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Study of nisin adsorption on plasma-treated surfaces for setting-up antimicrobial food packaging

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Setting up antimicrobial food packaging by nisin adsorption on plasma-treated surfaces depends on the interactions between the peptides and those surfaces. In order to investigate the factors affecting such adsorption, the native hydrophobic low density polyethylene (LDPE) was modified to generate hydrophilic surfaces using Argon/Oxygen (Ar/O_2) plasma, nitrogen (N_2) plasma and plasma-induced graft polymerization of acrylic acid (AA). The films were studied by various characterization techniques. The chemical surface modification was confirmed by X-ray photoelectron spectroscopy (XPS), the wettability of the surfaces was evaluated by contact angle measurements, the surface charge was determined by the zeta potential measurements and the changes in surface topography and roughness were revealed by atomic force microscopy (AFM). Nisin was adsorbed on the native and the modified surfaces. The antibacterial activity, the nisin adsorbed amount and the peptide distribution were compared for the four nisin-functionalized films. The roughness measurements highlighted the difference observed between surface topographies before and after nisin adsorption. The highest antibacterial activity was recorded on the Ar/O_2 film, followed by AA grafting then by nitrogen plasma and the lowest activity was on the native film. The observed antibacterial activity was correlated to the type of the surface, hydrophobic and hydrophilic interactions, nisin distribution on the surfaces, surface charge, surface topography and amount of nisin adsorbed on the surfaces.

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Anti-carcinogenic effect of co-administration of α-β unsaturated compounds and quercetin

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The effect of co-administration of α-β unsaturated compounds derivatives of benzoic acid and the flavonoid quercetin were evaluated in a variety of established human cancer cell lines. The synergic effect of these two chemicals showed anti-proliferative activity in cancer liver cells of 90% and in cancer cervical cells of 60% at 48 h post-treatment. Additionally significant events of apoptosis were observed in 90% of the cell population, when benzoic acid and quercetin were administered together. Independent treatments, quercetin or α-β unsaturated compounds decrease the migratory ability of HepG2, HuH7 and HeLa, however the co-administration of both, exerted a higher effect. It is suggested by in silico studies of α-β unsaturated compounds, that through 1, 4-addition reactions Michael type, they can selectively react with glutathione (GSH). High levels of GSH participate as a defense mechanism characteristic of cancer cells, thereby, inhibiting free radical induced cell death. Summarizing the co-administration of these compounds induce programmed cell death, probably by disrupting the cellular redox homeostasis, so further studies of the effect of independent or co-administration of these compounds, will give us the best way to use them as chemotherapeutic agents.

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