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Antimicrobial surfaces containing immobilized photosensitizers

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Abstract

Immobilization of photosensitizers onto solid supports opens multiple possibilities for their continuous and reusable application. A number of photosensitizers was immobilized on silica gel, talc or a copolymer of salicylic acid and formaldehyde by mechanochemical treatment or in polystyrene, polycarbonate and polymethyl methacrylate by mixing solutions of the photosensitizers with a polymer solution, followed by air evaporation of the solvent. The former method led to covalent attachment or to deep inclusion of the photosensitizers into solid supports, whereas the latter procedure yielded porous polymer films characterized by homogeneously distributed photosensitizers. The antimicrobial activity of the immobilized photosensitizers was tested against Gram-positive and Gram-negative bacteria. It was found that the immobilized photosensitizers exhibited high antimicrobial properties and caused a reduction in the viability of the bacterial culturesfrom 1.5-3 $\log_{10}$up to total eradication. The bactericidal effect of the immobilized photosensitizers is depended on the cell concentration and on the illumination conditions. Scanning electron microscopy has proven that immobilized photosensitizers excited by white light caused irreversible damage to microbial cells. Photosensitizers immobilized onto solid phases can find an applicationas antimicrobial surfaces in hospitals, for low-temperature sterilization of medical instruments and surgical accessories and for continuous disinfection of wastewater bacteria.

Biography

Dr. Marina Nisnevitch is a senior lecturer at the Ariel University (Israel). Dr. FainaNakonechny has completed her Ph.D. studies at the Bar-Ilan University and is performing her postdoctoral studies at the Ariel University in cooperation with the Samaria and Jordan Rift Valley Regional R&D Center (Israel). Anton Valkov is a M.Sc. student at the Ariel University. MinaGutterman is a Ph.D. student at the Bar-Ilan University (Israel). Dr. Svetlana Lugovskoy is a lecturer at the Ariel University. Anna Pinkus has completed her M.Sc. studies at the Bar-Ilan University. Prof. YeshayahuNitzan is a professor at the Bar-Ilan University.