

Muscle Matters:

Hard to Get and Easy to Lose

by Ellington Darden, Ph.D.

Muscle has been our engine, our means of movement, since the beginning of our time on earth. With muscle we run, kick, jump, throw, and swim. With it we lift heavy objects or thread tiny needles. With it we operate chainsaws or manipulate keyboards.

Our muscle varies only slightly from that found throughout the animal kingdom. From ants to whales, from bats to yaks, from caterpillars to zebras — muscle ambulates, propels, and steers them all. Proportionately speaking, our muscles aren't as strong as an ant's, nor as enduring as a whale's, but on both accounts they come close to nature's best.

As a testament to our strength and endurance the Great Pyramid of Egypt and the Great Wall of China were both built primarily by human muscle. The Great Pyramid is composed of more than 2 million blocks of limestone, each weighing from 2 to 70 tons. You could build 30 Empire State buildings with its masonry. The Great Wall of China, which is from 15- to 30-feet thick and 25-feet tall, stretches 3,300 miles across the mountains of northern China. It's one of the few things that can be seen clearly from orbiting the Earth.

The Great Pyramid was constructed 4,600 years ago and the Great Wall of China was initially finished approximately 2,208 years ago. Both these projects required hundreds of years to complete and nearly lifelong muscle power from millions of people.

THE ADVANTAGES OF STRONG MUSCLES

History abounds with extraordinary feats of muscular strength. Sometimes unappreciated, however, is the fact that strong muscles also do the following:

- Protect you from injury. Strengthen your muscles and you also toughen your tendons, ligaments, and bones — which equals greater structural integrity.
- Govern metabolism. More than any other organ you have voluntary control over, your working muscles must be supplied with nutrition and heat energy. Larger, stronger muscles rev up your metabolism.
- Look attractive. If you are lean, muscles make up from 30 to 50 percent of your body weight. The Greeks and Romans are well known for their statues that emphasize body leanness and muscularity for their simple beauty.
- Burn calories. Muscles, because they are richly supplied with blood capillaries, require calories to keep them functioning. Add a pound of muscle to your body, and your body needs an extra 37.5 calories per day to keep it alive.
- Support overlying fat and skin. There are 434 skeletal muscles throughout your body. These muscles are the primary foundation and shaping ingredient for your fatty deposits and skin.
- Allow you to work your cardiovascular system. Since your muscles contract and produce movement, they are the only thing that generate sustained action for working your heart in a progressive manner.

HOW MUSCLES GROW LARGER AND STRONGER

Muscular growth, very simply, is a two-step process. First, stimulate the muscle with an overload. Second, permit the stimulated muscle to grow by providing adequate rest. Remember, muscle grows during rest, not during exercise.

Underneath this two-step process, however, is the science of the muscular-growth process.

Each muscle consists of thousands of cylindrical fibers. These fibers divide into hundreds of thousands of myofibrils, which separate into millions of filaments of actin and myosin.

When a muscle grows, the actin and myosin filaments initially increase in size and/or number. This causes greater circumference in the involved myofibrils, which in turn produces expansion in the fibers. As a result, muscle fibers grow wider not longer — and they increase in size not number. This process is called hypertrophy.

Another growth process is called hyperplasia. Hyperplasia is when muscle fibers split, which creates an increase in the total number of fibers. This method of muscular growth occurs primarily in cats and other smaller mammals, but there is little evidence that it occurs in healthy humans. Hypertrophy is the way that human muscles grow.

The opposite of hypertrophy is atrophy. Atrophy is when muscle fibers shrink or waste away from lack of use. There are plenty of physical problems that are related to atrophy.

ATROPHY RESEARCH

Use it or lose it. That's the popular concept related to muscle that is taught in most physical education courses in the United States. The concept certainly applies to strength training. If you work harder this week than last week, your involved muscles grow slightly stronger. If you don't work as hard this week as you did the week before, then a small amount of atrophy or shrinkage occurs.

A lot of the basic research on muscle atrophy was done by Dr. Gilbert Forbes of the Rochester School of Medicine. I first met Dr. Forbes during the 1975 Nautilus West Point Study. He helped with the body-fat calculations of the cadets.

