Nitric oxide

From Wikipedia, the free encyclopedia

Nitric oxide is a chemical compound with chemical formula NO. This gas is an important signaling molecule in the body of mammals including humans and is an extremely important intermediate in the chemical industry. It is also a toxic air pollutant produced by automobile engines and power plants.

The nitric oxide molecule is a free radical, which is relevant to understanding its high reactivity. It reacts with the oxygen in air to form nitrogen dioxide, signalled by the appearance of the reddish-brown color.

Biological functions

NO is one of the few gaseous signaling molecules known. It is a key biological messenger, playing a role in a variety of biological processes. **Nitric oxide, known as the 'endothelium-derived relaxing factor', or 'EDRF', is biosynthesised from arginine and oxygen by various nitric oxide synthase (NOS) enzymes and by reduction of inorganic nitrate. The endothelium (inner lining) of blood vessels use nitric oxide to signal the surrounding smooth muscle to relax, thus dilating the artery and increasing blood flow.** The production of nitric oxide is elevated in populations living at high-altitudes, which helps these people avoid hypoxia. Effects include blood vessel dilatation, neurotransmission, modulation of the hair cycle, and penile erections. Nitroglycerin and amyl nitrite serve as vasodilators because they are converted to nitric oxide in the body. Sildenafil, popularly known by the trade name Viagra, stimulates erections primarily by enhancing signalling throught the nitric oxide pathway in the penis.

Nitric oxide is also generated by macrophages and neutrophils as part of the human immune response. Nitric oxide is toxic to bacteria and other human pathogens. In response, however, many bacterial pathogens have evolved mechanisms for nitric oxide resistance.[2]

Nitric oxide can contribute to reperfusion injury when excessive amount produced during reperfusion (following a period of ischemia) reacts with superoxide to produce the damaging free radical peroxynitrite. In contrast, inhaled nitric oxide has been shown to help survival and recovery from paraquat poisoning, which produces lung tissue damaging superoxide and hinders NOS metabolism.

In plants, nitric oxide can be produced by any of four routes: (i) nitric oxide synthase (as in animals), (ii) by plasma membrane-bound nitrate reductase, (iii) by mitochondrial electron transport chain, or (iv) by non-enzymatic reactions. It is a signaling molecule, acts mainly against oxidative stress and also plays a role in plant pathogen interactions. Treating cut flowers and other plants with nitric oxide has been shown to lengthen the time before wilting.[3]

A biologically important reaction of nitric oxide is S-nitrosylation, the conversion of thiol groups, including cysteine residues in proteins, to form S-nitrosothiols (RSNOs). S-Nitrosylation is a mechanism for dynamic, post-translational regulation of most or all major classes of protein.

Everyone REQUIRES nitric oxide to carry out key physiological processes within the body.