Study shows a mouse brain under stress sends messages to the gut that reduce levels of beneficial bacteria

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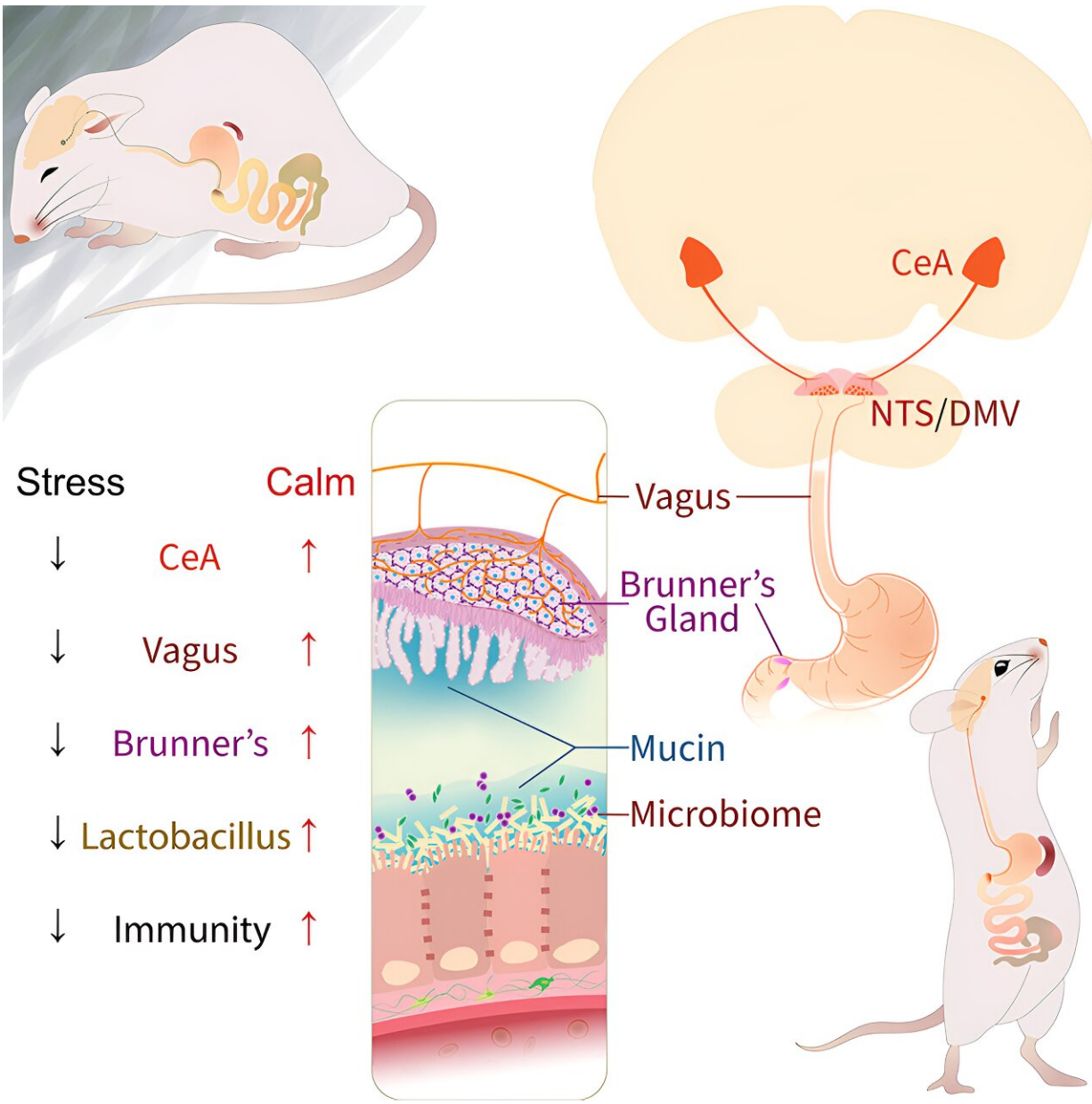

Credit: *Cell* (2024). DOI: 10.1016/j.cell.2024.07.019

A team of medical researchers from the U.S., China and Germany reports that when a mouse feels stressed, its brain sends signals to a gut gland that leads to elimination of a type of bacteria that prevents inflammation and an unnecessary immune response.

In their project, published in the journal *Cell*, the group studied communications between the mouse brain and Brunner's glands in the mouse gut.

Over the past several decades, medical researchers have found that different parts of the body communicate with one another far more than previously believed. One such network was found between the brain and the gut.

Researchers have discovered, for example, that when an organism experiences stress, the brain cues organs to release hormones to handle the stressful event. However, this can also set off a bout of inflammatory bowel disease. In this new study, the research team took a closer look at the lines of communication between the mouse brain and the mouse gut.

The researchers focused most specifically on the Brunner's glands, which reside in the walls of the small intestine. Prior research has shown that their function is to produce mucus to help material move through the gut. But because they also host many nerve cells, the research team suspected they might do more.

The team found that removing the glands reduced the ability to fight off

bacterial infections. It also led to inflammation and an overabundance of immune chemicals. They noted that humans had similar experiences after gland removal due to growth of tumors.

The team also found that removing the glands got rid of a type of bacteria known to induce production of proteins that line the gut, preventing undesirable contents of the gut from passing into the bloodstream. Without the bacteria, the gut walls became leaky, allowing undesirable material to move into the bloodstream, resulting in an immune response, which also caused inflammation.

The research team found that the nerve cells in the glands were connected directly to the vagus nerve, which winds its way to the amygdala, a part of the brain involved in processing stress.

The final stage of the research involved putting mice with healthy Brunner's glands under stress, which led to the same symptoms seen when the glands were removed.

More information: Hao Chang et al, Stress-sensitive neural circuits change the gut microbiome via duodenal glands, *Cell* (2024). DOI: 10.1016/j.cell.2024.07.019