

# Autism risk determined by health of mom's gut, research reveals

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The microbiome is the collection of microorganisms, such as bacteria, that

naturally live inside us. Science is increasingly revealing its vital importance to good health. Researchers at the University of Virginia School of Medicine have determined that the health of an expectant mother's microbiome determines the risk of autism and neurodevelopmental disorders. Credit: Alexandra N. Angelich / University of Virginia Communications

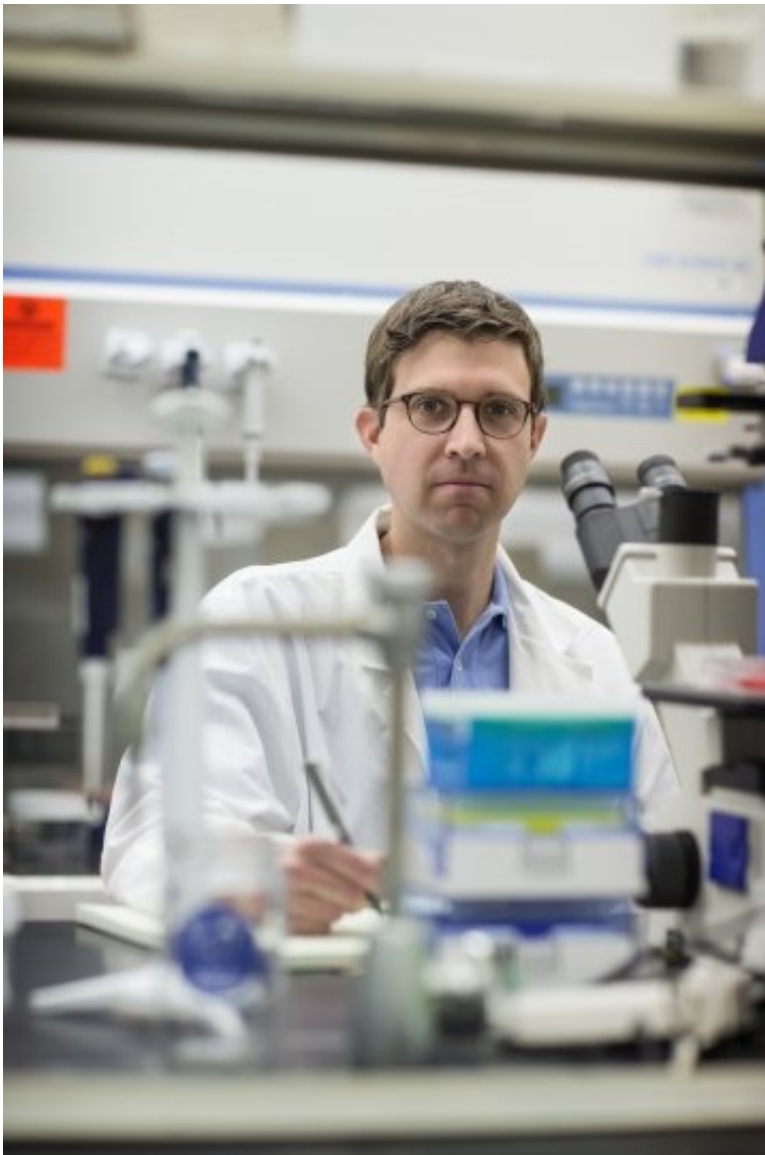
The risk of developing autism-spectrum disorders is determined by the mother's microbiome—the collection of microorganisms that naturally live inside us—during pregnancy, new research from the University of Virginia School of Medicine suggests. The work raises the possibility that preventing forms of autism could be as simple as an expectant mom modifying her diet or taking custom probiotics.

Further, the UVA scientists were able to use their discovery to prevent the development of autism-like [neurodevelopmental disorders](#) in lab mice. They found they could halt the development of such disorders by blocking a particular inflammatory molecule produced by the immune system. Targeting this molecule, interleukin-17a, offers another potential avenue for preventing autism in people, the researchers say. They caution, however, that this approach would be much more complex because of the risk of side effects.

"We determined that the [microbiome](#) is a key contributor in determining susceptibility [to autism-like disorders], so it suggests that you could target either the maternal microbiome or this inflammatory molecule, IL-17a," said lead researcher John Lukens, Ph.D., of UVA's Department of Neuroscience. "You could also use this [IL-17a] as a biomarker for early diagnosis."

## **Microbiome and Autism**

The groundbreaking work from Lukens and his colleagues sheds light on the complex relationship between the health of the mother's microbiome and the healthy development of her children. "The microbiome can shape the developing brain in multiple ways," explained Lukens, of UVA's Center for Brain Immunology and Glia (BIG) and UVA's Carter Immunology Center. "The microbiome is really important to the calibration of how the offspring's immune system is going to respond to an infection or injury or stress."



