors.

Why does TEWL happen?

Your skin is always interacting with the air around you, and that air has different humidity levels depending on where you are. To balance things out, water on your skin's surface evaporates. As Albert says, "TEWL is completely natural and unavoidable."

The idea is to keep this process in check because some factors can speed it up, leaving your skin dry and dehydrated. Albert shares what can cause excessive water loss:

Environmental conditions: Low humidity, air conditioning, or extreme temperatures can pull moisture from your skin.

How to give your skin deep, lasting hydration

Here’s how to create a simple, effective routine to keep your skin happy and hydrated:

Cleanse: Start with a gentle facial cleanser to clear away impurities without stripping your skin.

Hydrate: Apply a hydrating eye cream and serum with hyaluronic acid. Hyaluronic acid is a hydration hero that also helps boost elasticity.

Moisturize: Finish with your go-to moisturizer to seal in all that hydration and keep your barrier strong.

Sunscreen: Protect your skin daily with broad spectrum sunscreen to help prevent sun damage, which can dry out your skin and worsen TEWL.

Unit 9

AGING IN SKIN AND HAIR

With aging, skin becomes drier, less elastic, and more prone to wrinkles and age spots due to decreased natural oils and sun exposure. Additionally, hair may turn gray or white, become thinner and more fragile, and grow slower. These visible signs of aging often appear before other physical changes.

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The skin, your body's largest organ, undergoes a lot. From sun-soaked vacations to belly laughs shared with friends, your skin has to endure various environmental factors while keeping you safe and healthy.

The outer skin layer, also known as the epidermis, thins out.

There is a decrease in the number of pigment-containing cells, which can lead to pigmented spots, such as age spots or "liver spots."

Changes in connective tissue reduce the skin's strength and elasticity, a condition known as elastosis.

Blood vessels in the dermis become more fragile, which can cause bruising, bleeding under the skin, and cherry angiomas.

Sebaceous glands produce less oil, leading to dryness and itchiness.

Decreased sweat production can make it harder to keep cool, increasing the risk of overheating.

Aging Changes In Hair

Looking around, you see that everyone has vastly different hairstyles, textures, and colors. Some of these are genetically inherited, while others undergo changes in age.

The following are some common effects of aging on hair:

Melanocytes stop producing pigment, leading to colorless hair. The age at which this happens varies, but 50% of people have some gray hair by age 50.

Hair strands become smaller, less dense, and more fragile with age due to hormonal changes and decreased active follicles.

Some people's hair texture may change with age and phases of life such as menopause. For instance, curly hair may begin to lose its bounce, droop, or even form a new pattern.

Hair growth slows with age due to decreased hair cell production. Aging hair has a shorter life cycle, leading to thinning and loss caused by factors such as hormonal changes, hereditary traits, and nutritional deficiencies. In women near menopause, hormonal imbalances can halt new hair production, resulting in thinner hair that doesn't regenerate.

Hair can also change color, becoming dull with age due to oxidative stress and environmental factors.

Other Physical Changes

While skin and hair present the most visible aging signs, they're not the only parts of your body that change with time. Here are some other general changes brought on by aging:

As you age, bones lose minerals and become less dense, making them more susceptible to fractures.

Muscle mass decreases, reducing strength and mobility.

With age, individuals often encounter presbyopia, which affects lens flexibility and makes focusing on nearby objects difficult. Additionally, other age-related eye conditions can cause vision loss.

Hearing declines with age, most commonly due to changes in the inner ear.

The immune system becomes less efficient, meaning you're more susceptible to infections and diseases.

Some cognitive decline is a normal part of aging, but dementia and Alzheimer's disease are not.

Chronological aging and hormonal effect on hair

Hair is a key physical structure that has a significant impact on a person's psychosocial personality. Hair follicles (HFs) are made up of dermal papilla cells (DPCs) formed from mesenchymal cells and epithelial-derived root sheath cells, with mesenchymal-derived DPCs interacting with epithelial-derived root sheath cells [1]. The hair growth cycle consists of three phases. These phases are anagen, catagen, and telogen representing growth, regression, and rest respectively [2]. DPCs also produce and release a number of cytokines that control hair growth and cycle [3].

Hair growth, cycling, and density can all be affected by endocrine disorders, and a thorough examination may discover the underlying problem. Hormonal abnormalities include hypertrichosis, hirsutism, and alopecia areata. However, the task is complicated by a lack of data and a discrepancy in the literature on the effect of hormonal influence on the hair cycle, which has not been properly examined. This article briefly discusses the hormonal impact on hair growth and the association of different endocrine disorders with hair changes.

Hormones and their effects on hair

Androgens

They are the primary regulators of proper hair growth in humans [4]. They operate on hair follicles through interaction with intracellular receptors inside DPCs, depending on where the hair is located over the body [5,6]. Androgen's major effect is to interact with androgen receptors in DPCs [7]. The impact of androgens is to change the vellus hairs which are thin, short, and straight into terminal hairs which are darker, bigger, and curlier in sex-specific parts of the body [8]. In both sexes, androgens convert axillary and groin vellus hair follicles, as well as the vellus hair in

the trunk and beard area of males, into terminal hair during puberty [9]. The pathophysiology and course of patterned hair loss are influenced by circulating androgens. This is based on the observation that unless testosterone is provided, eunuchs and castrated boys do not acquire male-patterned hair loss [10]. On DPCs, when androgen receptors are occupied by di-hydro testosterone and testosterone, they mediate alteration in the production of soluble factors, influencing the activity and maturity of variable cells, in particular, hair follicle keratinocytes, which results in male patterned hair loss. As a result, scalp hairs get increasingly thinner [11].

