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## How physical and chemical properties of the biomaterial surfaces govern the cell behavior–A review

Physical and chemical properties of the biomaterial surface, paticularly its wettability, roughness and topography, mechanical properties and electrical activity, play a decisive role in the adhesion, growth and differentiation of cells. Earlier studies revealed that the adhesion and growth of cells is optimum on materials with moderate wettability, because on these surfaces, the adhesion-mediating proteins are adsorbed in almost physiological conformation, and are well-recognized by the cell adhesion receptors. As for the surface roughness and topography, a great attention has been paid to nanostructured surfaces. These surfaces mimic the nanoarchitecture of the native extracellular matrix and promote the cell adhesion and growth better than the conventional flat surfaces. Nanofibrous synthetic polymeric scaffolds proved as good substrates for adhesion and growth of dermal fibroblasts and keratinocytes, especially after coating with nanostructures of fibrin and collagen. After reinforcement with diamond or hydroxyapatite nanoparticles, these scaffolds improved the colonization with human bone marrow mesenchymal stem cells or human osteoblast-like cells. A higher biomaterial stiffness induced osteogenic cell differentiation, while softer substrates directed the cells towards myogenic or neurogenic phenotype. Electrical ativity of biomaterials is another favourable factor influencing the cell behavior. In our earlier performed on thermally oxidized TiNb and Ti, positive charge enhanced proliferation of human osteoblast-like cells, while the negative charge enhanced their osteogenic differentiation. The adhesion, growth and osteogeni cell differentiation was also improved on ferroelectric substrates, such as $LiNbO_3$ or $BaTiO_3$. Therefore, modulation of physical and chemical properties of biomaterials is an effective tool for inducing the desired behavior of cells in construction of body implants and in tissue engineering.

### Biography

Lucie Bacakova has been graduated from the Faculty of General Medicine, Charles University, Prague, Czechoslovakia. She has completed her PhD from the Czechoslovak Academy of Sciences, and has worked as Associate Professor at the 2nd Medical Faculty, Charles University. Since 2005, she is the Head of the Department of Biomaterials and Tissue Engineering, Institute of Physiology of the Czech Academy of Sciences. She is a specialist for studies on cell-biomaterial interaction and for vascular, bone and skin tissue engineering. She has published more than 160 papers in reputed journals (h-index 33).

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