

Title:

An intravascular bioartificial pancreas device (iBAP) with silicon nanopore membranes (SNM) for islet encapsulation under convective mass transport

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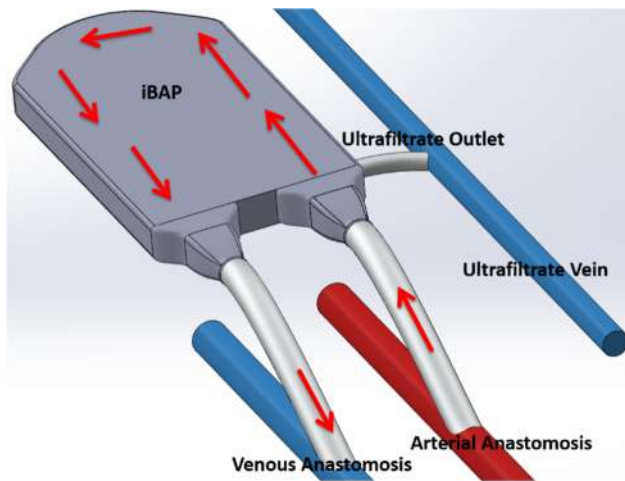
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Supplemental Figures

a.



b.

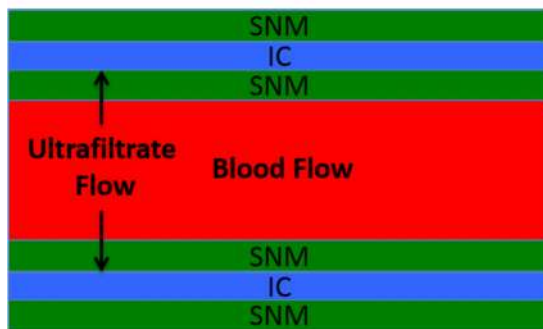


Figure S1. (a) Illustration of the full-scale iBAP connected to arterial-venous grafts and an Ultrafiltrate Outlet catheter delivering insulin rich ultrafiltrate to the ultrafiltrate vein. Blood flows into the iBAP and a looped blood channel transports blood to a vein. The SNM encapsulated IC is placed directly above and below the blood channel. (b) A cross-sectional view perpendicular to blood flow illustrating the blood channel surrounded by the SNM (green) encapsulated IC (blue). Ultrafiltrate (black arrows) crosses the SNM encapsulated IC into ultrafiltrate channels (side) and exits the Ultrafiltrate Outlet catheter into the ultrafiltrate vein.

