

Zinc enhances hippocampal long-term potentiation at CA1 synapses through NR2B containing NMDA receptors

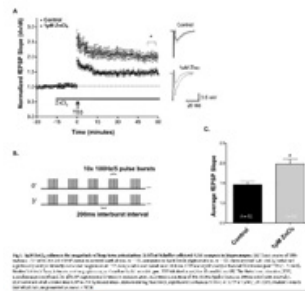
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Abstract

The role of zinc (Zn²⁺), a modulator of N-methyl-D-aspartate (NMDA) receptors, in regulating long-term synaptic plasticity at hippocampal CA1 synapses is poorly understood. The effects of exogenous application of Zn²⁺ and of chelation of endogenous Zn²⁺ were examined on long-term potentiation (LTP) of stimulus-evoked synaptic transmission at Schaffer collateral (SCH) synapses in field CA1 of mouse hippocampal slices using whole-cell patch clamp and field recordings. Low micromolar concentrations of exogenous Zn²⁺ enhanced the induction of LTP, and this effect required activation of NMDA receptors containing NR2B subunits. Zn²⁺ elicited a selective increase in NMDA/NR2B fEPSPs, and removal of endogenous Zn²⁺ with high-affinity Zn²⁺ chelators robustly reduced the magnitude of stimulus-evoked LTP. Taken together, our data show that Zn²⁺ at physiological concentrations enhances activation of NMDA receptors containing NR2B subunits, and that this effect enhances the magnitude of LTP.



Biography

Sullivan is an Assistant Professor at Touro College Physician Program in New York. He received a Medical degree with a focus in neurology and a Doctor of Philosophy degree for work in neurophysiology at New York Medical College. He is currently teaching medical, PT and PA students in neurology, cardiology and physiology. His research interests include treatments for chronic traumatic encephalopathy, patient compliance, and metal dysregulation.

Publication

- Sullivan JA, Zhang X-I, Sullivan AP, Vose LR, Moghadam AA, Fried VA, Stanton PK (2018). Zinc enhances hippocampal long-term potentiation at CA1 synapses through NR2B containing NMDA receptors. *PLoS ONE* 13(11): e0205907.
- Sullivan, AP, Sullivan GW, Sullivan JA, Kent, A (2017). Increasing University Enrollment in Times of Declining Demand: Industrial Organization Program Exemplar. *International Journal of Business and Social Science*, 8(5).
- Sullivan AP, Sullivan NT, Sullivan JA. (2016). Depression and anxiety in the elderly: Translating clinical methods for use by nonprofessionals. *International Journal of Business and Social Science*, Vol. 7.
- Goldstein LE, Fisher AM, Tagge CA, Zhang XL, Velisek L, Sullivan JA, Upreti C, Kracht JM, Ericsson M, Wojnarowicz MW, Goletiani CJ, Maglake-lidze GM, Casey N, Moncaster JA, Minaeva O, Moir RD, Nowinski CJ, Stern RA, Cantu RC, Geiling J, Blusztajn JK, Wolozin BL, Ikezu T, Stein TD, Budson AE, Kowall NW, Chargin D, Sharon A, Saman S, Hall GF, Moss WC, Cleveland RO, Tanzi RE, Stanton PK, McKee AC (2012). Chronic Traumatic Encephalopathy in Blast Exposed Military Veterans and a Blast Neurotrauma Mouse Model. *Science Translational Medicine*, 4:1-16.
- Zhang XL, Sullivan JA, Moskal JR, and Stanton PK (2008). An NMDA receptor glycine site partial agonist, GLYX13, that simultaneously enhances LTP and depresses LTD at Schaffer collateral CA1 synapses in hippocampus. *Neuropharmacology*, 55:1238-1250.