GENOTOXIC AND CYTOTOXIC POTENTIAL OF NIOBIUM PENTOXIDE NANOPARTICLES IN MG63 CELL LINE

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INTRODUCTION: Niobium pentoxide (Nb_2O_5) has been investigated for use in biomedical applications due to its corrosion resistance and biocompatibility. When these properties are translated to the nanoscale, Nb_2O_5 nanoparticles exhibit potential for osteoconductivity and the support of cellular differentiation, making such nanoparticles candidate biomaterials for tissue engineering applications. However, nanoparticles can behave unpredictably depending on particle size, morphology, and surface chemistry, potentially causing inflammatory responses or oxidative stress, consequently leading to DNA damage. **OBJECTIVE:** This study evaluated the cytotoxic and genotoxic potential of Nb_2O_5 nanoparticles in the MG63 cell line. **MATERIALS AND METHODS:** Amorphous Nb_2O_5 nanoparticles were physico-chemically characterized and exposed to human osteoblast-like MG-63 cells at increasing concentrations. Assessment of cell viability was conducted through the 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) colorimetric assay, while genotoxic and mutagenic markers were identified using the CBMN assay. **RESULTS:** In the MTT assay, Nb_2O_5 nanoparticles showed no statistically significant cytotoxic effect relative to the negative control. However, the CBMN assay revealed clear genotoxic alterations. A significant increase in the frequency of micronuclei (MNi) was observed at all tested concentrations. These effects were accompanied by cytostatic alterations and an increased frequency of necrotic cells. **CONCLUSION:** Our data underscore the importance of thoroughly evaluating the cytotoxic and genotoxic effects of Nb_2O_5 nanoparticles, particularly in relation to their physicochemical characteristics. The observed cellular responses highlight the need for further investigation into the safety of these nanomaterials before their incorporation into biomedical applications.

Keywords: niobium pentoxide; nanoparticles; cyto-genotoxicity.

Funding: This study was supported by CAPES (Finance Code 001) and CNPq (Finance code 306532/2022-0).