



HAL
open science

Exploring the protective role of GDF5 against skeletal muscle disuse atrophy

Chiara Noviello, Massiré Traoré, Bruno Cadot, Lucile Saillard, Béatrice Matot, Ericky Caldas, Yves Fromes, Benjamin Marty, France Pietri-Rouxel, Sestina Falcone

► To cite this version:

Chiara Noviello, Massiré Traoré, Bruno Cadot, Lucile Saillard, Béatrice Matot, et al.. Exploring the protective role of GDF5 against skeletal muscle disuse atrophy. Myology Conference 2022, Sep 2022, Nice (FRANCE), France. hal-04020141

HAL Id: hal-04020141

<https://hal.sorbonne-universite.fr/hal-04020141v1>

Submitted on 14 Mar 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Exploring the protective role of GDF5 against skeletal muscle disuse atrophy

Chiara Noviello¹, Massiré Traoré¹, Bruno Cadot¹, Lucile Saillard¹, Béatrice Matot², Ericky Caldas², Yves Fromes², Benjamin Marty², France Pietri-Rouxel^{1*} and Sestina Falcone^{1*}

¹Sorbonne Université, INSERM, Institut de Myologie, Centre de Recherche en Myologie, F-75013 Paris, France, *Equally contributed to this work

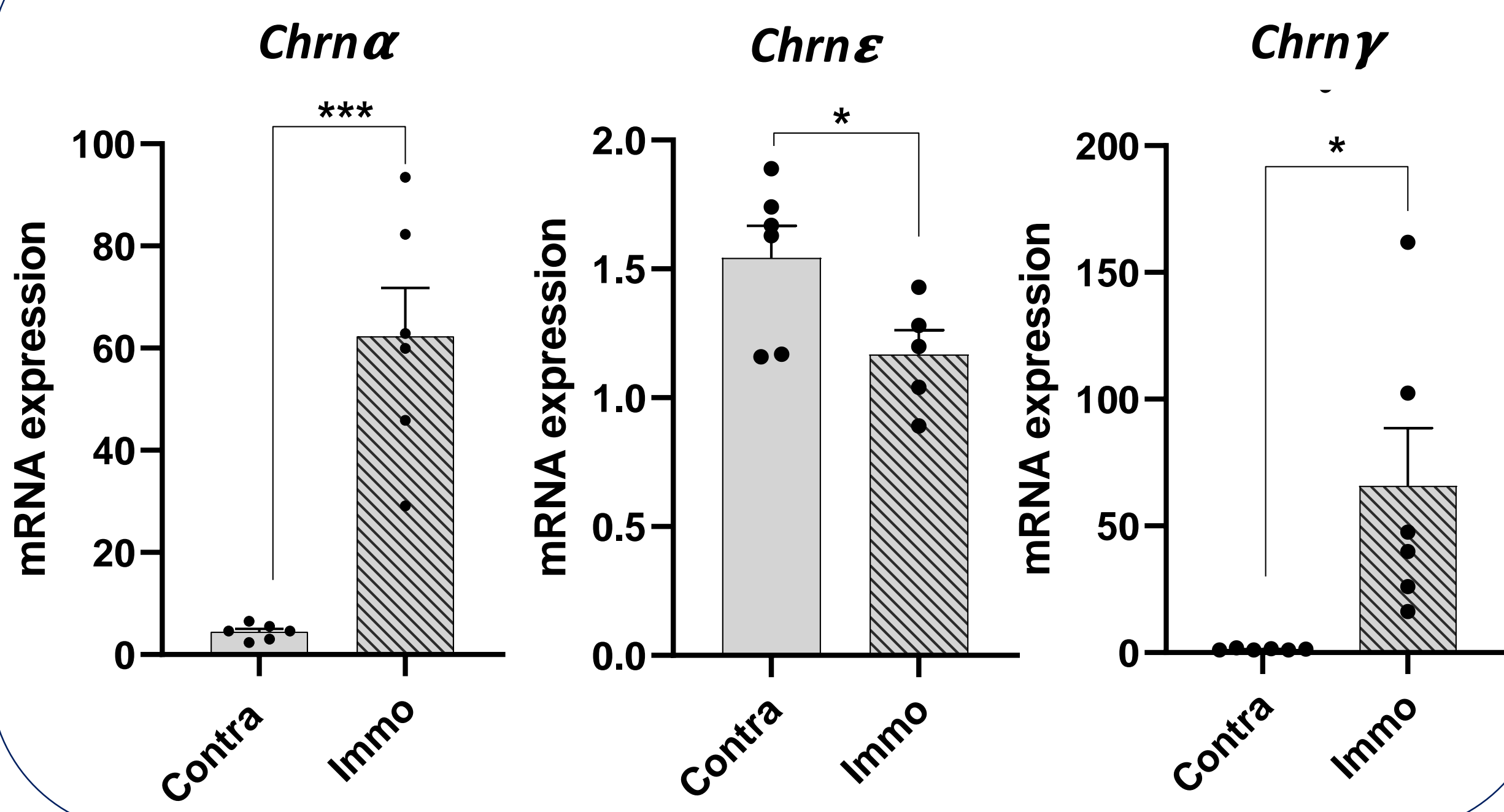
²Institut De Myologie, Cea, Laboratoire D'imagerie Et De Spectroscopie Par Rmn, F-75013 - Paris (France)

