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New optogenetic tool for controlling neuronal signalling by blue light

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Institute for Basic Science (IBS), the main organization of the International Science and Business Belt project in South Korea, has announced that a group of researchers, led by professor Won Do Heo, have developed a new technology in the field of optogenetics that can remotely control specific receptors by light. They have named this new technology "OptoTrk" and it has succeeded with neuronal differentiation inducement.

The most significant feature of OptoTrk technology is that it requires only light to activate neuronal functions without the need of other substances. The receptors are activated when exposed to blue light, and then induce both neuronal growth and differentiation by upregulating downstream cell signalling.

"We are now conducting neuroscience research on several mouse models using our OptoTrk technology," says professor Won Do Heo, who led the research. "This newly developed technology will play a ground-breaking role in investigating the functions of neurons in the brain, specifically those functions in the most complicated of neural networks, which existing technologies have limitations exploring."

Before the development of this new technology, natural ligands or agonists were widely used as tools to specifically control receptor activity. However, they did not allow spatiotemporal control, and so required a time period to bind with the receptor. Therefore, there were limits to understanding the dynamic nature of intracellular signalling

networks. To address these limitations, the researchers developed this new technology using optogenetics. Recently optogenetics is attracting attention from many, various fields in the biological sciences. This study applies light-sensitive proteins - found in microorganisms and plants - to human (and/or animal) cells and can manipulate several cell functions.

"We have found that optoTrk can be regulated by simply switching light on and off," says professor Won Do Heo. "We were able to control the functional duration of down-stream signalling by adjusting the frequency of blue-light illumination."

Professor Won Do Heo added that he plans to publish an additional paper related to source technology in another renowned journal by the end of June. This will bring the Professor's number of published research outcomes related to the study of optogenetics to a total of 3 in the last two months. These publications include the paper regarding "Light-Activated Reversible Inhibition by Assembled Trap (LARIAT)". This paper on LARIAT was published in May in the prominent science journal, *Nature Method*, in the field of biochemistry.

Provided by Institute for Basic Science