

The Integumentary System And Its Derivatives



Samuel D. Hodge, Jr.

is Professor and Chair, Department of Legal Studies, Temple University. Professor Hodge teaches both law and anatomy. He is also a skilled litigator and national lecturer, who has written multiple articles and books on medicine and trauma. Address correspondence to Professor Hodge at Temple University, Department of Legal Studies, 1801 Liacouras Walk, Alter Hall, Room 464, Philadelphia, PA 19122 or via e-mail at temple885@aol.com.

Samuel D. Hodge, Jr.

There's a lot more to skin than meets the eye.

WHAT MAKES UP ABOUT 16 percent of a person's weight, its outer surface is an accumulation of dead cells and the thickness of this organ varies by location? For those who need to utilize a lifeline to answer the question, a few more clues might be helpful. The surface area of this structure is around 18 to 20 square feet and its color is the only body part to start a war. In case you have not figured it out, the answer is skin and its derivatives, hair and nails.

The skin has been subjected to a number of unusual practices over the years including bleaching it pale white. Some of these customs presented a danger since the pores absorbed the materials and slowly poisoned the blood and organs. Modern medicine is aware of these dangers and has learned to appreciate the intricacies of the skin. Forester, Elizabeth, *What is the Function of Skin*, Discovery Health, <http://health.howstuffworks.com/skin-care/information/anatomy/function-of-skin.htm>. In fact, this organ has its own medical specialty, dermatology, and physicians who practice in this area utilize both medical and surgical techniques to treat a variety of conditions. *Dermatology*, <http://en.wikipedia.org/wiki/Dermatology>.

This article will provide an overview of the integumentary system including an anatomical discussion of this system and a review of the disease processes of interest to lawyers.

THE ANATOMY OF THE SKIN • The skin constitutes the largest organ in the body and it is part of the integumentary system. This word is derived from the Latin, *integere*, which means “to cover.” Merriam Webster Dictionary. Therefore, skin is the covering of the body. The skin is considered an organ because it consists of tissues that are joined together structurally to accomplish a specific function. *Disease of the Skin and Subcutaneous Tissue*, Advanced Anatomy and Physiology, Contexo Media, 2010 at 176.

On a very basic level, skin is much like the paint on the outside of a house. It has multiple layers, is visible for all to see and acts as a protective barrier. Skin, however, is much more complex and serves a number of important functions in homeostasis, the ability of a system to regulate its internal environment in order to maintain a stable, constant condition. *Homeostasis*, Wikipedia, <http://en.wikipedia.org/wiki/Homeostasis>. These roles include the regulation of the body’s temperature by shivering or sweating, water balance, absorption of materials, synthesis of hormones and the ability to detect sensations such as heat, cold, and pain through nerve endings. *The Integumentary System*, <http://www.emc.maricopa.edu/faculty/farabee/biobk/biobook-integusys.html>. See also, *The Skin and Its Functions*, Anatomy and Physiology, Cliff Notes, http://www.cliffsnotes.com/study_guide/The-Skin-and-Its-Functions.topicArticleId-22032,articleId-21894.html. Acidic secretions from glands within the skin also hinder the growth of fungi. *Id.* This organ’s primary functions, however, are to create a protective covering that repels the entry of foreign substances into the body such as germs, bacteria, and viruses and to retard the loss of body fluids. *Id.*

The Color And Thickness Of Skin

The skin’s color and texture are premised upon a person’s genetic makeup and are probative of an individual’s family history. The color of skin is based upon melanocytes and all races have the same amount of these cells. Melanocytes produce the pigment melanin which is responsible for the color of skin. Darker-skinned people have more and larger melanosomes than those with lighter skin. *Skin of Color*, American Academy of Dermatology, http://www.aad.org/public/publications/pamphlets/general_skin.html. As a rule of thumb, however, individuals with ancestors from tropical regions and higher altitudes have darker skin than those with descendants from subtropical regions. *What Determines Skin Color*, [Answers.com](http://www.answers.com/Q/What_determines_the_skin_color), http://wiki.answers.com/Q/What_determines_the_skin_color. Occasionally people are born without melanin and are dubbed albinos. This genetically based condition causes the hair, skin and eyes, to be white or very light in color. *Melanin: Skin Color and Freckles*, [Raising-Redheads.com](http://www.raising-redheads.com/melanin.html), <http://www.raising-red-heads.com/melanin.html>.

While the thickness of skin differs depending upon its location and frequency of use, the eyelids have the thinnest membranes while the palms of the hands and the soles of the feet have the thickest surfaces. *Skin Anatomy: How the Skin Protects You*, [About.com](http://seniorliving.about.com/od/healthnutrition/a/skinanatomy.htm), <http://seniorliving.about.com/od/healthnutrition/a/skinanatomy.htm>. The density of skin is also determined by age, the amount of sun exposure a person has experienced, and the person’s health. For instance, diabetes, aging, and thyroid disorders can negatively affect the thickness of skin. *Skin Qualities — Skin Thickness*, Real Age, <http://www.realage.com/look-young-stay-sharp/simply-beautiful-skin/skin-thickness>. This is important because thinner-skinned people are more susceptible to burns and injuries, and the foot problems of diabetics are well known. Jerrold S. Petrofsky et. al., *The Influence of Aging and Diabetes on Skin and Subcutaneous Fat Thickness in Different Regions of the*

Body, The Journal of Applied Research, Vol. 8, No. 1, 2008, 55-61.

