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Stem cell differentiation for muscle regeneration

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Physical activity has a positive role on muscle remodelling and vascularization, involv-ing stem cells differentiation processes. Indeed, the skeletal muscle homeostasis and repair are maintained by a subset of muscle stem/progenitor cells called Satellite Cells (SCs), while for heart repair and remodelling the cardiac potential of progenitor cells is otherwise expressed by different stem cell types: bone marrow hematopoietic stem cells (BMHSC), bone marrow mesenchymal stem cells (BMMSC), cardiac stem cells and embryonic stem cells.

The ε isoform of the PKC family (PKCε) is a serine-threonine kinase that is expressed in muscle and in a variety of other tissues, regulating their homeostasis acting on cell death and differentiation.

We focused on the role of PKCε in skeletal, cardiac and smooth muscle differentiation of adult stem cells. We found that inhibition of PKCε prevents myogenic differentiation of the myoblast cell line C2C12 and of primary SCs. In vivo PKCε inhibition resulted in impaired muscle regeneration, as well [1]. On the contrary, in cardiac and smooth muscle differentia-tion of stem cells we observed a negative role of PKCε both in vitro and in vivo [2,3]. In fact, it impaired cardiac markers expression like NKX2.5 and GATA4 but also vascular differ-entiation markers like SMA and PECAM. PKCε should therefore be considered as a finely tuned modulator of muscle cell differentiation.

References

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[2] Galli et al. (2013) The role of PKCε-dependent signaling for cardiac differentiation. His-tochem Cell Biol 139: 35-46.
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Keywords

Stem cells, satellite cells, PKCε, muscle cell differentiation.