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IGFs, Insulin, Shh, bFGF, and TGF- $\beta$ 1 Interact Synergistically to Promote Somite Myogenesis *in Vitro*Asta Pirskanen<sup>1</sup> ... Stephen D. Hauschka<sup>2</sup> **Show more**<https://doi.org/10.1006/dbio.2000.9784>[Get rights and content](#)Under an Elsevier [user license](#)[open archive](#)

## Abstract

Studies from our group and others have shown that *in vitro* somite myogenesis is regulated by neural tube and notochord factors including Wnt, Sonic hedgehog (Shh), and basic fibroblast growth factor (bFGF) together with transforming growth factor- $\beta$ 1 (TGF- $\beta$ 1). In this study we report that insulin and insulin-like growth factors I and II (IGF-I and -II) also promote myogenesis in explant cultures containing single somites or somite-sized pieces of segmental plate mesoderm from 2-day (stage 10–14) chicken embryos and that the combination of insulin/IGFs with bFGF plus TGF- $\beta$ 1 promotes even higher levels of myogenesis. We also found that Shh promotes myogenesis in this *in vitro* system and that Shh interacts synergistically with insulin/IGFs to promote high levels of myogenesis. RT-PCR analysis detected insulin, IGF-II, insulin receptor, and IGF receptor mRNAs in both the neural tube and the somites, whereas IGF-I transcripts were detected in entire embryos but not in the neural tube or somites. Treatment of somite–neural tube cocultures with anti-insulin, anti-IGF-II, anti-insulin receptor, or anti-IGF receptor blocking antibodies caused a significant decrease in myogenesis. These results are consistent with the hypothesis that systemic IGF-I as well as insulin and IGF-II secreted by the neural tube act as additional early myogenic signals during embryogenesis. Further studies indicate that insulin, IGFs, bFGF, and Shh also stimulate somite cell proliferation and influence apoptosis.

## Keywords

somite; myogenesis; muscle; neural tube; insulin-like growth factors (IGFs); IGF receptors; Sonic hedgehog (Shh); fibroblast growth factor; TGF- $\beta$ 1; apoptosis

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