The Layers Of The Skin

Skin is much deeper and more complex than its visible surface. In reality, this organ consists of three layers which differ in function, thickness, and strength. These include the epidermis, dermis, and a fatty layer of subcutaneous tissue, the hypodermis or subcutis. *Anatomy of Skin*, National Cancer Institute, SEER Training Modules, <http://training.seer.cancer.gov/melanoma/anatomy>.

The epidermis is the surface layer that acts as the initial barrier to keep foreign substances out of the body. Jason Swanson, *Epidermis*, Loyola University Medical Education Network, <http://www.med-dean.luc>. This layer is somewhat translucent so light can partially pass through it. The epidermis has no blood vessels so it must rely on the deeper skin layers for nutrients and oxygen. *Skin Anatomy: How the Skin Protects You*, About.com, supra. Even though the epidermis appears dormant, it is continually at work forming new cells at the bottom of this layer. When the cells are ready, they make their journey towards the top of the epidermis. As the newer cells reach the outer surface of the skin, the older cells die and fall off, a process known as desquamation. *Your Skin*, <http://kidshealth.org/kid/htbw/skin.html>. This cycle allows a person to obtain a new epidermis every 35 to 45 days as millions of these dead cells are discarded on a daily basis. *Skin (Integumentary System)*, Body Guide, ADAM, http://www.besthealth.com/besthealth/bodyguide/reftext/html/skin_sys_fin.html.

The epidermis contains five types of cells. The first produces keratin, a protein that gives skin its flexibility and waterproof surface. The second type is melanocytes which produce melanin, the dark pigment that gives skin its color. This is followed by Merkel's cells which act as touch receptors. Langerhans' cells correspond with the immune system by binding foreign bodies that enter the body. The fi-

nal layer is the stratum basale and its cells continuously divide. As these new cells form, the older ones are pushed toward the surface of the skin and discarded. *Id.*

The dermis is the middle layer of skin and it contains blood vessels, nerves, hair roots, sweat glands and sebum, an oily substance that helps lubricate the skin. *Definition of Dermis*, [MedicineNet.com](http://www.medicinenet.com), <http://www.medterms.com/script/main/art.asp?articlekey=2958>. The dermis is also known as the "true skin" and its major components are collagen, a protein that adds firmness and strength, reticular fibers, which add support, and elastic fibers, which provide flexibility to the structure. *Skin (Integumentary System)*, Body Guide, ADAM, supra. Therefore, this layer provides the skin with its elasticity by allowing for stretching while resisting distortion and sagging. *Integumentary System*, Wikipedia, http://en.wikipedia.org/wiki/Integumentary_system.

Surprisingly, the connective tissue fibers of the dermis are arranged in an irregular and haphazard manner that allows the skin to flex with the movements of the body while stretching and contracting without giving in to the stress of the forces being applied. *Disease of the Skin and Subcutaneous Tissue*, Advanced Anatomy and Physiology, supra at 175.

The dermis can be as much as 40 times thicker than the epidermis. At its meeting point with the epidermis, the surface of the dermis contains fibrous projections known as dermal papillae. *The Dermis, An Organ Revealed*, L'Oreal [Skin-Science.com](http://www.loreal.com/en/ww/loreal-skin-science/organe_revele/derme.aspx), http://www.loreal.com/en/ww/loreal-skin-science/organe_revele/derme.aspx. These permanent ridges are consistent throughout life and form the fingerprints that are unique to each person. The dermal papillae also nourish the hair follicles and deliver food and oxygen to the lower layers of the epidermal cells. *Dermal Papillae*, Wikipedia, http://en.wikipedia.org/wiki/Dermal_papillae.

The dermis contains a number of specialized cells and structures that provide a variety of important functions. These include:

- Hair follicles;
- Sebaceous (oil), apocrine (scent) and eccrine (sweat) glands;
- Blood vessels; and
- Specialized nerve cells that transmit the sensation of pressure, pain, and touch.

Heather Brannon, *Skin Anatomy*, [About.com](http://dermatology.about.com/cs/skinanatomy/a/anatomy.htm), Dermatology, <http://dermatology.about.com/cs/skinanatomy/a/anatomy.htm>.

Hair is located on most visible surfaces of the body but the strands are much more complicated than they appear. Heather Brannon, *The Biology of Hair*, Dermatology, [About.com](http://dermatology.about.com/cs/hairanatomy/a/hairbiology.htm), <http://dermatology.about.com/cs/hairanatomy/a/hairbiology.htm>. People have about five million hair fibers and 150,000 of these are concentrated on the scalp. *Hair Anatomy*, The Hair /Hair Loss Guide, http://www.afraid.toask.com/hair/hair_anatomy.html. Each piece of hair originates from a pocket in the dermis, the hair follicle. This pocket has a bulb-shaped appearance which is fed by small blood vessels that provide nutrients and remove waste. Sebaceous glands adjacent to the hair root discharge sebum, an oil that protects and provides the hair with its sheen. *Id.* The part of hair that protrudes up from the skin is the shaft and it is made up of the protein keratin. Heather Brannon, *The Biology of Hair*, Dermatology, [About.com](http://dermatology.about.com), supra. The primary purpose of hair is to provide a protective covering; scalp hair protects against overexposure to the sun, the eyebrows prevent sweat from running into the eyes, and nose hair filters dust from the air. *Skin (Integumentary System)*, Body Guide, ADAM, supra.

