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## Mounting Research Shows Gut-Brain Connection

By TRACI PEDERSEN Associate News Editor

Reviewed by John M. Grohol, Psy.D. on January 12, 2015

Over the past decade, numerous studies have linked the gut microbiome to a range of behaviors and body functions, such as appetite, cravings, mood, and emotion. The gut appears to help maintain brain function and has been increasingly proven to influence the risk of psychiatric and neurological disorders, including anxiety, depression, and autism.

Three experts at the forefront of this emerging field recently discussed the microbiome-brain connection with The Kavli Foundation, an organization that acts to promote public knowledge and support for groundbreaking research.

The work of these three researchers (some of the studies on mice) raises the possibility that brain disorders, including anxiety, depression, and autism, may be treated through the gut, which is a much easier target for drug delivery than the brain.

The human body contains trillions of microbes, collectively called the microbiome. In just one person's body, they are estimated to weigh two to six pounds — up to twice the weight of the average human brain.

Most reside in the gut and intestines, where they can help us to digest food, synthesize vitamins, and fight off infection. But their influence seems to reach the brain in a powerful way.

"The big question right now is how the microbiome exerts its effects on the brain," said Christopher Lowry, Associate Professor of Integrative Physiology at the University of Colorado, Boulder.

Lowry is studying whether beneficial microbes can be used to treat or prevent stress-related psychiatric conditions, including anxiety and depression.

One way in which the microbiome influences the brain is during development. Tracy Bale, Ph.D., professor of Neuroscience at the School of Veterinary Medicine at the University of Pennsylvania, and her team have found that the microbiome in mice is sensitive to stress and that stress-induced changes to a mother's microbiome are passed on to her baby and alter the way her baby's brain develops.

"There are key developmental windows when the brain is more vulnerable because it's setting itself up to respond to the world around it," said Bale, who has done pioneering research into the effects of maternal stress on the brain.

"So, if mom's microbial ecosystem changes — due to infection, stress, or diet, for example — her newborn's gut microbiome will change too, and that can have a lifetime effect."

Dr. Sarkis Mazmanian, a Louis & Nelly Soux Professor of Microbiology at the California Institute of Technology, is investigating the connection between gut bacteria, gastrointestinal disease and autism, a neurodevelopmental disorder.

He has found that the gut microbiome communicates with the brain through molecules that are produced by gut bacteria and then enter the bloodstream. These molecules are strong enough to change the behavior of mice.

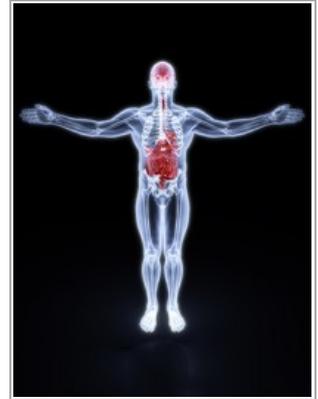
"We've shown, for example, that a metabolite produced by gut bacteria is sufficient to cause behavioral abnormalities associated with autism and with anxiety when it is injected into otherwise healthy mice," said Mazmanian.

There is still much more work to be done to understand the gut-microbiome-brain connection, the researchers said. Mazmanian's lab is also exploring whether the microbiome plays a role in neurodegenerative diseases such as Alzheimer's and Parkinson's.

"There are flash bulbs going off in the dark, suggesting that very complex neurodegenerative disorders may be linked to the microbiome. But once again this is very speculative. These seminal findings, the flash bulbs, are only just beginning to illuminate our vision of the gut-microbiome-brain connection," said Mazmanian.

Source: [The Kavli Foundation](#)

[Brain and gut connection photo by shutterstock.](#)



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