Membrane for islets of Langerhans transplantations

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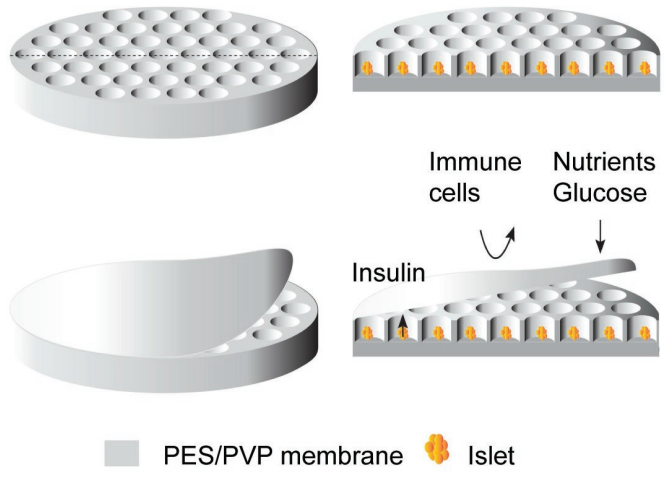

Figure 1. Credit: University of Twente

Researchers at the University of Twente and other Dutch knowledge institutes have developed a membrane with which individual islets of Langerhans – insulin-producing cell clusters – can be encapsulated. The idea behind the system is that these islets could eventually be safely transplanted to cure type 1 diabetes patients. The research results were published in the scientific journal *Scientific Reports*.

In the Netherlands alone about 150,000 people suffer from type 1 diabetes. Due to an immune disease the islets of Langerhans – clusters of pancreatic cells– function poorly and the production of insulin is limited. Therefore the patient's body can then no longer regulate its own blood sugar levels. Patients must therefore inject themselves with insulin, sometimes several times a day. They also have a raised risk of heart, eye and kidney disorders, nerve damage, and stroke.

Islet transplantation

The transplantation of islets into the liver is a solution, but a large proportion of the cells do not survive transplantation because of the body's immune response as well as due to the non-natural environments there which induces high stress to the cells. Researchers at the University of Twente have therefore been working together with researchers from several other knowledge institutes to devise a method of 'encapsulating' these islets for their safe transplantation. The challenge is to develop a semipermeable encapsulation membrane that would allow oxygen, nutrients and insulin to pass through, but that would simultaneously protect cell clusters against the body's own immune system, thereby preventing rejection reactions. The researchers have successfully developed such membrane which consists of small compartments with a diameter of about half a millimetre, where the islets can be cultured without aggregating, and a porous lid.

The results show that the device indeed prevents islet aggregation and preserves the islet's native morphology. The encapsulated islets maintain their glucose responsiveness and function after seven days of culture demonstrating the potential of this device for islet transplantation. The next step in this research is to perform animal studies; this is currently underway.

Xenotransplantation

UT researcher Prof. Dimitrios Stamatialis regards this as an important step in the research, but warns that it will be many years before such device could be implanted in human diabetes patients. "We need to test the biocompatibility of the device in vivo as well as develop good strategies of the device "upscaling." Creating the islets might be made possible through the use of stem cells, but in Stamatialis' view the membrane approach could also enable the option of xenotransplantation

(making use of islets taken from other species).

Study

The study was carried out by researchers at the MIRA research institute of the University of Twente, the Radboud University Medical Center, the Leiden University Medical Center, the Hubrecht Institute and Maastricht University. It is published in *Scientific Reports* under the title "Pancreatic islet macroencapsulation using microwell porous membranes."

More information: Katarzyna Skrzypek et al. Pancreatic islet macroencapsulation using microwell porous membranes, *Scientific Reports* (2017). DOI: 10.1038/s41598-017-09647-7

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