Gold and Silver-Decorated Conducting Polymer Coatings with Electroactive, Biocompatible, and Antibacterial Characteristics

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Abstract
The formation of multifunctional materials that demonstrate electrochemical capabilities, possess antibacterial attributes, and support cell adhesion stems from ongoing advancements in electrotherapy technologies. A significant challenge lies in formulating a material that can effectively counteract bacterial proliferation without adversely affecting mammalian cells. This study focused on modifying the surface of the conducting polymer, poly(3,4-ethylenedioxythiophene) (PEDOT), by integrating gold and silver particles. The modified PEDOT-Au/Ag surface displayed pronounced selective toxicity against E. coli while preserving its biocompatibility with normal human dermal fibroblasts. The physical characteristics of the PEDOT-Au/Ag surface, including its roughness and wettability, facilitated cell adhesion, while the inclusion of silver particles and the uneven surface contributed to its antibacterial properties. The cytotoxic potential of silver was mitigated through the incorporation of gold particles on the PEDOT surface. Consequently, PEDOT-Au/Ag surface has been identified as an advantageous candidate for enhancing electrotherapeutic applications due to its exceptional biological properties and electroactivity.

Keywords: Conducting polymers; Biocompatibility; Antibacterial properties