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BIO WARE-bioartificial vascular wall replacement

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Bioartificial Vascular Wall Replacement (BIOWARE) consists of vascular cells on carriers made of artificial materials. These carriers can be (1) synthetic vascular prostheses currently used in clinical practice or (2) newly constructed synthetic analogues of extracellular matrix (ECM).

In our studies, the inner surface of knitted polyethylene terephthalate (PET) prostheses (produced by VUP, Brno, Czech Republic) was coated with fibrin structures in order to facilitate their endothelialization. The reason for using fibrin was that autologous fibrinogen, a precursor of fibrin, can be derived in a reasonable quantity from the patient's own blood. For endothelialization of the PET prostheses, an experimental model of vascular endothelial cells, i.e. bovine pulmonary artery endothelial CPAE cells, was used, but some prostheses were also covered with autologous porcine endothelial cells using a dynamic cell culture system, and then implanted into pigs.

A degradable analogue of native ECM was created for constructing a completely new bioartificial vascular wall, and it was colonized with rat aortic smooth muscle cells. This analogue was based on PDLLA and PDLLA-*b*-PEO block copolymers, in which 5% or 20% of the copolymer molecules carried GRGDSG oligopeptide, a synthetic ECM-derived ligand for integrin adhesion receptors, which was attached to the end of the PEO chain. This material allowed the cells to attach, to spread, to form vinculin-containing focal adhesion plaques, to synthesize DNA and to proliferate not only in a serum-supplemented medium but also in a serum-free medium, which indicates specific binding to the GRGDSG sequences through the cell adhesion receptors.

Biography

Lucie Bacakova completed her MD studies at Charles University, Prague, Czech Republic in 1984, and was awarded a PhD degree of the Institute of Physiology, Academy of Sciences of the Czech Republic in 1992. She was a research fellow of Prof. S.M. Schwarz, University of Washington, Dept. Vascular Biology and Pathology, Seattle, WA, U.S.A. (1996) and of Prof. D.E. Discher, University of Pennsylvania, Dept. of Mechanical Engineering, Biophysical Engineering Lab, Philadelphia, PA, U.S.A. (2000-2001). She is the Head of the Department of Growth and Differentiation of Cell Populations, Inst. Physiol., Acad. Sci. CR. She has published more than 85 papers in international impacted journals.