



Title: Nanotechniques for Neurorestoratology: Nanoscaffolds, Neuroinflammation, and COVID

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Abstract:

Nanoscaffolds and nanomanipulation of inflammation to improve recovery are two major themes in neurorestoratology, and nanotechniques are proving to be an advance in vaccines for COVID-19.

Self-assembling peptide nanofiber scaffolds and their use for various injuries to both the central and peripheral nervous system will be discussed.

The phases of spinal cord injury (SCI) over time (days to months) will be reviewed, with a focus on the pro-inflammatory and anti-inflammatory cytokines, macrophages, and microglia at different times in the post-injury period. Recent research on the use of nanoparticles that target circulating immune cells to optimize the immunological response following SCI is encouraging, particularly given that the nanoparticles are administered intravenously.

The enhancement of restorative cytokines by bone marrow-derived mesenchymal stem cells will be noted, as well as the rapidly expanding use of exosomes to improve recovery both to the nervous system and to other tissues following injury. Exosome-mimetic nanovesicles derived from mesenchymal stem cells also show promise in treating SCI.

Given the devastating effect worldwide of the COVID-19 pandemic for more than a year now, the role of nanotechniques in combating COVID-19 will be addressed – with a focus on the nanotechniques used in messenger RNA COVID-19 vaccines. The thrombotic complications of other COVID-19 vaccines – rare but often fatal – make the nanotechniques for mRNA vaccines particularly appealing.

Restoring nervous system function following injury is a promising area of research, in large part thanks to techniques at the level of the nanorealm.