

## Abstract

# Human Milk Microbiome Is Altered in Mothers with Gestational Diabetes Mellitus<sup>†</sup>

Sophie A. Hughes<sup>1,2,3,4</sup>, Sharon L. Perrella<sup>1,2,3</sup> , Demelza J. Ireland<sup>4</sup>, Donna T. Geddes<sup>1,2,3</sup> and Lisa F. Stinson<sup>1,2,3,\*</sup> 

<sup>1</sup> School of Molecular Sciences, The University of Western Australia, Crawley, WA 6009, Australia; 22876633@student.uwa.edu.au (S.A.H.); sharon.perrella@uwa.edu.au (S.L.P.); donna.geddes@uwa.edu.au (D.T.G.)

<sup>2</sup> ABREAST Network, Perth, WA 6000, Australia

<sup>3</sup> UWA Centre for Human Lactation Research and Translation, Crawley, WA 6009, Australia

<sup>4</sup> School of Biomedical Sciences, The University of Western Australia, Crawley, WA 6009, Australia; demelza.ireland@uwa.edu

\* Correspondence: lisa.stinson@uwa.edu.au

<sup>†</sup> Presented at the Australian Breastfeeding + Lactation Research and Science Translation Conference (ABREAST Conference 2023), Perth, Australia, 10 November 2023.

**Keywords:** gestational diabetes mellitus; human milk microbiome; body mass index; milk production

Gestational diabetes mellitus (GDM) is a metabolic disease of pregnancy that is associated with alterations in the maternal and infant gut microbiota. The intake of human milk shapes the infant gut microbiome; however, to date, only one small study has investigated the impact of GDM on the milk microbiome. Therefore, we aimed to add more robust data to this field by characterising the human milk microbiome of mothers with GDM and without GDM over the first 6 weeks postpartum. Given the relationships between body mass index (BMI) and milk production with GDM, our secondary aims examined relationships between maternal BMI, milk production and the milk microbiome. Eighty-three mothers were included in the analysis (forty-three with GDM and forty without GDM). Participants measured their milk production at 3 weeks postpartum by test weighing their infants before and after each feed over 24 h and supplied milk samples at 1, 3 and 6 weeks postpartum. Full-length 16S rRNA gene sequencing was performed. Milk from mothers with GDM had a higher alpha diversity than milk from mothers without GDM (richness,  $p = 0.026$ ; Shannon diversity,  $p = 0.044$ ). Beta diversity differed between the two groups (PERMANOVA,  $p = 0.034$ ). At the OTU level, the composition of the milk microbiome varied significantly based on GDM status and maternal pre-pregnancy BMI. Mothers with GDM were more likely to have low milk production ( $<600$  g/24 h;  $p = 0.018$ ). However, the milk microbiome was not associated with milk production. This study contributes further to our understanding of differential microbiome outcomes in relation to GDM.



**Citation:** Hughes, S.A.; Perrella, S.L.; Ireland, D.J.; Geddes, D.T.; Stinson, L.F. Human Milk Microbiome Is Altered in Mothers with Gestational Diabetes Mellitus. *Proceedings* **2023**, *93*, 2. <https://doi.org/10.3390/proceedings2023093002>

Published: 19 December 2023



**Copyright:** © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

**Author Contributions:** Conceptualization, L.F.S., S.L.P. and D.T.G.; methodology, L.F.S.; formal analysis, S.A.H.; investigation, S.A.H.; resources, D.T.G.; data curation, S.L.P. and S.A.H.; writing—original draft preparation, S.A.H.; writing—review and editing, L.F.S. and D.T.G.; visualization, S.A.H.; supervision, L.F.S., D.T.G. and D.J.I.; funding acquisition, D.T.G. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by an unrestricted research grant from Medela AG (Switzerland).

**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki, and was approved by the Human Research Ethics Committee of The University of Western Australia (RA/4/20/5657).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

---

**Data Availability Statement:** Sequence data have been submitted to the NCBI SRA (BioProject Submission: SUB13895764).

**Acknowledgments:** The authors would like to acknowledge Ashleigh Warden for collecting the samples and Matthew Payne for the use of his laboratory space and equipment.

**Conflicts of Interest:** D.T.G. declares participation in the Scientific Advisory Board of Medela AG. D.T.G., S.L.P. and L.F.S. are/were supported by an unrestricted research grant from Medela AG, administered by The University of Western Australia. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.