Oestrogen

Androgens undergo peripheral aromatisation in adipose tissue to make oestrogens. In females, oestrogen is necessary for the development of pubic and axillary hair. Oestrogens, on the other hand, have long been known to have a significant impact on hair follicle changes affecting the growth of hair follicles through binding to high-affinity, locally produced oestrogen receptors [12]. Due to the depletion of finite ovarian follicles, menopause is accompanied by a decrease in oestrogen and progesterone release, which can lead to hair and skin illnesses [13,14]. After menopause, the higher frequency of developing female pattern hair loss indicates that oestrogens play a role in the stimulation of hair growth. In postmenopausal women, the etiologies as well as management strategies of certain conditions including hair loss and hirsutism are quite different compared to premenopausal women. During pregnancy, high circulatory levels of oestrogen may contribute to the prolonging of anagen, while a drop in circulatory levels of oestrogen in the post-partum period is thought to contribute to post-partum hair loss which is known as telogen

Growth Hormone

This enhances androgen's influence on sexual hair growth. In growth hormone-deficient hypogonadal males, the required level of testosterone to stimulate hair growth in the axilla may reach around 5 times the normal testosterone level in growth hormone-sufficient hypogonadal boys [9].

Insulin and Insulin-Like Growth Factor (IGF)

These hormones play a part in hair development stimulation and work in tandem with androgens. Hyperinsulinemia may boost di-hydro testosterone synthesis by inducing 5α reductase activity.

Prolactin

Prolactin is a hormone that plays a function in lactation, reproduction, angiogenesis, osmoregulation, and hair development [17]. In females, prolactin promotes the hair shaft lengthening in the front-temporal region of the scalp while inducing catagen in male occipital scalp hair follicles [18,19]. Prolactin excess is linked to hirsutism in clinical studies, most likely due to the stimulation of hyperandrogenism.

Melatonin

Melatonin is a hormone that regulates the rhythm of a variety of physiological systems. Melatonin receptors can be present in sweat glands, blood vessels endothelium, epidermal keratinocytes, and dermal fibroblasts, in addition to hair follicle cells. Melatonin affects hair pigmentation primarily by increasing the number of melanocytes, as well as its growth, most likely via accelerating the anagen phase. The ability of melatonin to control the hair follicle response to oestrogens, weakening oestrogen receptors expression in the hair follicle, is one of its most essential functions. One of the roles of melatonin is to activate nuclear factor erythroid-2-related factor 2, which has a significant impact on the protection of hair follicles from oxidative stress and thus to inhibit hair growth suppression [20,21].

Cortisol

Hair loss has become more common in women and young people, and it is thought that stresses, rather than genetic factors, are to blame. As a result, accumulating data on the impact of stress on HFs and their constituent cells is critical for hair loss treatment [22]. The association between stress hormones and hair loss, on the other hand, is poorly understood. Cortisol is recognized to affect the function and cyclic regulation of the hair follicle [23]. High levels of cortisol are linked to a decrease in the formation and early breakdown of hair follicle modulators such as proteoglycans and hyaluronans, which are essential for hair follicle activity [24]. Corticotropin-releasing factor (CRF), in particular, is a key HPA axis hormone in the peripheral stress response. Hair shaft elongation is greatly inhibited by CRF activation [25].

Thyroid

Thyroid receptors were detected on the outer root sheath cells of hair follicles. The thyroid hormone is believed to be responsible for regulating the hair cycle's frequency [26]. Hypothyroidism causes a decrease in anagen frequency, whereas hyperthyroidism causes thin hairs.

Endocrine conditions causing abnormal/excessive hair growth

Hirsutism

Excessive terminal hair in parts of the female body that are androgen-dependent is a symptom of elevated androgen activity in the hair follicle. Worldwide, hirsutism in females frequently leads to psychological suffering, lack of confidence, and cosmetic embarrassment. It is a clinical symptom of hyperandrogenemia (abnormally high levels of androgens detected in the blood) [27]. The prevalence of hirsutism ranges from 4-11 percent, however, Asians appear to have a lower rate [28]. With advancing age, the prevalence and severity of hirsutism decrease (especially in postmenopausal women) [29]. In 75 percent of patients with hyperandrogenemia, hirsutism is present [22]. Polycystic ovarian syndrome is the most frequent cause of hirsutism, accounting for more than 70% of cases [30]. Idiopathic hirsutism affects 5-17 percent of hirsutism sufferers, depending on ethnicity and geographic location. The underlying cause of hirsutism in about 1-8% of women is non-classical congenital adrenal hyperplasia due to a 21-hydroxylase deficiency [31]. The majority of females who experience frontal-central pattern hair loss do not have elevated levels of androgen and do not manifest with hyperandrogenism symptoms, such as hirsutism or irregular periods/anovulation [32].

Unit 11

Skin types

Understanding the four skin types: normal, dry, oily and combination

Attention Box

If you need help with identifying your skin type the skin test may be a useful tool. If you need further advice on how best to care for it, Eucerin recommend that you contact a dermatologist or pharmacist.

Normal skin is well balanced: neither too oily nor too dry.

Normal skin

‘Normal’ is a term widely used to refer to well-balanced skin. The scientific term for healthy skin is eudermic.

Dry skin

‘Dry’ is used to describe a skin type that produces less sebum than normal skin. As a result of the lack of sebum, dry skin lacks the lipids that it needs to retain moisture and build a protective shield against external influences.

Oily skin

‘Oily’ is used to describe a skin type with heightened sebum production. This over production is known as seborrhea.

Combination skin

Combination skin is, as the name suggests, skin that consists of a mix of skin types.

How to identify normal skin

A velvety, soft and smooth texture is a sign for a healthy and radiant skin.

Normal skin has:

fine pores

good blood circulation

a velvety, soft and smooth texture

a fresh, rosy colour uniform transparency

no blemishes

and is not prone to sensitivity.

