

Nitric Oxide Say Yes to NO

Enhance Your Health with The Miracle Molecule that Improves Circulation, Lowers Blood Pressure and Increases Energy

Nitric oxide (NO) is a simple molecule composed of one atom of nitrogen and one atom of oxygen. It is highly reactive and only lasts a few seconds in the body after it is created, but it plays a critical role in overall health because of its ability to enhance blood flow.

In 1998, the Nobel Peace Prize for Physiology or Medicine was awarded to three researchers for their discoveries concerning nitric oxide as a signaling molecule in the cardiovascular system. These researchers found that the lining of the blood vessels produce NO in order to relax the muscles in the blood vessels, thereby reducing blood pressure and allowing greater blood flow.

The research into NO explains why nitroglycerine works as a treatment for angina (chest pain from narrowed arteries). Nitroglycerine is transformed into nitrite, which is then converted to NO, causing an immediate relaxing of blood vessels.

Since that time, researchers have found numerous health benefits from enhancing NO production in the body, starting with its ability to greatly enhance cardiovascular health. In fact, NO may be a critical factor in helping to reduce cardiovascular disease in general.

Nitric Oxide and Cardiovascular Health



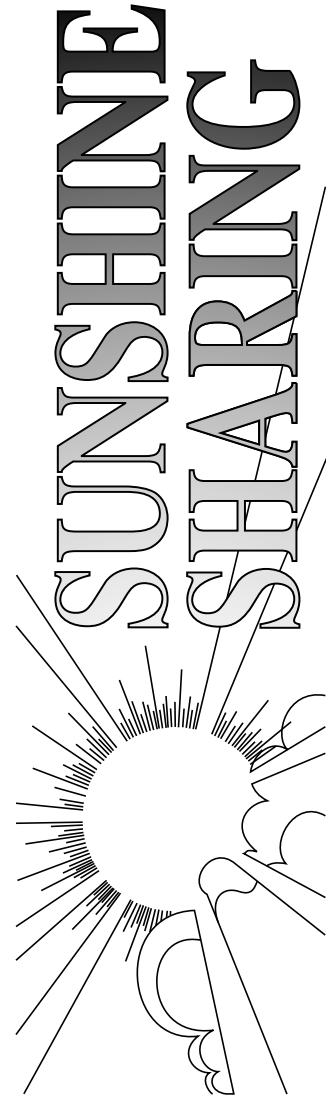
To start, declining levels of NO may be the cause of essential hypertension (high blood pressure from unknown causes), something which plagues millions of people. High blood pressure is a major risk factor for strokes and heart attacks. It also causes kidney damage and increasing NO levels appears to be a major way of getting blood pressure back into normal ranges.

The research suggests that increasing NO levels can help prevent, slow or even reverse arterial plaque, thereby helping to keep arteries healthy and flexible. It can also help prevent thrombosis, the formation of blood clots in the circulatory system that cause heart attacks, strokes and other problems.

Reduced blood flow from a lack of NO is also one of the causes of erectile dysfunction (ED) in men. In fact, many drugs for ED work by increasing NO levels.

Another benefit of NO is that increased levels can improve athletic performance by helping more blood (and oxygen) get to the muscles. Adequate levels of NO will help reduce muscle soreness after exercise.

Continued on page 2



Your guide to better health the natural way.

Vol. 30 No. 2

Important Notice

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Continued from page one

The Many Health Benefits of Nitric Oxide

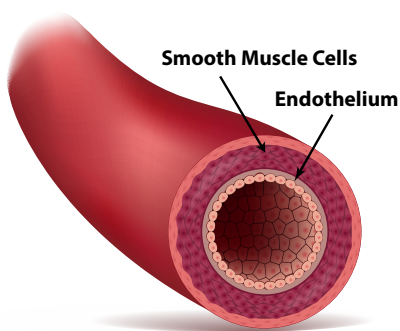
The benefits of NO don't stop with aiding circulation. Increased NO levels have also been shown to increase cellular sensitivity to insulin, making it helpful for people with diabetes. It also reduces diabetic complications such as blindness, foot and leg ulcers and kidney disease.

