

# ADVANCED ORTHOMOLECULAR RESEARCH



NOVEL MECHANISM OF RAISING NITRIC OXIDE LEVELS

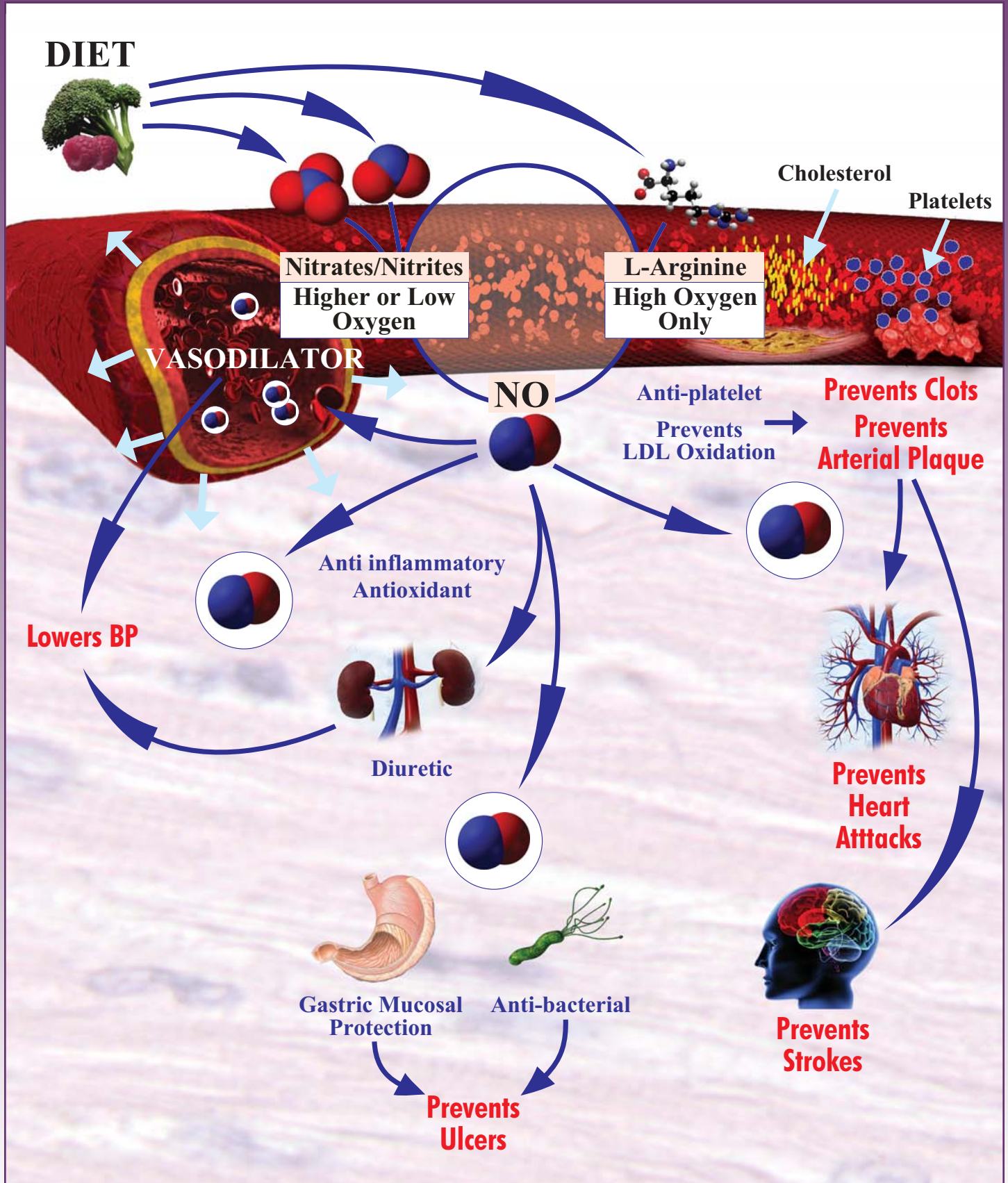
# The Power of Nitric Oxide

## What is Nitric Oxide (NO)?

Nitric Oxide is a simple molecule which exists as a gas but is extremely soluble in various bodily fluids like plasma, urine, extracellular fluid, gastric juice etc. and acts on virtually all cells in the body.

NO is considered as a signaling molecule which means that it helps communication between cells as well as maintaining proper cellular functions. Nitric oxide also has many health benefits.

# Role of Nitrates in the Body



## What health benefits does Nitric Oxide provide?

- Helps cells to communicate with each other
- Helps maintain proper function of the cell
- Powerful antioxidant
- Powerful vasodilator thereby lowering blood pressure
- Maintains proper functioning of the cells that line blood vessels preventing plaque formation
- Inhibits inflammation
- Protects the stomach lining by increasing mucus secretion thereby preventing stomach ulcers
- Inhibits growth of various bacteria like pseudomonas (bacteria found in cystic fibrosis patients), clostridium botulinum (food poisoning), Salmonella, H pylori (bacteria that causes stomach ulcers), E coli (that causes UTI's- urinary tract infections) etc.
- Prevents platelets from sticking together preventing blood clots and strokes
- Prevents aneurysm hemorrhage
- Prevents angina and myocardial infarction
- Diuretic effect which also helps to reduce blood pressure
- Beneficial for conditions where oxygen is limited e.g. sickle cell disease, asthma, emphysema, high altitude training, upper respiratory chest infections
- Improves sports endurance



## How is NO generated in the body?

There are two ways that NO is produced in our body.

