How Your Skin Works

by Rachel Oswald

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If senior superlatives were given out to human organs, the heart would probably win "hardest working," the lungs would garner "most athletic" and the brain would end up with "most intelligent" (no surprise there). But what would the skin be noted for? Our guess is "most underappreciated" -- not to mention "best dressed."

For an underappreciated organ, skin takes up a lot of space. It's the body's largest organ, and if you were to stretch out the skin of the average adult, it would cover 22 square feet (2 square meters, or a little bigger than a twin bed) and weigh 8 pounds (3.6 kilograms) [source: National Geographic]. And can you imagine what we'd look like without that 22 square feet of skin to hold in our insides? Your muscles, bones and organs would all be exposed (and rather messy).

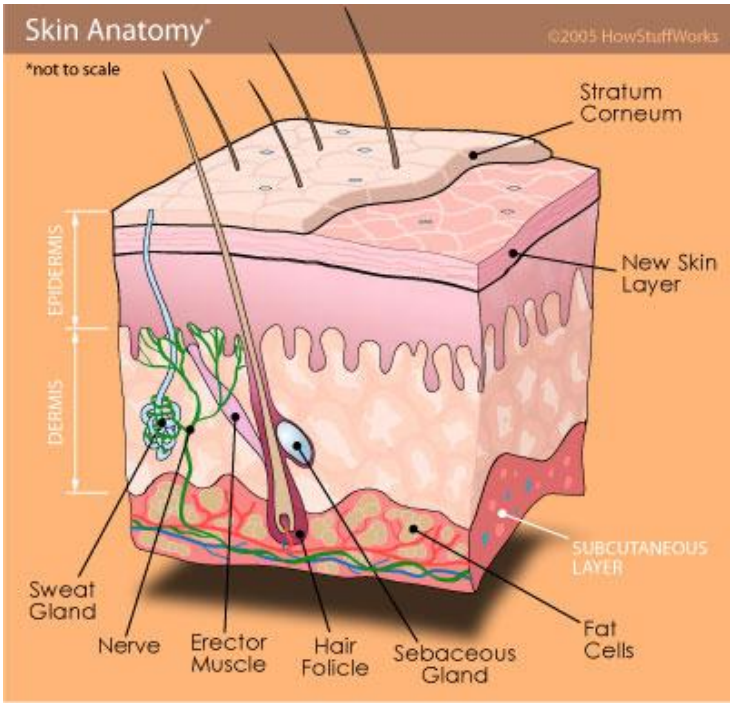
Besides keeping us nicely packaged, skin performs a host of important functions that are crucial for overall bodily health. Think of your skin as a protective covering that shields your body from germs. It's filled with white blood cells that are rigged to attack any invading harmful bacteria. Signals sent from your skin sound the alarm for your body's immune system to launch into action when germs have made entry.

Skin also helps regulate your body temperature. Blood vessels in the skin contract and dilate depending upon the outside temperature so that our bodies remain near 98.6 degrees F (37 degrees Celsius). When it's cold outside, blood vessels contract to keep the blood near the surface of your skin from becoming too cool. When it's hot outside, the same blood vessels expand to encourage heat loss, and you begin to sweat.

In addition to these vital jobs, skin provides us with the essential human experience of touch. Nerve endings in your skin send signals to the brain to communicate the sensations you're feeling: heat, cold, pain, pressure, texture. If it weren't for your skin and your nerves, you'd miss out on all the things that feel so good to the touch.

Now that you know why you should appreciate this special organ, let's find out what skin is made of.

Skin Composition, from the Outside In



Our skin is a tough but supple membrane composed of three layers -- the epidermis, the dermis and the hypodermis -- that work in support of one another. Affixed to the skin are ourfingernails and toenails, hair follicles, and glands that secrete sebum (we'll learn more about that term later) and sweat.

The **epidermis** is the thinnest of the skin layers and is also the outermost one. It has the important role of serving as our armor against infections and diseases. It also contains melanin, a pigment that gives our skin its color (we'll talk more about that in another section).

When our skin is healthy and glowing, it's a thing of true beauty, so you might be surprised to learn that the epidermis -- the layer that everybody gets to see -- is actually composed of dead skin cells that are always sloughing off and spreading bits of your DNA all over the place. The oldest skin cells are shed to make room for the younger ones that lie beneath them. But unlike snakes, we shed our skin gradually -- it takes about 35 days for us to replace all of the skin on our body [source: Arizona State University].

There aren't any blood vessels in the epidermis; they're located right below it in the **dermis**, the middle layer of our skin. If you cut yourself and bleed, it means you've torn through the epidermis and left the dermis exposed.

The dermis is full of collagen, which gives your skin its firmness, and that's where you'll find sweat glands and hair follicles. It also contains plenty of nerve endings that allow you to feel sensations such as heat, cold and pain. The dermis is like your body's own smoke detector. Pain felt in the dermis is a signal to the rest of the body to remove itself from whatever stimulus is causing so much hurt and discomfort.