There is also a link between NO and chronic inflammation. While the mechanisms involved in this link are still being explored, it appears that chronic inflammation reduces NO production, whereas enhancing NO production is linked with reduced inflammation. What the research shows is that enhancing NO production may help relieve the chronic inflammation involved in asthma and arthritis.

Finally, it appears that NO plays a critical role in the brain. Low levels are associated with memory loss and depression. There is also evidence that higher levels of NO can improve bone density and aid the immune system in fighting infections.

All of this may be linked to the simple fact that nothing in the body can be healthy or heal without an adequate supply of blood. Anything that interferes with how well the blood can supply oxygen and nutrients to the tissues is ultimately going to lead to health problems.

Endothelial Dysfunction and Low NO



The endothelium or endothelial lining is a layer of cells, just one cell thick, lining the arteries. Because these cells produce nitric oxide to signal the artery muscles to relax and increase blood flow they play a vital role in managing oxygen and nutrient

distribution to every other cell of the body.

Endothelial dysfunction occurs when the endothelial lining is damaged. This means that less nitric oxide will be released, resulting in less blood flow to the tissues. This is an underlying factor in chronic and degenerative disease because tissue health cannot be maintained without adequate blood flow.

Chronic inflammation, one of the major underlying factors in chronic and degenerative disease, contributes to low levels of NO and endothelial dysfunction. The more inflammation present in the body, the lower the levels of NO produced by the endothelium. Thus, all of the factors that contribute to chronic inflammation (discussed in the last issue of *Sunshine Sharing*) are also involved.

Another major factor is mitochondrial dysfunction. Mitochondria are tiny cellular structures involved in energy production and many other body processes. They produce electrical

energy or heat depending on the needs of the body. They also produce heme to produce hemoglobin and nitric oxide, both of which help deliver oxygen to the tissues. Mitochondria can also produce free radicals, which can be involved in tissue damage and chronic inflammation.

Understanding all the different ways NO production is linked with inflammation, energy production and overall health is still being explored by researchers. However, we do know a lot about how you can improve your NO production and overall health. What follows are a few simple ways to do so.

Exercising to Enhance NO

Exercising is one of the best ways to enhance NO production. Thirty to sixty minutes a day of walking, swimming, riding a bike, lifting some weights or engaging in any other form of moderate exercise greatly increases NO levels, which helps reverse endothelial dysfunction and improve blood flow throughout the body.



Exercise helps prevent cardiovascular disease, reduces your risk of stroke, helps low blood pressure, balances blood fats and triglycerides, reduces inflammation, eases leg pain and helps you lose weight. It doesn't matter how old you are, as soon as you start a program of regular physical activity you start to see the benefits within a few weeks.

NO Helps You Say Yes to Exercise

If you struggle to exercise, you're in luck. The relationship between exercise and NO levels is reciprocal. That is to say, not only does exercise enhance NO, NO enhances the ability to exercise. Several studies have shown that increasing blood levels of nitrates, a precursor to NO production, results in greater efficiency in energy production and oxygen utilization in the muscles during exercise. The research was done using beet juice to supply the nitrates (see *Nitrates and NO* on page 3).

This means that enhancing NO can help you exercise longer and with less fatigue and get even more dramatic results than those seen with exercise alone. This is particularly important to know if you are overweight, asthmatic, diabetic, already have heart disease or any other condition that makes exercise difficult. By enhancing NO, you can jump start your exercise program.

Jumpstart NO Production with Nutrition

While exercising is critical to healthy NO production, supplementation can spark the energy to get started while both enhancing the production of NO and the health of the endothelial lining. We'll start by looking at the two pathways in the body for creating NO and the nutrients that support them.

