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From the Los Angeles Times

Scientists create first personalized stem cells in ALS patients

Researchers for the first time are able to reprogram cells from sick patients. Though hurdles remain, such cells could be used to help screen drugs to treat the crippling disease.

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Scientists have created the first personalized stem cells for patients with a genetic disease by rewinding their skin cells to an embryonic state, according to a study published Thursday in the online edition of Science.

The researchers then converted some of those stem cells into the two kinds of brain cells that cause their crippling disease, amyotrophic lateral sclerosis, commonly known as Lou Gehrig's disease.

Stem cell experts said they were delighted -- though not surprised -- to see proof that the reprogramming technique worked on human cells from sick patients.

Previously, human versions of the so-called induced pluripotent stem cells had only been made from skin samples provided by healthy subjects.

"It is quite amazing and an important step that should allow the development of experimental and therapeutic interventions for this disease," said Kathrin Plath, a researcher at the Broad Center of Regenerative Medicine and Stem Cell Research at UCLA, who was not involved in the study.

The new cells were derived from 3-millimeter patches of skin removed from the arm of an 82-year-old woman and her 89-year-old sister, who share a rare genetic mutation that causes about 2% of ALS cases.

The scientists from Harvard University and Columbia University focused on the rare form of ALS in part to test whether cells from elderly patients could be reprogrammed, said biologist Kevin Eggan of the Harvard Stem Cell Institute.

"This opens the door to being able to make patient-specific stem cell lines from diseases which affect people very late in life, like Parkinson's disease or Alzheimer's disease," said Eggan, the study's senior author.

The team followed a cellular reprogramming recipe pioneered in Japan that has swept through stem cell research labs around the world in the last year. The scientists isolated fibroblast cells from the sisters' skin biopsies and infected them with viruses, prompting the cells to express four dormant genes -- Klf4, Sox2, Oct4 and c-Myc -- that are active during early embryonic development.

The scientists produced eight stable cell lines, and they studied three of them from the 82-year-old woman, whose ALS symptoms were more advanced.

The cells expressed the same markers as embryonic stem cells and were able to grow into all the body's main tissue types.

When the scientists exposed the cells to certain small molecules, the jumbles of tissue began to differentiate into motor neurons, the cells that regulate voluntary muscle movement.

They also found evidence of glial cells, a crucial component of the central nervous system.

ALS is caused by the degeneration of motor neurons, but until now scientists have had no way to take samples from patients and study them in the lab, said Christopher Henderson, a professor of pathology, neurology and neuroscience at Columbia and coauthor of the study. Now he anticipates growing unlimited supplies of motor neurons using the reprogrammed stem cells.

"This is an extremely important resource," said Lucie Bruijn, science director of the ALS Assn. in Calabasas Hills, which was not involved in the study. "It gives you a tool to start screening drugs."

Researchers at Harvard and Columbia are already working to create motor neurons that are genetically matched to healthy people so that they can compare them with the ones derived from ALS patients, Eggan said.

Eventually, the stem cells might be used to create fresh motor neurons that could replace the diseased cells in ALS patients.

But many significant hurdles remain, including finding a way to reprogram the skin cells without relying on viruses or embryonic genes that cause mutations that can lead to cancer.

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