

Patient-Engagement Informs Research Exploring Gut Microbiota and Social and Sensory Behaviors in Autism

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Introduction

- Gastrointestinal symptoms are common amongst individuals with autism, suggesting a possible link between the disorder and gut microbiota¹.
- Recent studies have provided evidence that gut microbiota have the capability of influencing the brain and behavior through multiple physiologic pathways^{1,2}.
- **Purpose:** *Communicate theorized pathways between the gut and behavior, and the research being conducted to explore relationships among the gut microbiota and social and sensory behaviors in autism.*

Driving Force

Families with autism identified dietary concerns as an area of research meaningful to them.

Families were engaged with researchers through a 3-year PCORI engagement project.

What is PCORI?

- The Patient Centered Outcomes Research Institute (PCORI) is a non-profit, non-governmental organization designed to improve the quality of research evidence available for making informed health decisions³.
- PCORI focuses on addressing concerns most relevant to the patients by involving various stakeholders:
 - Families of individuals with ASD
 - University healthcare
 - ASD service providers
 - Researchers

What topics were identified as important?

- Modified & restricted diets
- Modifying gut microbiota via probiotics
- GI symptomology
- Sensory symptomology
- Social functioning

Bidirectional Gut and Brain Interactions

Endocrine Pathways

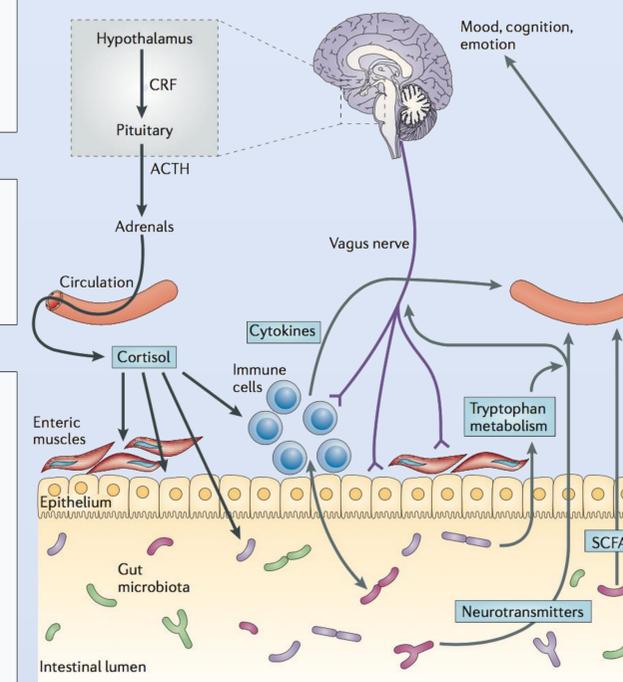
- The hypothalamus-pituitary-adrenal axis regulates cortisol secretion.
- Cortisol can alter gut permeability, change the gut microbiota composition, and affect immune cells.

Immune Pathways

- Maintain homeostasis at the luminal surface.
- Microbiota and probiotics can affect circulating levels of cytokines which can affect brain function.

Autonomic Nervous System (ANS) Pathways

- Vagus nerve contains afferent and efferent pathways vital to the multidirectional communication between the brain and gut.
- Enteric nervous system (governs the gastrointestinal tract)
 - Bacterial metabolites from dietary fibers (e.g., short chain fatty acids) can affect brain and behavior.
 - Tryptophan, a precursor for serotonin, is produced by the gut.
 - Other neurotransmitters (e.g., GABA, serotonin, dopamine, and acetylcholine) are produced and metabolized in the gut.



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Behavioral Data Collection Tools

Sensory Responsiveness Scale - 2nd Edition:

- 65-item rating scale measuring deficits in social behavior with ASD⁴.
- Results reported as T-scores for the treatment subscales: social awareness, social cognition, social communication, social motivation, restricted interests & repetitive behavior, and overall score

Child Sensory Profile 2:

- 86-item scale measuring child's sensory processing abilities and its effect on functional performance in every day life
- Results reported as a standard deviators for sensory system, behavioral, and sensory pattern subscales.

Questionnaire items inquiring as to presence of:

- Typical diet, typical bowel movements, GI pain symptoms

Discussion

- Current research is being conducted on the concerns that arose from the PCORI group and the current literature on gut microbiota.

Hypothesis: *Gut microbiota is related to autism symptomology, specifically, social and sensory behaviors.*
- Occupational therapists can encourage the development of healthy daily habits and routines that can support gut health and may modify sensory and social behaviors.

References

1. Cryan, J. F., & Dinan, T. G. (2012). Mind-altering microorganisms: The impact of the gut microbiota on brain and behaviour. *Nature Reviews Neuroscience*, 13(10), 701-712.
2. Dinan, T. G., Cryan, J. F. (2017). The microbiome-gut-brain axis in health and disease. *Gastroenterology Clinics of North America* 46(1). doi:10.1016/j.gtc.2016.09.007
3. PCORI. (n.d.). Retrieved June 29, 2015, from <http://www.pcori.org/about-us>
4. Constantino, J. N., & Gruber, C. P. (2012). *Social Responsiveness Scale, Second Edition* [Measurement instrument]. Los Angeles, CA: Western Psychological Services.
5. Dunn, W. (2014) *Child Sensory Profile, Second Edition* [Measurement instrument]. San Antonio, TX: The Psychological Corporation.

Acknowledgments

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