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The Effects of Cell Cycle Position on Skeletal Myoblast Differentiation or Apoptosis

College of Sciences and Health Professions

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Abstract

Programmed cell death (apoptosis) is induced by the same culture conditions as differentiation in skeletal myoblasts, yet these processes result in mutually exclusive physiological endpoints. Dissecting this coordinate regulation could enable selective manipulation relevant to the alleviation of muscle degeneration, the effectiveness of regeneration, or treatment utilizing skeletal myoblast transfer. Analysis of asynchronous cultures of myoblasts in growth media (GM) were determined to have 50% of cells in G1 phase, 30% of cells in S phase and 20% of cells in G2/M phase. When skeletal myoblasts in GM are switched to differentiation media (DM), roughly 70% of cells undergo differentiation and 30% of cells undergo apoptosis. This led us to the hypothesis that the 30% of cells undergoing apoptosis in response to DM may also be the 30% of cells in S phase. To confirm the potential role of the cell cycle, we began by performing a mitotic shake-off to synchronize cells in M phase. Cells were then monitored for progression to S phase by BrDU incorporation into newly synthesized DNA. Results show that cells peak in S phase 7 hours after mitotic shake-off. Future studies will investigate the potential for myoblasts in different cell cycle phases to undergo apoptosis.

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