

Poster

Characterize the role of Hydrogen Sulfide (H₂S) in the brain



Aida Estefanía Rosa Benítez^{1,2}, Alejandro Sola-García¹, María Ángeles Cáliz-Molina¹, Alejandro Martín-Montalvo¹, Isabel Espadas*¹

1) Department of Cell Therapy and Regeneration, Andalusian Center for Molecular Biology and Regenerative Medicine-CABIMER.

(2) Junta de Andalucía-University of Pablo de Olavide-University of Seville-CSIC, Seville, Spain.

Tutor académico: Víctor Alvarez Tallada

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ABSTRACT

Motivation:

The deregulation of H₂S levels in the brain seems to be involved in the origin of several neurodegenerative diseases [1]. However, its precise functions as a gasotransmitter in the central nervous system remains unknown. For this reason, the main objective of this study is to characterize the role of hydrogen sulfide (H₂S) as a key element in neurotransmission supporting synaptic plasticity processes in the brain.

Methods: We used both, in vitro (primary neuronal cultures) and in vivo (mouse brain tissue) to characterize the synthesis of H₂S in the brain by immunofluorescence using the specific antibody for the enzyme cystathionine gamma-lyase (CTH).

Results:

CTH enzyme has been detected for the first time in primary cortical neuronal cultures and confirmed by immunofluorescence in adult males and females mice cortex. In addition, we also observe a specific pattern of expression in striatum, substantia nigra and hippocampus. Surprisingly, we identified a specific expression in the mossy fiber pathway. Their unmyelinated axons projecting from granulos cells in the dentate gyrus that terminate in mossy hilar modulator cells and in Cornu Ammonis area 3 (CA3), a region involved in encoding short-term memory [2].

Conclusions:

The presence of H₂S-producing enzyme CTH in CA3 and Hilus in the hippocampus suggest that H₂S has a critical role in memory consolidation. Understanding the regulation of the H₂S production and the specific stimuli that induce their release will provide new insights into the biology of H₂S and the development of novel therapies for neurodegenerative diseases [3].

REFERENCES

1. Shefa U, Kim D, Kim MS, Jeong NY, Jung J. Roles of Gasotransmitters in Synaptic Plasticity and Neuropsychiatric Conditions. *Neural Plast.* 2018 May 6;2018:1824713. doi: 10.1155/2018/1824713. PMID: 29853837; PMCID: PMC5960547.
2. Kesner R. P. (2013). A process analysis of the CA3 subregion of the hippocampus. *Frontiers in cellular neuroscience*, 7, 78. <https://doi.org/10.3389/fncel.2013.00078>.
3. Kimura H. The physiological role of hydrogen sulfide and beyond. *Nitric Oxide.* 2014 Sep 15;41:4-10. doi: 10.1016/j.niox.2014.01.002. Epub 2014 Feb 1. PMID: 24491257.