Richard Westlund
July 31, 2020

Miller School Study Finds Linkage Between Depression and Bacteria in the Gut

A new laboratory study by researchers at the Univesity of Miami Miller School of Medicine has found a linkage between depression and the signals sent by bacteria in the microbiome of the digestive tract or gut. The findings could point the way toward potential therapies targeting the signal pattern or enhancing an individual's mood through a healthy diet.

Dr. Sylvia Daunert with researchers in the laboratory.

"Microbial imbalances have been linked to major depressive disorders, but the mechanisms affecting mood remain poorly understood," said Eléonore Beurel, Ph.D., associate professor of psychiatry and behavioral sciences, and biochemistry and molecular biology. "We have identified a new bacterial signaling circuit that promotes depressive-like behaviors in mice, linking the fields of microbiology and psychiatry."

In the study, Dr. Beurel looked at *Segmented filamentous bacteria* (SFB), a component of the microbiota of the digestive tract in many animals.

"SFB can induce inflammation as part of the immune system's response to infection," she said. "We showed that SFB-deficient mice were resilient to the induction of depressive-like behavior, but were re-sensitized when SFB was reintroduced in the gut. To our knowledge, this is the first time that such interactions have been demonstrated."

Dr. Beurel was the lead author of the study, "Identification of a Signaling Mechanism by Which the Microbiome Regulates Th17 Cell-Mediated Depressive Like Behaviors in Mice," published July 31 in the *American Journal of Psychiatry*. Miller School co-authors were Eva M. Medina-Rodriguez, Ph.D., Derik Madorma, Gregory O'Connor, Ph.D., Dongmei Han, Ph.D., Sapna Deo, Ph.D., Mark Oppenheimer and Sylvia Daunert, Pharm.D., M.S., Ph.D. Charles B. Nemeroff, M.D., Ph.D., former chair of psychiatry, now with the University of Texas at Austin, was also a coauthor.

The study analyzed how SFB in the gut use "quorum sensing" to determine if they are alone or in a group. Based on that signaling pattern, the bacteria work together to generate large numbers of Th17 cells, which increase inflammation and help defend against infection. However, overproduction of Th17 cells can lead to damaging vital organs including the brain.

Eleonore Beurel, Ph.D.

“We found that reintroduction of SFB in SFB-deficient mice resulted in an increase in Th17 cells that led to depression-like behaviors in otherwise resilient mice,” Dr. Beurel said. “Mice that were deficient in Th17 cells were able to resist the induction of depression-like behaviors.”

Dr. Beurel noted that a high-salt diet has been shown to increase Th17 cells, leading to neurovascular and cognitive impairments. On the other hand, oleic acid, a component of olive oil, blocked the excess production of Th17 cells and has been associated with mental well-being and the ability to cope with stress.
She added, “A healthy diet could potentially enhance mental health as well as physical well-being.”