COMPARATIVE ANALYSIS OF THE CYTOTOXIC AND/OR ANTIOXIDANT ACTIVITY OF GREEN-SYNTHESIZED CeO_2 NANOPARTICLES AND CeO_2 NANOBIOHYBRIDS WITH ROSEMARY ON HUMAN PERIPHERAL BLOOD MONONUCLEAR CELLS

Valentina Collo Salazar [1], Luisa María Rendón Barros [1], Victoria Niño Castaño [1], Rosa Dueñas Cuellar [1], Sofía Freyre Bernal [1], Jazmín Calvache Muñoz [1], Jorge Rodríguez Páez [1]. 1 University of Cauca.

valentiinacs@unicauca.edu.co, luisarendon@unicauca.edu.co

INTRODUCTION: Cerium oxide nanoparticles (CeO_2NPs), due to their Ce^{+3}/Ce^{+4} oxidation states, have a remarkable ability to accept and release oxygen ions, thanks to their crystal lattice structure and the presence of oxygen vacancies. It is reported that they have antioxidant activity however they can cause cytotoxic effects depending on their physicochemical characteristics. CeO_2NPs, were green synthesized without (CeO_2NPsgm) and with *Salvia rosmarinus* (RO) by the Ceramic Materials Science and Technology (CYTEMAC) research group, showed antimicrobial effects on *E. coli*. Therefore, the aim was to evaluate their potential cytotoxic and or antioxidant effects. OBJECTIVES: To evaluate the cytotoxic and/or antioxidant activity of CeO_2NPsgm and CeO_2NPsgm with RO on human peripheral blood mononuclear cells (PBMCs). MATERIALS AND METHODS: An in vitro experimental study was conducted using PBMCs cultures from three healthy male donors. Three independent experiments, each performed in triplicate, were carried out, the cells were exposed for 24 hours to various concentrations of CeO_2NPsgm and CeO_2NPsgm with RO. Cell viability was assessed using resazurin with CeO_2NPs concentrations ranging from 2 to 500 µg/mL, and apoptosis/necrosis induction was analyzed by flow cytometry using Annexin V/7AAD at concentrations from 3.9 to 250 µg/mL. Antioxidant capacity was analyzed using DCFDA at concentrations of 3.9 to 250 µg/mL in the presence of H_2O_2. A cellular uptake analysis was performed to assess the interaction of CeO_2NPs with PBMCs. RESULTS: No significant differences in cell viability were observed compared to the negative control, although atypical increases in viability of up to 122% and 141% were observed for CeO_2NPsgm and CeO_2NPsgm with RO, respectively, at 500 µg/mL, possibly due to their agglomeration and sedimentation. No statistical differences were found in apoptosis induction or ROS inhibition for both CeO_2NPs compared to the control. Additionally, dose dependent cellular uptake of CeO_2NPs by PBMCs was evident. CONCLUSIONS: CeO_2NPsgm and CeO_2NPsgm with RO, evaluated at concentrations from 2 to 500 µg/mL, do not induce significant cytotoxic effects, nor do they exhibit antioxidant activity at concentrations from 3.9 to 250 µg/mL on PBMCs exposed to an oxidizing agent.

Keywords: cerium oxide nanoparticles; cytotoxicity; antioxidant activity.

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