Diabetes is a disease affecting more and more people. Over the past 20 years, the number of people with diabetes has tripled. As much as 10% of global health expenditures are spent on diabetes. In order to completely cure diabetes, a pancreas or pancreatic islets transplant from a donor is needed. However, such operations are performed in small numbers compared to the demand (in Europe, less than 200 per year with about 400,000 in need). In addition, transplantation of islets alone does not have a long-term effect and must be repeated periodically.

As a solution to this problem, it is proposed to produce a bionic pancreas, using 3D printing. Such an organ will be created from bioinks and pancreatic islets, created from the patient's stem cells.

For the proper functioning of the pancreas, the properties of the bioink, which is to be its skeleton, are crucial. The bioink must have the appropriate structure to mimic the natural pancreas. By adjusting the parameters of creating the bioink, a product with specific properties can be obtained.

One of the bioinks is a hydrogel of methacrylated gelatin. It is created during the illumination of the solution of methacrylated gelatin with ultraviolet light. This process takes from tens of seconds to several minutes. Available methods only allow post-reaction investigation. To speed up the process of optimizing parameters to obtain a bioink with specific properties, we want to create a method to study the structure of the bioink during its creation process. For this purpose, the nuclear magnetic resonance (NMR) spectroscopy will be used. This is a non-invasive method that does not disturb the reaction. In this case, this method will allow us to determine the size of the pores that form during the irradiation of the material. Thanks to the latest methodological achievements - Ultra-Fast Laplace NMR method, we are capable of performing measurements on a second scale.

This project will create a method, which will enable faster investigation of hydrogels, speeding up their development.