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# Scientists Turn Skin Cells Into Motor Neurons in ALS Patients



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THURSDAY, July 31 (HealthDay News) -- Scientists have turned skin cells from patients with Lou Gehrig's disease into motor neurons that are genetically identical to the patients' own neurons.

An unlimited number of these neurons can now be created and studied in the laboratory, a capability which should result in a better understanding of the disease and, one day, lead to new treatments or even the production of healthy cells that can replace the diseased ones.

"The hope of some scientists is that they might be able to harness stem cells and program them to generate pluripotent stem cell lines [capable of differentiating into many different types of cells] which have the genes of patients," said Kevin Eggan, co-author of a paper appearing July 31 in the online version ofScience. "This would open up the possibility of producing a large supply of immune-matched cells to that patient that could be used in transplantation methodologies."

"The other hope, and one that's much closer upon us . . . is if you could produce the cell types that become sick in that person, you might be able to use them in the laboratory to come to understand basic aspects of the disease and take the study of disease out of patients, where it's very difficult, and put it into the Petri dish," added Eggan, who is a principal faculty member at the Harvard Stem Cell Institute and spoke about the research at a teleconference Wednesday.

However, the actual therapeutic potential of this approach is still years away.

Lou Gehrig's disease or ALS (amyotrophic lateral sclerosis) is caused by the degeneration and death of spinal motor neurons, which carry messages from the spinal cord to the body's muscles. This leads to paralysis of muscles and, eventually, death. Some 30,000 people in the United States suffer from the disease, which has no cure.

"We don't at all fully understand [ALS], and it is our lack of understanding of that disease process which we believe is preventing us from developing more effective [treatments]," said Christopher Henderson, a co-author on the paper and co-director of the Center for Motor Neuron Biology and Disease at Columbia University. "Because the disease process is happening in the spinal cord in the central nervous system of patients, we don't at all have access to living examples of the neurons that are undergoing the disease process. . . . No way could we go to ALS patients and take samples of their motor neurons."

The scientists had originally planned to use somatic cell nuclear transfer (SCNT), or "therapeutic cloning," to try to accomplish this feat. That process involves removing the genetic material from a donated human oocyte and replacing it with genetic material from the skin cells of patients. The approach has been hindered by political, ethical and other obstacles.

Instead, researchers decided to take adult skin cells from two elderly sisters (aged 82 and 89) with a genetic form of ALS and reprogrammed them into cells resembling embryonic stem cells using a technique called induced pluripotent stem (iPS) cells. iPS has already been successfully used to reprogram healthy adult cells.

This study was the first to apply the technique to cells from ill patients.

Those embryonic stem cells were then transformed into motor neurons, although it's not yet clear if the cells will suffer from the same disease process.

Although only about 2 percent of people with ALS suffer from this particular form of the disease, Eggan and Henderson believe the approach has promise for studying other forms of the disease. In fact, the research team is already working on producing similar cell lines from patients with the "sporadic" form of the disease.

It was also encouraging that the feat was accomplished in the two of the oldest, if not the oldest, ALS patients in the United States. Researchers didn't know if the ravages of the disease might have interfered with their ability to reprogram the cells.

The big question on everyone's mind is whether iPS will eliminate the need for somatic cell nuclear transfer. Eggan said it won't.

"There are still several important caveats for these cells that we've made that are important to be aware of," Eggan said. For one thing, the cells were infected with genetically modified viruses, making them potentially dangerous to humans. Future research will no doubt focus on ways to replace those viruses with chemicals.

"[But], for the moment, we're going to have to press forward with SCNT research just in case that doesn't work out," Eggan said. So far, though, no one knows if human SCNT is even possible.

**More information**

Visit the ALS Association for more on Lou Gehrig's Disease.

SOURCES: July 30, 2008, teleconference with Kevin Eggan, Ph.D., principal faculty member, Harvard Stem Cell Institute, Boston; Christopher Henderson, Ph.D., professor, pathology, neurology and neuroscience, co-director, Center for Motor Neuron Biology and Disease, Columbia University, and senior scientific advisor, Project A.L.S./Jenifer Estess Laboratory for Stem Cell Research, New York City; July 31, 2008,Science, online