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1: Dermatol Online J. 1999 Nov;5(2):1. Related Articles, Links

Insulin-like growth factor 1 and hair growth.

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Insulin-like growth factor 1 (IGF-1) has been identified as an important growth factor in many biological systems.[1] It shares considerable structural homology with insulin and exerts insulin-like effects on food intake and glucose metabolism. Recently it has been suggested to play a role in regulating cellular proliferation and migration during the development of hair follicles. [2,3] To exert its biological effects, the IGF-1 is required to activate cells by binding to specific cell-surface receptors. The type I IGF receptor (IGF-1R) is the only IGF receptor to have IGF-mediated signaling functions.[1] In circulation, this growth factor mediates endocrine action of growth hormone (GH) on somatic growth and is bound to specific binding proteins (BPs). The latter control IGF transport, efflux from vascular compartments and association with cell surface receptors.[4] In tissues, IGF-1 is produced by mesenchymal type cells and acts in a paracrine and autocrine fashion by binding to the IGF-1R. This binding activates the receptor tyrosine kinase (RTK) that triggers the downstream responses and finally stimulates cell division.[5] IGF-1 may therefore be able to stimulate the proliferation of hair follicle cells through cellular signaling pathways of its receptors. Local infusion of IGF-1 into sheep has been reported to be capable of stimulating protein synthesis in the skin.[6] It may also increase the production of wool keratin. Recently, transgenic mice overexpressing IGF-1 in the skin have been shown to have earlier hair follicle development than controls.[7] In addition, this growth factor plays an important role in many cell types as a survival factor to prevent cell death.[8] This anti-apoptotic function of IGF-1 may be important to the development of follicle cells as follicles undergo a growth cycle where the regressive, catagen phase is apoptosis driven. In this review, the effects of IGF-1 on follicle cell proliferation and differentiation are discussed. In particular, the paracrine versus endocrine action of IGF-1 on hair growth and the targeting of expression of the growth factor to the follicles of transgenic animals will be emphasized. The anti-apoptotic role of IGF-1 in hair follicles is also reviewed. Prospects for future studies on hair and fiber growth by IGF-1 are discussed.

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