

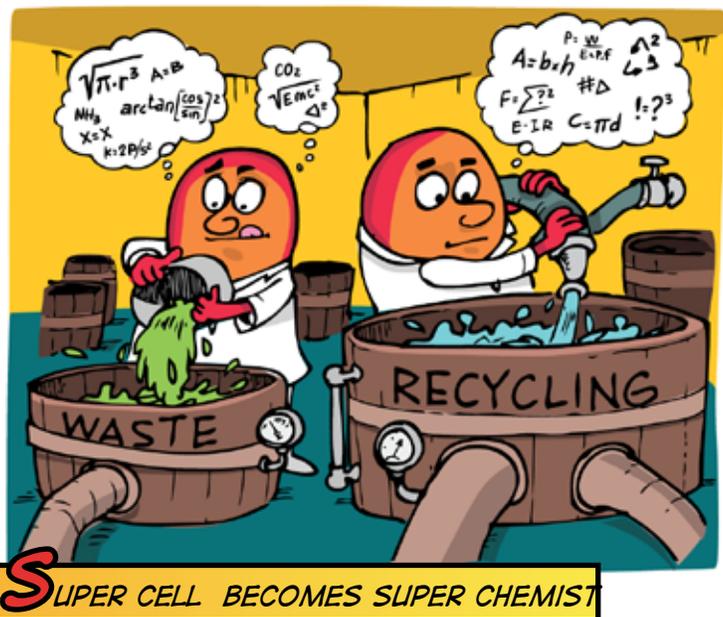


## WASTE REMOVAL ... AND MORE

**W**e saw how the blood and lymph feed us and carry away our wastes. Let's look at how the kidneys and skin support Human's body and help to get rid of our wastes.

### KIDNEYS

We'll start by visiting a kidney. Getting rid of wastes is only one function of the kidneys. Let's hop in with the red blood cells in the main artery carrying blood from the left side of the heart. We're passing the exit to the liver and approaching the exits to the kidneys. There's one kidney on each side of the spine behind the intestinal tract and just below the rib cage. The right kidney sits under the liver. The left kidney sits slightly higher. Let's ride into a kidney for a closer look.



We're passing through the fatty tissue that protects the inner workings of the kidney cells. Kidney cells are master chemists working to filter Human's blood. They are constantly calculating ratios in order to keep water in a delicate balance with numerous minerals. This kidney tissue is riddled with convoluted tubules—called nephrons. We'll squeeze through a tiny capillary to enter a nephron. Most of the filtering takes place in nephrons. Imagine, if you can, that there are well over one million of these nephrons in here, some 35 miles or 56 km of tubules, within this fist-sized organ. As chemists, the kidney cells must decide what needs to be excreted as waste in the urine and what needs to be reabsorbed—judging precisely the blood components in relation to the volume of water. They are responsible to return the best balance of nutrients to the blood stream. The cells in Human's two kidneys filter in the neighborhood of 45 gallons or 170 liters of blood each day producing about 4 to 6 cups or about 1½ liters of urine to be excreted in a day.

As urine is formed, see how it enters that muscular tube, the ureter that moves it along to the bladder. The bladder is a muscular sac that expands to store urine until Human is ready to excrete it. If Human doesn't let the urine out of the bladder when the urge strikes, it puts pressure on the valves—to the kidneys and to the urethra, the muscular tube that takes urine out of the body. The pressure is an extra burden these cells don't need. Human respects the cells of this sac and urinates when the urge comes rather than delaying. As long as Human drinks sufficient water and gets sufficient minerals, the urine is a light to medium shade of yellow.

In a female Human, it is a short trip through the urethra—it's only about 1½ inches or 4 cm long. In a male, it's a longer trip—at least 8 inches or 20 cm—as the urethra passes through the prostate and urine is excreted through the penis in the same tube that ejects sperm.

Thankfully, Human didn't have a problem with kidney stones—excess protein and other toxins can form kidney stones. No danger of that now that Human enjoys mostly fruit and vegetables.

There are three ways we can exit a kidney—with urine, with lymph fluid, or with blood. We'll exit the kidney in the blood via the vein that runs side by side with the artery in which we sailed in here. Let's squeeze through a capillary to enter the vein carrying blood back to the heart. It's a lot cleaner in the blood and veins now that the liver cells are able to keep up with viruses and other toxins and disarm them and it's a lot easier on Human's kidneys too.

## SKIN

We took the trip earlier to watch how the blood gets rid of one of our wastes, carbon dioxide (CO<sub>2</sub>), by expelling it through the lungs. Now, let's visit Human's

## THE BODY'S ABILITY TO REGENERATE

Every day our bodies replace hundreds of billions of cells. This gives us the opportunity to rebuild our bodies. Here's a testament to the body's ability to replace sick cells with robust, healthy cells.

At 41 years of age, Hazel Parcels, struggled to maintain her successful beauty shop. Doctors told her to put her affairs in order after tests indicated her heart was enlarged, one lung had collapsed from infection and 1/3 of a kidney had hemorrhaged away. Her skin was gray and each breath was difficult. She didn't accept that her body couldn't be healed. Instead, she said:

"I didn't see my death sentence as final judgment, but rather as an opportunity. After all, the doctors had admitted there was nothing more they could do to save my life. Now my future was completely up to me."

