DEVELOPMENT OF BIOMIMETIC SURFACES WITH AN ANTIBACTERIAL EFFECT BASED ON THE STRUCTURE OF DRAGONFLY WINGS

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Antibiotics, in the past so effective against wide spectra of infections, are nowadays omnipresent and their widespread availability, misuse and gradual accumulation over time in the environment is the main reason behind the sudden increase of bacterial resistance. However, it has been shown that some natural surfaces (e.g., cicada wing) possess topography which renders their surface antibacterial and resistant to bacterial colonization without any active chemical substance. The mode of action is such, that adhered bacterium is exposed to shear stress between the cell wall and surface topography (e.g., an array of nanopillars) resulting in cell deformation, wall rupture, lysis, and death. Moreover, the mechanical nature of bacteria-surface interaction virtually eliminates the risk of the sudden emergence of bacterial resistance since the whole process depends solely on surface topography and mechanical properties of the bacterial cell.

In this work, we propose to examine topographies of Czech domestic insects (e.g. dragonflies, damselflies, moths), test their antibacterial properties against model Gram-positive and Gram-negative bacteria and replicate their topology using suitable techniques allowing the transfer of antibacterial topology into a larger scale. We believe that such materials have the potential to be the answer to increasing number of MDR bacteria and secondary infections.