Graphene derivatives as scaffold for ex vivo survival and maturation of dopaminergic SN4741 cells.

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Carbon nanomaterial Graphene (G) can form a three-dimensional porous structure with efficient bioconjugation and cell differentiation properties, providing a promising scaffold for neural regeneration. **Aims:** To study this putative new application of G, we cultured a clonal substantia nigra dopaminergic neuronal progenitor cell line (SN4741) in presence of G as scaffold. **Methods:** Cells were cultured in DMEM/10% FCS to about 80% confluence and incubated with different concentrations (0.001 to 1 mg/ml) of three chemically different G derivatives (G oxide (GO); partially reduced GO (PRGO) and fully reduced GO (FRGO)) and two different presentation matrixes as powder and films. Cell viability was measured by the MTT assay. To study cellular characterization, morphology and assessment of cell engraftment into G films, we analyzed the immunostaining of the neuronal marker NeuN, the anti-rat Beta-3-tubulin antibody, and the anti-rabbit DCX as immature neuronal marker. Reactive oxidative species (ROS) and the mitochondrial membrane potential after JC-1 incubation were measured by flow cytometry. Lactate dehydrogenase was measured in the culture supernatant. **Results:** We found similar increase of survival and metabolism (30-40%) at low concentrations of PRGO and FRGO (0.05-0.01 mg/ml) compared with the higher concentration (1 mg/ml), no changes were seen in the GO group. PRGO or FRGO films showed an increased in the effective anchorage capacity to nest into the G matrix and in the maturation of the dopaminergic SN4741 cells. **Conclusions:** G scaffolds could offer a powerful platform for neural stem cells, direct cell conversion techniques and neural tissue engineering.