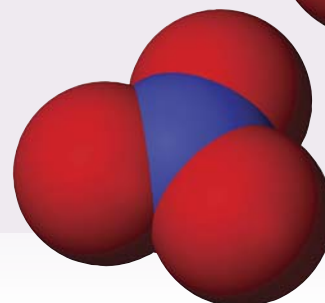
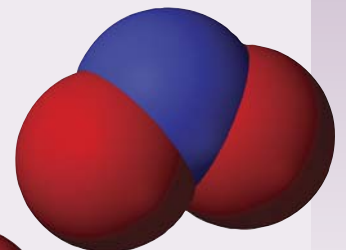
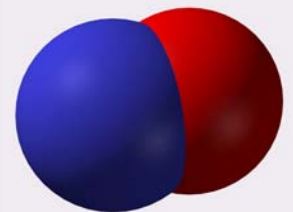
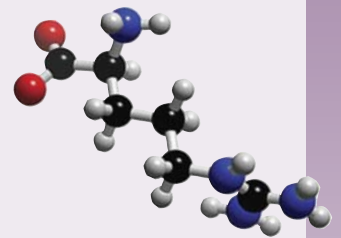
1. NO is generated by converting the amino acid L-Arginine into NO by the action of a family of enzymes called NOS (nitric oxide synthases). Unfortunately, high doses of L-Arginine are required and plenty of oxygen and energy is needed otherwise this conversion becomes slow and inefficient.

Until recently this was the only identified mechanism to produce NO in the human body. But recently another mechanism has been discovered.

2. NO can be made from components found in certain vegetables called nitrates that get converted quickly into NO in the stomach. This action is much faster and does not require enzymes. Also, only small quantities of nitrates are required and most importantly, this process takes place very effectively under high oxygen conditions but also when low oxygen levels are present. This offers an additional source of NO and can augment the L-Arginine pathway.

## How and where does NO work?

NO acts on virtually all cells of the body. Unfortunately, NO has a very, very short half life (milliseconds, or thousandths of a second!) and there is continuous demand for the molecule. NO itself cannot be provided as a supplement because it is highly unstable. NO has to be supplied as a precursor or a molecule that gets converted into NO. The most effective precursors for nitric oxide production are nitrates. The conversion of Nitrates into Nitric oxide is called the NOx 3,2,1 pathway where Nitrates from food are converted to Nitrites and then into Nitric Oxide. Nitrates therefore act as a storage form or a reservoir for NO generation.





Recent research has shown that consumption of certain vegetables can increase blood levels of NO rapidly and many of the above benefits become apparent when high levels of NO are achieved. The latest research reports that when humans consume a plate of spinach, kale, or beet root juice their blood pressure drops remarkably. They attributed this effect to nitrates being converted into NO. Additional research also showed that patients given potassium nitrate showed high blood levels of NO in their blood. This led to protective effects on the stomach lining due to increased mucus production (which protects the stomach lining) and by the inhibition of the bacterium *H. pylori* that is now linked to stomach ulcers and certain forms of gastric cancers.

Two recent studies have shown that consumption of high levels of nitrates results in high blood levels of NO and that cyclists performing strenuous exercise were able to reduce their oxygen requirements by around 20%. This is quite staggering!

### What does this mean for athletes?

Research in cyclists suggests that generation of NO via consumption of nitrates has an oxygen sparing effect which is very beneficial for athletes. Moreover, the lactate levels were reduced suggesting that endurance was increased. But how is oxygen spared? As mentioned earlier NO generation via L-Arginine pathway requires the action of a family of enzymes related to the production of Nitric Oxide and plenty of oxygen. All this requires the body to spend a lot of energy to generate NO which is costly especially when oxygen levels drop. The Nitrate-NO pathway on the other hand does not require the action of these enzymes, nor does it require oxygen. All this means that less energy is required by the body to generate NO from nitrates. This discovery offers significant advantages to any serious athlete. Besides applications in sports, NO could also play an important role where oxygen levels are seriously reduced e.g. people living in high altitudes, chest infections or where not enough blood (and therefore oxygen) is being delivered to tissues like the heart, kidneys, brain etc.



### Are there any toxicity concerns?

Nitrates and their reduced products have been consumed for thousands of years. For the last fifty years nitrates have been the subject of serious propaganda and regulatory restrictions. There have been suggestions that intake of these ingredients can cause cancers due to the link between cured meats and cancer. Yet population studies and various toxicological studies show that nitrates are important nutrients with significant health benefits of which we are being deprived. In fact various researchers suggest that nitrates are probably responsible for the health benefits associated with various fruits and vegetables and the so called "Mediterranean Diet". In addition various vegetables are rich sources of nitrates and an intake of a plate of salad or a glass of beetroot juice offers many times the nitrate level that the regulatory bodies have set as an upper limit.

In light of this discovery AOR offers the world's first series of supplements that incorporate the NOx 3,2,1 technology.

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