Mechanism for regulation of growth and differentiation of adult muscle stem cells is revealed

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During muscle regeneration, which is a natural response to injury and disease, environmental cues cause adult muscle stem cells (satellite cells) to shift from dormancy to actively building new muscle tissue.

Although the signaling pathways controlling muscle regeneration are fairly well known, how these signals lead to altered chromatin structure remains undiscovered. A group of scientists at the Burnham Institute for Medical Research in La Jolla, CA, analyzed the mechanism by which certain cellular signaling cues cause epigenetic modifications when released within the regenerative microenvironment, thus controlling the expression of genes that regulate growth and differentiation of muscle stem cells that repair injured muscle.

In a recent publication in *Molecular Cell*, the scientific group, led by Pier Lorenzo Puri, MD, Ph.D., shows how two signaling pathways, PI3K/AKT and p38, work together to assemble components of the protein complexes responsible for muscle-specific transcription, and how each pathway is responsible for a distinct step in the transcription process.

Additionally, the team was able to pharmacologically separate these two steps, showing that selective interference with either cascade leads to incomplete assembly of protein complexes, thus preventing muscle-specific gene expression. The results point to possible pharmacological

avenues for selective control of gene expression in adult muscle stem cells that may have therapeutic potential in regenerative medicine.

Source: Burnham Institute