Skeletal muscle is a high plastic tissue able to change its mass upon different stimuli accordingly with environmental changes. Its adaptability depends on many factors and is based on complex mechanisms. Among the process that could alter muscle mass homeostasis, disuse and inactivity induce strong muscle mass and function decrease, having heavy impact on life quality and requiring long time to recover.

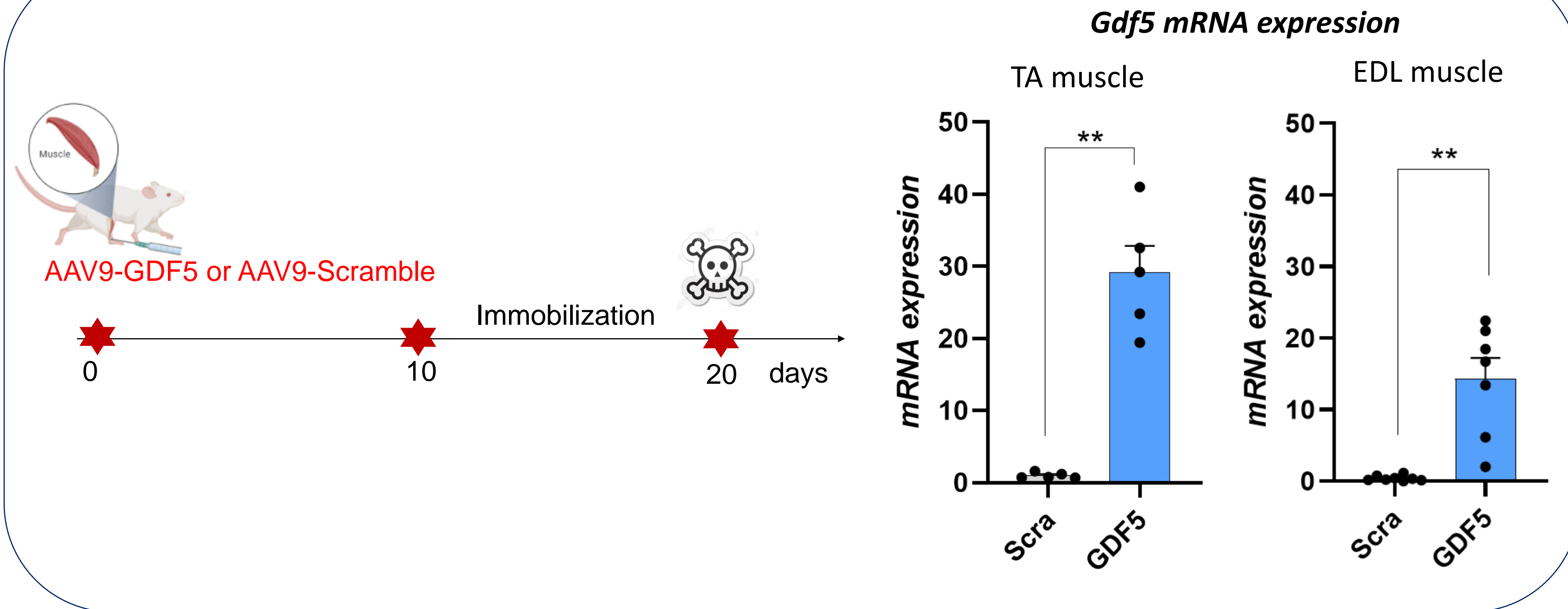
Growth Differentiation Factor 5 (GDF5) is a crucial player in muscle homeostasis, shown to counteract both denervation- and age-related muscle wasting by limiting the activation of catabolic signals. However, its effects on disuse atrophy following muscle immobilization has to be investigated.

