

Press release

October 24, 2019

**Bionic organs made from living cells are a chance to solve the problems of modern transplantology. The achievements of Polish scientists from the Foundation of Research and Science Development has proven that this technology marks a breakthrough in medicine, and the bioprinting of tissues and organs heralds a medical revolution that will significantly improve the quality and extend the life of patients after transplantation.**

Indicators that describe transplant activity are the number of donations and the number of transplants per million inhabitants. Despite public campaigns and a steadily growing awareness of organ donation, these indicators are still not satisfactory. The number of deceased donors per million inhabitants last year was 32 in the US, 23 in the UK and over 45 in Spain, making it the world leader. Currently, there are about 24 months of waiting for a transplant in Europe, and the number of people waiting is steadily increasing. On average, about 20 patients waiting for the gift of life die every day. Of all the organs transplanted, kidney transplants are the most common. The number of kidney transplants is increased by the pool of organs taken from living family donors. Unfortunately, in the case of other organs, obtaining an organ for transplantation is much more difficult and forces us to look for other ways of treating chronically ill patients.

In addition to the shortage of organs, the main problem of transplantology is the need to use immunosuppressive drugs to reduce the risk of rejection. Among the modern solutions, which significantly extend the possibilities of modern transplantology, we can distinguish mechanical devices, such as artificial hearts. There is another solution on the horizon which widespread use in clinical practice could render a real opportunity both to cover organ needs and to change the quality of life after transplantation. This remedy is the achievements of tissue engineering, i.e. functional, bionic organs made up of living cells. Bioprinting of tissues and organs that are "tailor-made" i.e. made from stem cells taken from a patient, is a breakthrough in regenerative medicine. Living tissues and organs together with blood vessels are printed in 3D technology, with the use of a special hydrogel substance called bioink. Since 2017, Polish scientists from the Foundation of Research and Science Development have been conducting research on organ bioprinting. Their aim is to create a bionic pancreas for patients with type 1 diabetes.

In March 2019, a team of scientists under the direction of Michał Wszola MD, PhD printed the world's first fully vascularized prototype of the bionic pancreas. Over the past six months, technology has been refined and animal research has begun. The first results indicate that the material developed is non-toxic to animals. The project currently being implemented assumes that the pre-clinical phase will be carried out. In order to develop technology and enter the clinical phase with the patient, the Foundation needs to obtain further resources and appropriate research facilities. The mission of the scientists is to introduce 3D printing of bionic pancreas into clinical practice worldwide. The achievements of the Polish research centre are more than a chance for diabetic patients. Developed products, such as bioinks, bioreactor or perfusion fluid together with know-how, i.e. the technology of their production and the technology of the 3D bioprinting itself, are an important contribution to the development of regenerative medicine and will enable the printing of other organs in the future.

The use of 3D bioprinting in transplantology is an ambitious and time-consuming idea, but what is worth emphasizing - an idea that has already emerged from the area of science-fiction and became reality, as evidenced by the achievements of Dr. Wszola's team, as well as by the work done in many laboratories around the world.

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Foundation of Research and Science Development is involved in research and education in the field of medical and biochemical sciences. The Foundation has been and still is inspired by the scientific activity of a transplant surgeon Michał Wszola MD, PhD, who took part in the first transplantation of pancreatic islets in Poland, the first transplantation of the pancreas itself and in the first exchange of kidney between family donors and recipients. Within 10 years of its operation, the multidisciplinary team has carried out many impressive and pioneering projects. Scientists are convinced that Poland, as a country, can have a real impact on the progress and technological development of the world. Currently, the Foundation, as the leader of the BIONIC Consortium, is working on 3D bioprinting of bionic pancreas - a functional organ made of living cells, which will enable people with diabetes to function normally and replace the need for chronic insulin therapy. The project is financed by the Polish National Centre for Research and Development within the framework of the STRATEGMED programme. On March 14, 2019, the team led by Michał Wszola MD, PhD, printed the world's first vascularized prototype of the bionic pancreas. The project is currently in the pre-clinical phase.

The Foundation has also carried out other projects dedicated to diabetics: pioneering research on endoscopic transplantation of pancreatic islets under the gastric mucosa, pilot research on gene expression in diabetes and a nationwide educational campaign "Wean-off sugar".

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**November 14th is World Diabetes Day.** The project of bionic pancreas implemented by the Foundation is a real chance for a breakthrough in the treatment of diabetes. Researchers working on organ printing are recognized experts in Poland and abroad, who participate in national and international symposia and give interviews as well as expert comments in the media. The specialists of the Foundation will gladly take part in the discussion on modern methods of diabetes treatment.

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