



Review

Hydrogen sulfide (H₂S) – the third gas of interest for pharmacologists

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Abstract:

Nitric oxide (NO) and carbon monoxide (CO) synthesized from L-arginine by NO synthase and from heme by heme oxygenase, respectively, are the well-known neurotransmitters and are also involved in the regulation of vascular tone. Recent studies suggest that hydrogen sulfide (H₂S) is the third gaseous mediator in mammals. H₂S is synthesized from L-cysteine by either cystathionine β-synthase (CBS) or cystathionine γ-lyase (CSE), both using pyridoxal 5'-phosphate (vitamin B₆) as a cofactor. H₂S stimulates ATP-sensitive potassium channels (K_{ATP}) in the vascular smooth muscle cells, neurons, cardiomyocytes and pancreatic β-cells. In addition, H₂S may react with reactive oxygen and/or nitrogen species limiting their toxic effects but also, attenuating their physiological functions, like nitric oxide does. In contrast to NO and CO, H₂S does not stimulate soluble guanylate cyclase. H₂S is involved in the regulation of vascular tone, myocardial contractility, neurotransmission, and insulin secretion. H₂S deficiency was observed in various animal models of arterial and pulmonary hypertension, Alzheimer's disease, gastric mucosal injury and liver cirrhosis. Exogenous H₂S ameliorates myocardial dysfunction associated with the ischemia/reperfusion injury and reduces the damage of gastric mucosa induced by anti-inflammatory drugs. On the other hand, excessive production of H₂S may contribute to the pathogenesis of inflammatory diseases, septic shock, cerebral stroke and mental retardation in patients with Down syndrome, and reduction of its production may be of potential therapeutic value in these states.

Key words:

hydrogen sulfide, arterial hypertension, atherosclerosis, homocysteine, septic shock, inflammation, diabetes mellitus
