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Molecular-based therapy for skeletal muscle repair: Platelet-derived autologous growth factors combined with TGF-antagonist promote myogenic differentiation of human myoblasts *in vitro*

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Injured skeletal muscle repairs spontaneously via regeneration; however, this process is often incomplete because of fibrotic tissue formation. Growth factors from platelet-rich plasma (PRP) with proven effects in tendinous and ligamentous healing have not yet been studied in skeletal muscles mainly due to the concern that exogenous TGF-β application could lead to even greater fibrosis development in an injured muscle. Therefore, only some TGF-β antagonists like decorin have shown their positive role in muscle repair so far. In our study, we investigated the effects of PRP in combination with TGF-β antagonist decorin in skeletal muscle regeneration.

A novel human myoblast cell culture, defined as CD56 (NCAM)$^{+}$ developed in our laboratory, was used for evaluation of potential bioactivity of PRP and decorin. The influence on the cells mitochondrial activity, expression of TGF-β was studied in parallel with cell proliferation. Further we have studied the ability of the therapeutic agents to influence the differential cascade of dormant myoblasts towards fully differentiated myotubes by monitoring step wise activation of single nuclear factors like MyoD and Myogenin via multicolor flow cytometry.

Our results clearly showed that PrP and decorin treated myoblasts have a significant increase in the mitochondrial activity and in the cell proliferation rate as compared to non-treated control cells. At the same time lower expression of TGF-β and MSTN was evident in PrP treated myoblasts, although PRP itself contains some amount of TGF-β. Further, significant increase in desmin and myogenin positive cells was detected together with MyoD down-regulation.

Despite concerns about promoting fibrosis developement, PrP inhibits the TGF-β and MSTN activity to even greater extent than decorin alone. We can conclude that PrP can be a highly potential therapeutic agent for skeletal muscle regeneration and repair, especially if in combination with a TGF-β antagonist.

Biography

Robi Kelc, M.D. is an orthopaedic surgery resident and a Ph.D. student at the University of Maribor in Slovenia. In past three years he has been extensively working in field of skeletal muscle regeneration after injury. He has attended many different professional meetings where he contributed to a scientific debate.

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