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Germany, Japan researchers reveal neuron behavior

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Singapore: An international team of researchers at German Center for Neurodegenerative Diseases (DZNE) and Tokyo Institute of Technology (Tokyo Tech) have revealed in a collaborative study that neurons change on the molecular level when they are exposed to prolonged light.

The innate neuronal property might be utilized to protect neurons from degeneration or cell death in the future.

Changes in the functional connections between neurons - 'synapses' - contribute to the ability to adapt to environmental changes. However until now, little was known about the signalling underlying such 'synaptic plasticity'.

Recent studies have suggested that changes in a region at the presynaptic membrane, described as the active zone, control synapse function. T-shaped structures at the presynaptic membrane tether synaptic vesicles and control the release of neurotransmitters to the postsynaptic neuron. By tagging proteins that are crucial to these T-shaped structures the researchers revealed a drop in a subset of active zone proteins, while others remained unchanged. Further, they found that corresponding to the loss of structural proteins, the number of T-shaped structures was also reduced.

The researchers were also able to identify that a feedback mechanism was responsible for these changes and that it relied on the signalling protein Wnt. The results contribute to a better understanding of the molecular mechanisms underlying brain functions such as learning and memory. Future work may investigate how modifying the Wnt signal can be used to manipulate synaptic plasticity, with possible therapeutic applications for neurodegenerative or mental diseases.

"This synaptic change might reflect an innate neuronal property that leads to protection from excessive stimuli," explains Dr Atsushi Sugie, study's lead author. "By enhancing this property, we might be able to protect neurons from degeneration or cell death."