

Antimicrobial surfaces containing immobilized photosensitizers

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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 cultures from 1.5-3 log₁₀ 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 application as antimicrobial surfaces in hospitals, for low-temperature sterilization of medical instruments and surgical accessories and for continuous disinfection of wastewater bacteria.

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