Sodium hydrogen sulfide upregulates cystathionine -synthase and protects striatum against 3-Nitropropionic acid-induced neurotoxicity in rats

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Abstract

Objectives: Hydrogen sulfide (H2S) is a neuromodulator that plays a protective role in multiple neurodegenerative diseases including Alzheimer's (AD) and Parkinson's (PD). However, the precise mechanisms underlying its effects against Huntington's disease (HD) are still questioned.This study aimed to examine the neuroprotective effects of sodium hydrogen sulfide (NaHS; H2S donor) against 3-nitropropionic acid (3NP)-induced HD like pathology in rats. Methods: Male Wistar rats were randomly allocated into four groups; (1) normal control receiving saline; (2) NaHS control receiving (0.5 mg/kg/day, i.p.) for 14 days; (3,4) receiving 3NP (10 mg/kg/day, i.p.) for 14 days, with NaHS 30 min later in group 4. Key findings: NaHS improved cognitive and locomotor deficits induced by 3NP as confirmed by the striatal histopathological findings. These former events were biochemically supported by the increment in cystathionine ß-synthase (CBS) gene expression, reduction of glutamate (Glu), dopamine (DA), malondialdehyde (MDA), tumour necrosis factor-alpha (TNF-Ŭ), cytochrome-c, cleaved caspase-3 and pc-FOS indicating antioxidant, anti-inflammatory as well as anti-apoptotic effects. Furthermore, NaHS pretreatment improved cholinergic dysfunction and increased brain-derived neurotropic factor (BDNF) and nuclear factor erythroid-2-related factor 2 (Nrf2). Conclusions: These findings suggest that appropriate protection with H2S donors might represent a novel approach to slow down HD-like symptoms. Keywords: 3-nitropropionic acid; Huntingtonôs disease; brain-derived neurotrophic factor; cystathionine-ß-synthase; dopamine; sodium hydrogen sulfide.

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