One step closer to finding a cure for brain diseases

16 July 2018

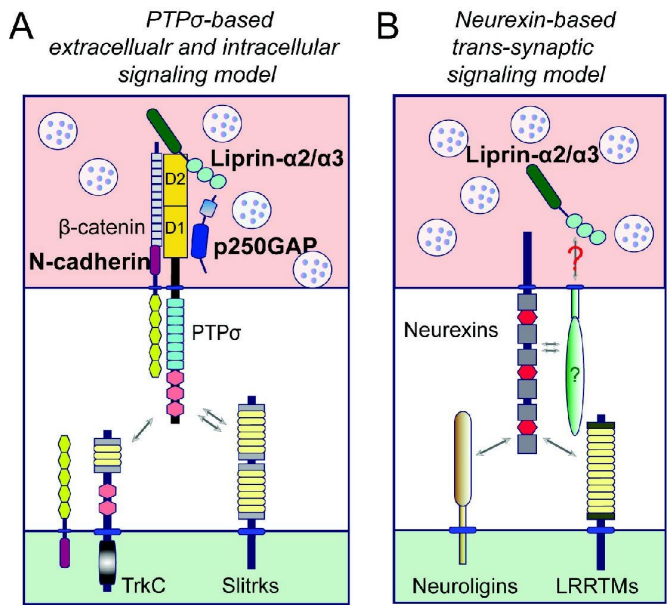

Fig 1. Molecular model of PTP? signaling pathways in heterologous synapse formation.A) PTP? triggers excitatory heterologous synapse formation through a combination of extracellular and intracellular signaling components. The PTP? D2 domain binds intracellular adaptor proteins (e.g., liprin-?) and substrates (e.g., p250RhoGAP and N-cadherin) to recruit the vesicular machinery for excitatory synapse development. This signal transduction model differs from that of neurexin.B) Neurexins serve as anchor proteins that transduce postsynaptic signals from various ligands (e.g., neuroligins and leucine-rich repeat transmembrane proteins) and transfer them to adjacent, but as yet unidentified, coreceptor protein(s) to mediate the signal transduction cascades necessary for full heterologous synapse formation activity. Credit: Daegu Gyeongbuk Institute of Science and Technology (DGIST)

A research team led by Professor Jaewon Ko and Ji Won Um from Department of Brain and Cognitive Sciences identified a new principle of formation of brain synapses through synaptic binding protein complexes.

Many nerve cells that make up the brain control the function of the brain through synapses. Although recent studies show that synaptic binding proteins play a certain role in the formation of synapses, detailed factors or processes for collectively controlling the synapses remain unknown.

The research team has been focusing on discovering related binding proteins and finding detailed mechanisms to identify the principles of formation of excitatory synapses among synapses.

In this study, the research team found that the interaction between the PTP? proteins and certain bone proteins among binding proteins plays a critical role in synapse formation. In particular, they have identified that the 'normal tyrosine signaling mechanism' resulting from the reaction of certain elements of the PTP? proteins is an essential component of synapse formation.

Given the potential correlation between proteins and mental disorders such as autism, schizophrenia, and depression that recent large-scale human genetics studies have shown, the research team's experiment is expected to provide important clues to help analyze the causes of brain disorders and enable treatment through further studies of related proteins.

Professor Ko expressed his determination by saying, "As our recent study has reported, PTP? proteins, along with neurexin, are considered key proteins responsible for the development of neural circuits. Our world-leading research team will conduct further studies to continue research on the development of synapses and neural circuits."

This research outcome was published on Friday June 22, 2018 in the online edition of *The Journal of Neuroscience*.

More information: Kyung Ah Han et al, PTP? drives excitatory presynaptic assembly via various

extracellular and intracellular mechanisms, *The Journal of Neuroscience* (2018). DOI: 10.1523/JNEUROSCI.0672-18.2018

Provided by DGIST (Daegu Gyeongbuk Institute of Science and Technology)