



WellnessOne Newsletter

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Published by WellnessOne of Redding

Boost Your Metabolism, Burn Pounds - With This "DNA Changer"

By Dr. Mercola

New research published in the journal *Cell Metabolism* shows that when healthy but inactive men and women exercise even briefly, it produces an immediate change in their DNAⁱ.

Although the underlying genetic code in human muscle doesn't change, exercise causes important structural and chemical changes to the DNA molecules within those muscles.

This contraction-induced gene activation, which modifies DNA at precise locations, appears to be early events leading to the genetic reprogramming of muscle for strength, and to the structural and metabolic benefits of exercise.

According to Science Dailyⁱⁱ:

"The DNA changes in question are known as epigenetic modifications and involve the gain or loss of chemical marks on DNA over and above the familiar sequence of As, Gs, Ts, and Cs.

The new study shows that the DNA within skeletal muscle taken from people after a burst of exercise bears fewer chemical marks (specifically methyl groups) than it did before exercise.

Those changes take place in stretches of DNA that are involved in turning "on" genes important for muscles' adaptation to exercise...

Broadly speaking, the findings offer more evidence that our genomes are much more dynamic than they are often given credit for."



Exercise Changes Your Biochemistry

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Previous studies have identified and measured the biochemical changes that occur during exercise and found alterations in more than 20 different metabolitesⁱⁱⁱ. Some of these compounds help you burn calories and fat, while others help stabilize your blood sugar, among other things.

What all of this tells us is that exercising regularly and maintaining a healthy weight creates a positive feedback loop. One of the key health benefits of exercise is that it helps normalize your glucose and insulin levels, by optimizing insulin receptor sensitivity. This is perhaps the most important factor for optimizing your overall health and preventing disease of all kinds, from diabetes, to heart disease, to cancer, and everything in between.

On Caffeine... Can Coffee Boost Exercise Benefits?

Interestingly, and as a bit of a side note, exposing muscle cells to [caffeine](#) had a similar effect on DNA methyl groups as the muscle contractions in the featured study. However, this does not imply that you can trade exercise for a few cups of coffee and get the same results. There's a lot more involved. Coffee has both potential health benefits and potential hazards, so it needs to be consumed with some caution. For more detailed information about coffee, please see my interview with [Ori Hofmekler](#), who has studied the health impact of coffee in depth.

The most important factor to keep in mind is that coffee is a 'whole food,' and quality is everything. Coffee is one of the most heavily sprayed crops, so this is definitely an instance when you'll want to buy organic.

That said, the reason I include the mention of coffee here is because recent research, which Ori has written about in his book *Unlock Your Muscle Gene*^{iv}, has shown that coffee also triggers a mechanism in your brain that releases a growth factor called Brain-Derived Neurotrophic Factor (BDNF), which in turn:

1. Activates brain stem cells to convert into new neurons, and
2. Expresses itself in your muscles by supporting the neuromotor, which is the most critical element in your muscle. Without the neuromotor, your muscle is like an engine without ignition, and neuro-motor degradation is part of the process that explains age-related muscle atrophy

What this means is that caffeine may help rejuvenate both brain- and muscle tissue! Research has also found that consuming the equivalent of two cups of coffee an hour before training can also help reduce post-workout muscle soreness by up to 48 percent, beating out both naproxen and aspirin in terms of effectiveness^v. Coffee increases your metabolism by up to 20 percent, according to Ori's research. And according to Ori, it can actually be quite beneficial if consumed before exercise. Ori has experimented using it before training, and claims it works.



"Coffee before training allows you fast energy to initiate your workout. For people who train in the morning, having coffee before training is a great advantage," he says.

However, you do want to be careful and moderate in the amounts you drink. Coffee can affect your adrenal glands so if you have an issue with decreased adrenal function, use care with coffee. Also remember we're talking about black coffee—no sugar added. Ori recommends having just one cup of coffee or one shot of espresso in the morning or before training, and that's it for the day. If you exercise in the morning, have your coffee prior to your workout, not after.

Exercise Boosts Fat Burning in Multiple Ways...

Going back to the featured study, several of the genes affected by an acute bout of exercise are genes involved in fat metabolism. (Demethylation allows genes to more easily make proteins, such as the proteins involved in the breakdown of fat.) Needless to say, exercising in general is an important factor for successful weight management—especially exercises that help you gain muscle. The study suggests that when you exercise, your body almost immediately experiences genetic activation that increases the production of fat-busting proteins.

Now, when it comes to boosting your metabolism, increasing muscle mass, and maximizing fat burning, one type of exercise stands out above all others and that is high intensity interval training. Research has shown that just 20 minutes of high intensity training, two to three times a week, can yield *greater* results than slow and steady conventional aerobics done five times a week.



It's also a potent "anti-aging" strategy as it will naturally increase your body's production of human growth hormone (HGH).