As a person with normal skin ages, their skin can become dryer. Read more in age induced dryness.

Unit 12

Common skin condition

Skin disorders, such as acne and eczema, vary greatly in symptoms and severity. They can be temporary or permanent and may be painless or painful. Some can be life threatening.

Pictures of different skin disorders

There are many different types of skin disorders. Here are pictures of 25 different conditions, followed by a list of details for each.

Acne often occurs on the face, neck, shoulders, chest, and upper back. Boy_Anupong/Getty Images

List of skin disorders

Acne

Acne is commonly locatedTrusted Source on the face, neck, shoulders, chest, and upper back.

Breakouts on the skin are composed of redness, blackheads, whiteheads, pimples, or deep, painful cysts and nodules.

This condition may leave scars or darken the skin if untreated.

People of Color can experience dark spots known as post-inflammatory hyperpigmentation (PIH).

Cold sore

This condition causes a red, painful, fluid-filled blister that appears near the mouth and lips. People with lighter skin may notice more redness than those with darker skin.

The affected area will often tingle or burn before the sore is visible.

Outbreaks may also be accompanied by mild, flu-like symptoms such as low fever, body aches, and swollen lymph nodes.

Cold sores usually look similar on any skin color but can also cause PIH in people with darker skin.

Blister

Blisters are characterized by a watery, clear, fluid-filled area on the skin.

They may be smaller than 1 centimeter (cm) (vesicle) or larger than 1 cm (bulla) and can occur alone or in groups.

Blisters can be found anywhere on the body.

Hives

This causes itchy, raised welts that occur after exposure to an allergen.

Welts may be warm and mildly painful to the touch.

Hives on darker skin can appear raised or inflamed and might be slightly darker or lighter than your natural skin color. On lighter skin, hives usually appear red.

They can be small, round, ring-shaped, or randomly shaped.

Actinic keratosis

This condition causes a thick, scaly, or crusty skin patch.

It’s typically less than 2 cmTrusted Source or about the size of a pencil eraser.

It often appears on parts of the body that receive a lot of sun exposure, such as the hands, arms, face, scalp, and neck.

The skin patch is usually pink in color but can have a brown, tan, or gray base. This patch may appear the same color as the surrounding skin in people with darker skin.

Unit 13

Hair condition

Hair conditioner is a hair care cosmetic product used to improve the feel, texture, appearance and manageability of hair. Its main purpose is to reduce friction between strands of hair to allow smoother brushing or combing, which might otherwise cause damage to the scalp.[1] Various other benefits are often advertised, such as hair repair, strengthening, or a reduction in split ends.[weasel words]

Conditioners are available in a wide range of forms, including viscous liquids, gels and creams, as well as thinner lotions and sprays. Hair conditioner is usually used after the hair has been washed with shampoo.

It is applied and worked into the hair and may either be rinsed out a short time later or left in.

Conditioners, also called deep conditioners or hair masks, are heavy and thick, with a high content of cationic surfactants that are able to bind to the hair structure and "glue" the hair surface scales together. This type of conditioner is designed to restore hair's moisture levels and reduce breakage. These are usually applied to the hair for a longer time (30–45 minutes).

Leave-in conditioners are thinner and have different surfactants, which add only a little material to the hair to avoid weighing down the hair or causing greasiness. They are based on unsaturated fatty acid chains, which are bent, not straight. Leave-in conditioner is designed to be used in a similar way to hair oil, preventing the tangling of hair and keeping it smooth. Its use is particularly prevalent among those with naturally curly or kinky hair.

Rinse-out/rinse-through conditioners are the most common or generic on the market. Ordinary conditioners are generally applied directly after using shampoo, and manufacturers usually produce a conditioner counterpart for different types of shampoo for this purpose.

Hold conditioners, based on cationic polyelectrolyte polymers, hold the hair in a desired shape. These have a function and composition similar to diluted hair gels.

Cleansing conditioners are a newer category, typically based on a combination of amphoteric and cationic surfactants that can be used either in place of shampoo or as a pretreatment before shampooing for hair that is damaged or very curly.[6]

There are several types of hair conditioner ingredients, differing in composition and functionality:

Acidifiers are acidity regulators that maintain the conditioner's pH at about 3.5. In contact with an acidic environment, the hair's somewhat scaly surface tightens up as the hydrogen bonds between the keratin molecules are strengthened.[7]

Antistatic agents, which bind to the hair and reduce the static, can include cationic polymers such as polyquaternium-10 and guar hydroxypropyltrimonium chloride.

Detanglers modify the hair surface pH as acidifiers or coat it with polymers as glossers.

Glossers are light-reflecting chemicals that bind to the hair surface and are usually polymers, usually silicones (e.g., dimethicone or cyclopentasiloxane).

Lubricants such as fatty alcohols, panthenol, dimethicone, etc.

Moisturizers, whose role is to hold moisture in the hair, usually contain high proportions of humectants. These could also be provided by natural oils such as Prunus Amygdalus Dulcis (sweet almond) oil.[8]

Oils (EFAs – essential fatty acids) can help dry/porous hair become more soft and pliable. The scalp produces a natural oil called sebum. Sebum naturally contains EFAs.

Preservatives protect the product from spoilage by microorganisms during the product's shelf life.

Reconstructors, usually containing hydrolyzed protein, supposedly penetrate the hair and strengthen its structure through polymer cross-linking.