Our aim is to better characterize the effect of GDF5 treatment on several morphological and functional parameters of skeletal muscle upon immobilization/release. In addition, we will assess its eventual benefits at shorter time points after release, in order to establish if GDF5-based treatment could be proposed to shorten the time-window needed for optimal muscle recovery after disuse.

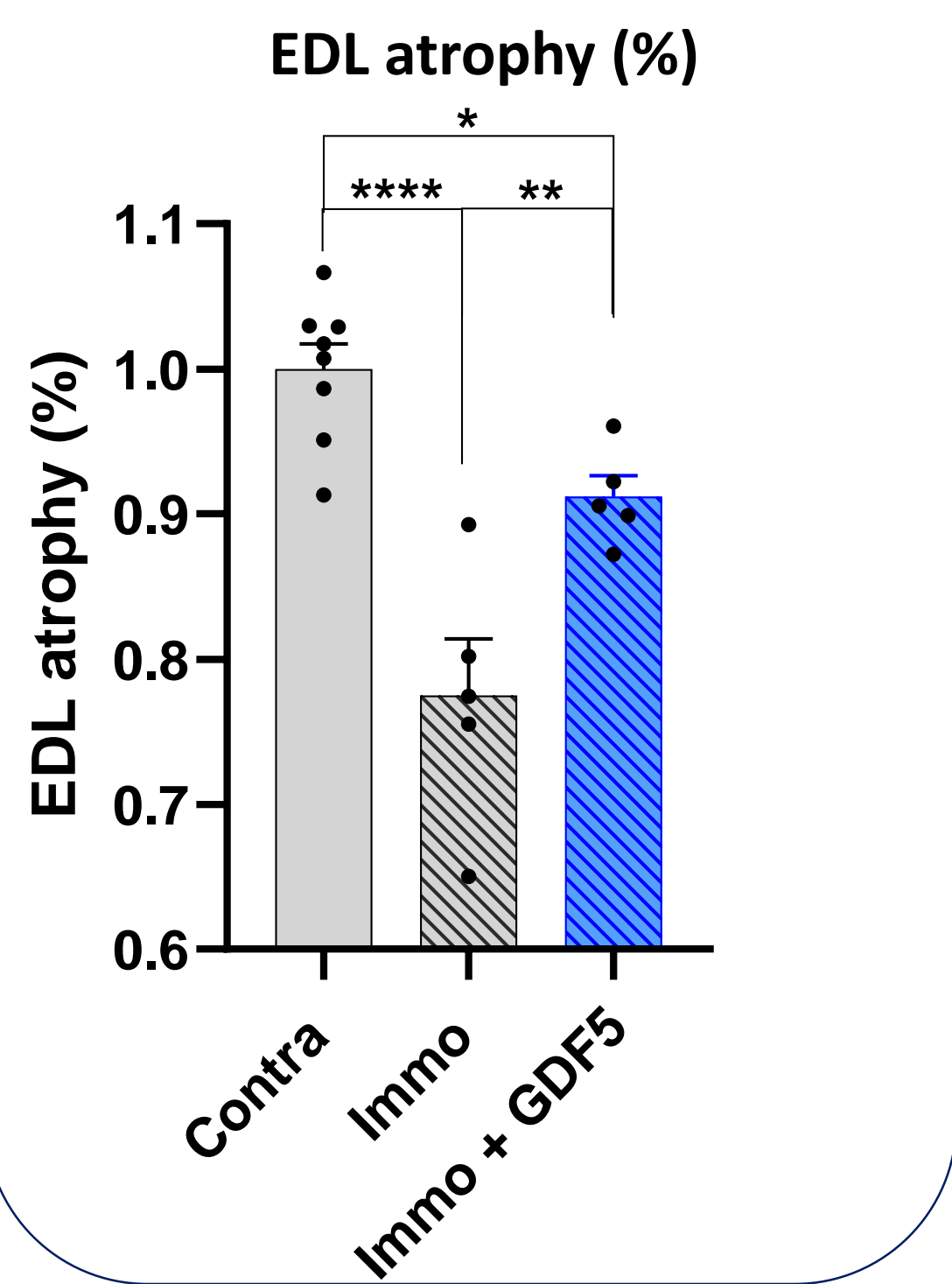
Immobilization induces AchR remodeling



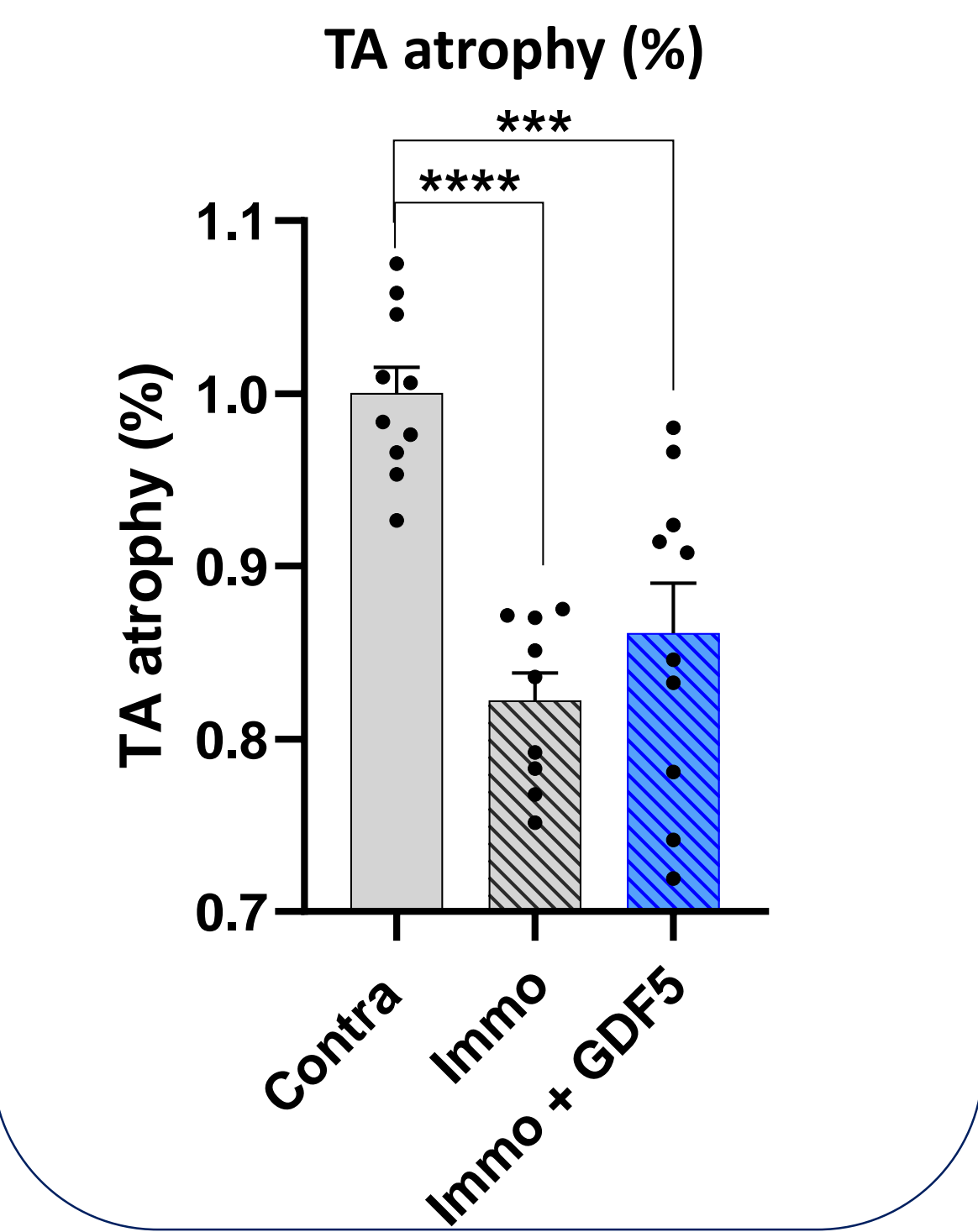
