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REPORT

Protecting Muscle Mass As You Age
By Dr. Edward R. Rosick

The field of anti-aging medicine, while still in its infancy, can take pride in the increased awareness people now have concerning things that can be done in order to stay active, healthy and vibrant. Just 30 or 40 years ago, most people accepted with a shrug and a sigh the inevitable decline in their physical and mental abilities as they grew older. Now, people are learning that through both physical activity and the judicious use of medications and supplements, they can help stave off some of the most debilitating effects of aging.



Osteoporosis is an example of a debilitating disease that is intimately associated with growing old. It's been estimated that 25 million women and men in the United States suffer from this disabling process that robs them of the very bones that keep their bodies intact. Fortunately, there are now medications and supplements available that can help prevent osteoporosis from ruining a person's life as they age. However, unfortunate as it may sound, there is another disease that occurs as we grow older that is just as disabling as osteoporosis, a disease that robs both women and men of their health, mobility and independence.

Sarcopenia—a new name for an old disease

People have recognized throughout the ages that as someone grows old, not only do their bones become brittle but also that their muscles shrink and atrophy. It wasn't until 1988 that the term sarcopenia, which means "vanishing flesh," was given to this condition of declining muscle mass by Dr. Irwin Rosenberg.¹ He created a catchy name so that mainstream medicine would begin to take it seriously. Fortunately, his nomenclature paid off, because finally, sarcopenia is being recognized by more and more researchers as an important bio marker of aging.



Even though it may come as a shock to most people, the loss of muscle mass begins in the third decade of life. Sarcopenia is medically defined as the loss of skeletal muscle mass. A study that looked at sarcopenia in older persons showed that a relative muscle mass standard deviation below those aged 18 to 40, exerts its debilitating effects in a slow, stealth-like fashion that may not be noticeable until its effects are quite pronounced.² Even in people who engage in regular aerobic exercise (like jogging or swimming), the body hides its loss of muscle mass by padding the affected area with fat. Therefore, even if a person's weight stays the same between the ages of 30 and 50, chances are they've lost a significant amount of muscle. It has been estimated that skeletal muscle mass decreases between 35% to 40% in men and women in the five decades of life between 20 and 80 years of age.² A recent study examined nearly 200 women and men, aged 64 to 93 years, and found that the prevalence of sarcopenia was 22.6% in women and 26.8% in men.³ Other studies have shown that almost half of men and women over 80 years of age suffer from sarcopenia.⁴

Just as debilitating as osteoporosis

While osteoporosis is often labeled the villain when one hears about the increased incidence of falls and fractures among the elderly, medical researchers are beginning to realize that sarcopenia causes as much, if not more of the disability seen in the elderly. While brittle bones secondary to osteoporosis certainly contribute to the increasing incidence of hip fractures and other debilitating injuries in the elderly, leg weakness caused by sarcopenia is a major contributing factor to the falls that cause hip fractures. As one author of a study on sarcopenia stated, "because [leg] strength is fundamental to the neuromuscular function that supports mobility, loss of strength below a critical threshold may be associated with an increased risk of falls."¹

Other studies have shown that sarcopenia is associated with a three to four-fold increased likelihood of disability in those that it affects, regardless of other factors such as age, sex or obesity.⁴ When sarcopenia robs people of their ability to walk, climb stairs

or perform the simple task of getting in and out of a chair, it pushes them into an unhealthy, sedentary lifestyle that not only exacerbates muscle loss but can contribute to other diseases associated with aging, such as heart disease and diabetes.

The multiple causes of sarcopenia

With the study of sarcopenia being in its infancy, researchers are still searching for its causes. Potential factors that may contribute to the decline in muscle mass include age-related declines in anabolic steroid hormones such as testosterone, along with similar declines seen in the levels of human growth hormone.⁵ Other researchers contend that decreased muscle protein synthesis and the poor nutritional status seen in the elderly significantly contribute to the development of sarcopenia.⁵ Ongoing research into the cause of sarcopenia has also shown that intramuscular mitochondrial DNA damage caused by free radicals as well as a significant decrease in overall physical activity, or 'muscle disuse,' may also be significant contributors to the loss of muscle mass seen in the aged.⁶

Can muscle mass loss be prevented?

Unlike osteoporosis, multinational pharmaceutical companies have yet to pour millions of dollars into research searching for medications that can help treat sarcopenia. Therefore, for people who are getting "old" (i.e., anyone past 40), it makes sense to try and establish some common sense preventive measures that can be easily incorporated into the hectic, high-pressured lives most people live these days. Fortunately, there are now some studies showing that through a combination of targeted physical activity, the judicious use of safe, natural supplements and the possible utilization of hormonal supplementation, sarcopenia can be, to a significant degree, prevented.



Strength training is key to prevention

With the hallmark of sarcopenia being a significant loss of skeletal muscle mass, it made sense that researchers would first examine the possible protective effects of exercise that is targeted specifically at those vitally important muscles. While just about any exercise is good for you no matter what your age, strength training is the key exercise to combat sarcopenia.

