Researchers reprogram cell identities in mice

The Washington Times
28.08.2008

NEW YORK | Talk about an extreme makeover - scientists have transformed one type of cell into another in living mice, a big step toward the goal of growing replacement tissues to treat a variety of diseases.

The cell identity switch turned ordinary pancreas cells into the rarer type that churns out insulin, essential for preventing diabetes.

But its implications go beyond diabetes to a host of possibilities, scientists said.

It's the second advance in about a year that suggests that someday doctors might be able to use a patient's own cells to treat disease or injury without turning to stem cells taken from embryos.

The work is "a major leap" in reprogramming cells from one kind to another, said one expert not involved in the research, John Gearhart of the University of Pennsylvania.

That's because the feat was performed in living mice rather than a lab dish, the process was efficient and it was achieved directly without going through a middleman like embryonic stem cells, he said.

The newly created cells made insulin in diabetic mice, though they were not cured. If the experiment's approach proves viable, it might lead to treatments like growing new heart cells after a heart attack or nerve cells to treat disorders like Parkinson's disease.

Douglas Melton, co-director of the Harvard Stem Cell Institute

and a researcher with the Howard Hughes Medical Institute, cautioned that the approach is not ready for people.

He and his colleagues report the research in a paper published online Wednesday by the journal Nature.

Basically, the identity switch comes about by a reprogramming process that changes the pattern of which genes are active and which are shut off.

Scientists have long hoped to find a way to reprogram a patient's cells to produce new ones. Research with stem cells, and similar entities called iPS cells that were announced last year, has aimed to achieve this in a two-step process.

The first step results in a primitive and highly versatile cell. This intermediary is then guided to mature into whatever cell type scientists want. That guiding process has proven difficult to do efficiently, especially for creating insulin-producing cells, Mr. Gearhart noted.

In contrast, the new method holds the promise of going directly from one mature cell type to another. It's like a scientist becoming a lawyer without having to go back to kindergarten and grow up again, Mr. Melton said.

So, he said, someday scientists may be able to replace dead nerve or heart cells in people by converting some neighboring cells. At the same time, he stressed that it's still important to study embryonic stem cells and iPS cells.

The Melton team started its work with pancreas cells that pump out gut enzymes used in digestion and turned them into pancreatic "beta" cells, which make insulin.

The researchers destroyed beta cells in mice with a poison, giving the mice diabetes. Then they injected the pancreas with viruses that slipped into the enzyme-making cells. These viruses delivered three genes that control the activity of other genes.

Just three days later, new insulin-secreting cells started to show up. By a week after that, more than a fifth of the virally infected cells started making insulin.

That shows "an amazingly efficient effect," commented Richard Insel, executive vice president of research at the Juvenile Diabetes Research Foundation.