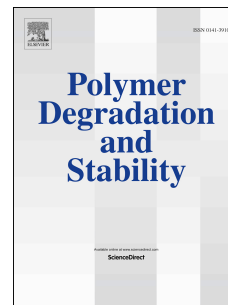


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Degradable Tannic acid/Polyethyleneimine polyplex particles with highly antioxidant and antimicrobial effects

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ABSTRACT

Tannic acid/Polyethylene imine (TA/PEI) polyplex particles in spherical form were synthesized via the electrostatic interaction between the TA molecules' phenolic groups and PEI positively charged ammonium groups. The size of polyplex particles was observed to be between 500 nm and 5 µm via SEM images. It was found that the TA/PEI polyplex particles showed thermal durability of 4.8 wt % residue in comparison to both components, TA or PEI, at 900 °C. Hydrolytic degradation of TA/PEI polyplex particles at different pHs e.g., pH 1.5 similar to stomach conditions, pH 7.4 similar to physiologic conditions, and pH 9 similar to intestinal conditions were investigated by UV-Vis spectroscopy by measuring degraded TA amount at 37.5 °C over two days and 65%, 31%, and 52% weight losses were found, respectively. FC, TEAC, and DPPH tests were used to determine the antioxidant properties of TA/PEI polyplex particles. The antimicrobial properties of TA/PEI polyplex particles were determined using micro-dilution and disc diffusion methods against gram-negative *Escherichia coli* ATCC 8739, *Pseudomonas aeruginosa* ATCC 10145, gram-positive *Staphylococcus aureus* ATCC 6538, *Bacillus subtilis* ATCC 6633 bacteria strains, and *Candida albicans* ATCC 10231 yeast strain. MIC values of TA/PEI polyplex particles were found to change between 0.025 and 0.1 mg/mL concentration depending on the type of microorganism and indicate that the polyplex particles possess strong antimicrobial activity.

Keywords: Polyplex particle; tannic acid; polyethylene imine; antimicrobial/antioxidant; biocompatible composites; microgel/nanogel polyplex.

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