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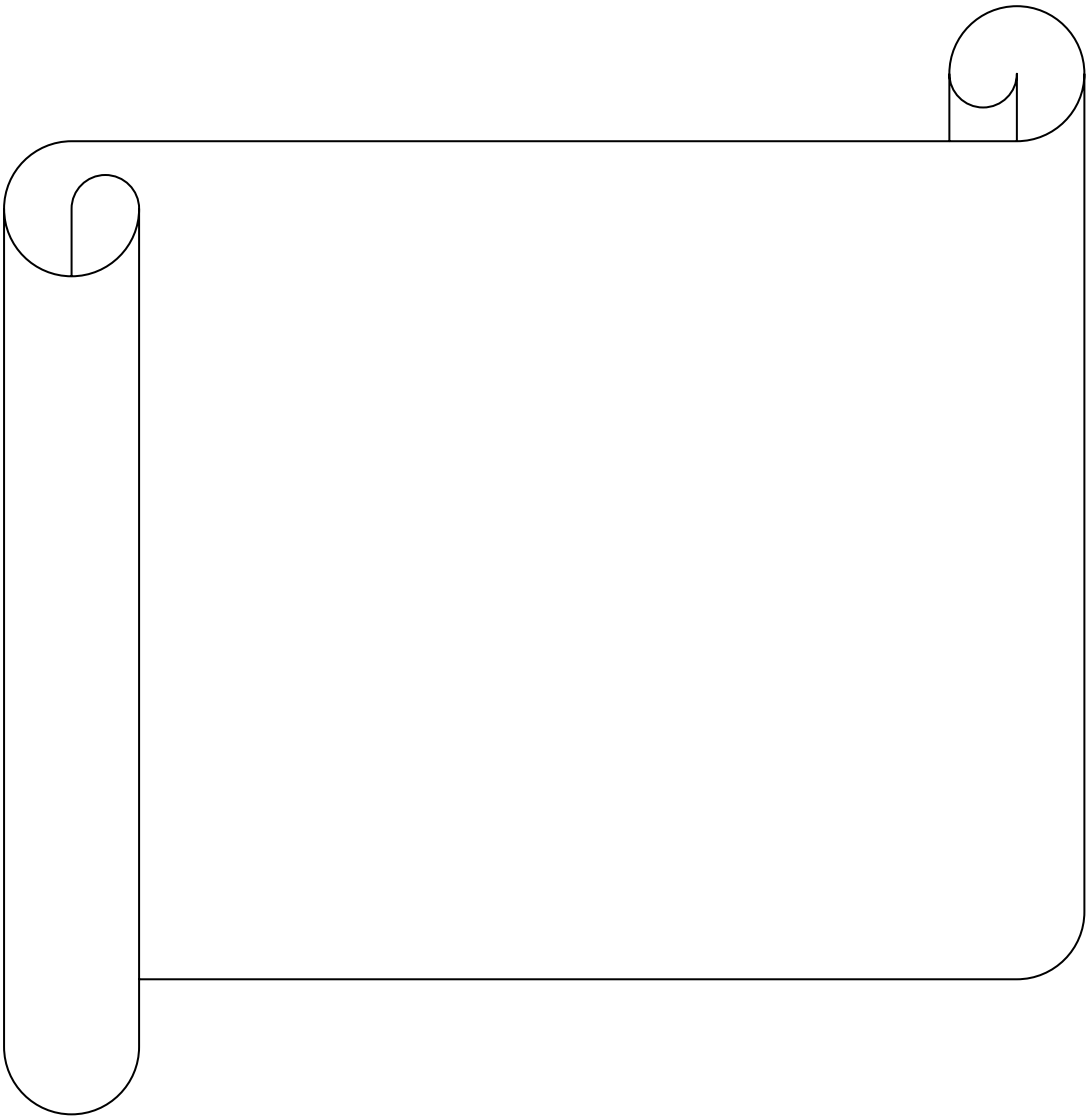
