Symposium | MDD：[Symposium 53] How does the gut microbiota contribute to elucidating the mental health in children and adolescents?

2025年9月26日(金) 16:30 ~ 18:00 Session Room 7 (Conference Room C)

[Symposium 53] How does the gut microbiota contribute to elucidating the mental health in children and adolescents?

Moderator: Katsunaka Mikami (Department of Psychiatry, Tokai University School of Medicine), Chaiyavat Chaiyasut (Innovation Center for Holistic Health, Nutraceuticals, and Cosmeceuticals, Faculty of Pharmacy, Chiang Mai University)

[SY-53-04] The Oral-Gut-Brain Axis: Impact of Maternal Oral Dysbiosis on Offspring Gut Colonization and Early-Life Behavior.

*Natsuru Watanabe[1], Katsunaka Mikami[1] (1. Department of Psychiatry, Tokai University School of Medicine (Japan))

キーワード：gut microbiome、oral dysbiosis、microbiota-gut-brain axis、maternal transmission、neurodevelopment

Background/aims:
Recent advances in microbiome research have revealed the critical role of early-life gut microbiota in neurodevelopmental health. While the gut microbiome has been extensively studied in this context, emerging evidence suggests that maternal oral microbiota may also significantly shape the initial gut colonization of offspring. Given the known associations between oral dysbiosis and systemic inflammatory diseases, we hypothesized that maternal oral dysbiosis could negatively affect offspring gut microbiota composition and, consequently, early-life behavioral development. This study aimed to explore the effects of maternal oral dysbiosis on offspring gut colonization and anxiety-like behavior during the early postnatal period.

Methods:
Oral dysbiosis was induced in female mice by ligature placement to model experimental periodontitis prior to mating. Offspring born to these dams and control dams were evaluated at 4 weeks of age. Anxiety-like behavior was assessed using the marble burying test. As a positive control for microbiota disruption, offspring of dams treated with cefoperazone, a broad-spectrum antibiotic, were also analyzed. Gut microbiota analysis was conducted to correlate microbial shifts with behavioral outcomes.

Results:
Anxiety-like behavior in offspring was assessed at 4 weeks of age using the marble burying test. Pups born to dams treated with the antibiotic cefoperazone prior to delivery or to dams with ligature-induced periodontitis exhibited a significant decrease in the number of marbles buried compared to offspring of control dams. Importantly, there were no observable deficits in general activity or short-term memory, indicating that the behavioral changes were not due to motor impairment. These findings suggest that early-life disturbances in gut microbiota, driven by maternal microbiota dysbiosis, can influence neurobehavioral development in offspring, particularly with respect to anxiety-related behavior.

Conclusions:

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This study reveals two significant findings. Maternal oral dysbiosis can greatly impact the gut microbiota composition of offspring during the early stages of life. Such changes are linked to observable behavioural modifications in offspring, particularly anxiety-like responses during the initial stages of development. These results support the existence of an oral-gut-brain axis, which was previously underappreciated, and emphasise the importance of maternal oral microbiota in determining neurodevelopmental outcomes in offspring. This research provides foundational evidence for the development of science-based public health strategies, including perinatal oral hygiene education.

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