Developmental Biology

Volume 233, Issue 2, 15 May 2001, Pages 394-411

Regular Article

FGF Signaling in Chick Lens Development

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https://doi.org/10.1006/dbio.2001.0194

Abstract

The prevailing concept has been that an FGF induces epithelial-to-fiber differentiation in the mammalian lens, whereas chick lens cells are unresponsive to FGF and are instead induced to differentiate by IGF/insulin-type factors. We show here that when treated for periods in excess of those used in previous investigations (>5 h), purified recombinant FGFs stimulate proliferation of primary cultures of embryonic chick lens epithelial cells and (at higher concentrations) expression of the fiber differentiation markers δ-crystallin and CP49. Surprisingly, upregulation of proliferation and δ-crystallin synthesis by FGF does not require activation of ERK kinases. ERK function is, however, essential for stimulation of δ-crystallin expression in response to insulin or IGF-1. Vitreous humor, the presumptive source of differentiation-promoting activity *in vivo,* contains a factor capable of diffusing out of the vitreous body and inducing δ-crystallin and CP49 expression in chick lens cultures. This factor binds heparin with high affinity and increases δ-crystallin expression in an ERK-insensitive manner, properties consistent with an FGF but not insulin or IGF. Our findings indicate that differentiation in the chick lens is likely to be mediated by an FGF and provide the first insights into the role of the ERK pathway in growth factor-induced signal transduction in the lens.

Keywords

lens; differentiation; FGF; vitreous humor; chick; ERK; MAP kinase; IGF

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