

Nitric Oxide Physiology and Pharmacology

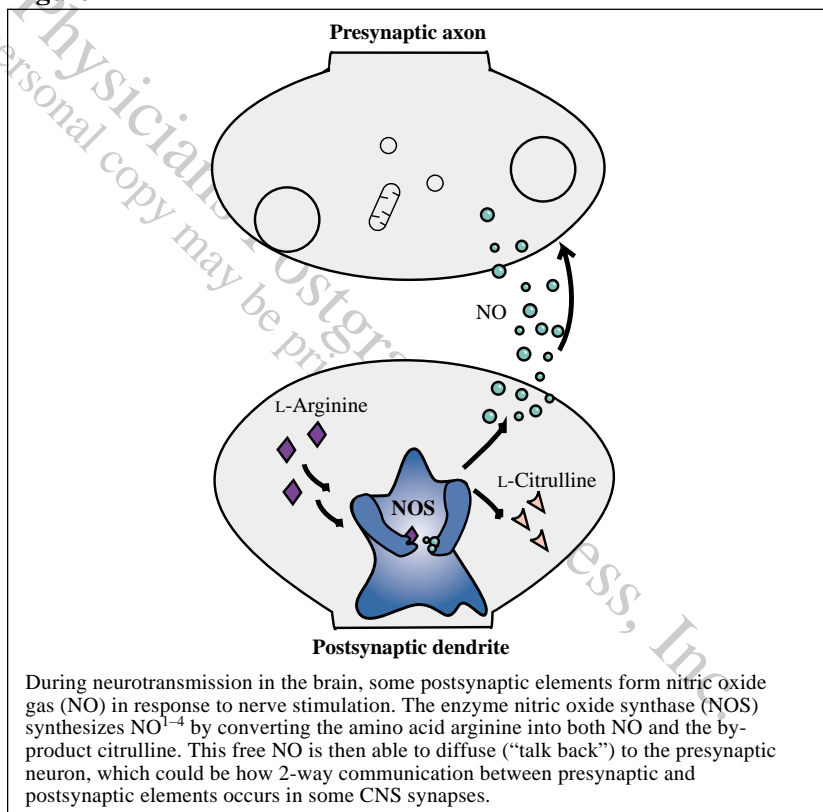
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Issue: Nitric oxide gas (NO) is an unconventional neurotransmitter that is synthesized upon demand. In the brain, it may allow postsynaptic elements to talk back to presynaptic neurons. In peripheral tissues it mediates smooth muscle relaxation. Various pharmacologic agents can enhance or reduce the actions of NO.

Take-Home Points

- ◆ Certain cells possess the enzyme nitric oxide synthase (NOS), which forms NO from the amino acid arginine
- ◆ NO is synthesized upon demand and then diffuses to receptor sites within the enzyme guanylyl cyclase to cause this enzyme to synthesize cyclic GMP
- ◆ cGMP mediates physiologic changes in the cells where it is formed. For example, in the penis it relaxes smooth muscle and produces a physiologic erection
- ◆ The pharmacology of NO includes drugs that can reduce nitric oxide synthesis (serotonin selective reuptake inhibitors), enhance nitric oxide synthesis (dopamine agonists such as apomorphine), and reduce cGMP destruction (sildenafil)

Figure 1



During neurotransmission in the brain, some postsynaptic elements form nitric oxide gas (NO) in response to nerve stimulation. The enzyme nitric oxide synthase (NOS) synthesizes NO¹⁻⁴ by converting the amino acid arginine into both NO and the by-product citrulline. This free NO is then able to diffuse ("talk back") to the presynaptic neuron, which could be how 2-way communication between presynaptic and postsynaptic elements occurs in some CNS synapses.

