



ADVENTURES IN THE BODY WITH SUPER CELL

## WASTE REMOVAL ... AND MORE

**W**e've seen how us cells rely on the blood and lymph to feed us and carry away our wastes. And, remember how we were expelled with solid wastes at the end of that awesome trip down the digestive tract. Let's look at more ways Human's body gets rid of wastes.

### KIDNEYS

We'll start by visiting a kidney. Getting rid of wastes is only one function of the kidneys. To visit a kidney, let's hop on a red blood cell raft. Follow me as we enter the main artery carrying blood from the left side of the heart. We're moving along swiftly although this isn't as thrilling as the rapids we rode through the heart. We're already passing the exit to the liver and approaching the exits to the kidneys. Human has 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.

First, we'll pass through the fatty tissue that protects the inner workings of the kidney cells. Kidney cells are master chemists. They are responsible to filter Human's blood. As chemists, they are constantly calculating ratios in order to keep water in a delicate balance with

numerous minerals, or electrolytes as these life-giving nutrients are called. You'll notice how kidney tissue is riddled with convoluted tubules. These are nephrons. We'll squeeze through a tiny capillary to enter a nephron. Most of the filtering or work of the kidneys takes place in nephrons. Imagine, if you can, that there are well over one million of these nephrons in here,



**S**UPER CELL BECOMES SUPER CHEMIST

some 35 miles of tubules, within this fist-sized organ. It is important that the cells making up these tubules be kept flexible. Their flexibility depends largely on Human eating foods rich in essential fatty acids.

As chemists, the kidney cells filter the blood deciding what needs to be excreted and what needs to be reabsorbed. As waste products are removed to be excreted as urine, judgements are being made about the blood components in relation to the volume of water in order to return the best balance of nutrients to the blood stream. Actually 99% of the blood components are reabsorbed with only about 1% excreted. 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.

### *FOODS RICH IN ESSENTIAL FATTY ACIDS THAT ARE ESSENTIAL FOR HEALTHY CELLS*

Organic seeds and seed oils such as flax, sunflower, safflower, sesame, hemp and pumpkin

Foods such as dark green veggies, squash, and walnuts

Fish such as salmon and sardines and cod liver oil

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 those cells don't need. Human respects the cells of this sac and urinates regularly 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 the body uses to eject sperm.

There are three ways we can exit this 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 we sailed in with. Let's squeeze through a capillary to enter the vein carrying blood back to the heart.

You'll notice the master chemists with their filtering action have been able to keep a balance so Human has normal blood pressure—their work is important to maintain healthy blood pressure. The kidney cells are grateful that Human has the liver factory working well again. As long as the liver cells are able to disarm the toxins, the kidney cells don't get overloaded and excess toxins don't have to be carried with the blood in this vein.

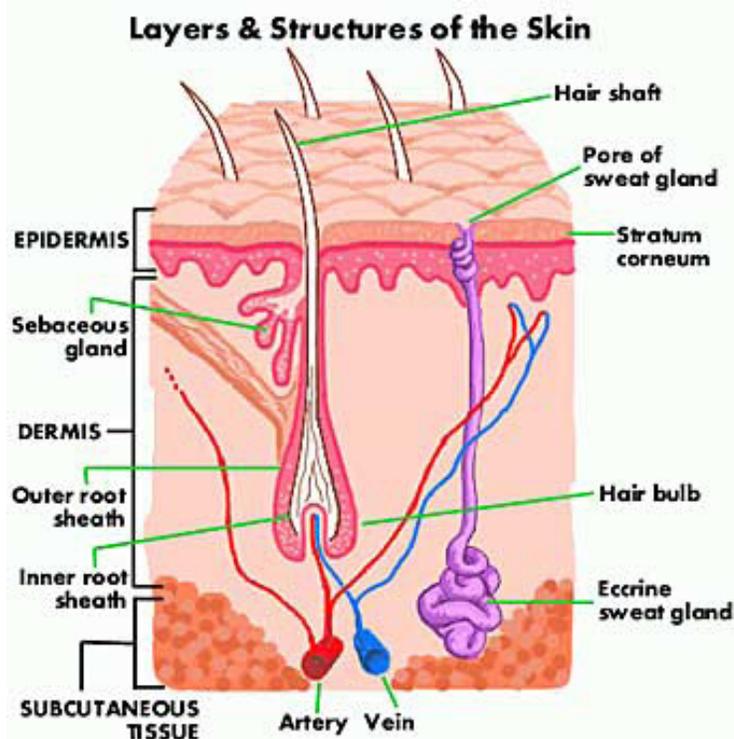
## SKIN

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 largest organ, an irregular-shaped bag called the skin. One of its functions is to get rid of more of our wastes. The skin is a mirror for the liver. Human's liver cells are performing well, so 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 itchy spots and rashes.

Human's skin has a surface of about 2.22 square yards or nearly 2 square meters and this covering for Human's body weighs about 6 pounds or 2.7 kilograms. It has three 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 endings 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. We'll explore more about nerve cells later. See how the red blood cells in the rich supply of capillaries is feeding the roots of hair follicles and the fat-producing sebaceous glands that funnel into the hair shaft. The sebaceous glands feed the skin with an oily substance that keeps the surface lubricated and moist. Human drinks sufficient water and eats foods rich in essential fatty acids to help keep the sebaceous glands working smoothly. 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. You'll note there is lots of lymph in here to ferry the wastes that aren't expelled



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

on the surface back to the bloodstream for the immune system to handle.

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 to reach the surface. These dead cells have a role to play as they form a protective layer to resist injury. Eventually they are sloughed off. These dead cells also protect Human as they have a level of acidity that repels 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 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.

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

### *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.

"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. 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*

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.

Skin cells are happy when Human gets exposure to the sun on a regular basis. Sunlight allows them to keep Human healthy by manufacturing the Vitamin D that is needed to carry calcium into the digestive system and bones.

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. Skin cells love it when Human gives them exercise by brushing the skin. The brushing stimulates the flow of blood and lymph to help give Human a healthy glowing skin.

Now that we've explored more waste removal systems and other work cells do in the kidneys and skin, let's explore how one of our early warning systems—the meridian system—swiftly and silently affects us cells. Later, we'll check out how other communication systems such as the nervous system and potent chemical messengers work with us.

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