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Schwann cells culture with adipose stem cells and neuregulin to determine influencing factors applicable in nerve regeneration

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Abstract

Schwann cell (SC) cultures are required for neural regeneration, as for example in injured nerves. However, SC culture procedures need improvements. This study evaluates and compares growth of SC cultures without and with neuregulin, and in co-cultures with adipose mesenchymal stem cells (ASCs). Rat originated SCs and ASCs were cultured, maintained and subcultured to prepare monocultures and co-cultures for this study. Morphological, immunohistochemical and quantitative evaluations were performed at 48 and 96 h. In monocultures SCs were S100 and vimentin positive, appeared bipolar with small somata containing small and elongated nuclei, and tended to contact on their ends forming chains or clustering around other cell types. ASCs were CD 105 and vimentin positive, showed fibroblast-like shape with large rounded nuclei and distinct nucleoli, became larger along time and contacted with the neighboring cells. In SC-ASC co-culture, a few ASCs appeared in triangular shape, their CD105 positivity turned weaker and became vimentin negative at 4 days confirming ASC differentiation initiation towards SC. Fibroblasts appeared in a small proportion in each culture. Cell counting and further ANOVA analysis revealed significant differences for cell growth between 48 and 96 h in each culture, whereas across different cultures, significant differences were found only between SC cultures grown without neuregulin and rest of SC cultures. In co-cultures ASC proliferated faster. Neuregulin increases SC cultures growth about 4 times faster than SC cultures alone. A similar SC proliferation increase was observed in co-cultures of SC with ASC at 96 h, suggesting possible role of ASC released growth factors in SC growth.

Keywords: Nerve Regeneration, Schwann, Adipose-derived mesenchymal stem cells, Neuregulin, Co-culture

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