

**On 14 March 2019, Polish scientists from the Foundation of Research and Science Development printed the world's first prototype of the bionic pancreas with vascular system. At present, the bionic pancreas consists exclusively of animal pancreatic islets producing glucagon and insulin, which are submerged in their proprietary bioink. The organ was placed in a bioreactor designed by the scientists, to which an active flow was connected.**

Scientists have already done magnetic resonance imaging and performed CT to evaluate the prototype from within. The results of these studies showed that all the vessels were reproduced exactly as designed in the computer program. Two stages of studies on small and large animals are planned for this year. They provide the necessary knowledge on the biological behaviour of bioink and bionic pancreas in the living organism. Intensive implementation and patent works are in progress in the laboratory. The Foundation's team has entered an advanced stage of research and is looking for partners to cooperate in the commercialization and marketing of its products.

Foundation of Research and Science Development as a leader of the Bionic Consortium is currently implementing a project related to bioprinting of pancreatic scaffolding in 3D technology, co-financed by Polish National Centre for Research and Development within the STRATEGMED III programme. The aim of the project is to create a "tailor-made" pancreas from the patient's stem cells, which will eliminate the risk of rejection. The extracted stem cells will be multiplied and converted into alpha and beta cells, which produce glucagon and insulin. They will then serve as a building block for pancreatic islets and will be placed in a cartridge of the 3D bioprinter with a scientifically developed bioink. The next cartridge will feature elements that will build the vascular system - the smallest vessels that the Foundation can print are those with a diameter of about 1 mm. Scientists assume that the remaining tiny vessels will develop by themselves under the influence of certain factors that will be added to their bioinks. The task of the team is to stimulate angiogenesis and create new vessels so that this printed organ, which is to be implanted in the future to the patient, will additionally rebuild itself in his or her body.

The innovation of the bionic pancreas is based on the application of a unique composition of bioink, containing living cells and pancreatic islets. Another advantage of this innovative project is that after the transplantation of previously isolated stem cells from fat tissue and their programming in such a way that they are capable of secreting insulin and glucagon, they

will become a completely new type of cells. It will be an autologous transplant. As part of the work on this project, in addition to the creation of proprietary bioinks, the engineering team designed and produced a bioreactor. The device incorporates the appropriate electronic and medical system that will allow scientists to monitor and adjust the parameters of bionic pancreatic maturation in real time before transplantation.

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Foundation of Research and Science Development was established in 2009. The organization deals mainly with educational and research activities in the field of medical and biochemical sciences. Over the 10 years of its operation, the Foundation has carried out many impressive projects. Starting from pioneering research on endoscopic transplantation of pancreatic islets under gastric mucosa, participation in the theoretical development of medical protection for the manned mission to Mars, conducting a nationwide educational campaign "Ogarnij cukier - Wean off sugar" and pilot research on gene expression in diabetes, to taking up the challenge of bioprinting of bionic pancreas in 3D technology. The Foundation was and still is inspired by the scientific activity of Michał Wszola MD, PhD, transplantologist surgeon, the author of a new method of mini-invasive treatment of complicated diabetes - endoscopic transplantation of pancreatic islets under gastric mucosa and the co-founder of international multimedia platforms for the exchange of medical knowledge: medtube.net and medizy.com.