Protocol



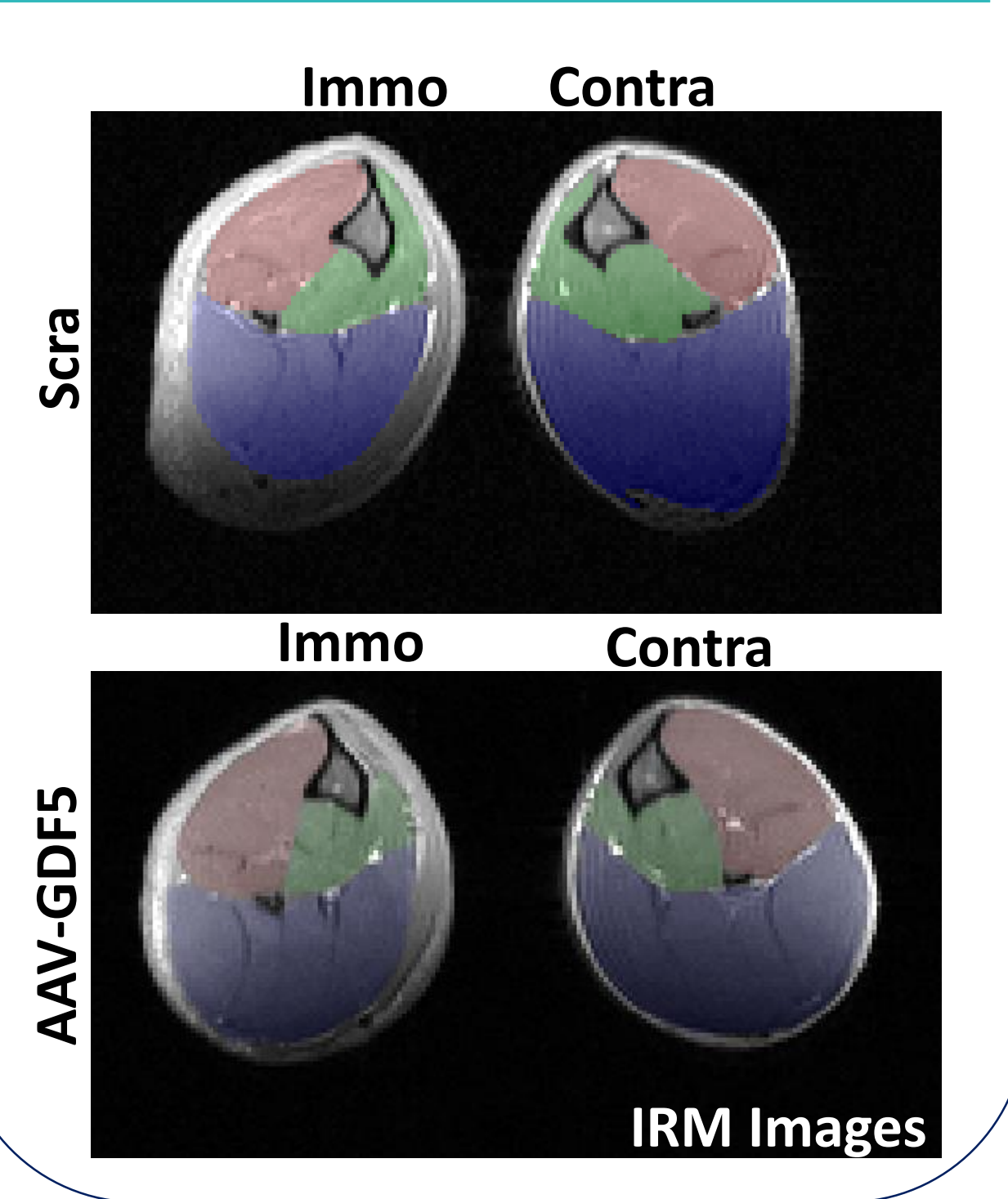
GDF5 OE rescues EDL atrophy



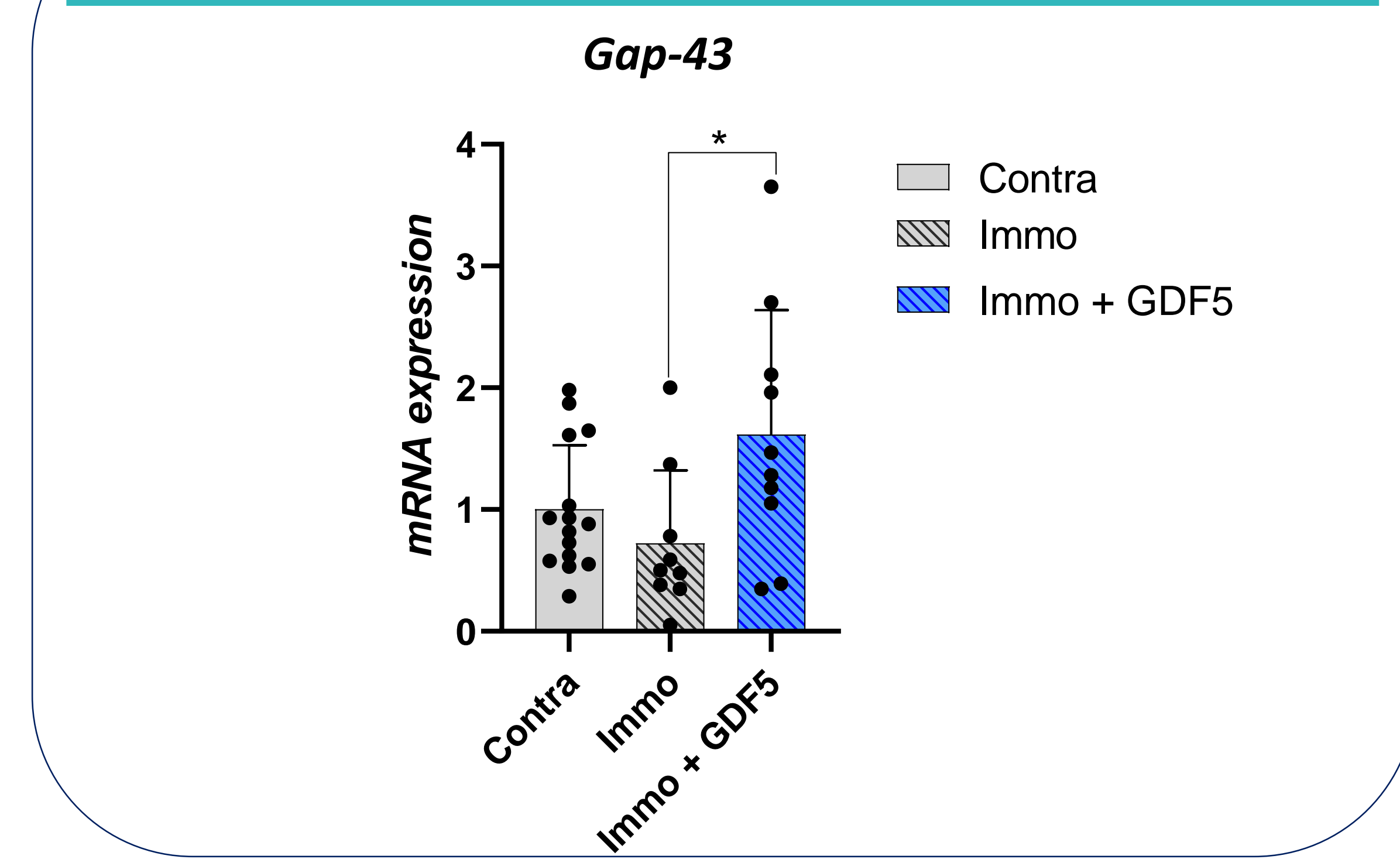
GDF5 OE has a mild effect on TA muscle weight