The innermost layer of our skin is the **hypodermis,** which is what connects our skin to the bone and muscle beneath it. The hypodermis is made up of subcutaneous tissue, wonderful stuff that insulates our body and controls its temperature.

We mentioned sebum earlier, a substance that shields our epidermis from the elements. On the next page, you'll learn all about the oils and secretions that coat your skin.

A runner works out her eccrine glands.

Pores, Sebum and Sweat Glands

We have **pores** all over our bodies, tiny holes that contain hair follicles and act as outlets for sweat and sebum to leave the body. **Sebum** is an oily substance that covers much of our body in a thin protective layer that both regulates body heat and makes it hard for bacteria to settle on the body's surface. Sebum is made by your body's **sebaceous glands**, which can be found everywhere on your body except the bottoms of your feet and the palms of your hands. These glands are most prevalent on our faces, backs, chests and groin areas.

Pore size varies, but your genes and your age are two big determinants for how large they'll be. People with large pores tend to have oily skin, and as skin ages, sun damage and the loss of collagen leads to bigger-looking pores. When your pores are clogged with dead skin cells and other debris, they can appear larger, too.

Like the size of our pores, whether our skin is dry or oily is often determined by genetics. Hormones also play an important role. Since our hormones activate sebum production, changes to our hormones can affect the level of oil our skin produces. In addition to puberty, menstruation andpregnancy also affect women's hormone levels and consequently the production of extra sebum [source: Bouchez].

Why does that level of oil matter? Because excess oil, combined with dead skin cells and bacteria, can lead to acne. When oil is unable to exit through the hair follicles because they're clogged with accumulated dead skin cells and sebum, you end up with a breakout. The extra skin cells and sebum form a small blockage beneath the surface of the skin that pushes outward, often in the form of small, upraised red bulges with white centers -- or what we (not so) fondly refer to as pimples.

Our body's other main secretion, sweat, exits the body through two different types of glands.

Eccrine glands are the most prevalent and are located all over the body. The sweat produced by them exits through the skin's pores, and is of the non-stinky variety.**Apocrine glands** are located in our armpits and groin-anal area. They begin producing sweat during puberty, which exits the body through hair follicles.

Skin Color and Where It Comes from

Melanin is a pigment that is produced by specialized skin cells called **keratinocytes**. How much you have and how it's distributed determines your skin's tone. The more melanin you have, the darker your skin will be. Hormones and genetics determine how much of the pigment our bodies will produce, which explains the wide variety of skin tones that are present. Even two siblings who share the same parents can have different skin tones.

Melanin performs the important function of absorbing harmful ultraviolet rays from the sun. Our bodies produce extra melanin when we're exposed to sunlight, which is why people tan under the sun (or get burned). Light-skinned people have a greater tendency to get sunburned than dark-skinned people, as they don't have as much of the ray-absorbing melanin.

THINK PINK

Our skin also gets color from the amount of blood circulating beneath it. People with a healthy amount of blood circulating might appear to "glow" or have a ruddy look. People with poor blood circulation can look pale and wan-looking.

Because melanin is sometimes unevenly dispersed throughout the body, freckles can develop, most often in light-skinned people. Freckles are small, flat groupings of melanin-filled cells called **melanocytes**. Freckles develop through exposure to the sun and can be a range of colors.

Several attempts have been made to classify people's skin tones throughout the years. While other systems have fallen out of use, the Fitzpatrick Skin Type classification system is widely in use today. The system breaks people into six skin types according to hair and eye color, skin tone and propensity to burning under the sun [source: Commonwealth of Virginia].

Now that you understand the basics about why your skin looks the way it does, let's dive into some other skin mysteries -- like how it heals itself after being harmed.

How Skin Heals

When your skin gets cut, your body springs into action to heal the wound. First, the body works to limit blood loss by reducing the amount of blood flowing to the wounded area. Proteins in blood, such as fibrin, work with the blood platelets already in place and plasma to form a protective covering called a **scab**. While your skin regenerates underneath the protective layer, the scab protects the wound from outside infection.

The wound is gradually healed as new granular skin tissue begins to generate. Starting at the edges of the wound, the new tissue forms and works its way toward the center until it has covered the entirety of the lesion. Once the wound underneath has sealed itself with another skin layer, the scab will slough off on its own.

If the cut or scrape was a shallow one that only affected the outer epidermis layer, then there shouldn't be a scar when your skin heals itself. If the cut went deeper, into the dermis of the skin, then **cicatrisation** begins as your body moves to create fibrous scar tissue from the granular tissue. In general, the worse the wound, the greater chance that it will result in a scar. Your body needs three to six weeks to bridge a deep cut, producing a protein called collagen at the site of the wound to repair it. Even after the wound is healed, it can take up to two years for a scar to settle into its permanent appearance [source: Ditkoff].