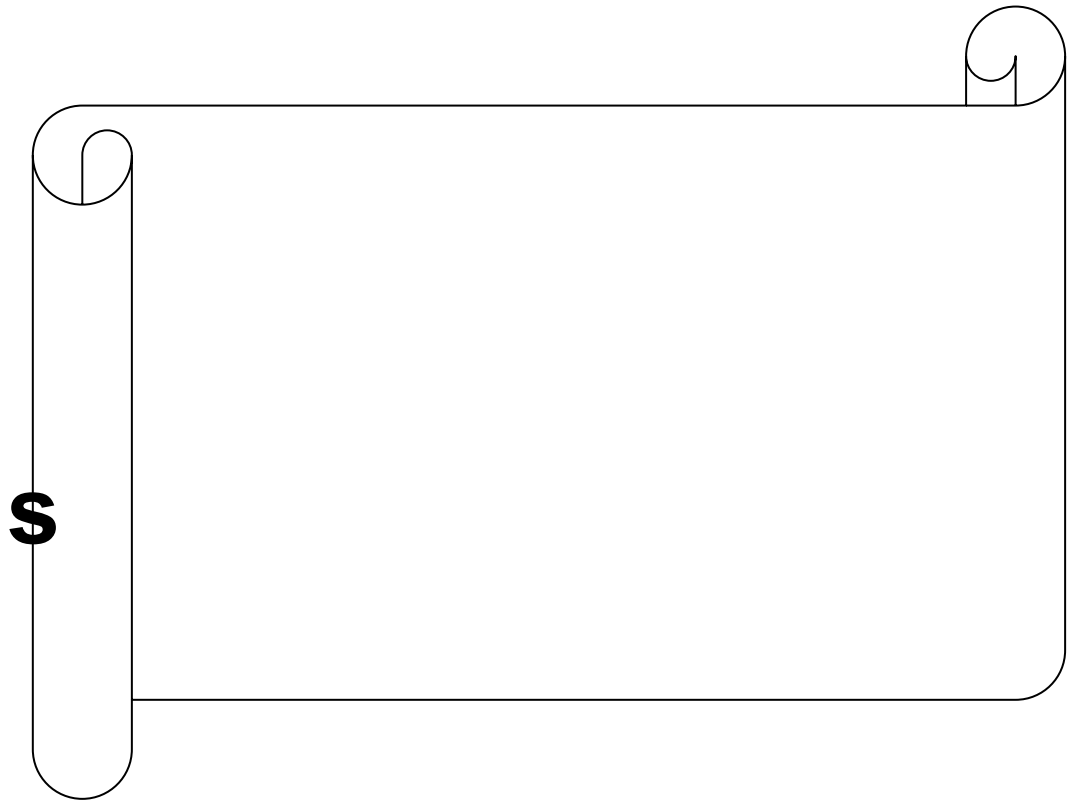
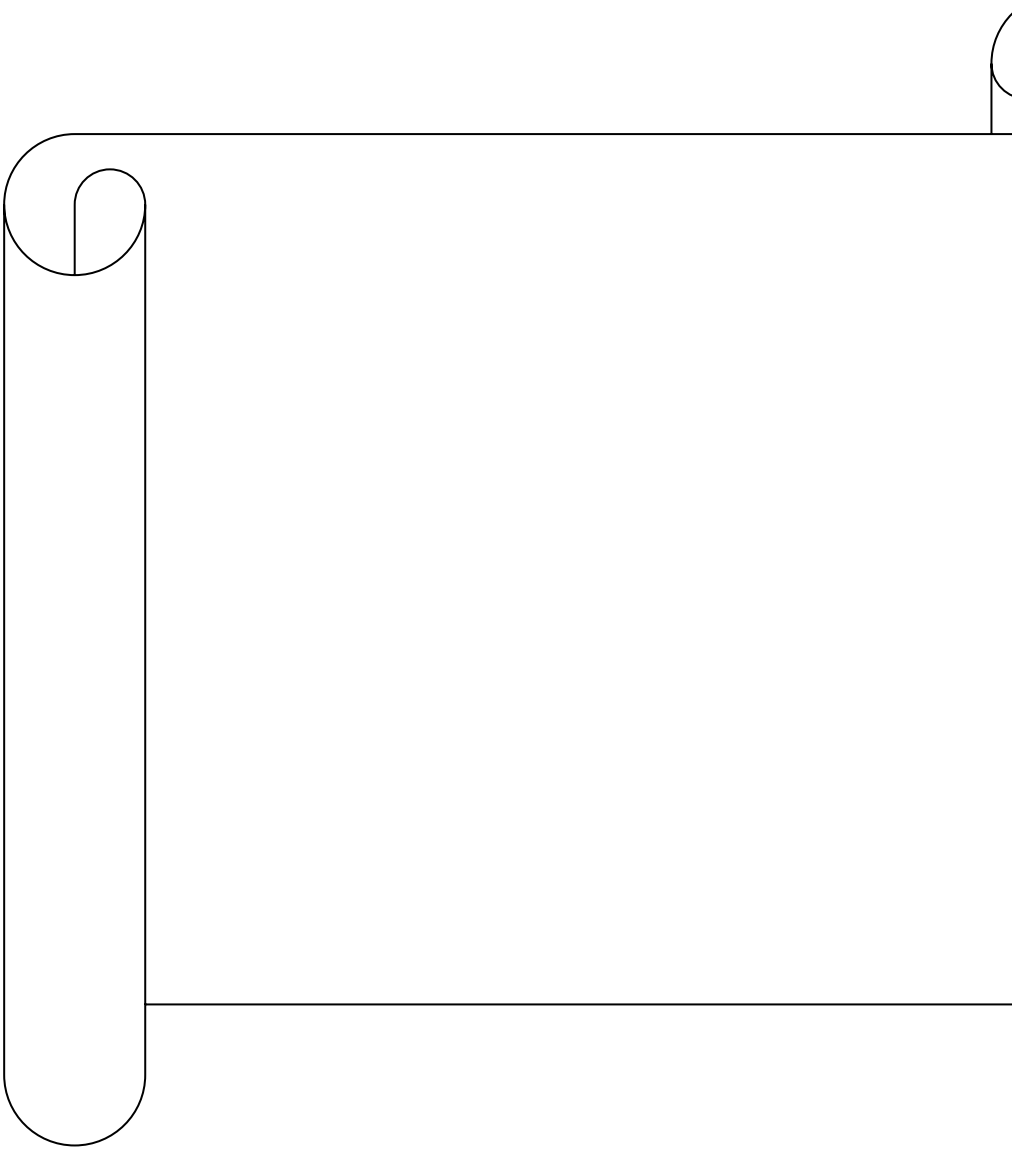
Clinical anatomy and physiology