As you reach your 30s, you enter what's called "somatopause." At this time your levels of HGH begin to drop off quite dramatically, and this is part of what drives your aging process. Your HGH levels decrease naturally as you age, but people in this age group also tend to fall into increasingly sedentary life styles, which further exacerbate matters. Regardless of your age, incorporating high intensity interval exercises—which are an integral part of my Peak Fitness program—can have a dramatic impact on your overall health by improving metabolism and boosting your levels of HGH, also known as "the fitness hormone." Once you regularly participate in these 20 minute exercises about twice a week, most people notice the following benefits:

Decrease in body fat	Firmer skin	Improved athletic speed and performance
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Improved muscle tone

Increase in energy and libido

Ability to achieve your fitness goals much faster

How to Maximize the Health Benefits of Interval Training

High intensity interval training can be performed with virtually any type of exercise; with or without equipment. You can just as easily perform interval training by walking or running outdoors as you can using a recumbent bike or an elliptical. As mentioned earlier, you only need to do these types of exercises *two or three times a week*. As a matter of fact, doing it more frequently than that could be counterproductive.

Rather than increasing frequency, focus on making sure you're *really pushing yourself as hard as you can* during those two or three weekly sessions, because intensity is KEY for reaping all the benefits interval training can offer. You want to raise your heart rate up to your anaerobic threshold. Keep pushing at maximum effort for 20 to 30 seconds, and then rest for 90 seconds. Repeat this cycle for a total of eight repetitions. When you're first starting out, depending on your level of fitness, you may only be able to do two or three repetitions. Just keep working your way up to about eight.



Here's a summary of what a typical interval routine might look like using an elliptical:

- Warm up for three minutes
- Exercise as hard and fast as you can for 30 seconds. You should be gasping for breath and feel like you couldn't possibly go on another few seconds. It is better to use lower resistance and higher repetitions to increase your heart rate
- Recover for 90 seconds, still moving, but at slower pace and decreased resistance
- Repeat the high intensity exercise and recovery 7 more times

Exercise is Medicine

"Epigenetic modifications that turn genes on and back off again can be incredibly flexible events. They allow the DNA in our cells to adjust as the environment shifts," Science Daily reports. "'Exercise is medicine,' Zierath says, and it seems the means to alter our genomes for better health may be only a jog away."[vi](#)

I couldn't agree more, and I've often likened exercise to medicine that needs to be taken as prescribed, meaning in the appropriate frequency and amount. I look forward to the day when every doctor will hand out a prescription for exercise before deciding on a drug. But there's no

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reason to wait; I urge you to take control of your own health and implement a comprehensive exercise program sooner rather than later, if you haven't started already.

There are three important variables to keep in mind when exercising:

- Length of time
- Frequency
- Intensity

As mentioned earlier, high intensity interval exercises accomplish greater benefits in a fraction of the time compared to slow, endurance-type exercises like jogging. The frequency is also reduced by about half. However, while interval training is one of the most effective types of exercise there is, you still want to incorporate other types of exercise to reap all the health benefits exercise has to offer. Another key to success is *variety*. Otherwise, your body will quickly adapt to your program. Whenever exercise becomes easy to complete, it's a sign you need to increase the intensity and/or give your body a new challenge.

So when you're planning your exercise routine, make sure it incorporates the following types of exercise:



1. **Aerobic:** Jogging, using an elliptical machine, and walking fast are all examples of aerobic exercise. As you get your heart pumping, the amount of oxygen in your blood improves, and endorphins, which act as natural painkillers, increase. Meanwhile, aerobic exercise activates your immune system, helps your heart pump blood more efficiently, and increases your stamina over time.
2. **Interval (Anaerobic) Training:** Again, this is when you alternate short bursts of high-intensity exercise with gentle recovery periods.
3. **Strength Training:** Rounding out your exercise program with a 1-set strength training routine will ensure that you're really optimizing the possible health benefits of a regular exercise program.
4. You can also "up" the intensity by slowing it down. For more information about using [super slow weight training](#) as a form of high intensity interval exercise, please see my interview with Dr. [Doug McGuff](#).
5. **Core Exercises:** Your body has 29 core muscles located mostly in your back, abdomen and pelvis. This group of muscles provides the foundation for movement throughout your entire body, and strengthening them can help protect and support your back, make your spine and body less prone to injury and help you gain greater balance and stability. You need enough repetitions to exhaust your muscles. The weight should

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be heavy enough that this can be done in fewer than 12 repetitions, yet light enough to do a minimum of four repetitions. It is also important NOT to exercise the same muscle groups every day. They need at least two days of rest to recover, repair and rebuild.

6. Exercise programs like Pilates and yoga are also great for strengthening your core muscles, as are specific exercises you can learn from a personal trainer.

Stretching: My favorite type of stretching is active isolated stretches developed by Aaron Mattes. With Active Isolated Stretching, you hold each stretch for only two seconds, which works with your body's natural physiological makeup to improve circulation and increase the elasticity of muscle joints. This technique also allows your body to repair itself and prepare for daily activity. You can also use devices like the [Power Plate](#) to help you stretch.

References:

- 1 [i Cell Metabolism March 7, 2012; 15\(3\):405-411](#)
- 2 [ii Science Daily March 6, 2012](#)
- 3 [iii Science Translational Medicine May 26, 2010; 2\(33\):33ra37](#)
- 4 [iv Unlock Your Muscle Gene by Ori Hofmekler](#)
- 5 [v The Journal of Pain March 2007; 8\(3\): 237-243](#)
- 6 [vi Science Daily March 6, 2012](#)

Source: [Science Daily March 6, 2012](#)

Source: [Cell Metabolism March 7, 2012; 15\(3\): 405-411](#)

Source: [New Scientist March 6, 2012](#)

Source: [Conditioning Research March 6, 2012](#)

