

Coming Soon: Blood Vessels from a Test Tube?

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Our tissues and organs consist of a complex, closely balanced assembly of different types of cells, extracellular matrix, and special signalcarrying molecules. The growth of such structures in the laboratory, perhaps for transplantation into patients, has remained an unmet challenge.

Japanese researchers have now come a big step closer. As they report in the journal *Angewandte Chemie*, they have successfully produced multilayer architectures from layers of cells and wafer-thin films of an extracellular matrix. Among other things, they have re-created bloodvessel-like structures.

The team led by Mitsuru Akashi had their first success with mouse fibroblasts (a type of connective tissue). They grew an initial layer of cells onto a support. This layer was then covered with a type of artificial extracellular matrix: a nanometer-thick film made of fibronectin and gelatins.

Fibronectin is a glycoprotein that plays an important role in physiological processes such as cell adhesion (attachment of cells), cell migration, and cell differentiation. The support covered in cells was dipped alternately into solutions of fibronectin and gelatin; after several coating steps, a thin fibronectin/gelatin film was produced over the layer of cells. This procedure was repeated until the optimal film thickness was obtained.

Another layer of fibroblasts could then be placed onto this film. The



researchers were thus able to produce, layer by layer, a structure with a total of four layers of cells. This layered structure was so stable that it could be removed from its support without any damage at all.

By using the same method, the scientists were able to reproduce the structure of human blood vessels. Blood vessels consist of a double layer of cells: one layer of muscle cells and one layer of endothelial cells. To reproduce this architecture, Akashi and his team allowed a layer of muscle cells to grow onto a support and coated these with a thin fibronectin/gelatin film. This allowed the endothelial cells to get a good grip on the muscle-cell layer, letting them grow into a stable layer.

"Building on the foundation of our technique," hopes Akashi, "it should be possible to grow artificial tissues, such as blood vessels or even human skin, in the lab."

Citation: Mitsuru Akashi, Fabrication of Cellular Multilayers with Nanometer-Sized Extracellular Matrix Films, *Angewandte Chemie International Edition* 2007, 46, No. 25, 4689–4692, doi: 10.1002/anie.200701089

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