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## Disease-Specific Stem Cell Lines Developed

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Researchers in Massachusetts have succeeded in generating several disease-specific stem cell lines which should advance both research and, one day, treatment.

The lines will be made available to researchers around the world through a Harvard Stem Cell Institute "core" facility being established at Massachusetts General Hospital, institute co-director Doug Melton said during a Wednesday teleconference.

The new lab is already up and running and is prepared to start shipping lines as soon as a new paper is published in the Aug. 6 online edition of *Cell*, added Dr. George Daley, senior author of the paper and a principal faculty member at the institute.

"This is a broader and more important collection of degenerative diseases for which there are no good treatments and, more importantly, no good animal models," Melton said. "The cells will allow researchers access for the first time to cell types of interest, to watch the disease progress in a dish, to watch what goes right or wrong. . . We'll see in the years ahead that this opens the door to a new way of treating degenerative disease."

The cell lines will be distributed "virtually free," Melton said, with a nominal fee to cover costs.

Last week, another team of scientists from the institute announced that they had transformed skin cells from patients with Lou Gehrig's disease into motor neurons that are genetically identical to the patients' own neurons. This will enable them to create unlimited numbers of cells to study the disease process better.

Those scientists had originally planned to use somatic cell nuclear transfer (SCNT) or "therapeutic cloning" for the 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. But the approach has been hindered by political, ethical and other obstacles.

Instead, those researchers took adult skin cells from two elderly sisters with Lou Gehrig's disease and reprogrammed them into cells resembling embryonic stem cells using a technique called induced pluripotent stem (iPS) cells. Those stem cells were then transformed into motor neurons.

The current paper in *Cell* describes a similar process, taking cells from patients aged 1 month to 57 years and suffering from one of 10 conditions including Down Syndrome, Parkinson's, Huntington's disease, muscular dystrophy and type 1 diabetes, and using iPS to produce pluripotent, undifferentiated stem cells.

These cells, of course, will then have to be coaxed into tissues of different types. "That is where all of the science will go on over the next many, many years," Daley said.

The recent successes will not likely obviate the need for controversial stem cells, however, the scientists said.

"Even though the iPS methodology gives us a facile way for making disease-specific lines, it does not eliminate the value or need for continuing to study human embryonic stem cells," Daley said. "Those are really the gold standard for pluripotent stem cell types. They have no genetic modifications and, at least for the foreseeable future, and I would argue beyond that, are going to be extremely valuable tools. . . Human embryonic stem cells allow you to ask questions that we never can ask with iPS cells."

The iPS method requires the use of viruses, limiting the therapeutic potential of the lines.

"Whether or not we're going to be able to figure out how to do it without viruses so we can use the cells therapeutically is, as of today, an unanswered question," Daley said. "I'm confident we're going to get there and that within the next year or two, we will have several strategies for reprogramming cells without viruses, and when that happens, we may have cells in our hands that may be valuable for cell replacement therapy."

The number of lines ultimately generated will depend on a host of factors.

"In these complex genetic diseases, we're so ignorant at the moment, we don't even know if patients who get type 1 diabetes all get it the same way. There could be 50 different ways to get type 1 diabetes," Melton said.

If there are 50 ways to get the disease, scientists are going to want to develop more stem cell lines to reflect that variety. If there are only one or two ways, then fewer lines will be needed.