Bioartificial pancreas

*Millions of diabetes sufferers worldwide would greatly benefit from a permanent therapeutic solution. A European project developed a bioartificial pancreas with very promising results.*

Currently, diabetes management relies on diet control and insulin therapy, which requires constant glucose monitoring. However, it is desirable to control diabetes in a physiological way, without requiring an external supply of insulin and without the continuous monitoring of blood sugar.

MAILPAN (Macroencapsulation of pancreatic islets) is a prototype device comprising a bioartificial pancreas that uses encapsulation with artificial membranes to ensure effective immune isolation of insulin-secreting cells. The membranes are impermeable to molecules involved in rejection but permeable to glucose, insulin, oxygen and nutrients.

The device functions to protect the transplanted cells from the recipient's immune system and the recipient from the transplanted cells, while maximising their function. It offers a physiological solution for diabetes, allowing cellular therapy to become a widely deployed reality. Importantly, no immunosuppressive treatment is required, thereby extending the treatment to a larger number of patients.

The EU-funded BIOSID project was designed to improve the MAILPAN bioartificial pancreas and bring the prototype to the pre-clinical and clinical phases. The activities focused on enhancing islet survival and function inside the device and validating the device in small and large animal models before its commercialisation.

Researchers employed EndoC-betaH1 cells for transplantation into the MAILPAN device as they are stable insulin-producing glucose-responsive cells that have been successfully used to rescue mice with chemically induced diabetes.

Project activities provided a thorough understanding of the physico-chemical conditions as well as the mechanisms affecting islet survival and function within the MAILPAN. A new adapted cell culture medium formulation provided an improved beneficial effect on islet cell survival and function. Furthermore, the device conformed to the regulatory directives in terms of safety and biocompatibility, demonstrating its potential to be further used in humans.

Overall, the BIOSID project results were valorised in several international meetings and media, emphasising the benefits of the clinical implementation of the MAILPAN device. Although clinical testing of the device in trials is pending, it is expected to improve the quality of life of millions of diabetics.