In vitro and In vivo toxicity of Gold nanoparticles synthesized and stabilized with phytochemicals

Reference	Presenter	Authors (Institution)	Abstract
04-052	Adriana Kuchinski Cavalcante	Cavalcante, A.K.(Instituto de Pesquisas Energéticas e Nucleares); Batista, J.G. (Instituto de Pesquisas Energéticas e Nucleares); Maziero, J.d. (IPEN); Fernandes, B.V. (Faculdade de Medicina da Universidade de São Paulo); Viveiros, W. (Companhia Ambiental do Estado de São Paulo); Rogero, S.O. (IPEN/CNEN-SP); Rogero, J.R. (IPEN/CNEN-SP); Lugao, A.B.(IPEN);	Gold nanoparticles (AuNPs) are among the most widely studied metal nanoparticles for biomedical applications. AuNPs can be synthesized by chemical reduction. Several methods for this type of synthesis are described in the literature, one of them is the Turkevich method, which uses sodium citrate (CITR) as a reducing agent. Other methods were developed based on the use of solvent systems during nanoparticle production. Although they are efficient production methods, they are environmentally unviable. In order to address this issue, metabolites present in various plant extracts have been explored for the preparation of different AuNPs. Green nanotechnology is the nanotechnology aspect that aims to develop protocols to generate sustainable products and production processes, in order to minimize the use of toxic compounds. In this study, the phytochemicals chosen as reducing agents and stabilizers for AuNPs synthesis were mangiferin (MGF) and resveratrol (RESV). Due to their ability to interact with biological systems, along with various applications of AuNPs, their toxicity has become one of the most important concerns. Due to the increased production and use of AuNPs, their risk of reaching different environmental compartments and becoming available increases the importance of determining toxicity in various species of biological interest, such as microcrustaceans and fish. Zebrafish is an important animal model used in the areas of developmental biology, genetics, biomedicine, nanotoxicology and is also used in ecotoxicological assays. The aim of the study is to evaluate the toxicity level of MGF (MGF-AuNPs) and RESV (RESV-AuNPs) reduced and stabilized AuNPs in vitro and in vivo by comparing them with the classical AuNPs synthesis method described by Turkvich (CITR-AuNPs). The study has two strands, one of which is to evaluate the level of nanomaterial toxicity using the zebrafish animal model as a preclinical study, and the other to evaluate the level of nanomaterial toxicity using the zebrafish animal model as a study of environmental toxicity. Cytotoxicity assay according to ISO 10993-5, Zebrafish FET TEST according to OECD 236 and Microinjection Assay in Zebrafish embryos. Green nanotechnology has proven to be a valuable tool in the synthesis of AuNPs for

toxicity, not requiring the use of solvents and potentially toxic substances. The toxicity of AuNPs varied according to the assay. In the cytotoxicity assay, IC50 was obtained from CITR-AuNPs, whose IC50 was about 72%, which corresponds to the Au concentration of 74.16 µg.mL-1. In FET, RESV-AuNPs caused delays in the hatching process of zebrafish embryos, and it was the only sample that could obtain the LC50 (4.41%, corresponding to the Au concentration of 6,57 µg.mL -1). In the assay in which AuNPs were microinjected into embryos, the concentration causing toxic effect was not found in 50% of the organisms.

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