WHY TATTOOS DON'T "HEAL"

Professional tattoos are created by rapidly puncturing the skin to inject droplets of ink into the dermis of your skin. Because the ink goes into the dermis and not the epidermis, which is constantly sloughing off skin cells, the pattern created by the ink is permanent and will maintain its shape, though stretching and fading do occur over time.

Scar skin tissue isn't like normal skin tissue -- it doesn't have sweat glands or hair growing from it. It's also more vulnerable to ultraviolet rays. Most scars are whitish and lay flat on the surface of your skin. But some scars, such as hypertrophic scars and keloids, take on an odd appearance. **Hypertrophic scars** are raised at the site of the original wound, reddish and sometimes itchy. Over time, they can subside. **Keloid scars** are also raised and red, but they grow past the site of the wound, overtaking normal healthy tissue. Researchers haven't yet been able to determine what causes these abnormal scars to form, but one theory is that they may be caused by changes to the signals sent by cells at the wound site. It seems these cells continue to direct the body to produce more fibrous tissue even after the wound has closed [source: Rockoff]. Laser treatments and cortisone injections are two methods used to treat keloids.

Scars, of course, aren't the only feature marking adult skin that was once baby-smooth. On the next page, find out how skin ages.

Skin as It Ages

We've all marveled at the softness of babies' skin, which is so much smoother than our own. There are several structural differences that give babies their soft skin. For one thing, their dermis layer is about 20 to 30 percent thinner than adult skin, which makes it less adaptable and more in need of sheltering [source: Johnson & Johnson]. Babies take in and lose water much more quickly than adults and, because

Laugh lines are the kind of wrinkles that are worth it.

they don't sweat as much, they aren't able to regulate their body's temperature like adults, either. Their skin is also very tender and prone to rashes when irritated. All of that softness comes with a price.

As children grow older, their skin becomes less sensitive. Adolescence is the next step, bringing with it a rush of hormones. Acne is often quick to follow, and may persist into adulthood. The next stop on the timeline of your skin is adulthood.

As we grow older, our skin ages in two ways: intrinsic and extrinsic. **Intrinsic aging** is what naturally happens to us due to our genes. The epidermis produces new skin cells more and more slowly as our skin cell layer decreases from a wall 20 cells deep to one that's only two skin cells deep [source: Roizen]. The proteins in our skin that give it firmness and elasticity ease up -- our bodies make less collagen, and elastin loses some of its strength. This is why our skin gets thinner and looser.

Intrinsic aging can be affected by external factors, such as smoking. This is known as **extrinsic aging**. Thenicotine in cigarettes, for example, constricts the blood vessels to your skin, which results in less oxygen and fewer vitamins getting where they need to be. Other chemicals in cigarettes break down the collagen and elastin we mentioned earlier.

Another big part of extrinsic aging is sun exposure. Everyone gets **wrinkles**, little patchworks of lines that crisscross all over our skin. Genetics partly determines just how wrinkly you'll be, but you can help keep lines to a minimum by taking care of your skin. If you're a smoker or a tanning bed enthusiast, it's likely you'll have more wrinkles than someone who isn't.

Photoaging is what dermatologists call the effects of too much skin on your skin. Wrinkles, pigmentation and changes in skin texture are a natural part of intrinsic aging, but they can be made worse by all the UV rays you've soaked up. Two people may be exactly the same age as far as birth date and yet have skin that makes them look a decade apart. **Age spots**, for example, also known as liver spots, are a common sight on the skin of older people. These brown, gray or black flat spots are found on the parts of your body that have seen the most sun. Less sun equals less of a chance of age spots.

And just because your skin looks great and healthy in your 20s and bounces back quickly from a summer burn doesn't mean you've seen the last of that willful decision to go without sunblock at the beach. Damage to the skin happens long before you can actually see it.

Sleep like a baby. It's good for you.

Caring for Your Skin

We've gone over the ways that your skin cares for your body and how it heals itself when wounded, but there are a number of ways you can help it do its job and ensure that it continues doing its job long into your life.

- Shield yourself from the sun. The sun's rays are at their most harmful between 10 a.m. and 4 p.m., so try and limit your time outside during these hours. If you're going to be outside, cover up. And, of course, don't forget the sunscreen, SPF 15 or higher.
- Throw away the cigarettes (or don't pick them up in the first place). As we discussed on the previous page, smoking shortchanges your skin of the nutrients it needs to stay healthy.
- Get plenty of sleep. They really do call it beauty sleep for a reason. While we're asleep, our skin repairs itself from the day before. Collagen production, which limits the amount of moisture loss in our skin, kicks into high gear while we slumber.
- Clean it (gently). Your skin encounters all sorts of nasty elements throughout the day, and it has your own dead cells and sebum to deal with. Reward your hard-working organ with regular upkeep. The key is not to overdo it -- use a mild, scent-free cleanser on your face and some warm water and don't forget to pat dry instead of rubbing. Follow with moisturizer to retain the elements your skin needs to look luminous.
- Drink up. Your skin is thirstier than you realize, and it needs H20 just like the rest of your body to hydrate and get rid of impurities.