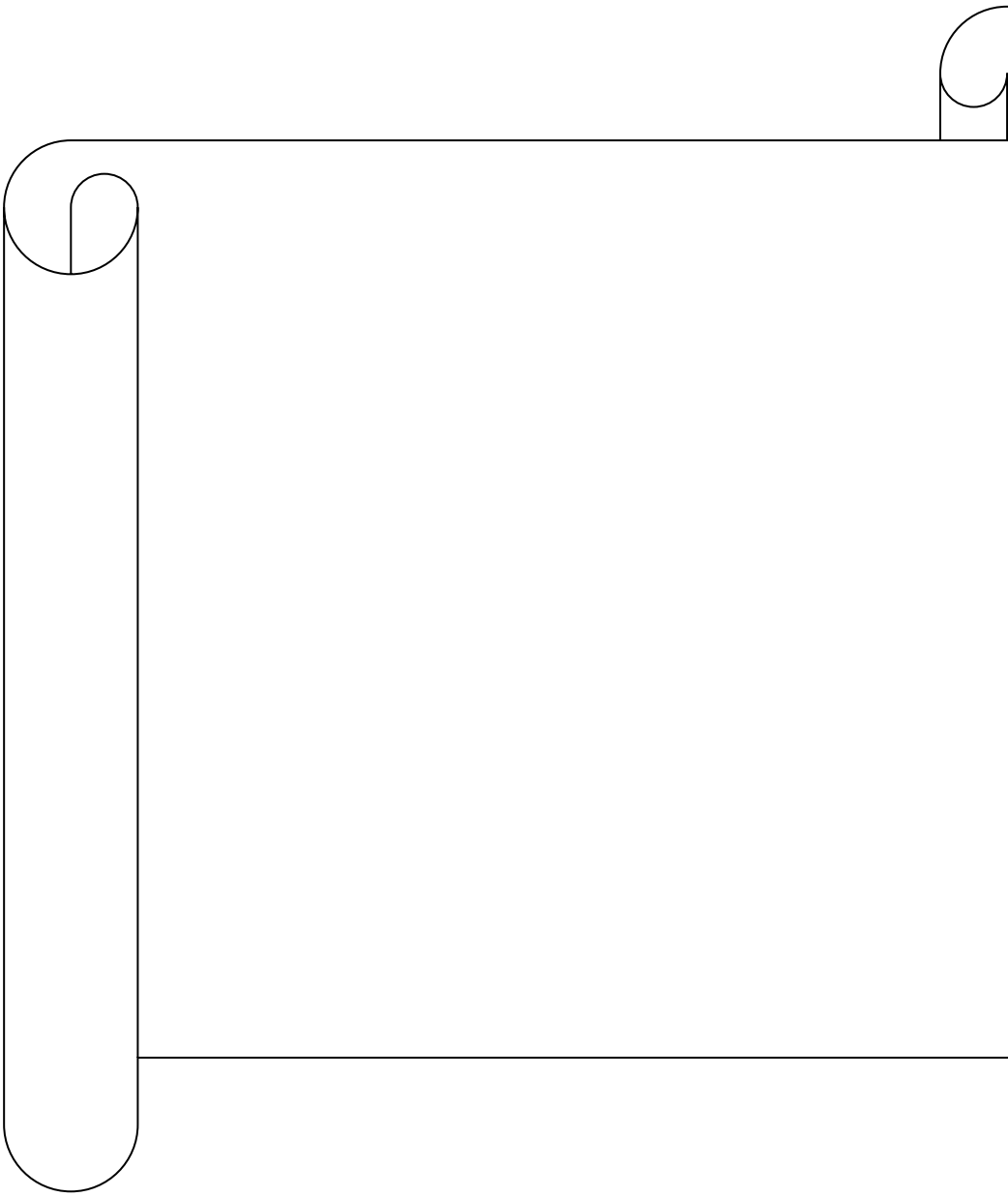
By

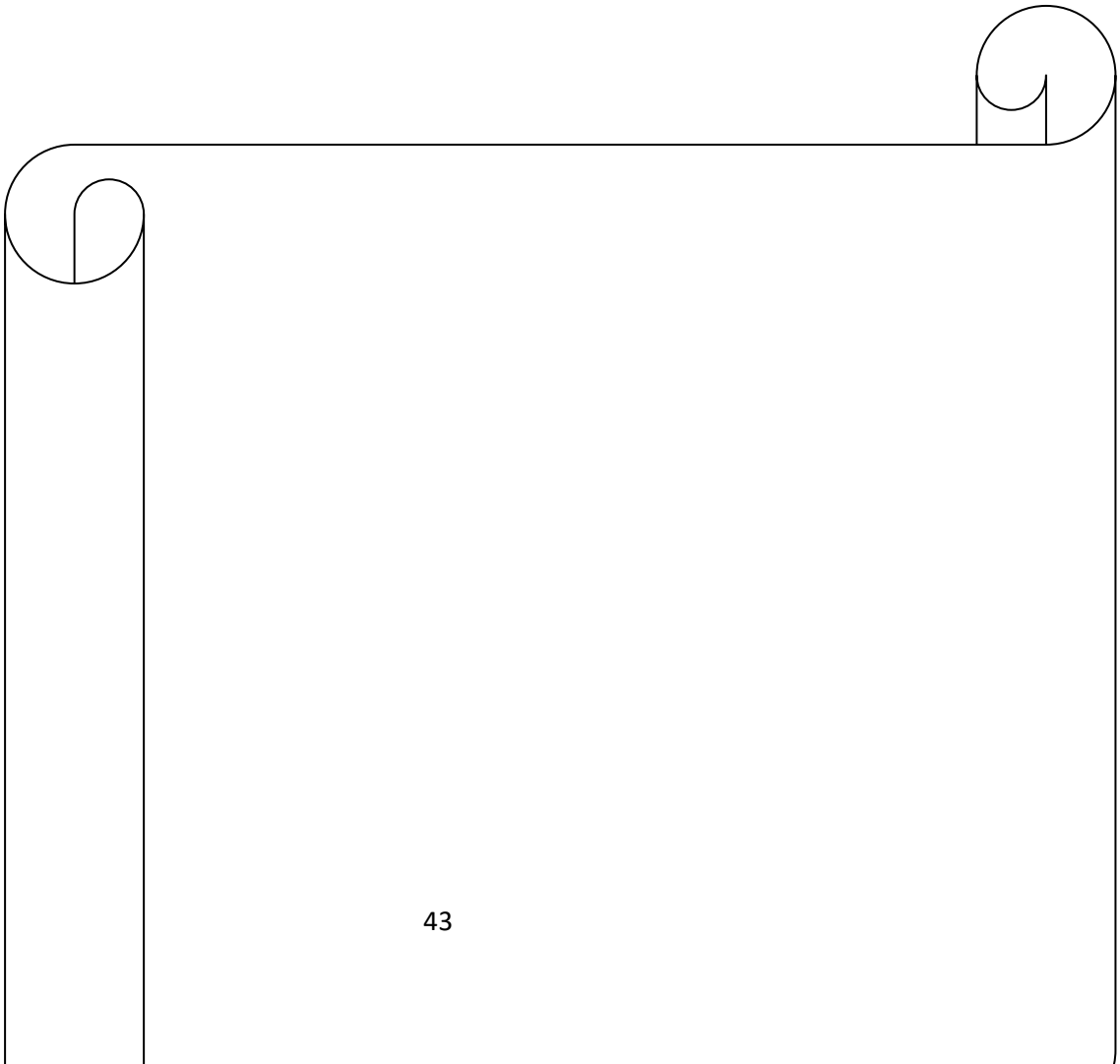
Thomas coville

