BIONIC PANCREAS - THE FIRST RESULTS OF FUNCTIONALITY OF 3D-BIOPRINTED BIONIC TISSUE MODEL TRANSPLANTATION WITH PANCREATIC ISLETS. (#EP129)

Topic
AS05 Artificial Pancreas

Authors
M.. [1, 2], Wszola M. [2, 1], Berman A. [2, 1], Filip A. [1], Kosowska A. [3], Olkowska-Truchanowicz J. [3], Tymicki G. [1], Rachalewski M. [1], Bryniarski T. [1], Kolodziejska M. [1], Dobrzanski T. [2], Ujazdowska D. [1], Wejman J. [4], Uhrynowska-Tyszkiewicz I. [3], Kami?ski A. [3]

Affiliations
1 - Foundation of Research and Science Development (Poland), 2 - Polbionica Ltd (Poland), 3 - Medical University of Warsaw (Poland), 4 - Center for Pathomorphological Diagnostics Ltd (Poland)

Background and Aims
Tissue engineering is currently on advanced stage of development which gives a possibilities for novel strategy of personal treatment of T1D. In the following study, a bioink based on ECM derived from decellularization of porcine pancreas was applied for 3D-bioprinting.

Methods
The SCID (n=60) and BALB (n=20) mice were used as a model for in vivo study. Porcine islets mixed with bioink were printed on extrusion printer and transplanted on studied animals. Effectiveness of transplanted petals with regard of their insulin secretion was evaluated based on glucose and c-peptide concentration in blood samples of studied animals. Thus, animals were divided into three groups: mice with transplanted islet-laden petals, mice with transplanted islets into kidney capsule and untreated mice. Examination of studied parameters took place at four time points during the experiment, at the beginning and on day 7^{th},14^{th} and 28^{th} day of experiment.

Results
Group with transplanted petals from day 7^{th} expressed lower mean fasting glucose concentration while compared with untreated group (129mg/dl, 119mg/dl, 118mg/dl vs.140mg/dl, 139mg/dl, 140mg/dl respectively in 7^{th},14^{th} and 28^{th} day post-transplantation; $p<0.001$). Post-surgery transverse section of petals revealed that connective tissue of studied animals surrounded and stabilized transplanted petals. Fibroblasts infiltration over time resulted in the process of new blood vessels formation within the petals. Hence, presented in the study bioink provides a favorable conditions for islets functionality. The bioprinted construct was stable over time. Furthermore, no pathological conditions of studied animals were observed which indicates that bioprinted petals were biocompatible.

Conclusions
Bionic flake transplantation lowered glucose levels significantly.