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Biomedical applications of zeolites- A review

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Zeolites are microporous aluminosilicate minerals of natural or synthetic origin, which have been extensively used in various technological applications, such as adsorbents and catalysts, laundry detergents, molecular sieves for separation and sorting the molecules according to their dimensions. These applications of zeolites were typically related with their porous character (i.e. inner surface, which is as large as $\sim 10^2$ m²/g), and also their ion exchange properties. Another promising field of application of zeolites is biotechnology and medicine, i.e. as alternative adsorbents of uremic toxins in blood purification by dialysis, as chromatographic carriers for purification of proteins and fractionation of cellular components, as potent hemostatics (due to their capacity to adsorb water), as therapeutics against tumors (due to their antioxidative effects), and also as carriers for drug and gene delivery. Fluorinated porous zeolite Y particles have been also incorporated in polymeric scaffolds for bone tissue engineering, where they acted as carriers for delivery of oxygen to cells. Synthetic sodium zeolite A added into cell culture media enhanced synthesis of transforming growth factor- β , activity of alkaline phosphatase and production of osteocalcin in normal human osteoblast-like cells. In addition, the zeolite A inhibited bone resorption. In our studies, we concentrated on silicalite films for potential coating of bone implants, and we found that these films supported the adhesion, growth, viability and alkaline phosphatase in an extent similar or even higher than standard cell culture polystyrene dishes.

Biography

Lucie Bacakova, MD, PhD, Assoc. Prof. has graduated from the Faculty of General Medicine, Charles University, Prague, Czechoslovakia, in 1984. She has completed her PhD from the Czechoslovak Academy of Sciences, and became Associated Professor at the 2nd Medical Faculty, Charles University. She is the Head of the Department of Biomaterials and Tissue Engineering, Institute of Physiology, Czech Academy of Sciences, Prague. She is a specialist for studies on cell-material interaction and vascular, bone and skin tissue engineering. She has published more than 200 papers in reputed journals (h-index 29).

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