Analysis of the biocompatibility and biomimeticity of a corn maltodextrin electrospinned fiber membrane used as a scaffold to promote peripheral nerve regeneration.

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The objective of the present study is to evaluate biocompatibility and biomimeticity of an innovative membrane with the aim to apply it for repairing somatic and autonomic peripheral nerves in case of traumatic or iatrogenic lesions. Starch-derived (GLUCIDEX®) hyper-crosslinked polymers with suitable mechanical properties were electrospinned as membrane and tested, in vitro using immortalized Schwann Cells (RT4-D6P2T cells), for cell survival and proliferation to evaluate the biocompatibility and biomimetic nature of the scaffolds.
RT4-D6P2T cells were cultured i) in direct contact with the membrane, to investigate the interaction with the substrate and ii) in the presence of membrane dissolution products, to test the effect on cell proliferation and organization.
i) Concerning to the adhesion assays, the actin cytoskeleton results more organized in the control group, however, after 24 hours, the density and the area occupied by RT4-D6P2T increased.
ii) Several analyzes were conducted using the dissolution products of Glucidex® membranes; the proliferation assay revealed that, after 1, 4 and 7 days of culture, cells maintain proliferative behavior under all conditions tested although a slight decrease, compared to the control, is observed at the first two time points. The actin cytoskeleton profile revealed that cells cultured in conditioned medium have a high organization and generate membrane protrusions, *lamellipodia*, correlated to cell migration, an important feature of glial cells in support of peripheral nerve regeneration.
Investigating apoptosis and the specific cellular alterations due to Bax, pro-apoptotic protein, and Bcl-2, anti-apoptotic protein, our study revealed that the dissolution products of the membrane are not related with cell death, contrarily, they are associated with good survival. Further investigations are underway to deepen the effect of the dissolution products on expression of gene involved in the regulation of nerve regeneration by Schwann cells.