Strength training, or resistance training, is defined as the use of weights or machines that involves a progressive increase in resistance against which a muscle generates force.⁷ Multiple studies have shown that strength training in the elderly improves body composition, increases muscle mass and protects against sarcopenia and can even reverse the most incapacitating effects of sarcopenia. One study examined the effects of 12 weeks of low-intensity leg training in a group of older men aged 69 to 74. After lightly working out three times a week for three months, the men showed a 9% to 22% increase in strength in their upper leg musculature.⁸ In contrast, another study examined the effects of a high-intensity, three times per week lower extremity workout on men with an average age of 64. At the end of the study the men showed an increase in strength in their upper legs ranging from 107% to 226%!⁹ Studies have also been done showing the beneficial effects of weight training for women. In a study looking at the effects of whole body resistance training in a group of women and men with an average age of 68 years, thirty weeks of three times a week training resulted in an increase of upper leg strength of 30% to 97%.¹⁰



Benefits of vitamin E

Entire papers, even entire books, have been written about the numerous beneficial effects of vitamin E. Well, it's time to add yet another plus to vitamin E's long list of accomplishments. A report out of Tufts University Nutrition Research Center on Aging has shown that vitamin E significantly reduces muscle damage and biomarkers of oxidative stress caused by free radicals after exercise in both young and elderly men.¹¹

While there should be no doubt that resistance training should be part of a sarcopenia prevention program, there can be some potential drawbacks. When elderly people exercise at a high level, the levels of free radicals produced can be dramatic, and could potentially contribute to even more muscle damage. To test the idea that a potent antioxidant, such as vitamin E, could quell this free radical activity, and therefore protect skeletal muscles from free radical damage, researchers gave both young (age 23 to 35) and elderly (age 66 to 78) men who were in an intensive exercise program either 1000 IU of vitamin E or a placebo daily for three months. The results showed that both the young and older men who were taking the daily vitamin E supplements had significantly less biochemical markers of free radical damage when compared to the men who were taking placebo.

CREATINE

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Creatine-a muscle and strength booster

One of the largest sellers in health food stores that cater to athletes is creatine, and for good reason: this extremely safe, natural supplement has been shown in study after study to improve fat free mass, maximal dynamic strength and lower and upper body power in practically all people who use it.¹² Creatine works by increasing the amount of ATP available to skeletal muscle cells during exercise. Since ATP can be likened to gasoline for a car engine, creatine can be thought of as an octane booster for skeletal muscle cells.

While it's true that most of the studies on the beneficial effects of creatine have been done on young men, there are now studies showing how creatine

can help prevent the loss of muscle mass in the elderly by improving their exercise performance. In one study, 30 men, aged 68 to 72, were given either creatine or placebo in a double-blind procedure and then participated in resistance training three times a week for 12 weeks. The men who took the creatine supplements had greater improvements in leg strength and exercise endurance when compared to the men who were taking placebo.¹³ Another more recent study examined the effects of just seven days of creatine supplementation on a group of men aged 59 to 72 years. Again, the results were impressive, causing the authors to state that "in summary, short-term creatine supplementation resulted in an increase in strength and power in older adults without any adverse side effects...the long term prophylactic use of creatine supplementation may be a useful therapeutic strategy for middle-aged adults to attenuate loss in muscle strength..."¹²

Carnosine-good for mind and muscles

Carnosine, a natural compound made up of amino acids and present in high concentrations in skeletal muscle, is an exciting compound, at least to those interested in anti-aging medicine. Carnosine has been shown in numerous studies to protect the brain against the ravages of strokes,¹⁴ delay the impairment of eyesight with aging¹⁵ and actually extend the life span of mammals.¹⁶ With this impressive resume, perhaps it should come as no surprise that studies are now showing that carnosine may help prevent the development of sarcopenia.

Carnosine is believed to exert its anti-aging effects through its potent ability as a free radical scavenger. It is thought that declining carnosine concentrations in skeletal muscle observed with increasing age may contribute to the development of sarcopenia. In humans, skeletal muscle carnosine levels decline 63% between the ages of 10 and 70.¹⁷ Since studies have shown that carnosine supplements inhibits lipid peroxidation and free radical-induced damage in rats, it seems reasonable to think that future studies will show that carnosine provides this same beneficial and protective effect in humans.¹⁸

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Sarcopenia prevention protocol:

Lifestyle Issues

- Resistance training/weight training exercise at least 30 minutes three times/week
- Avoid cigarettes and excessive alcohol consumption
- Diet high in organic fruits and vegetables

Natural supplements

- B-complex vitamin: one or two daily
- Antioxidant vitamins/minerals: 500 mg to 1000 mg of vitamin C, 400 IU to 1000 IU of vitamin E (along with at least 200 mg of gamma tocopherol), 200 mcg of selenium daily
- Creatine: 3000 mg to 5000 mg daily
- Carnosine: 1000 mg daily
- Amino Acids: Arginine, lysine and/or glutamine taken at bedtime on an empty stomach. Dosage depends on your weight. For specifics, search natural growth hormone.

