

Stem cells develop best in 3-D

November 21 2012

Scientists from The Danish Stem Cell Center (DanStem) at the University of Copenhagen are contributing important knowledge about how stem cells develop best into insulin-producing cells. In the long term this new knowledge can improve diabetes treatment with cell therapy. The results have just been published in the scientific journal *Cell Reports*.

[Stem cells](#) are responsible for [tissue growth](#) and tissue repair after injury. Therefore, the discovery that these vital cells grow better in a three-dimensional environment is important for the future treatment of disease with [stem cell therapy](#).

"We can see that the quality of the cells produced two-dimensionally is not good enough. By putting the cells in a three-dimensional environment and giving them the proper growth conditions, we get much better results. Therefore we are developing a three-dimensional [culture medium](#) in gelatine in the laboratory to mimic the one inside an embryo," says Professor Anne Grapin-Botton from DanStem at the University of Copenhagen, who produced the results together with colleagues from Switzerland and Belgium.

The international research team hopes that the new knowledge about three-dimensional cell growth environments can make a significant contribution to the development of cell therapies for treating diabetes. In the long term this knowledge can also be used to develop stem cell treatments for [chronic diseases](#) in [internal organs](#) such as the liver or lungs. Like the pancreas, these organs are developed from stem cells in

3D.

From stem cells to specialised cells

The research team has investigated how the three-dimensional organisation of tissue in the early [embryonic stage](#) influences development from stem cells to more [specialised cells](#).

"We can see that the pancreas looks like a beautiful little tree with branches. Stem cells along the branches need this structure to be able to create insulin-producing cells in the embryo. Our research suggests that in the laboratory [beta cells](#) can develop better from stem cells in 3D than if we try to get them to develop flat in a Petri dish," explains Professor Grapin-Botton.

"Attempts to develop functional beta cells in 2D have unfortunately most often resulted in poorly functioning cells. Our results from developing cells in 3D have yielded promising results and are therefore an important step on the way to developing cell therapies for treating diabetes."

The research is supported by the Novo Nordisk Foundation, Swiss National Research Foundation, and the National Institute of Health (NIH), USA.

The results from the paper "Planar Cell Polarity Controls Pancreatic Beta Cell Differentiation and Glucose Homeostasis" have just been published in the scientific journal *Cell Reports*.

Facts on beta cells

Insulin-producing cells are also called beta cells. They are found in groups in the pancreas in the Islets of Langerhans. These cells have been

destroyed in people with type 1 diabetes, who cannot therefore produce insulin. Insulin is the hormone that keeps our blood glucose level stable. Today most people with diabetes take insulin doses several times a day by hypodermic needle or insulin pump. In a few extreme cases surgeons transplant beta cells from another person to try to re-establish stable blood glucose, but this treatment strategy has severe limitations due to immunological complications and scarcity of donor tissue.

Provided by University of Copenhagen

Citation: Stem cells develop best in 3-D (2012, November 21) retrieved 19 April 2024 from <https://phys.org/news/2012-11-stem-cells-d.html>

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