Nitric Oxide and the Cardiovascular System

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Nitric oxide is produced by cells as a signaling molecule that can influence a variety of physiological responses. In the cardiovascular system, nitric oxide plays a central role in regulating blood flow and blood pressure by relaxing vascular smooth muscle. It is also involved in various other processes, including neurotransmission, immune function, and vascular development.

Nitric oxide is produced through the conversion of L-arginine to L-citrulline by nitric oxide synthase (NOS) enzymes. There are three types of NOS: neuronal, endothelial, and inducible. Each type of NOS is involved in different physiological processes.

Nitric oxide is a free radical and is rapidly inactivated by several mechanisms, including oxidation to nitrate, dimerization, and conversion to nitric oxide messenger (NOM) and nitroso compounds (NOX). These inactivation processes can affect the bioavailability of nitric oxide in the cardiovascular system.

Nitric oxide has several important functions in the cardiovascular system, including vasodilation, regulation of blood flow, and control of blood pressure. It also plays a role in the regulation of the immune system and in angiogenesis.

Nitric oxide synthase (NOS) is expressed in many tissues, including the cardiovascular system, nervous system, and immune system. NOS has three isoforms: neuronal NOS (nNOS), inducible NOS (iNOS), and endothelial NOS (eNOS). Each isoform has different regulatory mechanisms and targets.

Nitric oxide is rapidly degraded in the body, mainly by nitric oxide synthase inhibitors or by exposure to oxygen. This rapid degradation limits the bioavailability of nitric oxide in the cardiovascular system, making it a challenge to maintain adequate levels of nitric oxide for optimal cardiovascular function.

The study of nitric oxide and its role in the cardiovascular system has led to significant advances in the field of cardiovascular medicine. The discovery of nitric oxide and its functions has been recognized with several Nobel Prizes, including the Nobel Prize in Physiology or Medicine in 1998.

In conclusion, nitric oxide is a crucial signaling molecule involved in various physiological processes, including cardiovascular function. Understanding the regulation and metabolism of nitric oxide is essential for developing effective strategies to maintain optimal cardiovascular function.

Further reading: