PROGRAM & ABSTRACTS

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extended light absorption in the visible region with apparent optical transition energies of 3.04 and 2.48 eV, indicating improved light utilization. Photocatalytic experiments demonstrated that TCPP@TiO_2 achieved up to 94.03% removal of BTB (20 mg/L) within 240 min, significantly outperforming pristine TiO_2. Kinetic analysis revealed that the degradation process followed a pseudo-second-order model (R^2 = 0.9968), suggesting that surface interactions and adsorption-photocatalysis coupling dominate the reaction. The enhanced performance is attributed to efficient charge separation and increased generation of reactive oxygen species (•OH and $•O_2^-$), which facilitate BTB degradation and mineralization. The system also showed excellent stability, maintaining removal efficiency above 84% after seven reuse cycles. The effect of initial concentration indicated an optimal performance at 20 mg/L due to balanced adsorption and reactive species availability. The TCPP@TiO_2 composite demonstrates high efficiency, stability, and practical potential for treating dye-contaminated wastewater.

Keywords: TCPP@TiO_2, Photocatalysis, Bromothymol blue, Visible-light degradation, Organic-inorganic composite.

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Biocompatibility and Biodegradability of Multilayered Polymeric Materials for Tissue Regeneration

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Abstract: The tissue regeneration, especially the tympanic membrane regeneration, remains a significant challenge in otorhinolaryngology, necessitating the development of the advanced biomaterials. This study evaluates the screening of biocompatibility and biodegradation of three novel multi-layer polymer films: KPC (carboxymethyl cellulose/polyethylene oxide/polyvinylpyrrolidone/chitosan), PHC (pullulan/hyaluronic acid/chitosan), and HCA (hyaluronic acid/chitosan/alginate), that designed as biomimetic matrices for tissue repair. The materials were subcutaneously implanted into

Wistar rats for 21 and 45 days, with histological evaluation of the peri-implant fibrous capsule. All polymeric matrices underwent biodegradation, with a chronic aseptic inflammatory response characterizing by macrophage and lymphocyte infiltration within the fibrous capsule. However, the severity and dynamics of the inflammation were highly material-dependent. The KPC matrix induced the mildest cellular reaction, which significantly subsided by the day 45, accompanied by the formation of mature collagen layers and an absence of giant multinucleated foreign body cells. In contrast, PHC and HCA matrices provoked more pronounced and sustained inflammation, with PHC showing intensification at the later point linked to accelerated bioresorption and the presence of numerous spherical degradation products. Mast cell involvement was minimal for KPC but notable within the capsule for PHC and HCA at 45th day. In conclusion, while all tested composites are biodegradable, the KPC formulation demonstrates superior biocompatibility with a self-limiting inflammatory response, making it the most promising candidate for further development of regenerative implant for middle ear reconstruction.

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Keywords: regenerative medicine, hyaluronic acid, pullulan, polymer composites.

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Antibacterial Activity of Multilayer Polymeric Films for the Regeneration of Tympanic Membrane

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Abstract: Bacterial infection increased the healing time of eardrum. Many implants can adhere to pathogenic bacterial cultures, especially nosocomial bacterial strains. The ESKAPE group is the main reason of nosocomial infections and is resistant to many antibacterial drugs. We developed polymeric materials with antibacterial activity to prevent bacterial infection during the eardrum treatment. Fifteen samples of different compositions were analyzed on cell lines and clinical isolates of ESKAPE group bacteria strains. Gram-(+) bacteria, especially S. aureus, were more sensitive to polymeric films than gram-(-) microorganisms. Gram-(-) bacteria have an outer membrane that acts as the barrier. It reduces the permeability of the cell to hydrophobic and charged molecules due to the content of the lipid layer and proteins. The samples