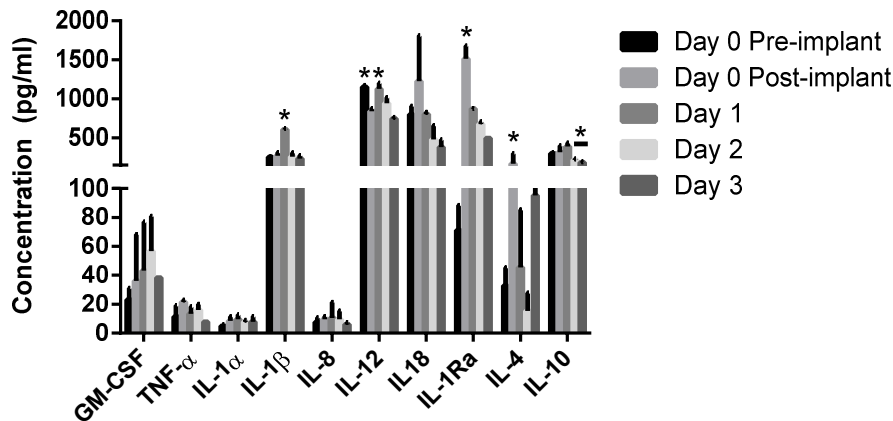


Figure S2. Daily measurement of the systematic cytokine concentration in the pig. The intravascular bioartificial pancreas (iBAP) with 5% islet density encapsulated with 10 nm-pore size SNM. Cytokines namely granulocyte-macrophage colony-stimulating factor (GM-CSF), tumor necrosis factor-alpha (TNF- α), interleukin 1-alpha (IL-1 α), interleukin 1-beta (IL-1 β), interleukin 8 (IL-8), interleukin 12 (IL-12), interleukin 18 (IL-18), interleukin-1 receptor antagonist (IL-1Ra), interleukin 4 (IL-4), and interleukin 10 (IL-10) were analyzed. Interferon gamma (IFN- γ) was not detected. About 35.89 pg/ml of interleukin 2 (IL-2) was detected post-implantation on Day 0 only.

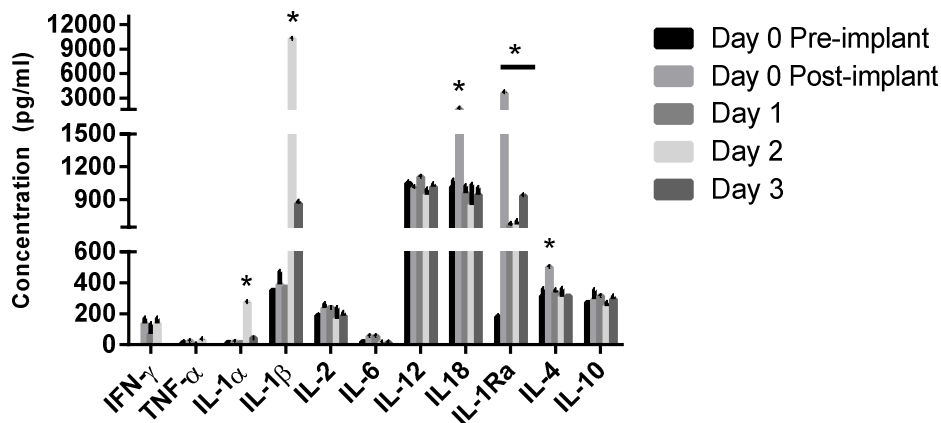


Figure S3. Daily measurement of the systematic cytokine concentration in the pig. The intravascular bioartificial pancreas (iBAP) with 10% islet density encapsulated with 10 nm-pore size SNM. Cytokines namely Interferon gamma (IFN- γ), tumor necrosis factor-alpha (TNF- α), interleukin 1-alpha (IL-1 α), interleukin 1-beta (IL-1 β), interleukin 2 (IL-2), interleukin 6 (IL-6), interleukin 12 (IL-12), interleukin 18 (IL-18), interleukin-1 receptor antagonist (IL-1Ra), interleukin 4 (IL-4), and interleukin 10 (IL-10) were analyzed. Granulocyte-macrophage colony-

stimulating factor (GM-CSF) was not detected. About 25.44 pg/ml of interleukin 8 (IL-8) was detected on Day 2 only.

Table S1. Silicon nanopore membrane (SNM) hydraulic permeability as a function of pore size.

SNM Pore Size (nm)	Hydraulic Permeability (ml/hr/m²/mmHg)
8	0.7 x 10 ²
10	1.5 x 10 ²
15	4.4 x 10 ²
30	38 x 10 ²
40	92 x 10 ²

Video S1. The angiogram of the intravascular bioartificial pancreas (iBAP) with 5% islet density encapsulated with 10 nm-pore size SNM in pig after 3 days. No obstruction of flow was observed after injecting the contrast agent into the device.

Video S2. The intravascular bioartificial pancreas (iBAP) with 10% islet density encapsulated with 10 nm-pore size SNM in pig after 3 days. (a) The video showed that a small bead of ultrafiltrate formed at the end of the ultrafiltrate port (metal) on the convective side of the device, indicating that the membrane under convective flow was still intact. (b) The angiogram indicated no obstruction of fluid flow inside the device after 3 days in pig.