Using Zebrafish to Understand the Role of Social Behavior on Microbiome Transmission

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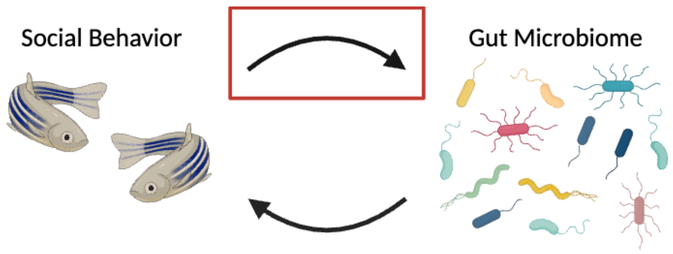
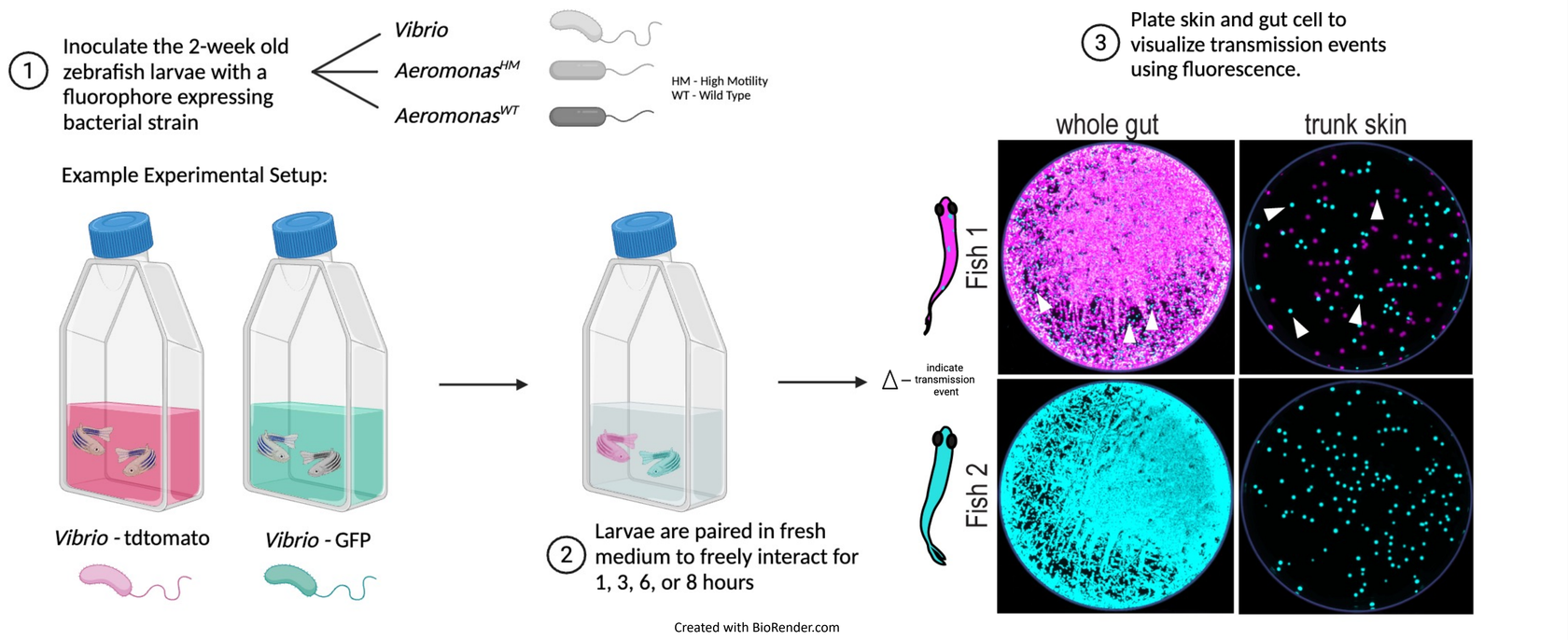
Introduction

