Regulation of skeletal muscle satellite cell proliferation and differentiation by transforming growth factor-beta, insulin-like growth factor I, and fibroblast growth factor.

Allen RE, **Boxhorn LK**.

Department of Animal Sciences, University of Arizona, Tucson 85721.

Skeletal muscle satellite cells were cultured from mature rats and were treated in vitro with various combinations of transforming growth factor (TGF)-beta, fibroblast growth factor (FGF), and insulin-like growth factor I (IGF-I). In serum-free defined medium the following observations were made: TGF-beta depressed proliferation and inhibited differentiation; FGF stimulated proliferation and depressed differentiation; IGF-I stimulated proliferation to a small degree but demonstrated a more pronounced stimulation of differentiation. In evaluating combinations of these three factors, the differentiation inhibiting effect of TGF-beta could not be counteracted by any combination of IGF-I or FGF. The proliferation-depressing activity of TGF-beta, however, could not inhibit the mitogenic activity of FGF. Maximum stimulation of proliferation was observed in the presence of both FGF and IGF-I. The highest percentage fusion was also observed under these conditions, but differentiation with minimal proliferation resulted from treatment with IGF-I, alone. By altering the concentrations of TGF-beta, FGF, and IGF-I, satellite cells can be induced to proliferate, differentiate, or to remain quiescent.

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