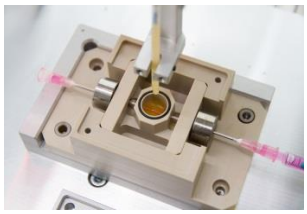
HIGHLIGHT

Stuttgart, April 2015

©Fraunhofer IGB
Blood vessel equivalents: Porous tubes with inner diameters of 1 mm to 2 mm From left to right: laser-fabricated tube with 120 µm pores, crosslinked gelatin hydrogel tube, electrospun poly(ester-urethane-urea) tube.



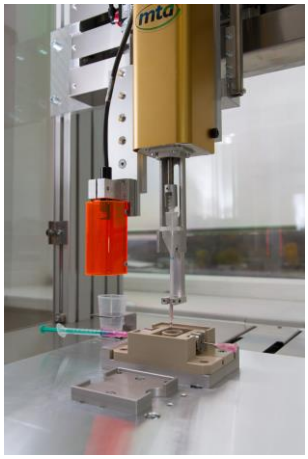
©Fraunhofer IGB
Bioink: Crosslinkable biomolecules and adipocytes at high density are deposited into a perfusion bioreactor by automated dispensing.

Artivasc 3D – manufacturing perfusable scaffolds for 3D tissue generation

A key challenge for the successful use of *in vitro* engineered tissues is long term stability. **The ArtiVasc 3D project has broken new ground in manufacturing technologies for the generation and culture of perfusable bioartificial tissue.**

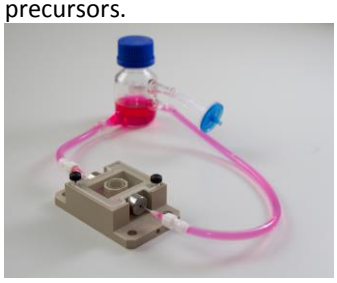
In a multidisciplinary approach, experts in biomaterial development, simulation, freeform fabrication, automation and tissue engineering have developed methods to produce versatile perfusable scaffolds. We apply and combine biomolecules from the native extracellular matrix (ECM) and synthetic photocurable polymer materials with micro-scale laser-based polymerization, electro-spinning and dip-coating techniques to fabricate tubular structures which can be mounted in perfusion-bioreactors. The inner surface of such blood vessel equivalents can be coated with biomolecules to facilitate cell adhesion and an endothelial cell monolayer can be installed. For the generation of surrounding tissue, automated dispensing is used to deposit cell-matrix bioinks into the bioreactor. Crosslinking of chemically modified ECM bio-macromolecules, e.g. gelatin and hyaluronic acid, result in stable, non-shrinking tissue models.

The technologies are designed to be applied in a modular way and can be adapted to generate various kinds of tissue by controlling the matrix properties.



© Fraunhofer IGB

The pneumatic dispenser features a LED UV unit for crosslinking of the hydrogel precursors.



© Fraunhofer IGB

The bioreactor (prototype) is designed for mounting of perfusable tubular structures and the assembly of tissue models.

Contact at Fraunhofer IGB
Dr. Kirsten Borchers (biofunctionalization of polymer surfaces)
Phone: +49 0711 970 4121
Kirsten.borchers@igb.fraunhofer.de
Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB
Nobelstraße 12
70569 Stuttgart, Germany

Contact at Stuttgart University:
Dr. Eva Hoch (crosslinkable biopolymers)
Phone: +49 0711 970 4153
Eva.hoch@igvp.university-stuttgart.de

Birgit Huber M. Sc. (adipose tissue engineering)
Phone: +49 0711 970 4153
Email: birgit.huber@igvp.university-stuttgart.de

Contacts at INNO
Dr. Matthias Schnabelrauch (crosslinkable biopolymers)
Phone +49 3641 2825 12
ms@innovent-jena.de

Dr. Ralf Wyrwa (electrospinning)
Phone +49 3641 2825 12
rw1@innovent-jena.de

Dr. Torsten Walter
Phone +49 3641 2825 63
tw@innovent-jena.de

Contacts at Fraunhofer ILT (project coordination)
Dr. Arnold Gillner (coordinator)
Phone +49 241 8906-148
Arnold.Gillner@ilt.fraunhofer.de

Dr. Nadine Nottrodt (project manager)
Phone +49 241 8906-605
Nadine.Seiler@ilt.fraunhofer.de

Fraunhofer Institute for Laser Technology ILT
Steinbachstraße 15
52074 Aachen, Germany

Contact at Fraunhofer IAP
Dr. Wolfdietrich Meyer (polymer materials)
Phone: +49 331 568-1442
wolfdietrich.meyer@iap.fraunhofer.de
Geiselbergstr. 69
14476 Potsdam, Germany

Contact at Unitechnologies SA
Ivan Calderon (bioreactor, dispensing, automation)
Phone: +41 32 338 8557
Email: ivan.calderon@unitechnologies.com
Route de Berne, 5
3238 Gals, Switzerland