L-Arginine and NO

The first NO pathway involves *nitric oxide synthase* (NOS) enzymes, which produce NO from the amino acid l-arginine. There are three forms of these NOS enzymes in the body.

The first is *neuronal* nitric oxide synthase (nNOS or NOS I) which is found in the brain. It aids blood flow in the brain and helps brain and nerve development. Thus, NO is essential to maintaining brain and nerve function.

The second NOS is *immune* nitric oxide synthase (iNOS or NOS II). It signals immune defenses to help the body fight infection. Thus, NO is also important for immunity and the regulation of chronic inflammation.

The final NOS enzyme is the one we've referred to previously. It's *endothelial* nitric oxide synthase (eNOS or NOS III) which produces nitric oxide to dilate arteries and enhance blood flow.

Supplementation with L-arginine helps increase nitric oxide production by all three of these enzymes. L-arginine supplements have been used to help cardiovascular disease, angina, intermittent claudication, dementia, erectile dysfunction, improve immune function and increase athletic performance. Another amino acid, L-citrulline can help to recycle L-arginine and make it more effective. The body also requires oxygen to convert arginine to NO.

Nitrates and NO

Another way the body makes NO is from nitrate (NO₃) and nitrite (NO₂). Nitrates are naturally found in many common vegetables, including lettuce, arugula, spinach, parsley, cabbage and turnips. Beets, however, are one of the best sources.



Dietary nitrates are absorbed in the stomach and intestines. They are carried through the blood stream to the salivary glands, which extract the nitrates and concentrate them in the saliva. Bacteria in the mouth convert the nitrates to nitrite, which is swallowed and converted into NO under the influence of hydrochloric acid.

Nitrites produce NO without oxygen, which means they can help enhance NO when oxygen levels are low. This is important because as we age, oxygen levels in tissues tend to fall. Oxygen levels are also low in many chronic diseases.

At one time people were concerned about the safety of nitrates because of their use as preservatives in processed meats. It turns out that natural nitrates and nitrites aren't harmful to human health, instead they are important phytonutrients.

Vitamin D3

Besides its role in promoting healthy bones and teeth, vitamin D3 is involved in immunity and cellular energy production. It is an antioxidant that helps protect the endothelial lining from damage and is also a cofactor in the activation of nitric oxide synthetase, the enzyme that produces nitric oxide. Low levels of vitamin D3 contribute to reduced levels of nitric oxide, and experts suggest that upwards of 90% of the population may be deficient in vitamin D3.



Continued on page 4

Nitric Oxide Benefits

Adequate levels of nitric oxide have many health benefits. Here is a summary of them, system by system.

Cardiovascular Benefits

- Vasodilation, improving blood flow, reducing blood pressure
- Triglyceride reduction
- Regulation of C-Reactive Protein (CRP), a pro-inflammatory compound
- Increases microvascular permeability, delivering oxygen and nutrients to cells
- Helps prevent, and possibly reverse, arterial plaque

Brain and Nerve Benefits

- Helps muscles relax, helps modulate stress
- May help reduce depression
- Aids sleep
- Aids learning and memory, may inhibit dementia

Respiratory Benefits

- Aids bronchial dilation, increasing oxygen flow into the lungs, may help ease asthma and improve lung function in COPD
- Helps with oxygen utilization, reduces altitude sickness, aids oxygen uptake during exercise

Reproductive Health Benefits

- Helps with male performance by enhancing blood flow, may be helpful for erectile dysfunction
- Aids female arousal by enhancing blood flow

Structural System Benefits

- Enhances pain medications to relieve arthritic pain, helps reduce arthritic pain directly
- Enhances exercise, reducing fatigue and increasing stamina