Sweat glands are used to regulate the body's temperature and consist of long, coiled tubes embedded in the dermis. It is at this location that sweat is manufactured and released to the outer surface of the skin when needed for thermoregulation. Craig Freudenrich, *How Sweat Works*, Discovery Health, health.howstuffworks.com/skin-care/information/

[anatomy/sweat.htm](http://health.howstuffworks.com/skin-care/information/anatomy/sweat.htm). Sweat also flushes metabolic waste products to the surface for their disposal from the body. *Disease of the Skin and Subcutaneous Tissue*, Advanced Anatomy and Physiology, supra. at 175.

There are two kinds of sweat glands, eccrine and apocrine. The first is the most numerous type found throughout the body, especially in the hands, forehead, and soles of the feet. Craig Freudenrich, *How Sweat Works*, Discovery Health, supra. The secretions from the eccrine glands are clear and consist primarily of water and sodium chloride which gives sweat its salty taste. These glands discharge their secretions directly onto the skin surface. *Sweat Gland*, Wikipedia, http://en.wikipedia.org/wiki/Sweat_gland. On the other hand, the apocrine gland is confined to the armpits and groin areas and their white or yellow-like secretions are discharged into the hair follicles. The eccrine glands are smaller and are active from birth while the apocrine glands become active at puberty and release an odor. Craig Freudenrich, *How Sweat Works*, Discovery Health, supra.

Anyone who has pricked a finger knows that the skin is filled with nerve endings that produce a pain response. More than one million sensory receptors are found throughout the skin and they are in constant communication with the brain and the environment. This process is what allows the skin to satisfy its function as an organ. *The Nerves of the skin*, Babor, <http://www.babor.eu/L/0/The-nerves-of-the-skin.1344.0.html>.

Sensory perception is critical in the avoidance of pressure, traumatic or mechanical forces, and extremes of temperature. This perception is accomplished by a variety of specialized structures in the skin. For instance, Merkel cells and Meissner corpuscles contained in the epidermis detect light touch. Pressure, however, is the function of Pacini corpuscles which are located deep within the dermis or subcutaneous tissue. Amirlak, Bardia, et. al., *Skin Anatomy*, eMedicine, <http://emedicine.medscape.com/article/1294744-overview>. These nerve

receptors perceive the outside stimuli and transmit the information to the brain for action. *Disease of the Skin and Subcutaneous Tissue*, Advanced Anatomy and Physiology, supra, at 175.

Pain itself is transmitted through nerve endings situated in the deepest layer of the epidermis and these nerves follow the route of blood vessels to the skin. *Id.*

The final and deepest layer of the skin is the hypodermis and it consists of fat and connective tissue that hosts larger blood vessels and nerves. The physiological functions of this layer include insulation, the storage of energy, and aiding in the anchoring of the skin. *Integumentary System*, Wikipedia, supra. The hypodermis is important for thermoregulation but the size of this layer is not uniform and varies from person to person. Heather Brannon, *Skin Anatomy*, About.com, Dermatology, supra. The subcutaneous fat layer consists of fat-filled cells, known as adipose cells, which loosely attach to the bones and muscles thereby allowing the skin to move. Sharon O'Brien, *Skin Anatomy: How Your Skin Protects You*, Anti-Aging Skin Care Series, Part 1, About.com Guide, <http://seniorliving.about.com/od/healthnutrition/a/skinanatomy.htm>.

MEDICAL PROBLEMS INVOLVING THE SKIN

• There are any number of things that can go wrong with this structure. For instance, problems that clog, irritate, or inflame this covering can cause burning, redness, itching, and swelling. An individual's genetic makeup, allergies, irritants, and certain immune system problems can cause hives, dermatitis, and other skin conditions. *Skin Conditions*, Medline Plus, <http://www.nlm.nih.gov/medlineplus/skinconditions.html>. The following is an overview of some of the problems affecting the skin that would be of interest to lawyers.

Psoriasis

Psoriasis is a non-contagious disorder that causes cells to rapidly build up on the surface of the

body resulting in thick, silvery scales and itchy red patches that are sometimes painful. *Psoriasis -Definition*, Mayo Clinic, <http://mayoclinic.com/health/psoriasis/DS00193>. This condition is also characterized by dry, cracked skin that may bleed and psoriasis can vary from isolated spots of dandruff-like scaling to significant eruptions that cover large areas. *Psoriasis — Symptoms*, Mayo Clinic, <http://www.mayoclinic.com/health/psoriasis/DS00193/DSECTION=symptoms>. Psoriasis usually affects the skin of the scalp, elbows, knees, and groin. Unfortunately, psoriasis is considered a chronic condition that has a variable course of remissions and exacerbations. *Psoriasis*, [MedicineNet.com](http://www.medicinenet.com/psoriasis/article.htm), <http://www.medicinenet.com/psoriasis/article.htm>.

Psoriasis affects about two percent of the world's population. *Id.* Physicians believe that the condition occurs when the body's immune system misidentifies healthy cells for dangerous substances. *Psoriasis*, MedlinePlus, U.S. National Library of Medicine, <http://www.nlm.nih.gov/medlineplus/ency/article/000434.htm>. While the exact cause of psoriasis remains unclear, environmental factors and genetics can play a role in its development. Weather also seems to influence the severity of the condition. The colder months cause a worsening in some people and others have improvement in a warmer climate or with increased sunlight. *Psoriasis*, [MedicineNet.com](http://www.medicinenet.com), supra.

Psoriasis is associated with joint problems in about 10 percent to 35 percent of the cases, a condition known as psoriatic arthritis. While any joint may be affected, those in the hands, knees, and ankles are most vulnerable. Therefore psoriatic arthritis is an inflammatory and destructive form of arthritis. *Can Psoriasis Affect My Joints*, [MedicineNet.com](http://www.medicinenet.com/psoriasis/page2.htm), <http://www.medicinenet.com/psoriasis/page2.htm>.

