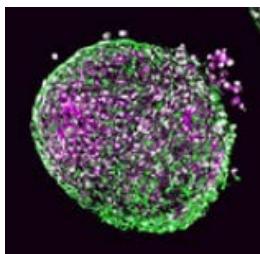


Technology Opportunity, Ref. No. UZ-19/179

In-vitro 3D model of human atherosclerotic plaques for drug testing



This novel 3D human *in vitro* model allows the investigation of atherosclerosis pathomechanisms and provides a novel human cell-based platform for drug design and high throughput screening of drugs influencing the formation of atherosclerotic plaques.

With this human late stage atherosclerotic model, it is now possible to investigate the time dependent effects of medical compounds on the cell viability and 3D structure of the plaques in a high throughput setting.

Keywords Disease modelling, tissue engineering, atherosclerosis, atherosclerotic plaque, 3D model, LDL, bioengineering, biofabrication, monocytes.

Inventors Anna Mallone, Benedikt Weber, Simon Hoerstrup, University of Zurich.

Reference [Biofabricating atherosclerotic plaques: In vitro engineering of a three-dimensional human fibroatheroma model \(Biomaterials. 2018 Jan; 150, 49-59\).](#)

Background Atherosclerosis is the major cause for vascular diseases as for example ischemic heart disease, stroke or peripheral arterial diseases. In the western world, atherosclerosis affects 10% of the population over 60 years. Industry investments in the research and development of novel therapies have therefore increased massively as the population ages.

Despite the fact that an atherosclerotic plaque model cannot entirely address the complexity of the human vascular environment, it provides a tool for investigation cellular interplay, viability, metabolism and behaviour in an environment sharing anatomic and pathological features with human native plaques. This will speed up the screening of novel drugs and the understanding of atherosclerosis pathomechanisms.

Invention This invention is the first bioengineered *in vitro* 3D model of a human atherosclerotic plaque. The bioengineered plaque architecture is characterized by a core of monocytes, macrophages and dendritic cells embedded in a collagenous and cholesterol-rich matrix, surrounded by a thin layer of myofibroblasts. It is the first human late-stage atherosclerosis model available.

Fields of Use Based on the invention, a high-throughput cell-based platform may be implemented in 96- or 384-well plates. The plaques can be designed for the analyses of plaque formation in patients with specific genetic predispositions. Alternatively, if a homogenous genetic background is needed, the plaques may be generated from commercially available cell culture.

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