

DBT-NII team explores possibilities of attaining complete muscle regeneration

New Delhi, Feb 11: Muscle is one of the sturdiest tissues in the body, which has a capacity to withstand intense pressure and force. The skeletal muscle exhibits an incredible regeneration potential. However, improper regeneration alters original tissue architecture while forming a scar. The improper muscle regeneration following certain anomalies such as accidents, war, animal attacks, etc. often result in loss of muscle mass, leading to physical disabilities in humans.



The severity of the wound to the muscle mass determines the nature of regeneration. The primary muscle stem cells called satellite cells contribute to muscle regeneration. The scar tissue is formed by cells called the myofibroblasts. There is limited information about the reasons behind scar formation in muscle. The current treatment strategies of drug therapies are based on providing temporary relief. A team of researchers at DBT- National Institute of Immunology (DBT-NII), New Delhi explored possibilities of attaining complete muscle regeneration by altering the wound responses.

They hypothesized that by preventing scar formation it would be possible to encourage wound repair directed towards maximum muscle replacement. A modified skeletal muscle injury model in mice was utilized to evaluate the concept. They observed an imbalance in the number of muscle stem cells that is not conducive to regeneration. The muscle stem cells were prevented from replacing the entire injured muscle tissue.

The scar formation was observed a month into healing. The scar tissue makes the muscle tissue less elastic and more brittle, allowing easy tear of the tissue when dealing with extreme force. Numerous drugs have been prescribed to relieve pain and try to recover the complete function of the injured muscle but have limited success. Recent treatment modes have

acknowledged the requirement of preventive therapies where scar tissue formation or fibrosis as the condition is termed.

The most recently acknowledged key drug under research is the Tyrphostin group of inhibitors that affect the fibroblasts' survival. The researchers targeted fibrosis at its onset stages to deter scar while promoting muscle regeneration. Tyrphostin A370 is the specific drug used to inhibit platelet-derived growth factor receptor- α signaling within the fibroblasts causing their death. The decrease in scar formation was subsequently resulting in the increase in muscle stem cells leading to improved skeletal muscle remodeling and repair. This opens new possibilities for the early treatment of muscle fibrosis by specific targeting of fibroblasts and modifying the wound region compared to investing in expensive transplantation procedures.

Reference:

Thooyamani AS, Mukhopadhyay A. (2021) PDGFR α mediated survival of myofibroblasts inhibit satellite cell proliferation during aberrant regeneration of lacerated skeletal muscle. Sci Rep.11(1):63. doi: 10.1038/s41598-020-79771-4.

Contact Person Name: Dr.Ashok Mukhopadhyay, Email: ashok@nii.ac.in

Link: <http://www.nii.res.in/content/national-institute-immunology>