DOI: 10.14232/syrptbrs.2022.58

Preparation of functionalized titanate nanotubes to improve toxicological profile and bioavailability

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Nowadays, inorganic nanoparticles have gained enormous attention in numerous fields such as pharmacy, medicine, agriculture, energy, etc. due to their tremendous potentials and novel characteristics offered by their nano size. These multiple applications and unique design make them widely presented around us in daily life therefore almost impossible to avoid.

Nanotubes are one of these nanoparticles that were introduced to the world as novel drug delivery system, and first appeared as carbon nanotubes (CNTs) then titanate ones. Titanate nanotubes (TNTs) were the answer to the previously detected problems of CNTs due to their special characteristics that make them ideal carriers for pharmaceutical applications. Some of these unique properties of nanoparticles were created by altering their surface properties to reduce toxicity [1, 2], achieve targeted delivery, enhance cell internalization or obtain proper bioavailability which was previously done successfully with TNTs using hydrophobic materials such as magnesium stearate or trichlorooctylsilane as a technique to enhance their absorption into the systemic circulation since their hydrophilicity negatively affects their permeability through the GIT [3]. The aim of this study is to functionalize TNTs with PEG, which is suitable to further improve aqueous solubility and reduce toxicity [4]. The results revealed that direct linking of PEG-to TNTs was unsuccessful, therefore, trichloroacetic acid and citric acid were investigated as possible linkers. The impact of functionalization on in vitro/in vivo toxicity, and on tablettability will be investigated. Tablets as final dosage form are planned to be prepared with both conventional compression and 3D printing.

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