УДК [61+615.1] (043.2)
ББК 5+52.81
А 43
ISBN 978-985-21-1864-4

Dompage Ohara, Pelaketiyage Yomini N.

THE GUT-BRAIN CONNECTION: IMPACT OF MICROBIOTA ON NEUROLOGICAL CONGENITAL MALFORMATIONS

Tutor: PhD, associate professor Savosh V.V.
Department of Pathological Anatomy and Forensic Medicine with a Course of Advanced Training and Retraining
Belarusian State Medical University, Minsk

Congenital malformations are structural abnormalities that occur at birth and can be shaped by a mix of genetic and environmental factors. Recent research emphasizes the gut-brain axis's role in neurological development and its link to congenital malformations. Studies show that gut microbiota composition can impact neurodevelopment, with dysbiosis during fetal development potentially leading to neurological disorders. Findings highlight the interactions between microbial metabolites and host signalling, suggesting that modifying the gut microbiome may help reduce the risk of these malformations.

This study examines the role of gut microbiota in congenital malformations during early development. Understanding its influence on neurodevelopment helps identify risk factors associated with these malformations. The research aims to enhance preclinical and clinical studies for diagnosis and treatment, promoting targeted strategies for early intervention and better clinical outcomes

To gather information for the research we conducted a literature review across several databases, including PubMed, Google Scholar, and lesser-known sources like Embase and Web of Science. We focused on studies linking gut microbiota to neurological development and congenital abnormalities, using key terms such as "gut microbiota," "congenital malformations," and "neurodevelopment.”

During early neurodevelopment, the brain's plasticity aligns with gut colonization, emphasizing the microbiota-gut-brain axis. Communication between gut microbiota and the host involves neuroendocrine and neuroimmune pathways, with microbial metabolites such as short-chain fatty acids (SCFAs) and tryptophan derivatives playing crucial roles.

To prevent congenital malformations, strategies to modify gut microbiota include dietary interventions like increasing fiber intake and consuming prebiotics and probiotics. Foods rich in short-chain fatty acids (SCFAs) can enhance gut health and neurodevelopment. Maternal supplementation with specific probiotics, especially Lactobacillus and Bifidobacterium strains, may optimize gut microbiota during pregnancy. These approaches aim to reduce dysbiosis and promote a healthier intrauterine environment for proper neurological development. Ongoing research into the timing and dosage of these interventions is crucial for maximizing their protective effects against congenital malformations.

In conclusion, this study underscores the critical role of gut microbiota in the development of congenital malformations by elucidating its influence on neurodevelopment through the microbiota-gut-brain axis. The interactions between microbial metabolites and host signaling pathways are pivotal in shaping neurological outcomes during early development. By identifying specific risk factors linked to gut dysbiosis, this research paves the way for targeted therapeutic strategies aimed at modifying the gut microbiome. Such interventions hold promise for reducing the risk of congenital malformations and improving clinical outcomes, highlighting the potential of harnessing the gut-brain relationship in pediatric health.