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P1426 Antimicrobial polymeric fibers prepared from recycled PET for medical textiles and food packaging applications

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Background: The highest amount of world's polyethylene terephthalate (PET) is designated for fiber production (more than 60%) and food packaging (30%) and represents one of the major pollutant polymer. Although, currently there is a great interest in recycling PET-based materials, there is still a high amount of unrecycled such materials derived especially from food and textile industry. The aim of this study was to obtain antimicrobial and environmental friendly PET based fibers for medical textile and food applications.

Materials/methods: PET obtained from clean bottles was chemically recycled by digestion in methylene chloride and trifluoroacetic acid and the obtained solution was transformed into fibers by electrospinning. The obtained recycled fibers were functionalized with chitosan (CS) or alginate and CuO2 (Alg-Cu) ions to obtain antimicrobial structures. Antimicrobial tests were performed on planktonic and attached laboratory bacteria species (Staphylococcus aureus, Pseudomonas aeruginosa), yeast (Candida albicans), microfungi (Aspegillus niger), by qualitative and quantitative assays (growth inhibition, viable count, attachment quantification, biofilm formation assay). Allergenic and inflammatory potential was tested by biochemical (ELISA) and histological assays on a mouse model.

Results: Results demonstrated that the obtained polymeric fibers functionalized with CS or Alg-Cu inhibit microbial attachment and colonization for at least 4 weeks. Bacterial biofilm formation is significantly limited on the surface of the obtained fibers, the higher anti-biofilm effects being observed for PET functionalized with Alg-Cu. In vivo results demonstrated that these materials are biocompatible and induce a very low inflammatory effect (in the case of PET+Alg-Cu), while no irritation and skin modification was observed in any of the tested conditions.

Conclusions: These innovative fibers based on recycled PET obtained by electrospinning and functionalized with natural and biocompatible polymers, such as CS, Alg and CuO2 ions proved enhanced antimicrobial and antibiofilm activity, being efficient against bacteria, yeast and microfungi and could be utilized for the design of ecological textiles and food packaging.