P89 CHARACTERIZATION OF PIEZOELECTRIC MATERIALS DOPED WITH CARBON NANOTUBES TO IMPROVE COCHLEAR IMPLANTS

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Cochlear implant (CI) is the only therapeutic option for patients with severe or deep hypoacusis to restore hearing. However, CI surgery may cause an electrode insertion trauma, followed by inflammatory reaction, oxidative stress and electrode impedance leading to malfunction and patient frustration. We planned to improve the CI performance by developing an innovative electrode based on conductive and piezoelectric nanomaterials, which, upon a direct application in the scala tympani, will be able to self-generate electric stimuli. Nanomaterials were produced by solvent casting followed by compression molding. The piezoelectric copolymer polyvinylidene fluoride-co-trifluoroethylene, P(VDF-TrFE), used as a matrix, was doped with conductive carbon nanotubes (CNT) with different weight percentages (0.5%, 1%, and 1% w/w plus 1% Tween 20 surfactant). The chemical-physical analyses of P(VDF-TrFE)/CNT composites showed good piezoelectric properties. The biocompatibility of these composites was tested on cells derived from the organ of Corti (OC-k3). When cultured on P(VDF-TrFE)/CNT composites up to 48 hours, the OC-k3 did not show significant cell deaths ($p>0.05$) nor morphological alterations such as cytoskeleton reorganization or nuclear shrinkage. In conclusion, P(VDF-TrFE)/CNT were found able to generate electricity when mechanically stressed and showed high biocompatibility. Based on these in vitro properties, these composites appear suitable as improvements of CI electrodes and further investigations of these materials on in vivo models may be planned.