The treatment options for this disorder vary depending upon the severity of the condition but the most common action is medication applied directly to the skin. These include cortisone creams and oint-

ments, applications that contain coal tar or anthralin, dandruff shampoos and moisturizers. *Psoriasis*, MedlinePlus, U. S. National Library of Medicine, supra. When these options fail or if the condition is severe, oral medications will be added to the regimen such as a synthetic form of Vitamin D, anthralin, and salicylic acid. Psoriasis may even be treated by exposing the skin to controlled amounts of natural sunlight or ultraviolet light, a process known as light therapy. *Psoriasis — Treatment and Drugs*, Mayo Clinic, <http://mayoclinic.com/health/psoriasis/DS00193/DSECTION=treatment-and-drugs>.

Cancers Of The Skin

Skin cancer is the most common malignancy accounting for nearly half of all cases. More than one million people in the United States receive this diagnosis annually but not all skin cancers are created equal. Some are localized to the outside layer of the skin and have an outstanding rate of recovery while others can invade the body and have fatal consequences. Exposure to the sun is the primary culprit and people with light-colored skin, hair, and eyes have the greatest risk. Statistically, most skin cancers surface after the age of 50 and genetics may play a role in their development. Rockoff, Alan, *Skin Cancer* (Nonmelanoma Skin Cancer), [MedicineNet.com](http://www.medicinenet.com/skin_cancer/article.htm), http://www.medicinenet.com/skin_cancer/article.htm.

Normally, skin cells grow and divide to create new ones. In turn, the old cells die and new cells take their place. This orderly process, however, can misfire and new cells form even though the skin does not need them, and the old cells do not die. This progression can then lead to the development of extra cells that form a growth or tumor. In turn, this abnormal tissue can become malignant. *Understanding Skin Cancer*, National Cancer Institute, U.S. National Institutes of Health, <http://www.cancer.gov/cancertopics/wyntk/skin/page3>.

The classification of skin cancer is based upon the type of epidermal cells that became malignant

and there are three major kinds: basal cell carcinoma, squamous cell carcinoma, and melanoma. *Id.* Basal cell carcinoma originates in the outer layer of the epidermis and usually appears as a small, fleshy bump or nodule on the neck, hands, or head. This type of malignancy is responsible for approximately 90 percent of all skin cancers in this country and has an excellent prognosis. Basal cell carcinoma rarely spreads to other parts of the body but can occasionally infiltrate the bone, causing considerable local damage. *Basal Cell Carcinoma — Skin Cancer Health Guide*, University of Maryland Medical Center, <http://www.umm.edu/dermatology-info/cancer.htm>. This form of cancer grows slowly and is painless. Characteristics signs include tissue that is pearly or waxy, white or light pink or flesh-colored or brown. In some cases, the only detectible sign is that the skin may be slightly elevated. Kevin Berman, *Basal Cell Carcinoma*, Medline Plus Medical Encyclopedia, <http://www.nlm.nih.gov/medlineplus/ency/article/000824.htm>.

Squamous cell carcinoma is the second most common type of skin cancer. This form occurs in the squamous cells, which help form the epidermis. *Squamous Cell Carcinoma*, Skin Cancer Foundation, <http://www.skincancer.org/squamous-cell-carcinoma.html>. These are thin, flat cells that resemble the scales of a fish when examined under a microscope. Hence, the word is derived from the Latin, squama, which means “the scale of a fish or serpent.” Rockoff, Alan, *Skin Cancer* (Nonmelanoma Skin Cancer), [MedicineNet.com](http://www.medicinenet.com/skin_cancer/article.htm), supra. This form of cancer may occur on any area of the body including the mucous membranes and genitals, but it is most commonly detected in the parts of the skin exposed to the sun, such as the rim of the ear, lower lip, face, bald scalp, neck, hands, arms, and legs. *Squamous Cell Carcinoma*, Skin Cancer Foundation, supra. Its development is considered more serious than basal cell carcinoma because it can spread to vital organs inside the body. *What Are The Different Types Of Skin Cancer?*, eHealth-

MD, http://www.ehealthmd.com/library/skincancer/sc_types.html.

While exposure to sunlight remains the major culprit in causing this form of cancer, regular use of tanning beds increases the risk of squamous cell carcinoma. Skin injuries are another important factor in its development and this type of cancer can follow scar formations, burns, ulcers, sores of long-standing duration, and sites exposed to x-rays or certain chemicals such as arsenic and petroleum by-products. *Squamous Cell Carcinoma*, Skin Cancer Foundation, supra.

The third type of cancer is melanoma which involves the formation of cancer cells in the melanocytes. Melanoma is the rarest form of skin cancer but it is also the most dangerous. *Melanoma*, University of Maryland Medical Center, <http://www.umm.edu/dermatology-info/cancer.htm>.

As noted previously, melanocytes are the cells that produce melanin. In addition to coloring the skin, melanin protects the deeper layers of the body's covering from the sun's harmful ultraviolet rays. When people expose themselves to the sun, the melanocytes generate more melanin and the skin tans. However, if the skin is exposed to an overabundance of ultraviolet light, the melanocytes may grow abnormally and become cancerous. *What is Melanoma?*, Skin Cancer Foundation, <http://www.skincancer.org/Melanoma>.

There are four primary kinds of melanoma and each has its own characteristics:

- Superficial spreading melanoma is the most common form. These cancerous cells are usually flat and irregular in appearance and color, with different shades of black and brown. Superficial spreading melanoma can occur at any age or body location, and Caucasians have the highest incidence;
- Nodular melanoma generally starts as a raised area that is dark blackish-blue or bluish-red, although some are devoid of color;

- Lentigo maligna melanoma most often strikes the elderly. It is usually found in sun-damaged skin on the neck, face, and arms. These types of lesions are represented by abnormal skin formations that are large, flat, and tan with intermixed areas of brown;
- Acral lentiginous melanoma is the least common form of melanoma. It usually occurs on the soles of the feet, palms of the hands, or under the nails. African Americans are the most susceptible to this type of melanoma. *Melanoma — An Overview*, Google Health, <https://health.google.com/health/ref/Melanoma>.

The first sign of melanoma often involves a change in the appearance of an existing mole or the development of a new, unusual-looking growth on the skin. These suspicious changes may include itching, scaliness, spreading of pigment from the mole into the surrounding tissue, bleeding, or oozing. Melanoma, however, doesn't always have to start as a mole. It can also develop on otherwise normal-appearing skin. *Melanoma — Symptoms*, [MayoClinic.com](http://www.mayoclinic.com), <http://www.mayoclinic.com/health/melanoma/DS00439/DSECTION=symptoms>.

The American Academy of Dermatology has created a list of what to look for when examining the skin for cancer. The following checklist has been dubbed “the ABCDE’s of Melanoma Detection”:

- A is for asymmetry — the patient should look to see if one half of the lesion fails to match the other side.
- B is for border — are the edges irregular, scalloped, or poorly defined?
- C represents color — melanoma is usually not a single color. Therefore, the patient should see if the abnormal tissue is varied in color from one area to the next. Melanoma will usually have shades of tan, brown, or black. However, it may also be white, red, or blue.

- D stands for diameter — melanomas are usually larger than six mm or the size of a pencil eraser but they can be smaller;
- E is for evolving — does the mole or skin lesion look different from the others or is it changing in size, shape or color?

See *Melanoma: What it looks Like*, SkinCancerNet, http://skincarephysicians.com/skin_cancernet/melanoma.html; Melanoma — Symptoms, Mayo Clinic, <http://www.mayoclinic.com/health/melanoma/DS00439/DSECTION=symptoms>.

It is important to recognize that a lesion or mole may have a few of the above listed characteristics but not be a melanoma. A biopsy is usually needed to establish a definitive diagnosis and to distinguish an atypical mole from a cancerous lesion. *Id.*

Alopecia Areata

Alopecia is the medical term for hair loss. This condition usually affects the scalp and can leave the person bald. Alopecia does not refer to male baldness, an inherited condition, but to a rapid loss of hair which usually involves one side of the scalp more than the other. *Alopecia Areata*, [MedicineNet.com](http://www.medicinenet.com), http://www.medicinenet.com/alopecia_areata/article.htm. While the condition is usually involuntary, it may be caused by a person's compulsion to pull the hair out or predilection for excessively tight ponytails or braids. Some researchers have noted that the condition can also be related to an underlying medical condition such as an iron deficiency, a fungal infection, a poorly functioning thyroid, stress, a hereditary disorder of the hair shafts, secondary syphilis, lupus, cellulitis, or chemotherapy. *Alopecia*, Wikipedia, <http://en.wikipedia.org/wiki/Alopecia>. Surprisingly, alopecia tends to occur more frequently in children and young adults.

In about half of the cases, alopecia requires no treatment and the hair will grow back within a year. However, the longer the hair loss exists, the smaller

the chance that the hair will grow back. A variety of medications can be prescribed to treat alopecia such as steroids, creams, minoxidil, and topical immunotherapy. *Alopecia Areata*, [MedicineNet.com](http://www.medicinenet.com), *supra*.

Lipomas

A lipoma is nothing more than a slow growing, fatty tumor that is usually detected between the skin and the underlying muscle layer. Lipomas are easily diagnosed because the lump freely moves about with the application of gentle finger pressure. *Lipoma* — Definition, Mayo Clinic, <http://mayoclinic.com/health/lipoma/ds00634>.

These tumors are usually painless and are removed for cosmetic purposes, to evaluate their histology, when they cause symptoms or when the tumors grow to be larger than five cm. Todd Nickloes, *Lipomas*, eMedicine — General Surgery, <http://emedicine.medscape.com/article/191233-overview>. The cause of a lipoma is not fully understood but there may be a genetic component to it. Minor injury has also been found to be an inculpatory cause to their development. These fatty tumors usually do not require treatment since they are noncancerous. *Lipoma* — *Topic Overview, Skin Problems and Treatments Health Center*, WebMD, <http://www.webmd.com/skin-problems-and-treatments/tc/lipoma-topic-overview>.

Shingles

Shingles or herpes zoster is an irritating rash caused by the same virus as chicken pox. Its technical name is the varicella zoster virus (VZV). Once a person develops chicken pox, the virus lies dormant in the nervous system. Under certain conditions, however, such as stress, immune deficiency, or cancer, the virus can reactivate and cause shingles. Melissa Stoppler, *Shingles (Herpes Zoster)*, [MedicineNet.com](http://www.medicinenet.com), <http://www.medicinenet.com/shingles/article.htm>. One may wonder how stress can cause shingles. Tension can weaken the immune system thereby awakening the chicken pox virus and the

development of skin rashes that can be painful or itchy. The condition can last for days or be of an indefinite duration. Adrian Whittle, *Stress Causes of Shingles*, Ezisne@artilce, <http://EzineArticles.com/?Stress-Causes-Of-Shingles&id+529738>.

