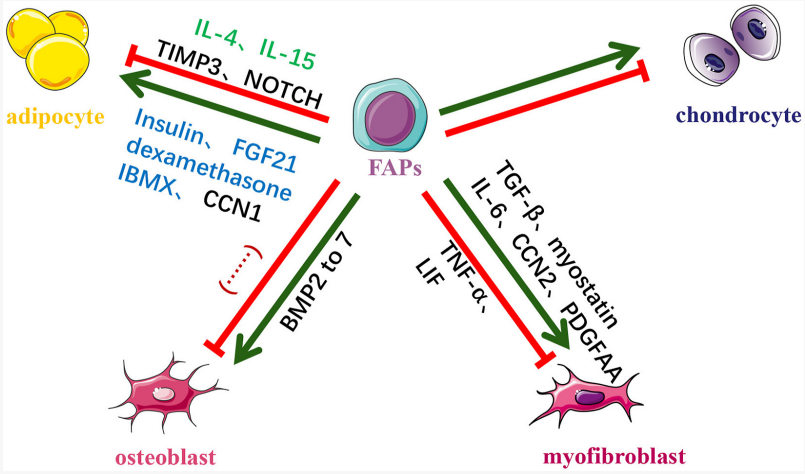
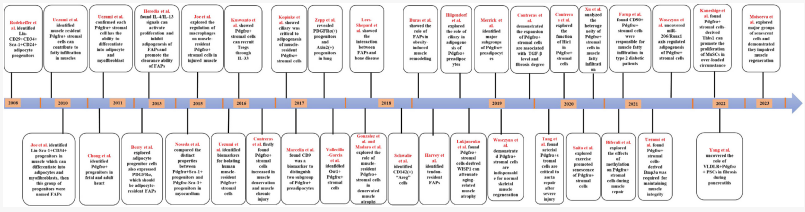
Highlighting the Role of Fibro-Adipogenic Progenitors in Muscle Regeneration and Degeneration

SHANNON, CLARE, IRELAND, March 2, 2025 /EINPresswire.com/ -- A recent study has shed new light on the role of fibro-adipogenic progenitors (FAPs) in muscle regeneration, fibrosis, and degeneration. These cells play a crucial part in tissue homeostasis, and their functions have significant implications for conditions such as muscular dystrophy, sarcopenia, and muscle atrophy.



Multi-lineage differentiation of Pdgfrα+ stromal cells in vitro and in vivo. Pdgfrα+ stromal cells have multipotent capacity in different conditions. Representative signals regulating differentiation of Pdgfrα+ stromal cells in vitro and in vivo are liste



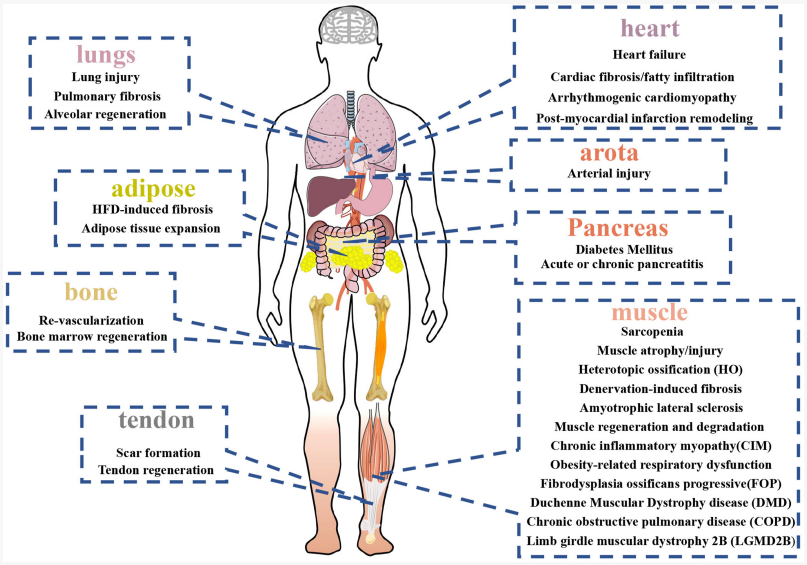
Representative milestone events leading to the discovery and development of Pdgfrα+ stromal cells in various tissues and diseases.

How inflammatory cytokines influence the behavior of FAPs, impacting their proliferation, apoptosis, and differentiation was explored. The role of TNF-α, a key cytokine secreted by Ly6C^high macrophages, which can either promote FAP apoptosis and reduce fibrosis or contribute to muscle degeneration, depending on the state of the muscle was highlighted. Additionally, IL-1α and IL-1β were identified as potent inhibitors of FAP adipogenesis, while growth factors such as betacellulin and epidermal growth factor enhance their proliferation.

One of the most important findings relates to IL-33, a cytokine primarily secreted by FAPs, which plays a crucial role in muscle injury repair by recruiting regulatory T cells. The study also reveals that in denervated muscles, FAPs secrete IL-6 through STAT3 pathway activation, contributing to both muscle atrophy and fibrosis.

The study highlights the potential for targeted therapies to modulate FAP behavior in various muscle disorders. Notably, histone deacetylase inhibitors (HDACi), currently in clinical trials for Duchenne muscular dystrophy (DMD), can induce FAPs to shift towards a pro-myogenic phenotype, improving muscle regeneration in dystrophic environments.

Such research offers new therapeutic directions for managing muscle-wasting diseases and underscores the importance of understanding cellular interactions in muscle repair and degeneration.



Biofunctions of Pdgfrα+ stromal cells in different diseases in various organs.

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