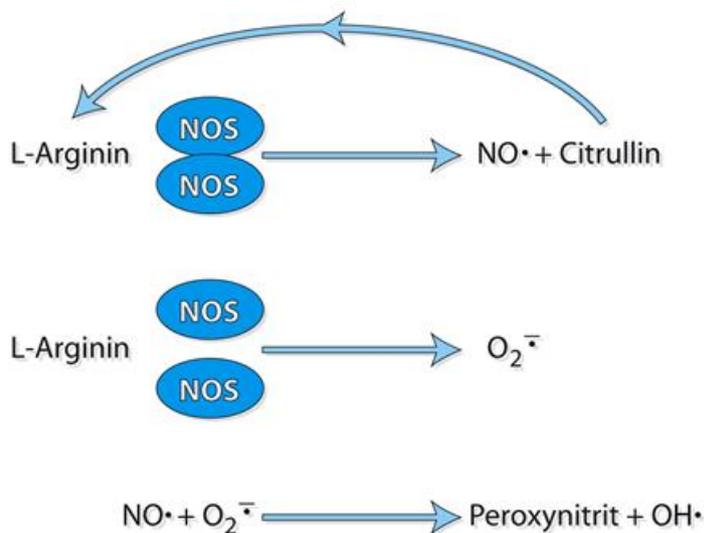


## NITRATE-RICH SOURCES IMPORTANT FOR SEXUAL AND ERECTILE FUNCTION. BACKGROUND INFORMATION.

November 27<sup>th</sup> 1980, Robert F. Furchgott published a study about the discovery of a new factor called EDRF (Endothelial Derived Relaxing Factor), produced in blood vessels (1). He showed that this substance regulates the blood flow in the body. This was the start of one of the most crucial research areas in medicine. In 1986 EDRF was demonstrated to be nitric oxide (NO), a very small gaseous substance. In 1987 it was shown that the amino acid L-arginine was a main source of NO. 1998 Robert Furchgott, Ferid Murad, and Louis Ignarro received the Nobel prize in Physiology or Medicine for this discovery. This Nobel prize is still considered as one of the most important in medical history.

Louis Ignarro contributed to the prize by demonstrating that NO was the principal factor behind sexual arousal and erection. This started two areas of research. 1. Giving L-arginine to increase sexual function. 2. Inhibiting the degradation of one substance, cyclic GMP (cGMP) produced by NO, to increase the erection. This second area led to the discovery of several so called PDE-5-inhibitors such as Viagra (sildenafil), Cialis (tadalafil), and Levitra (vardenafil). These are synthetic and rather expensive drugs.

The formation of NO from L-arginine is shown in figure 1.



**Figure 1. Formation of NO from L-arginine.**

The conversion of L-arginine to NO is regulated by the enzyme NO-synthase (NOS). This is a complex of two identical parts of the NOS-monomer. Only if these two monomers are connected, there will be formation of NO and one molecule of the amino acid L-citrullin. L-citrullin is converted in two steps back to L-arginine. If the two parts of the enzyme NOS-synthase are disconnected, called uncoupling, the free radical superoxide (O<sub>2</sub><sup>•-</sup>), but no NO, is produced.



This formation is increased by some factors in the body in collaboration with ingested antioxidants (polyphenols and vitamin C). One especially effective type of polyphenol is antioxidants from lingonberry juice (5). The produced NO in the body is first transformed to nitrite and then to nitrate. The nitrate is highly accumulated in the salivary glands. In the mouth, the nitrate in the saliva, is by microorganisms in the mouth, transformed to nitrite, which is swallowed. After it is taken up in the blood NO is again produced.

In contrast to the formation of NO from L-arginine, when NO is formed from nitrate and nitrite in the food and juices, the formation becomes better and better with age, and it is not affected by the above mentioned NOS-uncoupling.

The discovery that nitrate and nitrite in food and juices are very important sources of NO is very recent. It is wellknown that the Mediterranean food is very protective against many diseases. Today the investigators mean that their nitrate and nitrite content is the most important explanation. Especially world leading experts at the Karolinska Institute, Stockholm, such as professors Jon Lundberg and Eddie Weitzberg, have done a lot of research in this area (3, 4).

Nitrate, for instance from beet juice, has in recent years been shown have many positive effects on blood circulation, blood vessel stiffness, blood pressure, mitochondrial function, physical activity, maximal oxygen consumption, muscle strength, chronic tiredness etc. (2, 3, 4, 6).

Retrospectively, it is known that peroral administration of the heart drug Nitroglycerin improves erection. Local application of nitroglycerin on the penis also increases erection. Due to the very recent discovery of nitrate and nitrite as very important sources of NO, no studies on their sexual effects have yet been published, but are certainly under way (6). Nitrate for better erection and sexual desire have the potential of becoming a new effective agent for improving erection. This is reinforced by berry antioxidants, such as lingonberry juice. From many of my patients with poor blood circulation, I have had many reports of improved erection, in conjunction with better blood circulation, measured with so called Arteriography after having a mixture of beet and lingonberry juices. In a coming book this autumn in Swedish, called "Nitric oxide for good and evil. The great importance of nitrate, amino acids and berry antioxidants" there will be a section about nitrate and nitric oxide in sexual function and erection.

One year ago, I contacted a few professionals to discuss my experience with beetroot juice and lingonberry juice. They have now developed a new company called Wellnox which produces a series of high quality products with various blends of beetroot juice and lingonberry juice ([wellnox.se](http://wellnox.se)).



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