At that time, Dr. Forbes was in the process of analyzing longitudinal data on the body composition of men and women he had monitored for several decades. His full report was published in *Human Biology* in 1976. Basically, what he discovered was as follows:

Average men and women between the ages of 20 and 50, who do not strength train, lose one-half pound of muscle per year. Eight ounces per year translates into slightly more than 22 hundredths of an ounce per day, which seems insignificant. And it probably would be, if wasn't for the cumulative effect.

Bit by bit, little by little, ounce by ounce, things add up. After a decade, it's 5 pounds. After 30 years, it's 15 pounds.

A loss of 15 pounds of muscle is nothing to laugh about. The next time you're at the supermarket, spend some time in the meat department. Pick up and hold a 5-pound roast. Maybe there's a bigger cut available. If so, grasp it — or imagine holding three 5 pounders. That's approximately the space that 15 pounds of your muscle occupies. Of course, atrophy is not selective, it happens throughout your body, from all of your muscle-containing areas.

There are a two of pounds that shrink from each thigh, another pound from each buttocks, a couple of pounds more from your back, as well as over your chest and shoulders, and finally a half pound from each arm and each calf, and the remaining several pounds from around your lower back, midsection, and neck.

If that sernerio is not enough to make you want to go workout, then the next facts will be for sure.

Dr. Forbes also found that while average men and women are losing muscle ounce by ounce, they are gaining fat at triple the rate. That fat gain amounts to 1-1/2 pounds each year, or 15 pounds per decade. That's a 45-pound fat gain over 30 years.

Fat tissue is approximately 20-percent less dense than muscle, so it takes up 20-percent more space. The closest size comparison to fat at the supermarket would be 40-pound sack of dog food. You should be able to get the picture!

In one way, the muscle loss and fat gain are not quite as bad as they seem. If you lose 15 pounds of muscle and gain 45 pounds of fat — then the overall increase in body weight is only 30 pounds.

THE EFFECT ON METABOLISM

Your resting metabolism is the number of calories your body requires to operate in a relaxed state. Your brain and internal organs — such as your heart, lungs, liver, and kidneys — demand a lot of energy. But it's your skeletal muscles, which comprise from 30 to 50 percent of a lean person's body weight, that use the most energy.

Lose a pound of muscle through disuse atrophy and your resting metabolic rate goes down approximately 37.5 calories per day. Add a pound through strength training and your rate goes up by the same number.

A pound of fat tissue inside the human body also has a metabolic rate: approximately 2 calories per day. Muscle is thus 18.75 times as metabolically active as the same amount of fat.

It's fairly well known that as adults age they have a harder and harder time shedding their excessive fat. The reason: a decrease in metabolism.

Long-term metabolic studies reveal that an average individual experiences a 0.5 percent reduction in resting metabolic rate each year between 20 and 50 years of age. The gradual, wasting away of muscle each is primarily responsible for the metabolic slowdown.

Atrophy involves the metabolic breakdown of muscle into its constituent compounds, which are removed by the bloodstream. The involved muscle fibers actually lose their fluids and become smaller, weaker, and less supportive.

The continued loss of muscle may manifest itself in physical ailments such as lower-back pain, bothersome knees and shoulders, arthritis, or even heart disease. From there, it's often a steady downward spiral.

THE HIT CHALLENGE

Your body doesn't have to get caught up in this downward spiral. With the new HIT, you can put a stop to the regression and actually reverse the process. You can rebuild your atrophied muscle, and perhaps, get your muscles larger and stronger than they've ever been.

No, it won't be easy, especially if you're over 40 years of age. But it will be well worth it, as thousands and thousands of trainees will testify.

Accept the HIT challenge.

Make sure your hard-to-get muscle, is even harder, to lose.

Ellington Darden, Ph.D., is the leading disciple of the HIT training methods of Arthur Jones, the inventor of Nautilus exercise equipment. Darden, for 17 years the director of research for Nautilus Sports/Medical Industries, is the author of such enormously popular books on high-intensity workouts as *The Nautilus Book*, *High-Intensity Bodybuilding*, and *100 High-Intensity Ways to Build Your Body*, along with 40 other fitness books. He currently resides in Windermere, Florida.