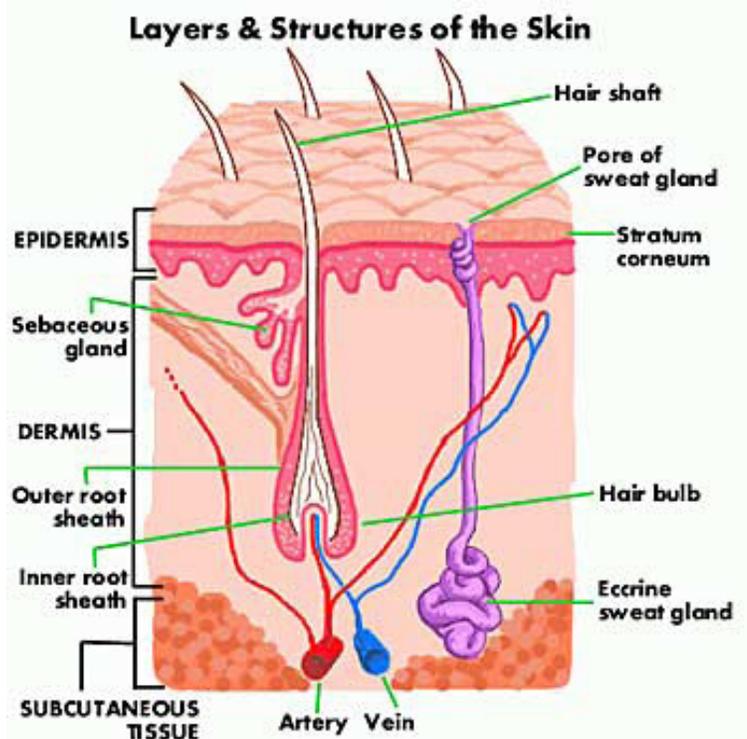
Hazel Parcels eventually became a naturopathic physician. After restoring her own health, over the next 65 years she helped countless people return to a vibrant life before she passed away peacefully in her sleep at 106 years of age.

*Live Better Longer, Joseph Dispenza*

largest organ, an irregular-shaped bag called the skin. One of the functions of skin cells is to get rid of more of our wastes. The skin is a mirror for the liver. When Human's liver cells are performing well, the skin has a healthy glow. When liver cells are overworked, the skin has to handle some of the excess toxins. Those wastes can create eruptions like pimples and boils, itchy spots and rashes.

Human's skin has a surface of about 2.22 square yards or nearly 2 square meters and weighs about 6 pounds or 2.7 kilograms. It has three main layers so let's enter the innermost layer, the hypodermis, by squeezing through yet another tiny capillary. Human's skin is well-fed with several miles of capillaries carrying nourishment. This innermost layer is made up of connective tissue, fat and blood vessels. The work of the cells in this layer is to provide protection or cushioning, to insulate, and to help control body temperature. We'll see how that works as we work our way to the surface.

These tiny blood vessels continue into the second layer, the dermis. Let's ooze out and explore this area. The skin gets strength and support here as most of the cells are made of sturdy proteins called collagen and elastin. Collagen provides firmness while elastin gives flexibility. This area is packed with nerve cells that make the skin a sensitive organ to pain, touch, pressure, cold and heat. Skin cells are particularly sensitive to touch in the lips, genitals, and hands.



<http://www.healthy-skin-guide.com/skin-diagram.html>

This level houses the follicles or shafts that support each hair on the skin. Red blood cells are feeding the roots through these hair follicles while sebaceous or fat glands are feeding the skin with an oily substance that keeps the surface lubricated and moist. The red blood cells are also feeding the base of the sweat glands that provide a vast drainage system to help get rid of wastes. There is lots of lymph in here to ferry the wastes that aren't expelled on the surface back to the bloodstream. Remember the lymph system is a key part of Human's immune system with a rich supply of white blood cells to zap pathogens.

Some cells are naturally migrating to the surface or epidermis layer, so let's ascend with them. By the time these

cells reach the surface, they'll be dead skin cells. We need to make our way through several layers of dead skin cells. These dead cells have a role to play as they form a protective layer to resist injury. Eventually they are sloughed off. Dead cells, with their acidity, also protect Human as they repel many bacteria that might otherwise enter the body.

Amazing how porous the skin looks up close. Look at all the hair poking through and the millions of pores for the sweat glands. The amount of moisture expelled through the sweat glands depends on the temperature. In hot weather, Human sweats a lot so several cups or liters a day are evaporated. Now that Human has the digestive system working well, body odor is less of a concern, as we don't have to get rid of as much waste through the sweat glands. There are special sweat glands in the armpits, genitals and anus that secrete a scented fatty liquid. This secretion can create an unpleasant odor when bacteria feed on this liquid and multiply, making it smelly.

Skin cells provide an amazing air conditioning system for the body. Cells in the sweat glands have the task of cooling the body when needed to help keep Human's internal temperature at 98.6 degrees Fahrenheit or 37.0 degrees Celsius. Cells in the muscles that control the hair follicles have the task of helping to warm the body by making the hair stand up and creating goose bumps to trap air on the surface of the skin. These muscles also squeeze the sebaceous glands to excrete more oil onto the surface of the skin. The oil covers the skin's surface and helps to keep the skin warm by reducing evaporation of sweat from the skin's surface. Of course, blood vessel cells play a key role. To keep Human from overheating, they expand the capillaries in the skin to allow more blood to reach the surface and cool before returning to the heart. If Human is getting too cold, they contract the capillaries in the skin to keep blood deeper inside and prevent it from cooling.

Human may look in the mirror in the morning and think it's the same skin looking back. It's not! Human looks at a completely new skin every month ... it takes about 27 days for the outer skin cells to be replenished. The good news is that means if Human doesn't like the wrinkles, blemishes or rashes that appear, given the right conditions, they can be replaced as new skin is formed. Human is constantly shedding these surface layers of dead cells. The shedding adds up to about one and one half pounds of dead skin each year.

Now that we've explored some of the work cells do in the kidneys and skin including the removal of wastes, let's explore how one of our early warning systems—the meridian system—swiftly and silently affects us cells to warn Human.

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