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PII: S0024-3205(17)30587-8
DOI: doi:10.1016/j.lfs.2017.11.010
Reference: LFS 15422

To appear in: *Life Sciences*

Received date: 11 July 2017
Revised date: 25 October 2017
Accepted date: 7 November 2017

Please cite this article as: Wei Wang , Optogenetic manipulation of ENS - The brain in the gut. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Lfs(2017), doi:10.1016/j.lfs.2017.11.010

Optogenetic manipulation of ENS -- the brain in the Gut

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Abstract:

Optogenetics has emerged as an important tool in neuroscience, especially in central nervous system research. It allows for the study of the brain's highly complex network with high temporal and spatial resolution. The enteric nervous system (ENS), the brain in the gut, plays critical roles for life. Although advanced progress has been made, the neural circuits of the ENS remain only partly understood because the appropriate research tools are lacking. In this review, I highlight the potential application of optogenetics in ENS research. Firstly, I describe the development of optogenetics with focusing on its three main components. I discuss the applications *in vitro* and *in vivo*, and summarize current findings in the ENS research field obtained by optogenetics. Finally, the challenges for the application of optogenetics to the ENS research will be discussed.

Keywords: Enteric neurons; Gut; Gastrointestinal tract; Optogenetics; ChR2