# Production of hydrogen sulfide in mammalian cells

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Hydrogen sulfide ($H_2S$) has been recognized as a signaling molecule as well as a cytoprotectant. $H_2S$ modulates synaptic activity by enhancing the activity of *N*-methyl-D-aspartate receptors in neurons and by activating astrocytes that surround the synapse. It protects neurons from oxidative stress by recovering glutathione levels, scavenging ROS and suppressing intracellular $Ca^{2+}$ concentrations. $H_2S$ is known to be produced from L-cysteine by two pyridoxal 5'-phophate (PLP)-dependent enzymes, cystathionine beta-synthase (CBS) and cystathionine gamma-lyase (CSE). Recently, 3-mercaptopyruvate sulfurtransferase (3MST) has emerged as the third $H_2S$-producing enzyme. 3MST produces $H_2S$ from 3-mercaptopyruvate (3MP), an achiral keto acid, which is generated by PLP-dependent cysteine aminotransferase (CAT) from L-cysteine and alpha-ketoglutarate. In addition to these enzymes, we found an additional pathway to produce $H_2S$ from D-cysteine. D-Cysteine is metabolized by D-amino acid oxidase (DAO) to 3MP, which is a substrate for 3MST. Unlike the L-cysteine pathway, this D-cysteine pathway operates predominantly in the cerebellum and the kidney. The activity to produce $H_2S$ from D-cysteine is greater than that from L-cysteine. Exploring sources of D-cysteine may lead to a new insight into the physiological role of $H_2S$.