



## ARTIVASC 3D – ARTIFICIAL BLOOD VESSELS IN 3D PRINTING

### Task

Artificial organs from living cells are only functional in the long term if they are accompanied by blood vessels that provide nutrients and remove metabolic waste products. A fundamental aspect of the EU project »ArtiVasc 3D«, therefore, was to prepare such branched blood vessels from macroscopic vessels and capillaries for the generation of three-layered artificial skin.

### Method

A consortium of 16 partners from research, industry and clinicians developed a concept that provided the three-layer structure of subcutaneous fat tissue, dermis and epidermis. The isolation of tissue-specific cells and their cultivation had to be established within the project. Then, artificial blood vessels within the fat layer from a 3D printer should supply the surrounding cells with nutrients.

### Result

As a part of the four-year project, the researchers – in close cooperation – were able to develop materials that largely meet the requirements of biology and of processability in 3D printing. Thanks to this, Fraunhofer ILT has generated branched porous vessels that can provide fat cells with nutrients in a hydrogel matrix. The project has shown that the three-layer structure can be generated and that the cells behave specific to fatty tissue. Nevertheless, materials and processes have to be optimized in the future to establish a process chain as reproducible as possible so that artificial three-layered skin can be built.

### Applications

There are two major areas of application that can benefit from this development in the future. The project's immediate objective addressed the structure of a skin model to replace animal tests in pharmacological testing. The ultimate goal, however, is a skin model that can be used as an implant for patient care.

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1 Branched blood vessel made by a 3D printer.

2 Sketch of the three-layered skin model

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