

Stem cell breakthrough offers diabetes hope

April 3 2008

Scientists have discovered a new technique for turning embryonic stem cells into insulin-producing pancreatic tissue in what could prove a significant breakthrough in the quest to find new treatments for diabetes.

The University of Manchester team, working with colleagues at the University of Sheffield, were able to genetically manipulate the stem cells so that they produced an important protein known as a ‘transcription factor’.

Stem cells have the ability to become any type of cell, so scientists believe they may hold the key to treating a number of diseases including Alzheimer’s, Parkinson’s and diabetes.

However, a major stumbling block to developing new treatments has been the difficulty scientists have faced ensuring the stem cells turn into the type of cell required for any particular condition – in the case of diabetes, pancreatic cells.

“Unprompted, the majority of stem cells turn into simple nerve cells called neurons,” explained Dr Karen Cosgrove, who led the team in Manchester’s Faculty of Life Sciences.

“Less than one per cent of embryonic stem cells would normally become insulin-producing pancreatic cells, so the challenge has been to find a way of producing much greater quantities of these cells.”

The pancreas contains different types of specialised cells – exocrine

cells, which produce enzymes to aid digestion, and endocrine cells, including beta cells, which produce the hormone insulin to regulate the blood glucose levels. Diabetes results when there is not enough insulin to meet the body's demands.

There are two forms of the disease: type-1 diabetes is due to not enough insulin being produced by the pancreas, while type-2 or adult-onset diabetes occurs when the body fails to respond properly to the insulin that is produced.

The team found that the transcription factor PAX4 encouraged high numbers of embryonic stem cells – about 20% – to become pancreatic beta cells with the potential to produce insulin when transplanted into the body.

Furthermore, the scientists for the first time were able to separate the new beta cells from other types of cell produced using a technique called 'fluorescent-activated cell sorting' which uses a special dye to colour the pancreatic cells green.

“Research in the United States has shown that transplanting a mixture of differentiated cells and stem cells can cause cancer, so the ability to isolate the pancreatic cells in the lab is a major boost in our bid to develop a successful therapy,” said Dr Cosgrove.

“Scientists have had some success increasing the number of pancreatic cells produced by altering the environment in which the stem cells develop, so the next stage of our research will be to combine both methods to see what proportions we can achieve.”

Scientists believe that transplanting functional beta cells into patients, most likely into their liver where there is a strong blood supply, offers the best hope for finding a cure for type-1 diabetes. It could also offer

hope to those with type-2 diabetes whose condition requires insulin injections.

But the more immediate benefit of the team's research is likely to be in providing researchers with a ready-made supply of human pancreatic cells on which to study the disease process of diabetes and test new drugs.

The research, which was funded by the Juvenile Diabetes Research Foundation and the Medical Research Council, is published in the journal Public Library of Science (PLOS) One.

Source: University of Manchester

Citation: Stem cell breakthrough offers diabetes hope (2008, April 3) retrieved 9 April 2024 from <https://phys.org/news/2008-04-stem-cell-breakthrough-diabetes.html>

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