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Figure 2

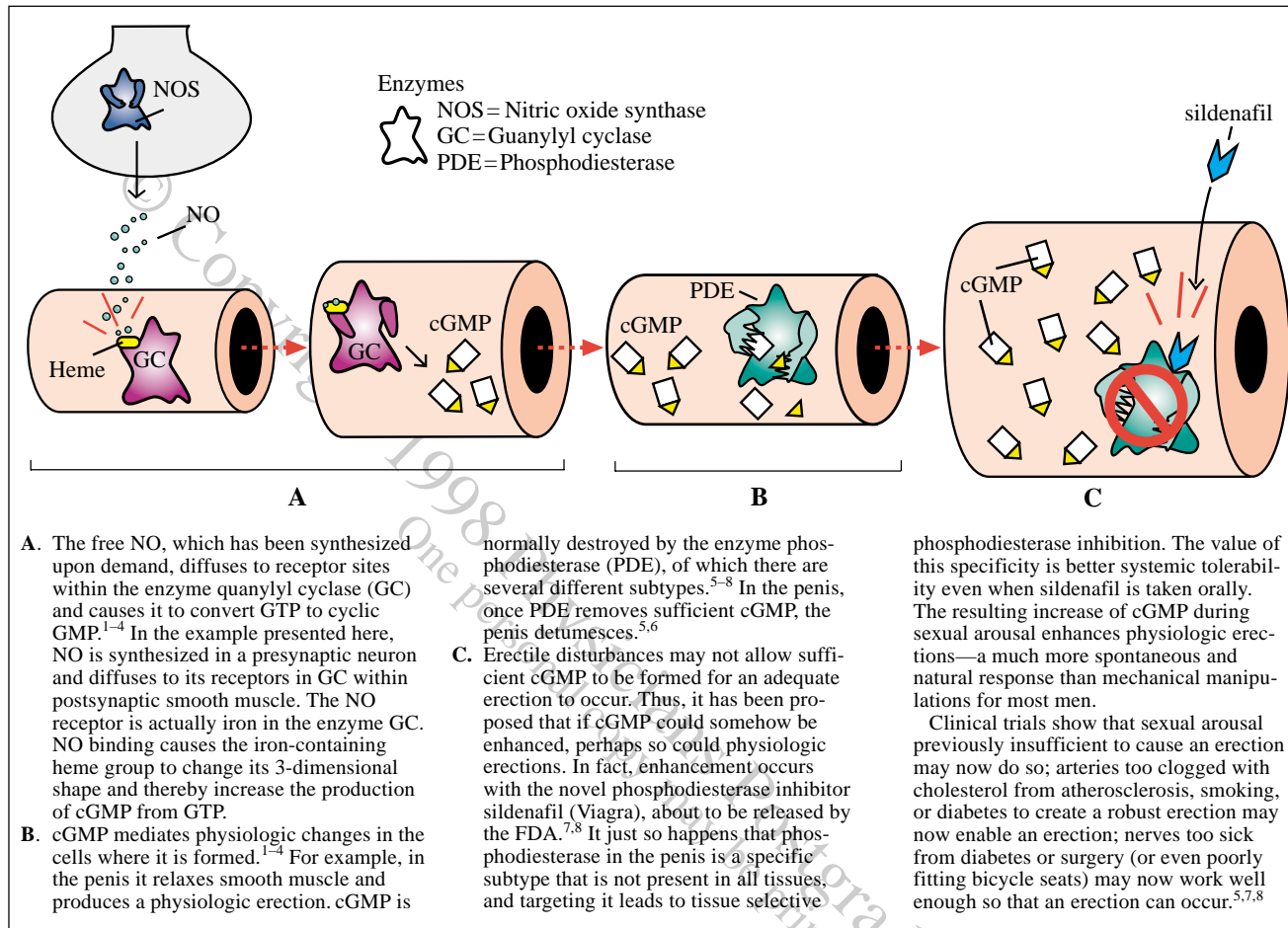
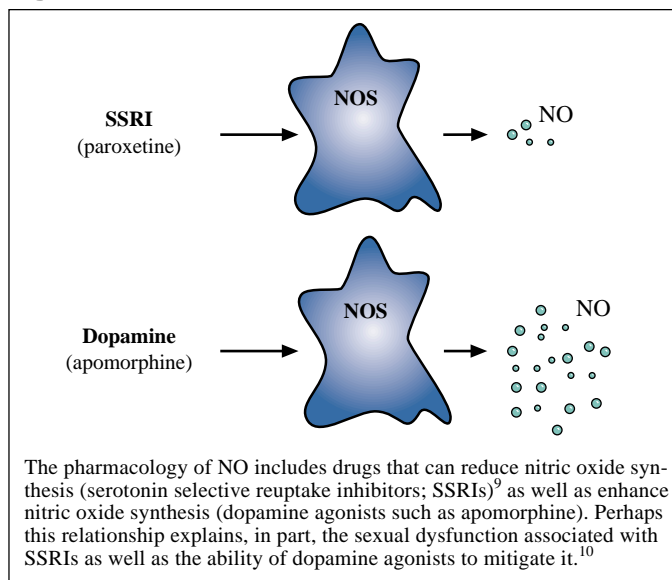


Figure 3



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