New brain cells implicated in machinery of cannabinoid signaling

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The brain cells called astrocytes, and not just neurons, are sensitive to the substances called cannabinoids—the active chemicals in marijuana.

The researchers said their findings could aid in development of treatments for cannabinoid drug abuse. Also, because so-called "endocannabinoids" produced by brain cells are involved in the neural machinery of pain perception and learning and memory, the findings could help in understanding those processes, said the researchers.

Marta Navarrete and Alfonso Araque published their findings in the March 27, 2008, issue of the journal *Neuron*, published by Cell Press.

Astrocytes do not transmit nerve impulses, as do neurons. Rather, they provide neurons with support and nutrition and modulate signaling among neurons.

In their experiments with mouse brain slices, Navarrete and Araque sought to establish the role that cannabinoid receptors on astrocytes—which previous studies had indicated to exist—played in astrocyte function. Receptors are proteins that rest in the membranes of cells and that are triggered by specific chemicals, like a key fitting a lock. That triggering activates a cellular response.

The researchers' electrophysiological and imaging studies showed that astrocytes do express endocannabinoid receptors that, when activated, produce a cellular response. They also found that neurons associated

with the astrocytes release endocannabinoids that trigger an astrocyte response. Finally, they also showed that this response in astrocytes can, in turn, activate neurons to release the neurotransmitter glutamate, which mediates signaling among neurons.

Navarrete and Araque concluded that “These results indicate that neurons and astrocytes communicate via endocannabinoid signaling and suggest the existence of intercellular communication pathways mediated by endocannabinoid-glutamate signaling where astrocytes serve as a bridge for interneuronal communication.”

The researchers also concluded that their findings identify astrocytes “as cellular elements possibly involved in the physiology of cannabinoid addiction as well as potential targets for the treatment of cannabinoid-related drug abuse. Furthermore, considering the importance of the endocannabinoid-mediated intercellular signaling in numerous processes of the nervous system, such as pain perception or learning and memory, present findings indicate that astrocytes may be actively involved in relevant phenomena of brain physiology.

Source: Cell Press

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