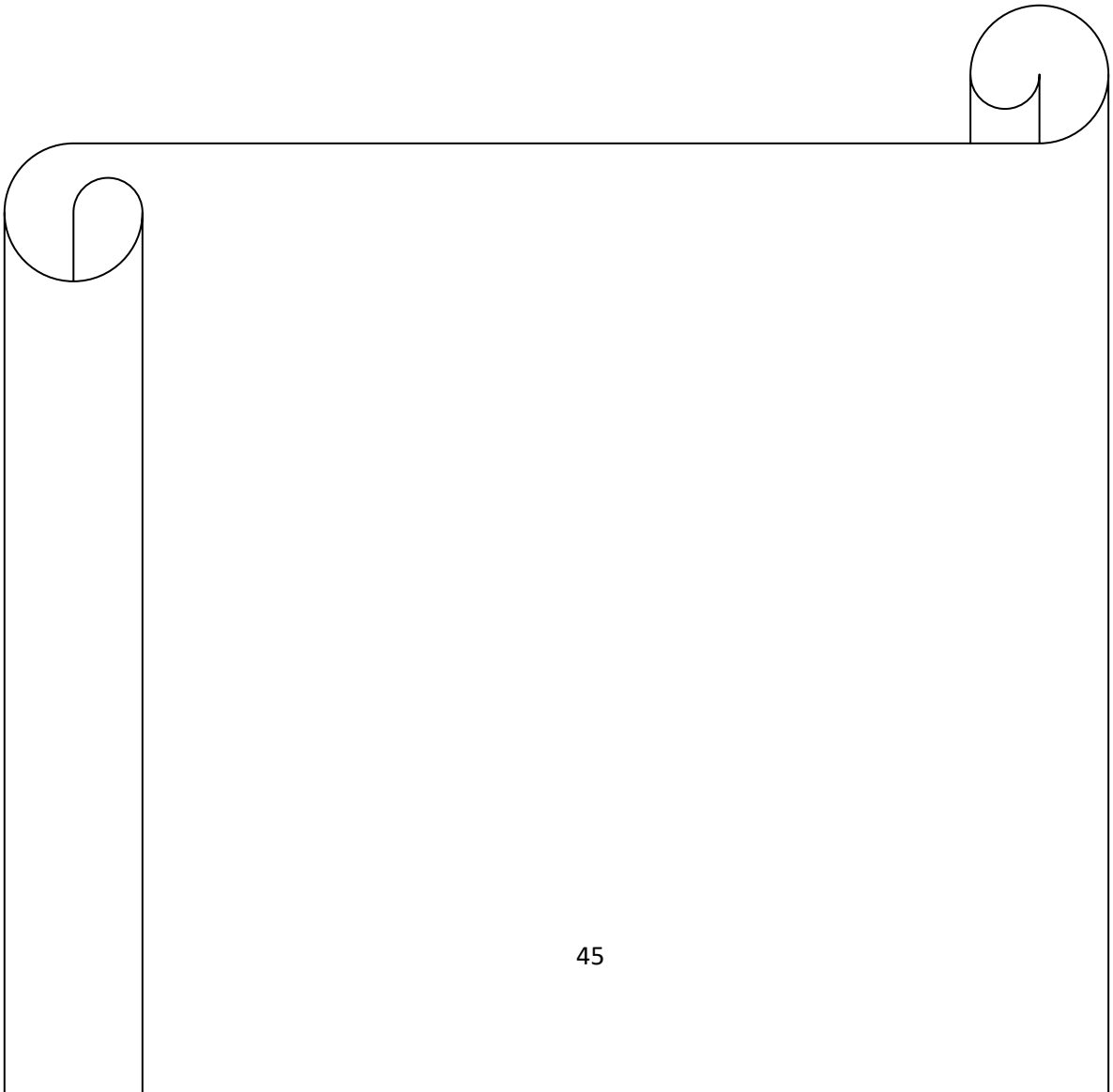


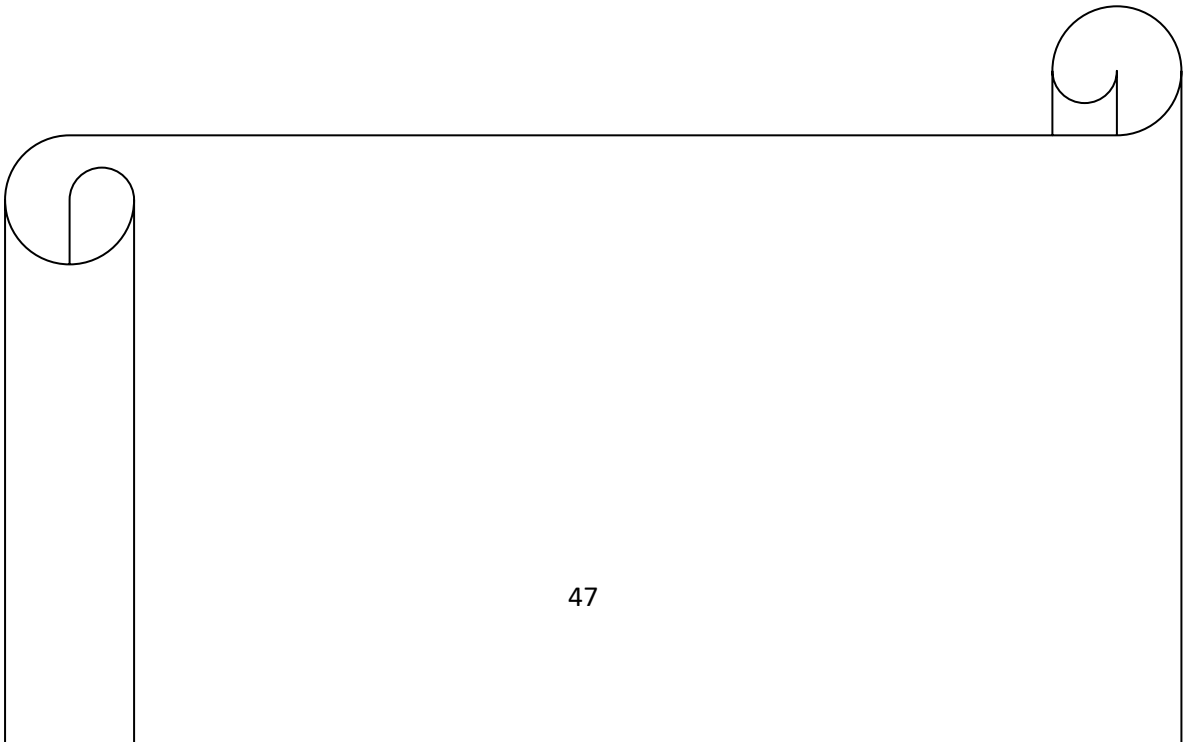