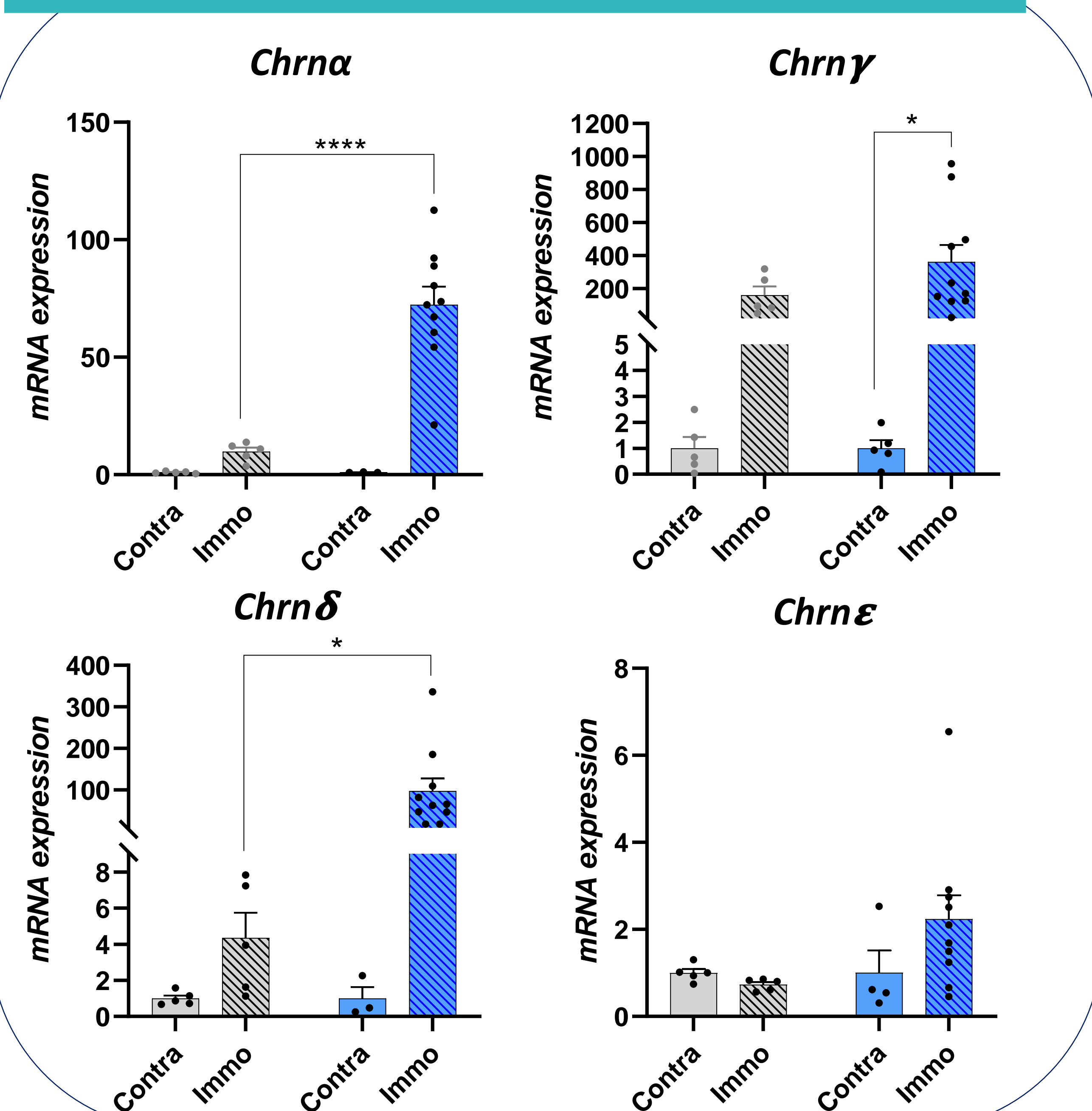
GDF5 OE slightly reduces hindlimb atrophy