Other Benefits

- Increases sensitivity to insulin to manage blood sugar and reduces complications of diabetes
- May help with bladder infections, urinary incontinence and improving kidney filtration in chronic kidney disease
- Aids eye health by enhancing circulation in the eyes, may help reduce glaucoma
- May help the body fight bacterial infections, including E. coli and Staphylococcus aureus (staph), including MRSA, the antibiotic resistant form of staph

Additional Help and Information

For more information about the health benefits of enhancing nitric oxide and information about health practices and supplements that enhance nitric oxide contact the person who gave you this newsletter. You can also consult the following resources:

Rejuvenation! by Robert Buckingham, MD, FACP

The Nitric Oxide (NO) Solution by Nathan S. Byran, Ph.D. and Janet Zand, OMD

Say NO to Again: How Nitric Oxide Prolongs Life by T. Barry Levine, MD and Arlene Bradley Levine, MD

Beet the Odds by Nathan S. Bryan, Ph.D. and Carolyn Pierini, CLS, CNC

This issue of *Sunshine Sharing* is provided by:

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Continued from page 3

Magnesium



Experts suggest that magnesium deficiency may affect as high as 70% of the population. It is essential in mitochondrial energy production and therefore in the synthesis of nitric oxide in endothelial cells. Magnesium also aids muscle relaxation, in contrast with calcium which aids muscle contraction. As a result, increasing magnesium intake often

helps reduce blood pressure and increase blood flow.

Other Beneficial Vitamins

Vitamin C has a protective effect on the endothelial cells, preventing endothelial dysfunction. B vitamins, such as B1 (thiamine), B3 (niacin), B6 (pyridoxine) and B9 (folic acid) are absolutely critical to energy production within all mitochondria, including the nitric oxide producing mitochondria in the endothelial cells. **Niacin**, taken as a single is helpful for opening up blood flow.

Finally, vitamin K2, a vitamin involved in blood clotting, has been discovered to assist vitamin D3 in maintaining the health of the endothelium. It helps to mobilize calcium and keep it from depositing in the artery walls, thus preventing hardening of the arteries.

Omega-3 EFA

Omega-3 Essential Fatty Acids are important in reducing inflammatory reactions throughout the body, and the people consuming the typical modern diet do not get adequate amounts of these important nutrients. They are extremely important for reducing the risk of cardiovascular disease because they help to reduce blood triglycerides, decrease arterial inflammation and reduce the risk of thrombosis. The omega-3 fatty acid **DHA** is also important in aiding mitochondrial function.

Other Tips for Enhancing NO

In addition to exercise and supplements, it should be obvious that a diet rich in vegetables (like beets, chard, leaf lettuce and other sources of nitrate) is highly beneficial for circulation. There are also a few things one should avoid if one wants to raise NO levels and avoid endothelial dysfunction.

Say No to Sugar to Get more NO

Sugar is a major factor in damaging the endothelium. It is pro-inflammatory, highly addictive and reduces levels of NO. This is why high blood sugar is linked with all major diseases. If you have problems with blood sugar start limiting your intake of starchy and sugary foods and take a **Blood Sugar Balancing Formula** containing herbs like cinnamon, nopal, fenugreek and gymnema.

Don't Smoke

Smoking or inhaling airborne contaminants results in toxic substances being readily diffused straight into the blood stream. These irritants set up a cascade of inflammatory reactions, beginning with the damage they do to the endothelial lining, which lays the foundation for low levels of NO and cardiovascular disease.

Start Saying Yes to NO Today

If you're ready to experience all the health benefits of enhanced NO levels here's what you need to do. Start by creating a program of regular moderate exercise. Avoid eating refined carbohydrates and take supplements to balance your blood sugar. If you smoke, work on quitting.

Then, take a **Dual Pathway Nitric Oxide Enhancing Supplement** containing both l-arginine and beet root, along with l-citrilline, magnesium, and vitamins B1, B9, C and D. Also take an **Omega-3 Essential Fatty Acid Supplement** or a **Krill Oil Supplement**. You should notice improvements in energy and overall health within a couple of weeks.