Using old and young blood to study age-related muscle loss

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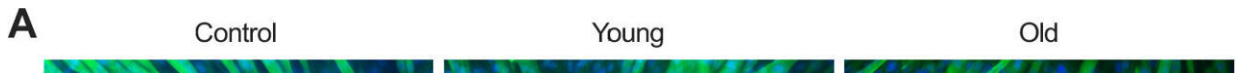

Figure 1. Myotube diameter and nuclear fusion index (NFI). The effect of ex vivo human serum-conditioned media on myotube diameter and NFI in vitro. A: representative images illustrating atrophy in myotubes conditioned with serum from older males in comparison to untreated control C2C12 myotubes and myotubes treated with serum from young males. B: mean myotube diameter. C: mean NFI. Data are expressed as the means (cross), median (central horizontal line), 25th and 75th percentiles (box), and the minimum and maximum values (vertical lines), with n = 4 per group, corresponding to treatment of each participant's serum, repeated in triplicate. *P

An innovative model using human blood samples to study muscle protein growth may help advance scientists' understanding of age-related muscle loss. The study is published ahead of print in the *American Journal of Physiology-Cell Physiology*. It was chosen as an APSselect article for July.

Age-related muscle loss, called sarcopenia, is a condition that can reduce quality of life and restrict independence as a person gets older. Lifestyle changes, such as decreased mobility, poor diet, hormonal fluctuation and increased inflammation in the body, may all play a role in the development of sarcopenia.

Studying the production and life cycle of muscle protein (muscle protein synthesis) in people can be expensive, difficult and sometimes invasive. However, finding new and easier methods for studying the causes of sarcopenia

is critical to establish new treatments that could support muscle health and help improve healthspan—the length of time a person remains healthy in their life.

Researchers from the University of Birmingham in the U.K. used myotubes—synthetic muscle—from mice to study muscle protein synthesis and signaling. They treated the cells with human blood donated by two groups of healthy male volunteers. One group was younger, with an average age of 26, and the other group was older, with an average age of 72. Some of the cells were also treated with the amino acid leucine to determine how cells responded to a growth-promoting stimulus. The research team found the myotubes exposed to blood from older volunteers were smaller (indicating muscle loss), had impaired muscle protein synthesis and blunted signaling responses when compared to the cells treated with the younger volunteers' blood.

"We have demonstrated here that there are many factors present in aged blood that impair pathways that regulate muscle cell size and may partly explain age-related muscle degeneration," said Leigh Breen, Ph.D., corresponding author of the study. "Our next steps are to understand the factors in blood that may cause this response and to develop ways to reverse or prevent this."

More information: Sophie L. Allen et al, The effect of young and old ex vivo human serum on cellular protein synthesis and growth in an in vitro model of aging, *American Journal of Physiology-Cell Physiology* (2021). DOI: 10.1152/ajpcell.00093.2021

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