Microbiological investigation of an antibacterial sandwich layer system

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To allow medical application of an artificial bladder made of biocompatible polyurethane, a longterm stable antibacterial coating is required. Alone, the artificial bladder exhibits no defense against microorganisms. Silver coating provides long-term antibacterial protection by the continuous release of silver ions into aqueous solutions. To control and to prolong the rate of silver ion release, the deposited silver film has to be protected by an inert film of biocompatible polyparylene by means of chemical vapor deposition. In this study, an antibacterial artificial bladder surface was developed by the formation of a sandwich structure consisting of silver and a biocompatible polymer (polyparylene) as a diffusion barrier. Specifically, this study analyzed the correlation between polyparylene thickness and silver release to determine optimal concentrations to combat common bacteria in vitro. The release of silver from sandwich structures was investigated in vitro by testing different thicknesses of polyparylene (0, 190, 540, and 1000 nm) as a diffusion barrier. The best result was demonstrated with a thickness of 190 nm of polyparylene, which yielded a silver dispense rate of 650 pg=ðcm2 _ minÞ; which would yield bacteriozidal concentrations above 30 lg=l in the bladder volume. The authors confirmed the antibacterial effect in vitro against common urinary tract infection pathogens, namely, Escherichia coli and Staphylococcus cohnii. Inhibition of bacterial growth could be detected within 8 h. A diffusion assay with spherical silver spots showed concentric zones free of bacterial growth. Our results suggest the possible utility of silver-polyparylene coatings as antibacterial agents. [http://dx.doi.org/10.1116/1.4876736]