Associations Between Prenatal Depressive Symptoms, Infant Temperament and the Maternal Gut Microbiome

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Background

- Approximately 17-25% of all pregnant individuals experience prenatal depression[1]. This illness increases the risk of negative obstetric outcomes such as low birthweight and hampers child development their infants[2].
- The gut microbiome is linked to both depressive symptoms[3] and temperament[4].
- This research aimed at understanding if gut microbial bacteria are associated with infants' temperament and the occurrence of prenatal depression.

Methods

- Data for this project was obtained from the *Pregnancy During the Pandemic* cohort[5]. Participants (n=249), were less than 35 weeks pregnant, lived in Canada, were able to read and write in English/French and were 17 years of age or older.
- Participants were excluded if they were using alcohol, illicit drugs, or antibiotics, if they had a clinical diagnosis of depression and if they had any symptoms of a COVID-19 infection.
- Stool samples were collected using an at-home collection kit (DNAGenotek, OM-200). Samples were analyzed using shotgun metagenomics sequencing.
- The Edinburgh Postpartum Depression Scale (EPDS) was used to gauge pregnant individuals' depressive symptoms[6] at recruitment and the Infant Behaviour Questionnaire- Revised (very short form) (IBQ-R VSF)[7] was used to assess infant temperament at 6 months of age.
- Spearman correlations were conducted to associate gut microbial abundance to EPDS scores.

CATEGORIES	FREQUENCY	PERCENT
EDUCATION		
Less than high school diploma	1	0.4
Completed high school	12	4.8
Completed trade, technical, vocational school or business/community college	28	11.2
Bachelor's Degree	105	42.2
Master's Degree	66	26.5
Doctorate (PhD)	13	5.2
Professional (MD, JD, DDS, ETC)	24	9.6
ETHNICITY		
Caucasian	216	86.7
First Nations	3	1.2
Metis	2	0.8
Inuit	0	0
Black	2	0.8
Chinese	4	1.6
Filipino	3	1.2
West Asian(e.g., Afghan, Iranian)	4	1.6
South Asian(e.g., East Indian, Pakistani)	2	0.8
Southeast Asian (e.g., Cambodian)	3	1.2
Hispanic/Latinx	10	4
INCOME		
Less than $20, 000	6	2.4
$20,000- $39,999	6	2.4
$40,000-$69,999	15	6
$70,000-$99,999	38	15.3
$100,000 -$124,999	59	23.7
$125,000- $149,999	39	15.7
$150,000 - $174,999	41	16.5
$175,000- $199,999	13	5.2
$200,000+	32	12.9

CATEGORY	MEAN (S.D.)	RANGE
Maternal age	32.70 (3.90)	20.00-47.00
Infants' gestational age at birth	39.12 (1.43)	34.00-42.00

Table 1. Sociodemographic characteristics of participants

Results

Correlations with prenatal depression

- Maternal depression was not significantly associated with the relative abundance of bacteria.

Correlations with infant temperament

Compositional Associations

The following factors of infant temperament were associated with bacterial abundance-

- Negative affectivity with Adlercreutzia equolifaciens, Prevotella copri, Parabacteroides merdae and Ruminococcus callidus (r = .247, p = 0.000421; r = -.221, p = .002; r = .221, p = .002; r= -.209, p = .003)
- Orienting/Regulation with Rothia mucilaginosa (r = .254, p = 0.000267).

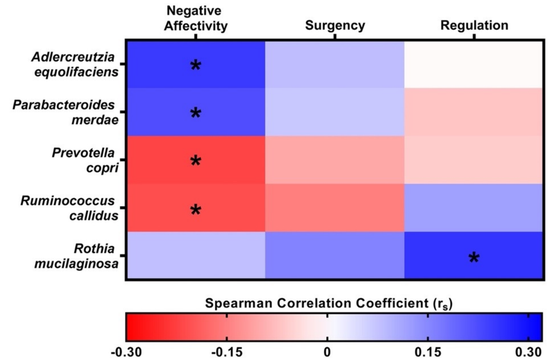

Figure 1
Associations between factors of infant temperament as measured by the IBQ-R (very short form) and the relative abundance of bacterial species

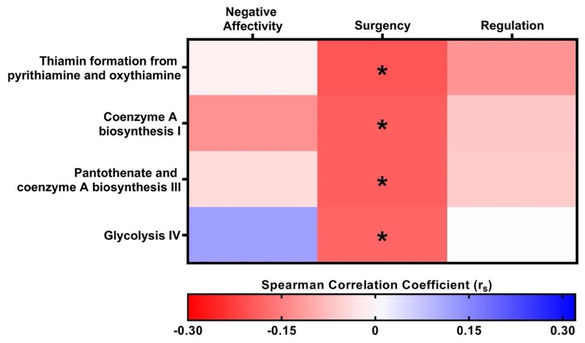

Figure 2
Associations between factors of infant temperament as measured by the IBQ-R (very short form) and metabolic pathways expressed by the human gut microbiota

Functional Associations

The following metabolic pathways were associated with surgency-

- Thiamin formation from pyrithiamine and oxythiamine (yeast) (p = 0.004, r = 0.201)
- Coenzyme A biosynthesis I (p = 0.007, r = -0.189)
- Pantothenate and coenzyme A biosynthesis III (p = 0.007 , r = - 0.189)
- Glycolysis IV (plant cytosol (p = 0.011, r = -0.18)

Conclusions

These findings suggest that the maternal microbiome is associated with the infant's negative affectivity, orienting and regulation. This opens the possibility of using gut-microbiome targeted interventions during pregnancy to promote infant socio-cognitive development.

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