Nanomaterials for neural therapeutics

María Concepción Serrano
Instituto de Ciencia de Materiales de Madrid, CSIC, Calle Sor Juana Inés de la Cruz 3, 28049 Madrid, Spain

Contact: mc.terradas@csic.es

Neural pathologies remain a therapeutic challenge for both clinicians and scientists. Recent advances in healthcare are permitting neurologic patients to improve their quality of life and life expectancy. Moreover, important breakthroughs are being made by the scientific community regarding both the understanding of their pathological features and the design of novel therapeutics. However, an effective cure for these diseases is still a dream for many of these patients. In this context, nanotechnology provides attractive tools to approach neural repair with more specific, targetable and effective nanomedicines. In our group, we focus on two different families of nanomaterials and explore their therapeutic interest for neural repair. The first includes 3D scaffolds composed of reduced graphene oxide (rGO) [1-3]. The second refers to iron oxide nanoparticles (IONPs) contained in collagen hydrogels [4-5]. In this talk, we will revise the main and most recent advances of the group in the exploration of both bio(nano)materials for neural therapeutics, with findings both *in vitro* (in primary neural and immune cell cultures) and *in vivo* (in preclinical models of spinal cord injury in rats).

References

[1] Girão *et al.,* ACS Nano, 16 (2022) 13430.
[2] Domínguez-Bajo *et al.,* Biomaterials, 192 (2019) 461.
[3] Camacho-Toledano *et al.,* Nanoscale (2024), Advance article (DOI: 10.1039/D3NR05351B).
[4] Benayas *et al.,* ACS Applied Materials and Interfaces 15 (2023) 17726.
[5] Martínez-Ramírez *et al.,* Acta Biomaterialia, 176 (2024) 156.

Figures

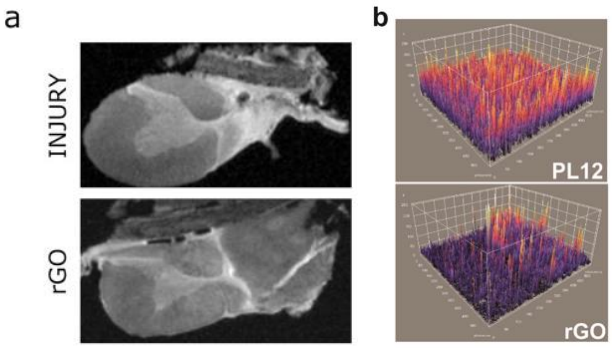

Figure 1. Main results of the group in the exploration of reduced graphene oxide (rGO) scaffolds [2]. **(a)** RMI images of implanted rats. **(b)** βIII-tubulin^{+} neurites grown in the interior of the rGO scaffolds designed.

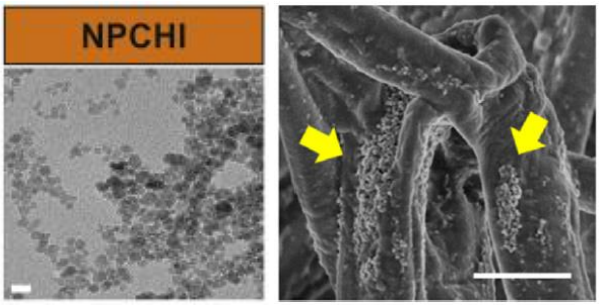

Figure 2. Design of novel iron oxide nanoparticles coated with chitosan (NPCHI; left) and loaded in collagen hydrogels to generate magnetic hydrogels (right) [5].

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