

FLIPPING THE SWITCH:
REGULATION OF PROLIFERATION AND DIFFERENTIATION IN
ADULT MUSCLE STEM CELLS

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ABSTRACT

Adult muscle stem cells or satellite cells are the committed somatic stem cells responsible for maintenance and regeneration of adult skeletal muscle tissue. Skeletal muscle is capable of multiple rounds of complete regeneration due to the action of satellite cells. These cells are necessary for the muscle to respond to multiple stimuli including, periods of growth, injury, adaptation and aging. Additionally, in severe myopathic diseases such as Duchenne Muscular Dystrophy, the regenerative capacity of skeletal muscle is exhausted. The potential of stem cells in regenerative medicine lies in the ability to remove them from their natural niche, inducing them to proliferate in culture and placing functional cells back into a tissue environment. In order to achieve this it is important to better understand the mechanisms regulating the processes of proliferation and differentiation in satellite cells. I have addressed three important topics pertaining to the study of these functions in satellite cells: how to differentiate between proliferating cells and cells that have recently committed to myogenic differentiation on the basis of their membrane raft components, specifically neural cell adhesion molecule expression, how separate domains of a single protein, syndecan-4, can regulate proliferation and differentiation, and how the interpretation of a secreted signal can regulate satellite cell proliferation as a population.