Embryonic anti-aging niche.

Journal: Aging (Albany NY)

Publication Year: 2011

Authors: Irina M Conboy, Hanadie Yousef, Michael J Conboy

PubMed link: 21666284

Funding Grants: Identification of hESC-mediated molecular mechanism that positively regulates the regenerative capacity of post-natal tissues

Public Summary:
This work identifies novel ways to enhance the regeneration of skeletal muscle in the old by the application of soluble factors that are produced by human embryonic stem cells. Future characterization of these proteins will yield novel therapeutics for boosting tissue regeneration in the elderly and those afflicted by the degenerative disorders.

Scientific Abstract:
Although functional organ stem cells persist in the old, tissue damage invariably overwhelms tissue repair, ultimately causing the demise of an organism. The poor performance of stem cells in an aged organ, such as skeletal muscle, is caused by the changes in regulatory pathways such as Notch, MAPK and TGF-beta, where old differentiated tissue actually inhibits its own regeneration. This perspective analyzes the current literature on regulation of organ stem cells by their young versus old niches and suggests that determinants of healthy and prolonged life might be under a combinatorial control of cell cycle check point proteins and mitogens, which need to be tightly balanced in order to promote tissue regeneration without tumor formation. While responses of adult stem cells are regulated extrinsically and age-specifically, we put forward experimental evidence suggesting that embryonic cells have an intrinsic youthful barrier to aging and produce soluble pro-regenerative proteins that signal the MAPK pathway for rejuvenating myogenesis. Future identification of this activity will improve our understanding of embryonic versus adult regulation of tissue regeneration suggesting novel strategies for organ rejuvenation. Comprehensively, the current intersection of aging and stem cell science indicates that if the age-imposed decline in the regenerative capacity of stem cells was understood, the debilitating lack of organ maintenance in the old could be ameliorated and perhaps, even reversed.