ArtiVasc 3D

HIGHLIGHT

Aachen,
November 27, 2012

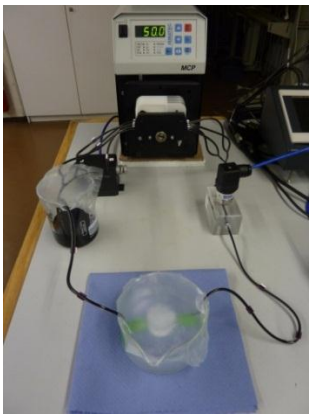

Figure 1: Diffusion test bench with peristaltic pump, pressure sensors, hydrogel and liquid reservoir.

Model for diffusion simulation

A method to analyze diffusion properties of tracer molecules within a hydrogel scaffold was established. The results will help to develop optimized hydrogels.

For the development of thick fatty tissue it is important to get information about the diffusion profiles of nutrients within the hydrogel scaffold. A test bench (fig.1) was set up which can be used to determine the diffusion coefficient of permeates in hydrogels. A test liquid comparable to nutrients like glucose flows through a channel with porous walls within the hydrogel sample. First tests used a dye (an indigo carmine solution (IC)) as liquid in order to be able to analyze visually the concentration distribution in the hydrogel. The test gel was made from polyvinyl alcohol (PVA). After a few hours of diffusion, samples were cut perpendicular to the channel and pictures were taken with a stereomicroscope (fig.2).

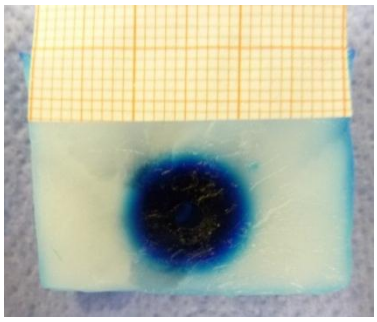

Figure 2: Diffusion profile of IC in a cut PVA-cryogel after 3 hours.

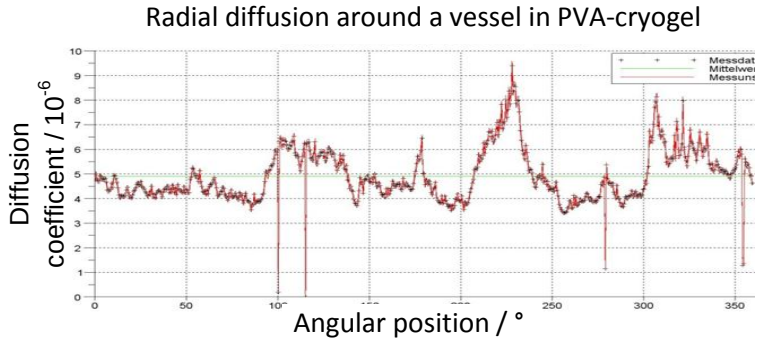

Figure 3: Measurement diffusion coefficient of IC in PVA-cryogels

SEVENTH FRAMEWORK PROGRAMME

Pictures were analyzed with custom-made Scilab© 5.3 code. The code determines the average value for the diffusion coefficient as well as its distribution inside the hydrogel (fig.3).
Taking into account that the hydrodynamic radii of IC and glucose are similar, the measured diffusion coefficient for IC of $5 \cdot 10^{-4} mm^2/s$ agrees well with literature values for the diffusion coefficient of glucose.

In the future, the experimental set-up can also be used to visualize and analyze the diffusion of tracer molecules in hydrogel scaffolds which are supplied by an embedded artificial vessel system.

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