Washington State University

Posted in Human Body and Behavior

You Light Up My Life!

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My question is how or where or what organs actually produce the electric current that powers the human body? How much current is produced?
Thank You,
Jerry

Professor Simasko is a pharmacologist here at Washington State University. Pharmacologists study drugs and how they affect the body. So why, you ask, would a pharmacologist be interested in electricity?

He says a lot of drugs work because they interfere with the "channels" that carry the "ions" that help produce electricity in the cells. For example, a local anesthetic, like you get at the dentist's, works by "blocking the ion channels and preventing pain fibers from generating electricity." So your pain fiber never fires, and your brain feels no pain.

But maybe we need to back up a little bit. **Electricity in the cells, though not nearly as strong, is the same as the electricity that lights your house**. But it IS produced a little differently.

The electric current that lights your house is the flow of electrons. The electricity in your cells comes from the flow of "ions." Ions are atoms or molecules that have an electric charge because they have either lost or gained electrons.

Like a battery, or the generators at the Grand Coulee Dam, the cells generate "potential energy" by separating electrical changes. That means the energy used to separate them will be released if they come back together. That released energy is called "voltage."

The cells separate the charges by pumping one kind of ion through a "channel," basically a hole, in their membranes that will only let one kind of ion through. So what you end up with is two opposite charges separated by the cell membrane.

But these opposite charges long to get back together. So when the cell needs electricity, all it needs to do is open one of these channels to complete the electrical circuit. Neat, huh?

Some cells generate more than others, says Professor Simasko. The amount depends on what the cells do and what they use the electricity for. Nerve cells and heart cells generate a lot of electricity. Nerve cells use it to transmit messages over long distances.

Suppose, for example, that you burn your finger. A nerve fiber (which is really one cell) uses electricity to send that pain signal all the way from your finger to your spinal cord. There, it makes a chemical signal to another cell, which sends another electrical signal to the brain. And there, somehow the signal gets interpreted as pain. We don't really know exactly how that happens.

Other cells that use a lot of electricity are heart cells. They use electricity to control the beating of the heart. Endocrine cells, which Professor Simasko studies, use electricity to control how much hormone they give off.

Now, you also asked how much electricity is produced in the body. Well, the difference between the outside charge and the inside charge of a cell (what's called the "resting potential") is about 50 millivolts. That's 50 x 1/1000 of a volt. Compare that to a little AAA flashlight battery, which has 1.5 volts. Not much, right? But, says Professor Simasko**, add up the electricity generated by all the trillions of cells in the body and what you get is enough to light a 40 watt light bulb!**