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Wound Healing Potential of Antibacterial Microneedles Loaded with Green Tea

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This study evaluates the utility of an antibacterial microneedle composed of green tea extract (GT) and hyaluronic acid (HA), for the efficient delivery of GT. These microneedles have the potential to be a patient-friendly method for the conventional sustained release of drugs. In this study, a fabrication method using a mold-based technique to produce GT/HA microneedles with a maximum area of ~60 mm^2 with antibacterial properties was used to manufacture transdermal drug delivery systems. Fourier transform infrared (FTIR) spectrometry was carried out to observe the potential modifications in the microneedles, when incorporated with GT. The degradation rate of GT in GT/HA microneedles was controlled simply by adjusting the HA composition. The effects of different ratios of GT in the HA microneedles were determined by measuring the release properties. In HA microneedles loaded with 70% GT (GT70), a continuous higher release rate were sustained for 72 h. The in vitro cytotoxicity assays demonstrated that GT/HA microneedles are not generally cytotoxic to chinese hamster ovary cells (CHO-K1), human embryonic kidney cells (293T), and mouse muscle cells (C2C12), which were treated for 12 and 24 h. Antimicrobial activity of the GT/HA microneedles was demonstrated by ~95% growth reduction of gram negative [Escherichia coli (E. coli), Pseudomonas putida (P. putida) and Salmonella typhimurium (S. typhimurium)] and gram positive bacteria [Staphylococcus aureus (S. Aureus) and Bacillus subtilis (B. subtilis)], with GT70. Furthermore, GT/HA microneedles reduced bacterial growth in the infected skin wound sites and improved skin wound healing process in rat model.

Keywords: Microneedle; wound healing, drug delivery system, green tea

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Preparation and Atomic Force Microscopy (AFM) Characterization of DNA Scaffolds as a Template for Protein Immobilization[1]

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The design of DNA nanostructures is of fundamental importance, the intrinsic value of DNA as a building-block material lies in its ability to organize other bio-molecules with nanometer-scale spacing. Here, we report the fabrication of DNA scaffolds with nano-pores (< 10 nm size) that formed easily without the use of additives (i.e., avidin, biotin, polyamine, or inorganic materials) into large-scale structures by assembling DNA molecules at near room temperature (30°C) and low pH (~5.5). Protein immobilization results also confirmed that a fibronectin (FN) proteins/large scale DNA scaffolds/aminopropylytriethoxysilane (APS)/SiO2/Si substrate with high sensitivity formed in a well-defined manner. The DNA scaffolds can be applied for use with DNA-based biochips, biophysics, and cell biology.

Keywords: Atomic force microscopy, DNA, Nanostructure, Nanopore, Adsorption