Toward the next generation of nerve guidance conduits (NGCs), novel biomaterials and functionalization concepts are required to address clinical demands in peripheral nerve regeneration (PNR). As a biological polymer with bioactive motifs, gelatinous peptides are promising building blocks. In combination with an anhydride-containing oligomer, a dual-component hydrogel system (cGEL) was established. First, hollow cGEL tubes were fabricated by a continuous dosing and templating process. Conduits were characterized concerning their mechanical strength, in vitro and in vivo degradation and biocompatibility. Second, cGEL was reformulated as injectable shear thinning filler for established NGCs, here tyrosine-derived polycarbonate-based braided conduits. Thereby, the formulation contained the small molecule LM11A-31. The biofunctionalized cGEL filler was assessed regarding building block integration, mechanical properties, in vitro cytotoxicity, and growth permissive effects on human adipose tissue-derived stem cells. A positive in vitro evaluation motivated further application of the filler material in a sciatic nerve defect. Compared to the empty conduit and pristine cGEL, the functionalization performed superior, though the autologous nerve graft remains the gold standard. In conclusion, LM11A-31 functionalized cGEL filler with extracellular matrix (ECM)-like characteristics and specific biochemical cues holds great potential to support PNR [1].

1)
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