Biocompatibility of reduced graphene oxide nanoscaffolds following acute spinal cord injury in rats

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Abstract (Arial 10)

Graphene has unique electrical, physical, and chemical properties that may offer significant potential as a bioscaffold for neuronal regeneration after spinal cord injury (SCI).

To establish the in vivo biocompatibility of pristine graphene and its mechanical support for cells and axons when implanted into spinal cord tissue.

Graphene nanoscaffolds were prepared by the mild chemical reduction of graphene oxide (GO). Twenty Wistar rats (19 male and 1 female) underwent hemispinal cord transection at approximately the T2 level. To bridge the lesion, graphene nanoscaffolds with a hydrogel were implanted immediately after spinal cord transection. Control animals were treated with hydrogel matrix alone. Histologic evaluation was performed 3 months after the spinal cord transection to assess in vivo biocompatibility of graphene and to measure the ingrowth of tissue elements adjacent to the graphene nanoscaffold.

The graphene nanoscaffolds adhered well to the spinal cord tissue. There was no area of pseudocyst around the scaffolds suggestive of cytotoxicity. Instead, histological evaluation showed an ingrowth of connective tissue elements, blood vessels, neurofilaments, and Schwann cells around the graphene nanoscaffolds.

Graphene is a nanomaterial that is biocompatible with neurons and may have significant biomedical application. It may provide a scaffold for the ingrowth of regenerating axons after SCI.

References