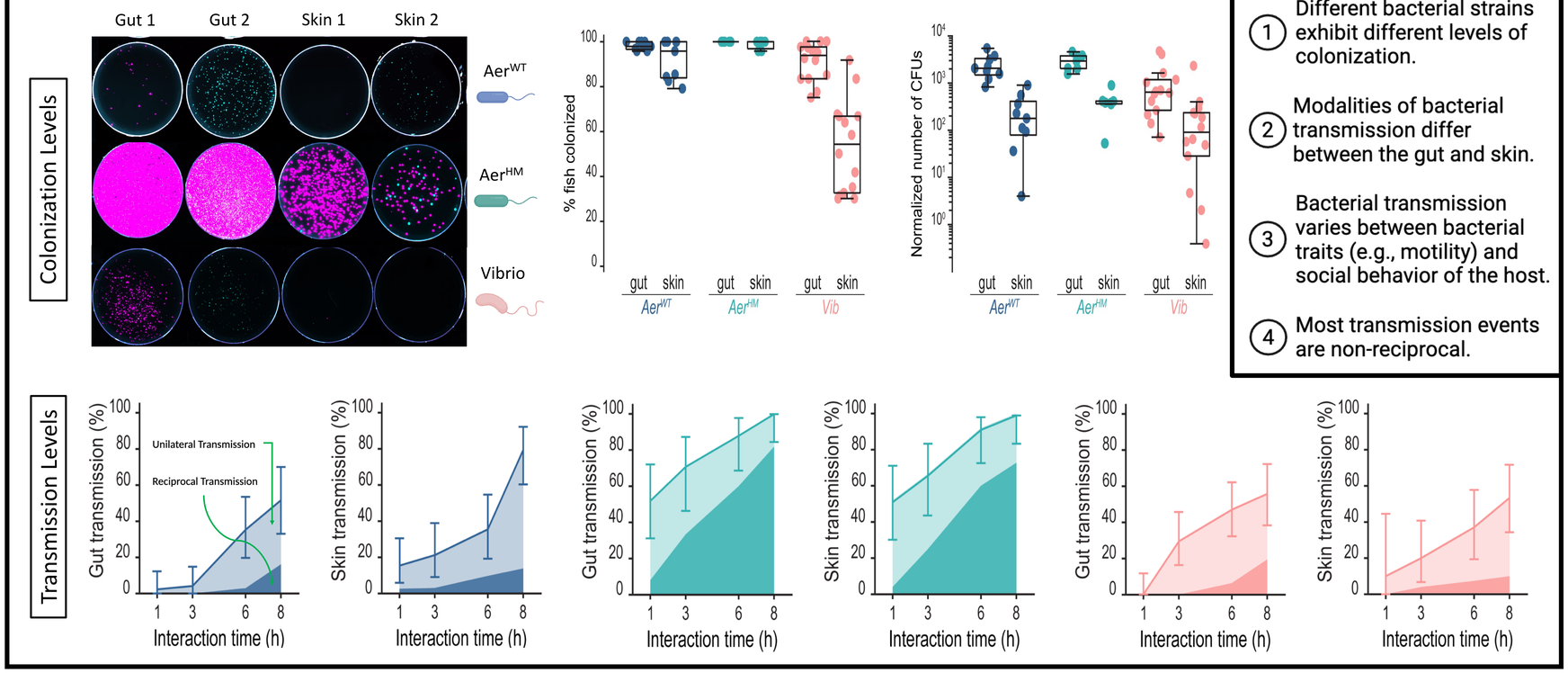
Social interactions are a hallmark of neurodevelopmental disorders such as Autism Spectrum Disorder (ASD)[1]. Our own observations in zebrafish and a growing literature reveal that host-associated microbes play a critical role in social behaviors. However, how these microbes are acquired, and the mechanisms of their interaction with social behavior remain unknown.



Methods



Results & Conclusions



1) Different bacterial strains exhibit different levels of colonization.
2) Modalities of bacterial transmission differ between the gut and skin.
3) Bacterial transmission varies between bacterial traits (e.g., motility) and social behavior of the host.
4) Most transmission events are non-reciprocal.

Future Directions

- We hypothesize that the non-reciprocity of transmission is the result of asymmetrical social interactions between individuals. We are testing the role of social hierarchy in microbiota transmission.
- We are investigating the link between disorders with social deficits (e.g., ASD) and social transmission of microbiota using zebrafish genetic models[2].

Acknowledgements

UO Zebrafish Facility

GORDON AND BETTY MOORE FOUNDATION

References

1) Zoodsma, J. D.; Keegan, E. J.; Moody, G. R.; Bhandiwad, A. A.; Napoli, A. J.; Burgess, H. A.; Wollmuth, L. P.; Sirotkin, H. I. Disruption of grin2B, an ASD-Associated Gene, Produces Social Deficits in Zebrafish. *Molecular Autism* **2022**, *13* (1), 38. https://doi.org/10.1186/s13229-022-00516-3.

2) Tallafuss, A.; Stednitz, S. J.; Voeun, M.; Levichev, A.; Larsch, J.; Eisen, J.; Washbourne, P. Egr1 Is Necessary for Forebrain Dopaminergic Signaling during Social Behavior. *eNeuro* **2022**, *9* (2). https://doi.org/10.1523/ENEURO.0035-22.2022.