

Study show aging might not entail losing muscle, strength

Research shows older men build and lose muscle protein as fast as young men

Losing muscle and strength late in life may not be the inevitable consequence of aging, as scientists traditionally have thought, according to a study undertaken by UTMB researchers.

Many believe that the decline of muscle as people grow older—called sarcopenia—and the accompanying loss of strength and function occur because muscle proteins begin to break down faster than they can be created and restored. But a three-year study casts that belief into doubt, the researchers report in the Sept. 12 issue of the *Journal of the American Medical Association*.

The team studied 48 healthy men—the largest group to date examined on this topic—during non-eating hours and tracked the rate at which their bodies created muscle proteins and the rate of muscle protein breakdown. They found that turnover rates were similar in younger and older men. That means that other factors must account for the muscle loss and weakening that come with age.

“From a medical standpoint, it’s very good news,” says Dr. Elena Volpi, the paper’s lead author who conducted the study with colleagues at UTMB while on faculty here.

Volpi has since joined the faculty at the Keck School of Medicine of the University of Southern California. “It means sarcopenia may not be an inevitable effect of aging,” Volpi says.

Muscle loss in aging may be linked to many other potential reasons, including older people’s eating habits, the body’s ability to use protein from food, and hormonal changes. Reductions in physical activity and the effects of disease also are potential targets for investigation, she says.

Further research may eventually lead to medical strategies to keep elderly people stronger for longer, such as physical activity programs, improved diets, and medicine to help the body better use nutrients and hormone therapy. “It is a positive finding, because it is much easier to develop exercise programs for seniors or to administer, say, nutritional or hormonal supplements, than it is to develop treatments targeted at changing a basic defect in muscle cell function,” Volpi says.

As older adults lose muscle mass and strength, they may eventually lose their independence or experience life-threatening injuries such as hip fractures. In addition, reduction in lean body mass may contribute to metabolic problems, including type 2 diabetes and osteoporosis. Such health challenges may increase in coming years. Demographers expect the number of Americans over age 65 to double— swelling to 20 percent of the population— by 2030.

The body uses amino acids to create muscle proteins, which routinely break down and are replaced by new proteins in a natural recycling process, Volpi explains. Using methods developed in the UTMB laboratory of Dr. Robert Wolfe, who is a world renowned expert in the field of metabolism and senior author of this paper, researchers injected an amino acid intravenously into the volunteers during their basal state (that is, when they were not eating).

A label in the amino acid allowed the researchers to recognize it and measure it in muscle biopsies and blood samples to see how much was taken up by muscle to make proteins. The researchers also measured how much the labeled amino acid was diluted by unlabeled amino acid— already present in the body—due to muscle protein breakdown. They also calculated muscle volume.

Researchers used three different methods to examine the rates of protein synthesis and protein breakdown.

Between 1997 and 2000, researchers recruited 22 healthy seniors with an average age of 70 to participate in the study.

They compared them to 26 younger healthy men with an average age of 28. In both old and young participants, the balance between synthesis and breakdown was similar—although the researchers found that muscle protein both was created and broken down a little faster in older people than in the young group.

The findings may differ from those of earlier studies because the earlier studies did not directly measure muscle protein breakdown and net muscle balance in older men, Volpi says. In addition, the researchers did not change or control participants' diet or activities before the study because these changes could have affected basal muscle protein turnover. The health of participants in other studies may have differed from those in the current investigation, as well.

Researchers hope to conduct more detailed investigations into muscle breakdown as tests are refined to detect the turnover rates of individual proteins within muscle.

Volpi also is pursuing research funded by the National Institutes of Health into insulin's effects on muscle protein turnover in older people, and Wolfe is studying the effects of nutritional supplements and exercise on muscle growth in aging, also funded by the National Institutes of Health.

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