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Analysis of cytotoxicity and genotoxicity of differently charged gold nanoparticles in human SH-SY5Y neuronal cells

N. Fernández-Bertólez^{1,2}, M. Paz^{1,3}, A. Touzani^{1,2}, L. Ramos-Pan^{1,2}, S. Baúlde³, J. Mosquera³, A. Criado³, E. Pásaro^{2,4}, B. Laffon^{2,4}, & V. Valdiglesias^{1,2,*}

¹ Universidade da Coruña, Grupo NanoToxGen, Centro Interdisciplinar de Química e Bioloxía - CICA, Departamento de Biología, A Coruña, Spain

² Instituto de Investigación Biomédica de A Coruña (INIBIC), A Coruña, Spain

³ Universidade da Coruña, Grupo Nanoself, Centro Interdisciplinar de Química e Bioloxía - CICA, Departamento de Química, A Coruña, Spain

⁴ Universidade da Coruña, Grupo DICOMOSA, Centro Interdisciplinar de Química e Bioloxía - CICA, Departamento de Psicología, A Coruña, Spain

* vvaldiglesias@udc.es

Gold nanoparticles (AuNP) have aroused great interest in the last years due to their potential for biomedical applications. Due to their small size, these NP can cross the blood-brain barrier, which makes them good candidates for the treatment of diseases related to the central nervous system. For all these applications, they must be introduced in the body, so it is essential to discard any potential harmful effects. Our objective was to evaluate the influence of surface charge on biological behaviour of AuNP by assessing the cytotoxic and genotoxic effects induced in neuronal cells exposed to AuNP with different charge, i.e. cationic, anionic and neutral. SH-SY5Y cells were treated with each type of nanoparticle for 3 and 24h. Cytotoxic effects were analysed by changes in cell viability, whereas genotoxic effects were assessed by γ H2AX assay. Also, cellular uptake was evaluated by flow cytometry. The results obtained showed different toxicological behaviour depending on the surface charge: cationic NP showed cytotoxic effects, but not anionic and neutral NP. Furthermore, cationic and neutral AuNP showed a low genotoxic potential, while anionic NP did not induce DNA double-strand breaks. Cell uptake analysis did not provide conclusive results likely because the extremely small size of the NP hinders their detection by the flow cytometer.

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