

Gut Microbiome Composition in Relation to Gastrointestinal and Neurobehavioral Symptoms in Autism Spectrum Disorder

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Autism Spectrum Disorder, which affects 1 in 44 children, is defined by the American Psychiatric Association as a life-long, complex neurodevelopmental condition that is marked by restricted interests, repetitive behaviors, and persistent challenges with social communication. There has also been reported associations between ASD and other gastrointestinal symptoms such as chronic inflammatory intestinal disease, gastritis, nausea and vomiting, in addition to disaccharide malabsorption. Parents of children with ASD, as well as reports from animal and human trials have reported a link between heightened gastrointestinal symptoms with matching intensities of maladaptive neurobehavioral symptoms. One environmental factor commonly considered when analyzing those with ASD, and their symptoms, is the dysbiosis, or dysregulation of the gut microbiome. Along with having limited spread of beneficial digestive and immune-modulating bacteria, those with ASD were also found to have increased levels of cytotoxic bacteria, such as *C. histolyticum* and *Clostridium*. This was found to inhibit the integrity of the mucosal barrier in its ability to prevent the permeation of cytotoxic bacteria and inflammatory metabolites from digestion. The increased permeation of those inflammatory species has been theorized to impact the neurobehavioral symptoms of patients with Autism due to the avenue of the brain-gut axis. This has been theorized to connect the gastrointestinal system through the gut's lumen, to the enteric, central or limbic nervous systems into the brain. Research findings discovered increased levels of those inflammatory markers within the brains of those with ASD, resulting in higher levels of microglial cells, and claudin concentrations, as well as decreased functions of blood-brain barrier function. Treatments surrounding these theories found correlations between long-lasting microbiome-damaging antibiotic use in children with ASD and more severe neurobehavioral and gastrointestinal symptoms, while also reporting decreased intensities of symptoms when given microbiota treatments such as probiotics or fecal transplants, which opens up the doors for possible new avenues of research and targeted treatments.