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Advanced Natural-based Biomaterials To Tackle The Current Challenges In Peripheral Nerve Regeneration**J. M. Oliveira, Sr.¹, C. R. Carvalho¹, J. B. Costa², R. L. Reis, Sr.²;**¹UMinho, Braga, PORTUGAL, ²3Bs, UMinho, Braga, PORTUGAL.

More than 200,000 peripheral nerve repair procedures are performed annually in the USA. But, the adequate functional recovery of the peripheral nerve is still a significant clinical challenge. The direct suture repair without the use of grafted materials may be used in cases where a short (<5 mm) nerve gap has to be overcome. However, larger defects repaired by neuroorrhaphy, exhibit excessive tension over the suture line and offer poor surgical results. The nerve autograft is recognized as the “gold standard” technique but it is limited by tissue availability, donor-site morbidity, secondary deformities, as well as potential differences in tissue structure and size. In our group, we have been developing a series of natural-based biomaterials to be used as nerve conduits that became an alternative to synthetic polymers such as PCL, PLGA and polyurethane. Among the natural materials, chitosan, Gellan gum, keratin and silk fibroin have been used. The relevant *in vitro* and *in vivo* studies that have been performed will be presented. Their final properties (e.g., compressive modulus, storage modulus, stiffness, swelling behavior, durability, degradation profile, porosity, permeability, suture ability) can be tuned for specific uses, by means of using different concentrations and processing techniques, i.e. fibres, membranes and tubes can be produced. Furthermore, the inner diameter, thickness of the wall and length of the nerve guidance conduit can be tuned according to the final needs (e.g. permeability and biodegradability), thus opening up new possibilities to address the current challenges in PNR, especially in the treatment of long gaps.