

# From degeneration to regeneration: Advances in skeletal muscle engineering

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A study published today in BioMed Central's open access journal *Skeletal Muscle* reports of a new therapeutic technique to repair and rebuild muscle for sufferers of degenerative muscle disorders. The therapy brings together two existing techniques for muscle repair – cell transplantation and tissue engineering – specifically, mesoangioblast stem cells delivered via a hydrogel cell-carrier matrix.

A number of conditions can lead to considerable degeneration or loss of skeletal muscle and, since skeletal muscle has a limited capacity for self repair, therapies for muscle reconstruction or regeneration are often necessary. There are currently two ways to rebuild muscle: cell transplantation, whereby stem cells are injected directly into the muscle or arteries, and tissue engineering, whereby cells are embedded on a biomaterial scaffold to reconstruct a whole muscle.

[Stem cell transplantation](#) on its own can be limited by poor [cell survival](#), but the authors hoped that the technique in combination with tissue engineering could increase the chances of efficacy for localized disorders of muscle.

The research team, comprised of researchers from institutions all over Europe, embedded Mab cells within a [polyethylene glycol](#) and fibrinogen (PF) hydrogel scaffold that has a proven track record in tissue and cardiac engineering. The Mab/PF grafts were then injected into mice, directly into the chronically inflamed and sclerotic regions typical of the advanced stages of muscular dystrophy. The team observed increased

engraftment and survival of Mabs when injected with PF than with Mabs suspended in [saline solution](#).

Five weeks after treatment, analyses revealed that Mabs had better integrated into regenerating muscle fibers when used with a PF carrier than when used without. In addition, there was better organization of [muscle fibers](#) when Mabs was used in combination with PF.

Lead author Cesare Gargioli commented, "This study demonstrates a novel tissue engineering approach that is capable of producing enriched donor cell engraftment into skeletal muscle after an acute injury or in more-difficult-to-treat advanced-stage muscular dystrophy. Both Mabs and PF are currently undergoing separate clinical trials, but their combined use may increase efficacy for sufferers with more localized forms of muscular dystrophy or disorders that lead to damage of skeletal muscle, including hernias and sphincter disorders."

**More information:** Injectable PEG-fibrinogen hydrogel adjuvant improves survival and differentiation of transplanted mesoangioblasts in acute and chronic skeletal muscle degeneration. Claudia Fuoco CF, Maria L Salvatori MLS, Antonella Biondo AB, Keren Shapira-Schweitzer KS-S, Sabrina Santoleri SS, Stefania Antonini SA, Sergio Bernardini SB, Francesco S Tedesco FST, Stefano M Cannata SMC, Dror Seliktar DS, Giulio Cossu GC and Cesare Gargioli CG, *Skeletal Muscle* (in press)

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