Skin Abscess, Furuncle, And Carbuncle

A skin abscess or cutaneous abscess is an accumulation of pus and infected materials within the layers of the skin. These abnormalities are common and can follow a minor injury, a bacterial infection, or a boil. *Skin Abscess — Overview*, University of Maryland Medical Center, <http://www.umm.edu/ency/article/000863.htm>. Symptoms include swelling and hardening of the tissue, an open or closed sore and the abscess may become red in appearance. Abscesses can occur anywhere on the body and age plays no role in their development. *Skin Abscess*, Google Health, <https://health.google.com/health/ref/Skin+abscess>. Their diagnosis is usually obvious to a physician and treatment is by incision and drainage. *Cutaneous Abscess: Bacterial Skin Infections*, Merck Manual Professional, <http://www.merck.com/mmpe/sec10/ch119/ch119d.html>.

A furuncle, more commonly known as a boil, is an infection that develops in a hair follicle and surrounding tissue. Their development is related to staphylococcus bacteria which are commonly found on the surface of the skin. While furuncles may be discovered in any hair follicle, they tend to occur most frequently in the neck, face, buttocks, armpit and thighs. *Furuncle — Medical Dictionary*, Discovery Health, <http://healthguide.howstuffworks.com/furuncle-dictionary.htm>. While these infections may get better on their own after a brief period of itching and discomfort, the more common course is for a furuncle to grow more painful as the pus accumulates. The boil will then burst allowing the infected material to drain and the skin to heal. *Furuncle*, MedlinePlus Medical Encyclopedia, <http://www.nlm.nih.gov/medlineplus/ency/article/001474.htm>.

A carbuncle, on the other hand, is a skin infection that involves multiple infected hair follicles. This abscess is larger than a boil because of the involvement of multiple hair follicles and is contagious, often spreading to other areas of the body or to other people. *Carbuncle*, Wikipedia, <http://en.wikipedia.org/wiki/Carbuncle>.

Cellulitis

Cellulitis refers to a bacterial infection or inflammation of the skin. In the majority of cases, there has been some type of traumatic insult such as a cut, burn, or surgical incision. Steven Ehrlich, *Cellulitis*, University of Maryland Medical Center, <http://umm.edu/altmed/articles/cellulitis-000033.htm>.

The symptoms of cellulitis include pain, tenderness, swelling, redness, and warmth. This type of infection is usually detected in the legs, arms, or hands. Cellulitis found in the face, however, presents an emergency situation because the infection can spread to the brain. *Drug Treatment for Cellulitis*, *Livestrong.com*, <http://www.livestrong.com/article/116190-drug-treatments-cellulitis>.

Diagnostic tests include a CBC in order to check for an elevated white blood cell count and a blood culture if a generalized infection is being considered. *Cellulitis — Medical Dictionary*, Discovery Health, <http://healthguide.howstuffworks.com/cellulitis-dictionary.htm>. The infection is usually treated with antibiotics such as Keflex or some type of penicillin-based drug. If left untreated, the condition can become life threatening. *Cellulitis*, Free Online Medical Dictionary, <http://medical-dictionary.thefreedictionary.com/cellulitis>.

Decubitus Ulcers

A decubitus ulcer is known by the average person as a bedsore or pressure ulcer. Decubitus is derived from decumbere which means “to lie down.” These types of ulcers, therefore, arise at locations overlying bones close to the skin, such as the hip, buttock, shoulder, ankle, and heel, and they occur

most often when an individual is bedridden or confined to a wheelchair. Christian Kirman and Joseph Molnar, *Pressure Ulcers, Nonsurgical Treatment and Principles*, eMedicine, <http://emedicine.medscape.com/article/1293614-overview>; and *Diseases of the Skin and Subcutaneous Tissue*, Advanced Anatomy and Physiology, Contexo/Media, 2010 at 179.

Decubitus ulcers develop because of the constant pressure exerted against the skin which in turn reduces the blood supply to that area causing the tissue to die. A pressure sore starts innocently as a reddened patch of skin but can become progressively worse. Over time, it can blister, followed by an open sore and then turn into a crater with resulting damage to the underlying structures. *Pressure Ulcer*, MedlinePlus Medical Encyclopedia, U.S. National Library of Medicine, <http://www.nlm.nih.gov/medlineplus/ency/article/007071.htm>. They can even cause necrosis to the muscle and bone in advanced cases. *Id.*

The majority of pressure sores are detected in people over age 70 and are the cause of death in seven percent to eight percent of paraplegics. Also, hospitalized patients with acute illnesses develop decubitus ulcers three percent to 11 percent of the time. Unfortunately, individuals who achieve successfully healing of the wound have a recurrence rate of up to 90 percent. Don Revis, *Decubitus Ulcers*, eMedicine General Surgery, <http://emedicine.medscape.com/article/190115-overview>.

A pressure sore is a serious medical problem causing pain, a decreased quality of life, and the expenditure of significant caregiver time and health-care dollars. The development of new decubitus ulcers while a patient is hospitalized has been determined by the National Quality Forum to be a hospital-acquired condition that may be prevented. Nevertheless, the Center for Medicare and Medicaid Service no longer reimburses acute care facilities for the ancillary cost of facility-acquired pressure sores. Catherine VanGilder, et al., *Results of the 2008-2009 International Pressure Ulcer Prevalence Survey*

and a 3-Year, Acute Care, Unit-Specific Analysis, Ostomy/Wound Management, <http://www.o-wm.com/content/results-2008-%E2%80%93-2009-international-pressure-ulcer-prevalence%E2%84%A2-survey-and-a-3-year-acute-care->.