Hormonal replacement therapy

- Testosterone and/or HGH replacement therapy-due to the potential side effects of these powerful hormones, should only be done under the close supervision of a physician well versed in anti-aging medicine and hormonal replacement therapy



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Testosterone's role in muscle mass

Testosterone, the hormone that brings about the changes that literally turns a boy into a man, has been in the press lately in regards to its effects on age-related impotence. While adequate levels of testosterone are certainly vital to the sexual well being of both men and women, studies are now showing that testosterone supplementation may play a very important role in the fight against age-induced muscle loss.

It has been well documented that testosterone levels decrease in men as they age.¹⁹ It's also been shown that in hypogonadal men (men who have low testosterone levels due to disease or other non-age related factors), testosterone supplementation increases fat-free body mass, as well as increasing muscle size and strength.²⁰ With these two facts in mind, researchers have begun to examine the effects of testosterone supplementation on muscle mass in the elderly, and initial reports have been quite positive. One of the first studies done, in 1995, showed that testosterone, given to six men (age 64 to 69) who had low testosterone levels, caused a measurable increase in skeletal muscle protein synthesis and strength.²¹ A more recent study, published last year, examined the effects of testosterone supplementation on 10 men, 60 to 78 years in age, in a double-blind trial.²² The results showed that testosterone supplementation increased fat-free mass, improved exercise endurance time and improved balance.

Human growth hormone-is it the fountain of youth?

An entry of "human growth hormone" into any common Internet search engine will yield thousands of hits. This hormone, present in high amounts in our younger years and falling precipitously as we age, has been touted by many as the proverbial fountain of youth. While human growth hormone (HGH) may or may not provide a way in which humans can significantly increase their life span, it does show great promise in preventing or even reversing the harmful effects of sarcopenia in both elderly women and men.



A landmark study published in the New England Journal of Medicine reported on the effects of giving HGH to 21 otherwise healthy men, aged 61 to 81, over a six-month period.²³ The men who received the HGH showed an 8.8% increase in lean body mass, a 14.4% increase in adipose tissue mass and a 1.6% increase in average lumbar spine vertebral bone density. The authors of the study concluded that "the findings in this study are consistent with the hypothesis that the decrease in lean body mass [skeletal muscle], the increase in adipose-tissue mass and the thinning of the skin that occur in older men are caused in part by reduced activity of the [human] growth hormone-IGF-1 axis, and can be restored in part by the administration of human growth hormone." The news for women is also encouraging: studies have indicated that HGH supplementation in women can restore youthful levels and help increase skeletal muscle mass lost to sarcopenia. A study done on 16 women, 70 to 73 years of age, showed that four weeks of HGH supplementation increased their HGH blood levels and lean body mass while causing a significant decrease in overall body fat.²⁴

While HGH might sound like the fountain of youth to some, there can be potentially significant drawbacks. Although mainstream medicine can no longer ignore the potential anti-aging benefits of HGH supplementation, anti-aging proponents would be unwise to turn a blind eye to some reported significant side effects, including water retention, headaches, lethargy and joint swelling. Whereas these side effects may be lessened with lower doses of HGH, supplementing with this powerful hormone should only be considered under care of a physician well versed in anti-aging medicine. Also, HGH replacement therapy doesn't come cheap, with injections costing as much as thousands of dollars monthly.

Amino acid supplements may restore youthful HGH levels

Fortunately, for those that want to wait for more definitive HGH studies or can't afford the cost of such therapy, there may be a much more economical and safe way to boost HGH levels. There is now a considerable body of literature indicating that certain amino acids, when taken in high enough doses, can stimulate a significant increase in HGH levels. An early study done in 1981 showed that 1200 mg of L-arginine and 1200 mg of L-lysine, when taken together, produced a measurable increase in HGH secretion. Interestingly, neither of these amino acids showed an effect on HGH levels when taken separately, even at the same doses. A more recent study, done in 1997, again showed that relatively low doses of arginine and lysine (1500 mg of each), when taken together increase HGH levels.²⁶ While most studies have been done in people less than 30 years of age, a study done at the Louisiana

State University College of Medicine has shown that even the elderly can benefit from amino acid supplements. Nine men, aged 32 to 64, were given 2000 mg of the amino acid glutamine; 90 minutes after ingestion, HGH levels increased over 400% from baseline.²⁷

Don't let sarcopenia rob you of mobility and life

Many of us can remember our grandmothers as frail, hunchbacked little old ladies whose bones were as brittle as those of a newborn baby bird, and whose muscles could barely lift her out of her favorite rocking chair. Fortunately, we live in an age where researchers in the anti-aging field are finding ways in which we can prevent and treat sarcopenia, osteoporosis and other disabling aspects of aging. Through resistance training, natural supplements and possibly hormonal replacement therapy, your muscles may be able to stay young and healthy well into your 60s, 70s and 80s. Perhaps not so distant in the future our model of a grandmother, rather than being that of a debilitated, empathic figure, will soon be thought of as a vibrant woman with strong arms and spry legs playing tennis with her grandchildren.

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