John Lukens, PhD, of the University of Virginia School of Medicine's Department of Neuroscience and Center for Brain Immunology and Glia (BIG), has determined the health of an expectant mother's microbiome determines the risk of autism and other neurodevelopmental disorders. The microbiome is the collection of microscopic organisms that naturally live inside us. Credit: Dan Addison | University of Virginia Communications

But an unhealthy microbiome in the mom can create problems: Lukens' work shows that it can make her unborn offspring susceptible to neurodevelopmental disorders. The researchers found that the IL-17a molecule was a key contributor to the development of autism-like symptoms in [lab mice](#).

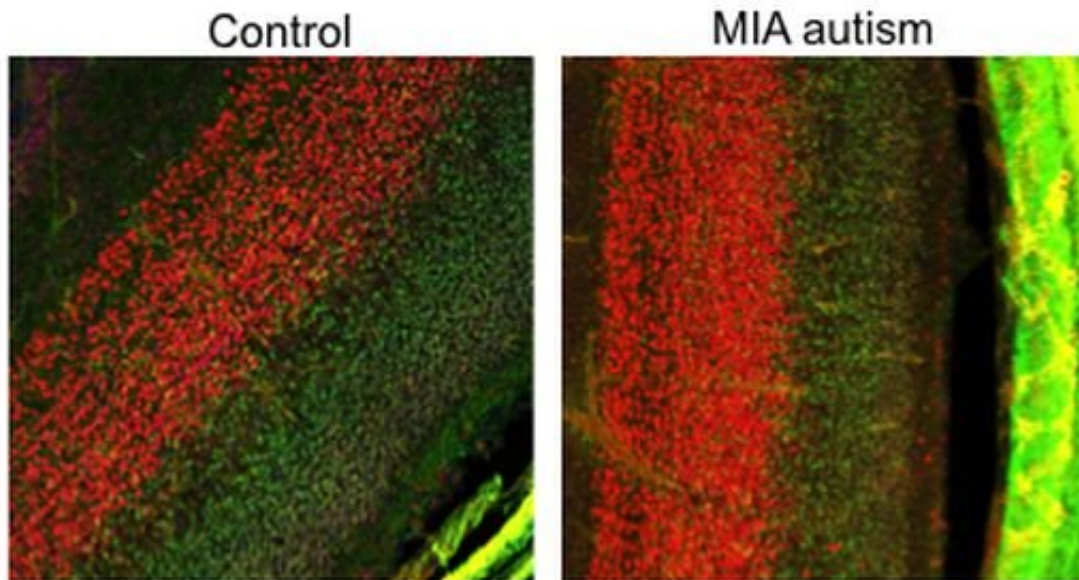
The good news: The microbiome can be modified easily, either through diet, probiotic supplements or fecal transplant. All of these approaches seek to restore a healthy equilibrium among the different microorganisms that live in the gut.

"In terms of translating our work to humans, I think the next big step would be to identify features of the microbiome in pregnant mothers that correlate with autism risk," Lukens said. "I think the really important thing is to figure out what kind of things can be used to modulate the microbiome in the mother as effectively and safely as we can."

## **Another Option for Preventing Autism**

Blocking IL-17a also might offer a way to prevent autism, but Lukens said that path carries much more risk. "If you think about pregnancy, the body is basically accepting foreign tissue, which is a baby," he said. "As a result, maintenance of embryonic health demands a complex balance of [immune regulation](#), so people tend to shy away from manipulating the

immune system during pregnancy."



Altered neurodevelopment in a mouse model of autism. New research from the University of Virginia School of Medicine reveals that the health of the microbiome during pregnancy determines autism risk. The microbiome is the collection of microscopic organisms that naturally live inside us. Credit: John Lukens lab, University of Virginia School of Medicine Department of Neuroscience.

IL-17a previously has been implicated in conditions such as rheumatoid arthritis, multiple sclerosis and psoriasis, and there are already drugs available that target it. But Lukens noted that the molecule has an important purpose in stopping infections, especially fungal infections. Blocking it, he said, "could make you susceptible to all kinds of infections." And doing so during pregnancy could have complex ripple effects on a child's development that scientists would need to sort out.

For their next steps, Lukens and his team plan to explore the potential

role of other immune molecules in the development of autism and other such conditions. IL-17a may be just one piece in a much larger puzzle, he said.

While Lukens' work links the immune system with neurodevelopmental disorders, he emphasized that this in no way suggests that vaccines are contributing to the development of [autism](#). "There's a definite link between the immune response and the developing brain," he said. "It just doesn't have anything to do with vaccines. It's much, much earlier."

Lukens' work is but the latest research from UVA to speak to the importance of the microbiome in maintaining good health. For example, one of Lukens' colleagues in the Department of Neuroscience, Alban Gaultier, Ph.D., found that probiotics in yogurt can reverse depression symptoms.

**More information:** Catherine R. Lammert et al, Cutting Edge: Critical Roles for Microbiota-Mediated Regulation of the Immune System in a Prenatal Immune Activation Model of Autism, *The Journal of Immunology* (2018). [DOI: 10.4049/jimmunol.1701755](https://doi.org/10.4049/jimmunol.1701755)

Provided by University of Virginia

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