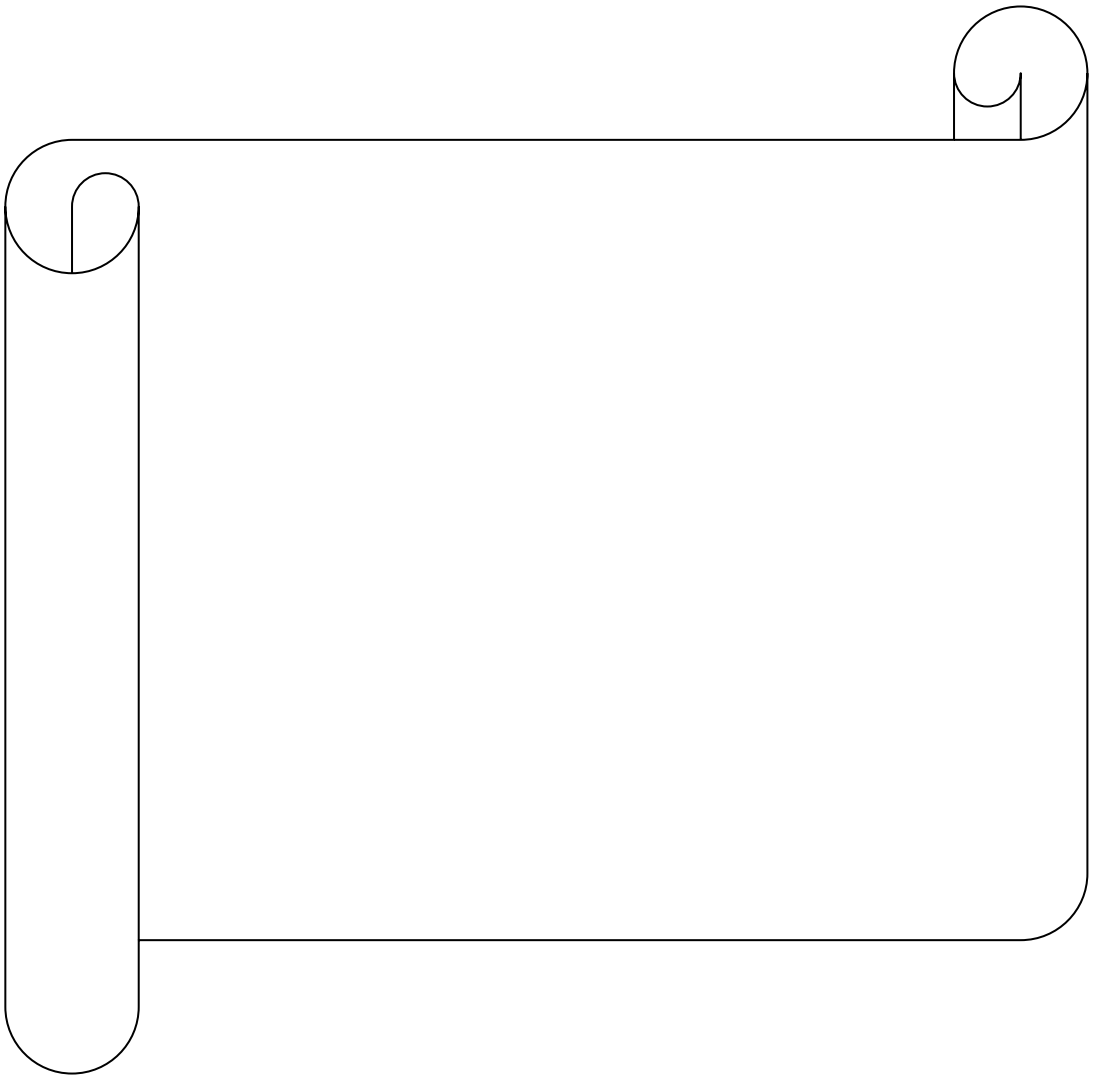












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