

Dysbiosis of Microbiome and Probiotic Treatment in a Genetic Model of Autism Spectrum Disorders

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Background: The gut microbiome may influence brain development and behavior, mainly through the modulation of physiological metabolism and the immune system. Recent studies have determined that the microbiome has direct effects on behavior, and may be dysregulated in neurodevelopmental conditions. Considering that neurodevelopmental conditions, such as autism, have a strong genetic etiology, it is necessary to understand if genes associated with neurodevelopmental disorders, such as *Shank3*, can influence the gut microbiome, and if probiotics can be a therapeutic tool.

Methods/Results: Using 16S high-throughput sequencing, we have determined the gut microbiome community of the Shank3 KO mouse model, and its relative controls. In this study, we have identified dysregulation of several genera and species of bacteria in both the gut and colon of Shank3 KO mice, in addition to a sex-dependent dysregulation of the immune system. *L. reuteri*, a species with decreased relative abundance in the Shank3 KO mice, positively correlated with the expression of GABA receptor subunits in the brain. Treatment of Shank3 KO mice with *L. reuteri* induced an attenuation of unsocial behavior and a decrease in repetitive behaviors, in males and just decrease in repetitive behaviors in females, without affecting anxiety. *L. reuteri* treatment also induced an increase in GABA receptor expression in multiple brain regions, and affected serum immune system markers.

Perspectives: This study has confirmed that genetic differences associated with autism can induce changes in the microbiota profile. In addition, this study identifies bacterial species that are sensitive to an autism-related mutation, and further suggests a therapeutic potential for probiotic treatment.

Biography:

After sustained her PhD in 2012 in molecular and cellular neuroscience and structural biology within the functional and adaptive biology unit of Paris Diderot-Paris 7 University, Dr. Laure Tabouy taught at the Faculty of Sciences of the Franche-Comté University, then went for a post-doctorate in Israel, working on the role of the microbiome and the Gut-Brain axis in autism and the establishment of a probiotic treatment, in the Molecular and Behavioral Neuroscience laboratory of Dr. Evan Elliott, in the faculty of Medicine in the Galilee of the Bar-Ilan University. She continues to work on the microbiota in France at the Neuroscience Institute of Paris Saclay in France, (NeuroPSI)