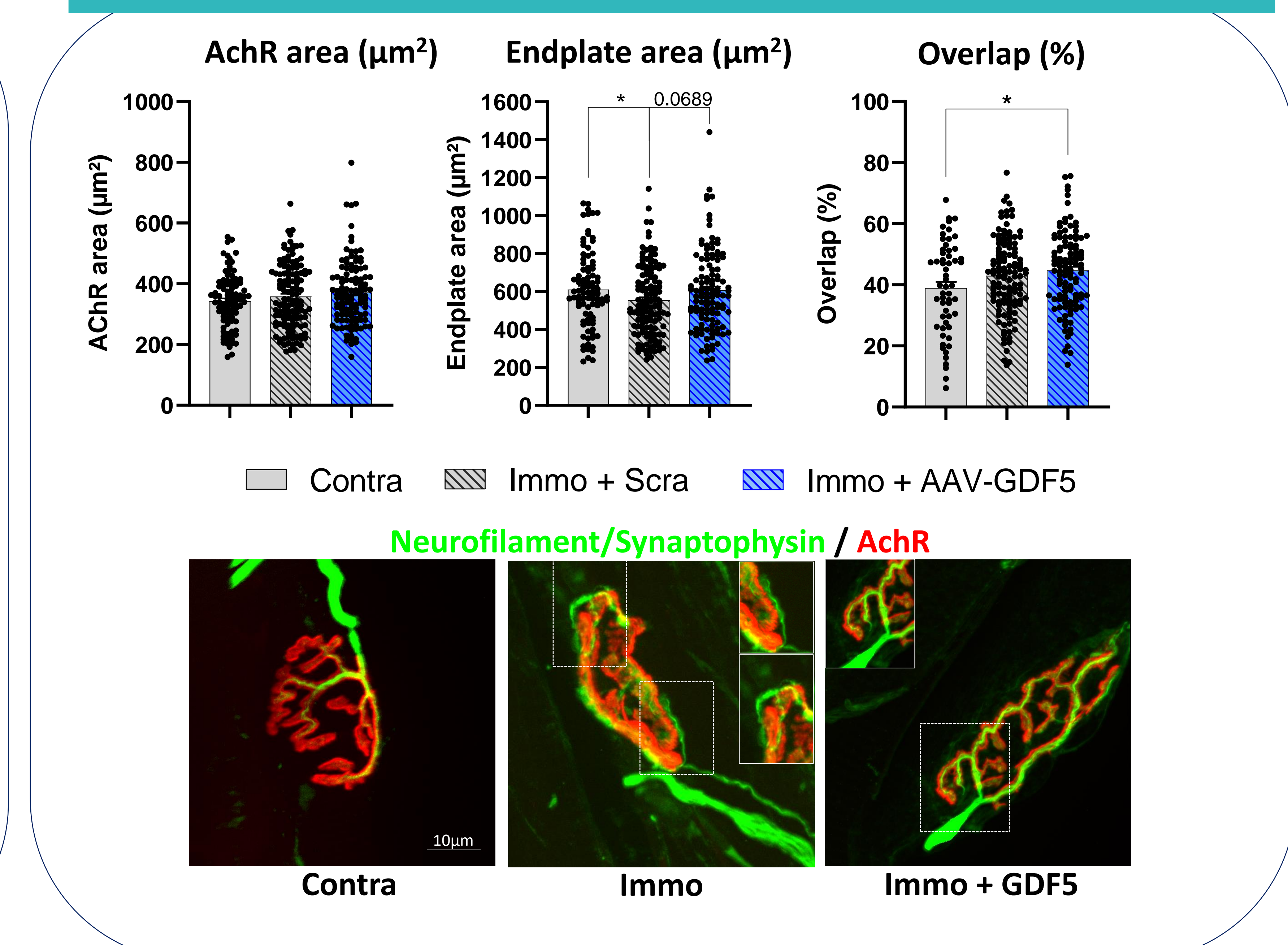
GDF5 OE increases the expression of gene responsible for nerve sprouting and axons regeneration



GDF5 OE influences gene expression of AchR subunits



GDF5 OE ameliorates NMJ connection



Conclusion

OE of GDF5 limits muscle atrophy caused by immobilization. In particular it has a positive effect on neuromuscular junction, increasing the expression of AchR subunits. These data suggest that GDF5 stimulates the formation of new receptors increasing the muscle sensibility to the immobilization. Moreover NMJ investigations shows that GDF5 OE ameliorates myofibers innervation.

Perspectives

In vitro studies are envisaged in order to understand the molecular mechanism influencing muscular cells in absence of gravity. Future studies could consider GDF5 as a potential therapeutic tool to reduce the side effects caused by immobilization on neuromuscular system.