IN VITRO AND IN VIVO TOXICOLOGICAL EVALUATION OF PEGYLATED GRAPHENE OXIDE IN THE CENTRAL NERVOUS SYSTEM

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Abstract

The aim of this study was to evaluate the effect of PEGylated graphene oxide (GO-PEG) nanoparticles in the response of neurons and astrocytes, estimated in rats by NeuN and GFAP expressions and in differentiated PC12 and C6 astrocyte cell lines. The hippocampus of six-week-old male Wistar rats were examined at 15 minutes, 1 hour, 3 hours and 7 days after intravenous injection into the tail vein (n=5/group) of 7 mL/kg of GO-PEG (sized 697 nm). Hippocampal NeuN and GFAP protein expression assessed by Western blotting showed a 50% increase in NeuN expression at 1 hour ($p<0.01$) and an 80% decrease in GFAP level at 7 days ($p<0.01$). PC12 and C6 cells growth curves showed a dose-dependent response in the proliferation rate of GO-PEG-treated cells: concentrations as low as 0.1 µg/mL and 1µg/mL maintained proliferative population, whereas 10 µg/mL concentrations resulted in a statistically significant decrease from day 2 till the end of experiments (day 8). No morphological changes were observed in cell lines compared with the control cells even with the highest concentration of GO-PEG. Our findings provide new insights about the impact of GO-PEG nanoparticles in the central nervous system, enhancing our understanding on the toxicology of these nanoparticles. Further investigation is required to confirm why a high concentration of GO-PEG causes growth arrest in vitro and in vivo.

Keywords: Graphene oxide, Brain, Neurotoxicity

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