Gangrene

Gangrene originates from the Greek gangraina which means “an eating sore that ends in mortification.” *Definition of Gangrene*, [MedicineNet.com](http://www.medicinenet.com), <http://www.medterms.com/script/main/art.asp?articlekey=14506>. In application, this serious condition occurs when there is death of tissue. Gangrene can develop in the skin, muscles, or an internal organ but is most often found in the legs and arms. Symptoms develop suddenly and become progressively worse. *Gangrene*, Wikipedia, <http://en.wikipedia.org/wiki/Gangrene>.

Several factors increase a person’s risk for developing gangrene. For instance, it occurs more often in the elderly population. Diabetics are at greater risk because they don’t produce sufficient amounts of insulin or are resistant to the effects of insulin. This can lead to damaged blood vessels and a subsequent interruption of blood flow to a part of the body causing tissue death. Hardening of the arteries or the development of blood clots can also block normal blood flow to an area causing tissue death. Even trauma to the skin and underlying structures increases the risk as well as those with a suppressed immune system. Gangrene also has a correlation with people undergoing chemotherapy or radiation therapy because the body’s ability to fight infection is impaired. *Gangrene — Risk Factors*, Mayo Clinic, <http://www.mayoclinic.com/health/gangrene/DS00993/DSECTION=risk-factors>.

There are two major forms of gangrene, dry and wet. Dry gangrene is the result of a poor or interrupted blood supply causing the tissue to shrivel and die. Wet or gas gangrene is caused by a bacterial infection which thrives in the absence of oxygen. *Gangrene*, Wikipedia, *supra*.

The symptoms of gangrene vary depending upon the type involved. Dry gangrene usually starts by the affected area becoming numb and cool. The skin then starts to change colors, usually turning from red to brown and finally to black. During this process, the tissue shrinks, dries out, and it may slough off the body. On the other hand, wet gangrene generally starts with swelling and significant pain. Initially, the area may be red and show signs of decay. A horrible smell is detected as the condition progresses because of the release of compounds such as cadaverine and putrescine, which are generated as the infection destroys the tissue. Eventually, the area develops a moist and black appearance. Charles Davis, *Gangrene*, [MedicineNet.com, http://www.medicinenet.com/gangrene/article.htm](http://www.medicinenet.com/gangrene/article.htm).

Hemangiomas

A hemangioma is a benign collection of extra blood vessels in the skin that have a variety of looks based upon the depth of the increased number of blood vessels. *Hemangioma*, Children's Specialists of San Diego, <http://www.cssd.us/body.cfm?id=498>. They are strawberry or red in color and vary in size from small blebs to large tumor-like growths. Hemangiomas are usually not present at birth like port wine stains or birthmarks but develop anytime after the infant is born, up to about 18 months. At this point, they slowly shrink. *Hemangiomas*, Dermatologic Disease Database, American Osteopathic College of Dermatology, http://www.aocd.org/skin/dermatologic_diseases/hemangiomas.html.

Hemangiomas are the most frequent kind of benign tumors in babies. Statistically, about four percent to 10 percent of Caucasian infants have hemangiomas and these extra blood vessels are three to five times more common in females than males. *Hemangioma*, Children's Hospital of Boston, <http://www.childrenshospital.org/az/Site998/mainpagesS998P0.html>. Heredity usually does not play a role in their development, although 10 percent of infants have a family history of these blemishes.

There is also no known medication, food consumption, or activity during pregnancy that causes a hemangioma to develop. *Id.*

The majority of these abnormalities occur in the head and neck areas. However, 25 percent are located in the trunk and 15 percent occur in the legs or arms. The vast majority of hemangiomas develop as a single tumor but about 20 percent arise in multiple locations. *Id.*

Treatment options for hemangiomas vary depending upon their location, size, and severity. Small, non-invasive hemangiomas are left alone since they will become smaller on their own. Hemangiomas that cause complications such as bleeding, feeding or breathing difficulties, impairment of vision, or growth disturbances may require intervention. Viable treatment options include the use of steroids, injection of material into the blood vessels to block the blood flow, and laser or surgical removal. *Vascular Malformations and Hemangiomas*, Roper St. Francis Healthcare, <http://healthlibrary.rsfh.com/Search/90,P01841>.

Nevus

Nevus is the medical term for a mole or birthmark. *Nevus*, Wikipedia, <http://en.wikipedia.org/wiki/Nevus>. These skin spots are present at birth or develop soon thereafter and can be any number of colors. Some nevi are mere colorations of the epidermis while others protrude above the skin or extend below the surface into the tissues of the skin. Despite the many myths about the cause of birthmarks, their source is largely unknown. *Skin Conditions: Pigmented Birthmarks*, WebMD, <http://www.webmd.com/parenting/baby/baby-skin-10/birthmarks>.

Nevus can appear anywhere on the skin and consist of melanocytes, those cells that produce melanin. *Moles*, [Healthcommunities.com](http://www.healthcommunities.com), <http://www.dermatologychannel.net/moles/index.shtml>. Most of these blemishes require no treatment and usually fade with age. Some birthmarks, however,

may need intervention because of their location, i.e. a raised nevus near a child's eye may interfere with vision. *Skin Conditions: Pigmented Birthmarks*, WebMD, supra.

