

# Fat molecule ceramide may factor in muscle loss in older adults

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As men and women age, increasing quantities of fat tissue inevitably take up residence in skeletal muscle. A small study of older and younger men conducted at the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University suggests that a build-up of a fat molecule known as ceramide might play a leading role in muscle deterioration in older adults. The results of the study were published online this month by the *Journal of Applied Physiology*, a publication of the American Physiological Society.

The study enrolled 10 men in their mid-seventies and nine men in their early twenties. None of the men carried excess weight or had [chronic health problems](#) and none had exercised in six months. Ceramide was measured in a muscle biopsy taken at baseline. The participants performed a single bout of exercise (three sets of ten repetitions of knee extensions and leg presses) followed by two muscle biopsies which the authors used to examine how the exercise impacted muscle growth response.

"There is a known relationship between elevated ceramide levels and unhealthy muscle in [obese adults](#), but to the best of our knowledge, this had not been studied in healthy weight, older adults," said Donato Rivas, Ph.D., the study's first author and a scientist in the Nutrition, [Exercise Physiology](#) and Sarcopenia Laboratory at the USDA HNRCA at Tufts University. "Our analysis of the [muscle biopsies](#) showed an accumulation of two types of ceramide molecules containing [saturated fatty acids](#) that were 156% and 30% higher in the older men. Furthermore, having

higher accumulation of one of these saturated fatty acid types was associated with having less leg muscle mass in both younger and older men."

"Although it is well known that fat tissue replaces some of our muscle tissue as we grow older, we are seeking to understand whether some fat molecules are more damaging to muscle than others," said Roger A. Fielding, Ph.D., senior author and director of the Nutrition, Exercise Physiology and Sarcopenia Laboratory. "We suspect that the increased storage of ceramide we saw in the older men, exacerbated by the presence of saturated fat, has a part in weakening the anabolic signaling that responds to resistance exercises and helps with the assembly of new muscle."

Learning more about ceramide activity through larger, long-term interventional trials involving older and younger men and women may identify a role in dietary or therapeutic drug interventions for sarcopenia, an age-related condition of muscle loss and function.

"The deterioration of muscle is compounded by a loss of muscle strength, which really begins to decline around age 50 and appears to be a factor in the visible decrease in mobility people exhibit around age 80," added Fielding, who is also a professor at the Friedman School of Nutrition Science and Policy at Tufts University and at Tufts University School of Medicine. "Previous research done at Tufts and other institutions suggests that even with limited exercise older adults can maintain and build some new muscle. Until there is enough research to develop specific exercise and dietary interventions, staying as physically active as deemed safe by your health care provider can only benefit aging muscle."

**More information:** Rivas DA, Morris EP, Haran PH, Pasha EP, da Silva Morais, M, Dolnikowski GG, Phillips EM, Fielding RA "Increased

ceramide content and NF 1 kB signaling may contribute to the attenuation of anabolic<sup>2</sup> signaling after resistance exercise in aged males." Published online October 4, 2012.

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