

Spermidine as multifunctional agent in the design of innovative tools for nervous tissue repair

Barbara Vigani

Department of Drug Sciences, University of Pavia

Nervous tissue injuries affect more than one billion people worldwide and dramatically impact on the patient's quality of life. Aim of the work was to develop a potential neural scaffold, endowed with both neuroprotective and neuroregenerative potential, to be applied at the injury site: in particular, nanofibers (NFs), consisting of gellan gum (GG), an anionic polysaccharide, and spermidine (SP), a bioamine, were prepared through the electrospinning technique. SP was selected for both its neuroprotective activity and its cationic nature that makes it an ideal GG cross-linking agent. After local application at the site of nervous injury, NFs should support and guide axonal outgrowth, releasing SP in a controlled manner.

Mixtures, containing 1.5% w/w GG and increasing SP concentrations (0-0.125% w/w), were prepared to investigate GG/SP interaction and, thus, to find the best mixture to be electrospun. Mixtures were subjected to rheological and mechanical measurements: more and more structured GG/SP mixtures were obtained by increasing SP amount, proving its cross-linking potential. The mixture, consisting of 1.5% w/w GG and 0.05% w/w SP, was selected to be blended with poly (ethylene oxide) and poloxamer and, then, electrospun. The resulting NFs appeared homogenous and, when subjected to a tensile test, underwent a plastic deformation without structure break, suggesting a good mechanical resistance when applied at the injury site. Moreover, NFs were insoluble in aqueous media and able to form a thin gel layer after hydration. Further studies are ongoing to assess NFs capability to be colonized by Schwann cells.