There are two main classifications of nevus, red birthmarks, and pigmented birthmarks. A red birthmark consists of blood vessels near the surface of the skin whereas a pigmented birthmark is an area in which the color of the blemish is unlike the color of the surrounding tissue. Kevin Berman, *Birthmarks — red*, MedlinePlus, <http://www.nlm.nih.gov/medlineplus/ency/article/001440.htm>.

There are several types of nevi and each has its own characteristics and distinguishing features. These include:

- A port wine stain, which is a harmless blemish that is dark red or purple in color and usually appears on the face, neck, upper arms, and chest;
- Mongolian blue spots which are black and blue marks usually located near the lower back or buttocks area of a child;
- Café au lait spots which represent flat areas of nevus that are light brown or tan in color. These blemishes can appear anywhere from an individual's scalp to the stomach or leg areas;
- Congenital pigmented nevi, which are birthmarks that are light or dark brown in color. These moles can grow or darken in color and must be monitored since they can become cancerous. Lisa Bower, *Types of Birthmarks*, Life123, <http://www.life123.com/beauty/cosmetic-procedures/birthmarks/types-of-birthmarks.shtml>.

Drug Rashes

Drug rashes are a side effect of the body's reaction to certain medication. Classic symptoms involve redness of the skin, peeling, or hives. The sufferer may also develop a runny nose and watery eyes. Most rashes of this type resolve by merely stopping the medication. If a serious reaction oc-

curs, an injection of epinephrine, benadryl, and a corticosteroid must be administered. *Drug Rashes*, Merck Manual of Medical Information, <http://www.merck.com/mmhe/sec18/ch203/ch203d.html>.

In the United States, drug reactions occur in about two percent to five percent of inpatients and in more than one percent of outpatients. Adverse skin reactions are more prevalent in women and the elderly have an increased rate of such side effects. Jonathan Blume, et al., *Drug Eruptions*, eMedicine from WebMD, <http://emedicine.medscape.com/article/1049474-overview>.

Drug allergies are most often related to the use of Penicillin and similar antibiotics. Other common causes include the use of sulfa drugs, anticonvulsants, insulin preparations, and iodinated x-ray contrast dyes. *Drug Allergies*, MedlinePlus, <http://www.nlm.nih.gov/medlineplus/ency/article/000819.htm>.

Toxic Epidermal Necrolysis

Toxic epidermal necrolysis, a condition also known as Lyell's syndrome, is a life-threatening skin disorder in which the epidermis peels off the body in sheets. *Toxic Epidermal Necrolysis*, Wikipedia, http://en.wikipedia.org/wiki/Toxic_epidermal_necrolysis. The condition can implicate a variety of body parts, but the mucous membranes, such as the mouth, eyes, and vagina are most severely affected. Toxic epidermal necrolysis is often preceded by one to two weeks of an elevated temperature with symptoms that resemble a common upper respiratory infection. Eventually, a rash appears over large and diverse parts of the body. The dermis then fills with fluid and the skin begins to sag and can be removed in swaths. The mouth may even develop blisters, making it difficult to consume food requiring the insertion of a tube through the nose or directly into the stomach. The eyes may also be affected by becoming swollen, crusted, and ulcerated and blindness may result. *Id.*

The death rate for this condition is significant and has been estimated to be as high as 30 percent to 40 percent of affected patients. This high morbidity rate is attributed to the fact that the loss of skin leaves the victim susceptible to infection, and can result in sepsis, the primary cause of death in the condition. *Id.*

Keloids

A keloid is the abnormal growth of fibrous or scar tissue at the site of a healed skin injury. These abnormal skin formations are common in African Americans and young females and often run in families. Keloidosis is the word utilized when a person has multiple or repeated keloids. *Keloids*, Medline-Plus, <http://www.nlm.nih.gov/medlineplus/ency/article/000849.htm>.

Keloids develop subsequent to an injury and extend beyond the wound's initial location. This propensity to travel into nearby areas that were not injured distinguishes keloids from scars. Keloids usually develop subsequent to surgery or injury, but they may also emerge spontaneously or be the result of some trivial inflammation, such as an acne pimple, burn, or body piercing. *Keloids*, [MedicineNet.com](http://www.medicinenet.com/keloid/article.htm), <http://www.medicinenet.com/keloid/article.htm>.

Keloids may be prevented by applying a silicone gel pad, pressure dressing, or paper tape over the injury location and these applications are kept

in place for most of the day. Once keloids have formed, there is no completely satisfactory treatment, although cryosurgery, excision, laser, x-rays, and steroid injections may be utilized to mitigate the effects of the abnormal formation. *Keloids and Hypertrophic Scars*, American Osteopathic College of Dermatology, http://www.aocd.org/skin/dermatologic_diseases/keloids_and_hypert.html.

CONCLUSION • The skin is often overlooked until something goes wrong with it. As the largest organ in the body, it is very complex and made up of the epidermis, dermis, and the hypodermis. Each layer serves a unique and different function, from providing the body with its protective covering against the outside world to thermal regulation. However, there are any number of things that can wrong with the skin from psoriasis to skin cancer. The sun is one of the major influences that can cause the skin to become diseased, as are trauma and hereditary factors. Litigation involving this system of the body is not as common as that involving the musculoskeletal or reproductive systems but there are a fair number of lawsuits involving the skin. They range from claims for long-term disability to medical malpractice. It is very beneficial to know how the integumentary system works because it is part of most routine medical examinations and provides an excellent window into a person's overall health.

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