

7th International Conference on

PHARMACEUTICS & ADVANCED DRUG DELIVERY SYSTEMS

March 27-28, 2023 | London, UK

Received date: 23-12-2022 | Accepted date: 26-12-2022 | Published date: 03-04-2023

Activity-dependent structural plasticity of perisynaptic astrocytic domains promotes excitatory synapse stability

Tabinda Hassan

Princess Nourah University, Saudi Arabia

Excitatory synapses in the CNS are highly dynamic structures that can show activity-dependent remodeling and stabilization in response to learning and memory. Synapses are enveloped with intricate processes of astrocytes known as perisynaptic astrocytic processes (PAPs). PAPs are motile structures displaying rapid actin-dependent movements and are characterized by Ca²⁺ elevations in response to neuronal activity. Despite a debated implication in synaptic plasticity, the role of both Ca²⁺ events in astrocytes and PAP morphological dynamics remain unclear.

Results In the hippocampus, we found that PAPs show extensive structural plasticity that is regulated by synaptic activity through astrocytic metabotropic glutamate receptors and intracellular calcium signaling. Synaptic activation that induces long-term potentiation caused a transient PAP motility increase leading to an enhanced astrocytic coverage of the synapse. Selective activation of calcium signals in individual PAPs using exogenous metabotropic receptor expression and two-photon uncaging reproduced these effects and enhanced spine stability. *In vivo* imaging in the somatosensory cortex of adult mice revealed that increased neuronal activity through whisker stimulation similarly elevates PAP movement. This *in vivo* PAP motility correlated with spine coverage and was predictive of spine stability.

Conclusions This study identifies a novel bidirectional interaction between synapses and astrocytes, in which synaptic activity and synaptic potentiation regulate PAP structural plasticity, which in turn determines the fate of the synapse. This mechanism may represent an important contribution of astrocytes to learning and memory processes.

Recent Publications

1. Is dissection humane, T hasan, Journal of medical Ethics and history of medicine 4 (4)66* 2011
2. Assessing the learning environment at Jazan medical school of Saudi Arabia T Hasan, P Gupta, Medical teacher 35 (sup1), S90-S96 55 2013
3. Characteristics of the mental foramen in different populations, T Hasan The Internet Journal of Biological Anthropology 4 (2), 1-7 50 2011

Biography

Tabinda Hasan has completed his/her PhD at the age of 35 years from Subharti University, India. She is the director/professor of PRINCESS NOURAH University, KAA. He/She has over 45 publications that have been cited over 200 times, and his/her publication H-index is 17 and has been serving as an editorial board member of reputed Journals.

e: drtabindahasan@gmail.com