

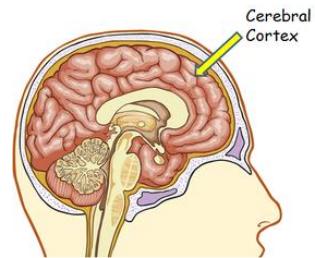
Your Body Is Younger Than You Think

By NICHOLAS WADE AUG. 2, 2005

Whatever your age, your body is many years younger. In fact, even if you're middle aged, most of you may be just 10 years old or less.

Many of the cells in our body are constantly reproducing or dividing. One cell biologist from Sweden, Jonas Frisen, believes the average age of all the cells in an adult's body may turn out to be as young as 7 to 10 years.

Dr. Frisen has also discovered that the cells in the front of our brain (called the cerebral cortex) live in the body without reproducing new cells. These cells stay the same age as the person. This may be why we behave differently depending on our age.



Because cells reproduce at different rates, scientists like Frisen are looking for a new way to figure out how old human cells really are. Dr. Frisen wondered if he could use some kind of marker or tag on the cell to track its age. A natural "tag" already exists in nature and it's called Carbon-14.

Breathed in by plants worldwide and eaten by animals and people, the carbon-14 gets taken into the DNA of cells each time the cell divides and the DNA is duplicated or copied.

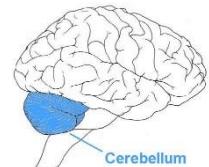
Most molecules in a cell are constantly being replaced but the DNA is not. All the carbon-14 in a cell's DNA is taken in on the cell's birth date, the day its parent cell divided. Therefore, the amount of carbon-14 could be used to figure out the cell's age.

Having studied the method with various tests, he and his colleagues have reported in the July 15 issue of Cell the results of their first tests with a few body tissues. Cells from the muscles of the ribs, taken from people in their late 30's, have an average age of 15.1 years, they say.

The epithelial cells that line the *surface* of the intestines have a rough life and are known by other methods to last only five days. Ignoring these surface cells, the average age of those in the *main body* of the intestine is 15.9 years, Dr. Frisen found.

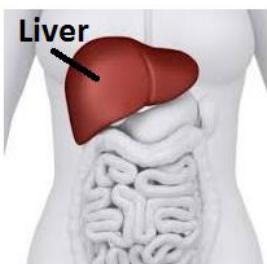
Another scientific team then turned to the brain. It has been believed that the brain does not generate new cells except for two places: the area where the brain "smells" and records memories.

Using Dr. Frisen's method to test a cell's age will enable all areas of the brain to be dated to see if any new nerve cells are made. So far he has tested only cells from the front area (cortex) and has found that these are exactly the same age as the individual, showing that new neurons are not generated after birth in this region of the cerebral cortex, or at least not in significant numbers. Cells of the cerebellum are slightly younger than those of the cortex, which fits with the idea that the cerebellum continues developing after birth. The cerebellum is responsible for learning new skills, balance and coordination.



Although people may think of their body as permanent, most of it is in a state of constant change as old cells are removed and new ones are made in their place. Each kind of tissue has its own turnover time, depending in part on the workload needed by its cells. The cells lining the stomach, as mentioned, last only five days. The red blood cells, bruised and battered after traveling nearly 1,000 miles through the maze of the body's circulatory system, last only 120 days or so on average before being removed by the spleen.

The epidermis, or surface layer of the skin, is recycled every two weeks or so. The reason for the quick replacement is that "This is the body's saran wrap, and it can be easily damaged by scratching, solvents, wear and tear," says Elaine Fuchs, an expert on skin's stem cells at Rockefeller University.



As for the liver, which filters the blood removing poisons and toxins, the cell life is quite short. An adult human liver probably has a turnover time of 300 to 500 days, says Markus Grompe, an expert on the liver's stem cells at the Oregon Health & Science University.

Other tissues have lifetimes measured in years, not days, but are still far from permanent. Even the bones endure a constant makeover. The entire human skeleton is thought to be replaced every 10 years or so in adults.

About the only pieces of the body that last a lifetime, on present evidence, seem to be the nerve cells of the cerebral cortex, the inner lens cells of the eye and perhaps the muscle cells of the heart.

But if most of the body's cells reproduce throughout a person's life, why doesn't this reproduction continue forever? Some experts believe the root cause is that the DNA inside of cells begins to have mutations that increase over time and cannot be fixed by the body. Another theory is that the stem cells creating other new cells begin to not work as well as we get older.

"The notion that stem cells themselves age and become less capable of reproducing new cells is gaining increasing support," Dr. Frisen said. He hopes to see if the rate of a cell's ability to reproduce slows as a person ages. Therefore a cell's age may be a link to a person's mortality.