

Recent genetic drift in the co-diversified gut bacterial symbionts of laboratory mice



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Introduction

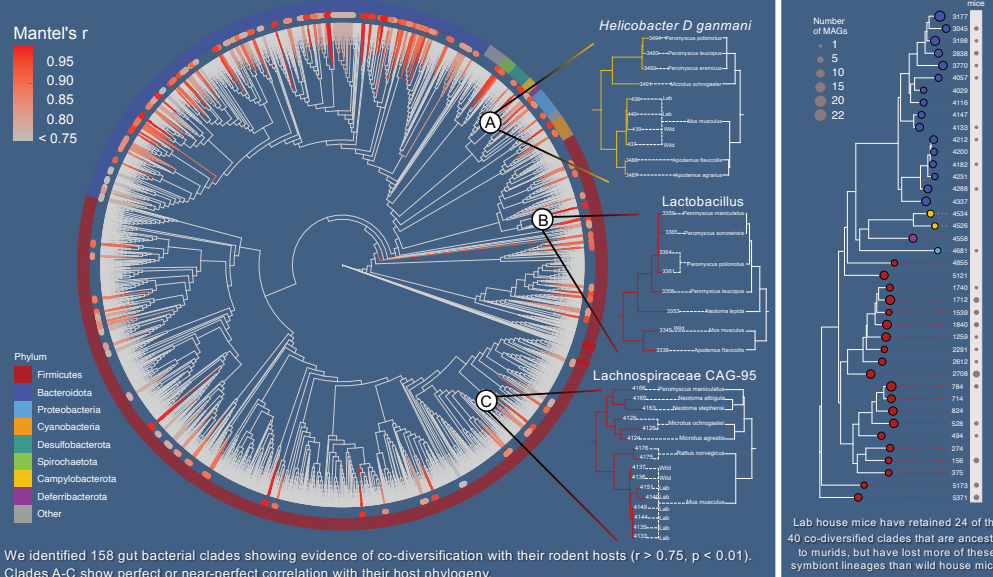
What are the evolutionary origins of the house mouse microbiota?



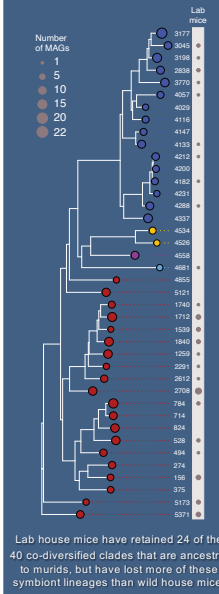
The gut microbiota of lab mice is distinct from that of their wild-living conspecifics, but we don't know if they've acquired those differences from the lab environment, or if lab lineages have evolutionarily diverge since their most recent common ancestor. Here, we investigate the evolutionary origins of the house mouse microbiota using a co-phylogenetic approach.

Results

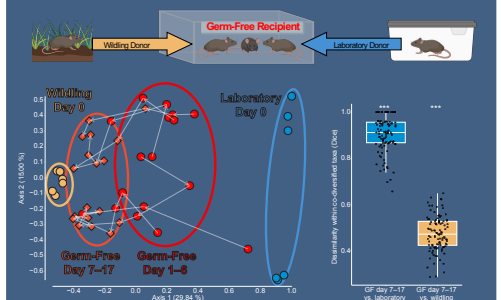
Widespread co-diversification between gut bacterial symbionts and their rodent hosts



Co-diversified clades ancestral to murids

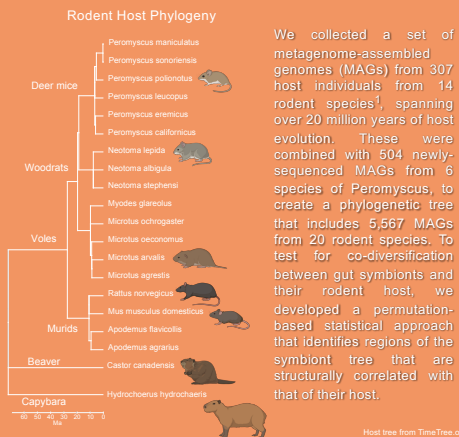


Co-diversified wild strains out-compete related lab strains in vivo

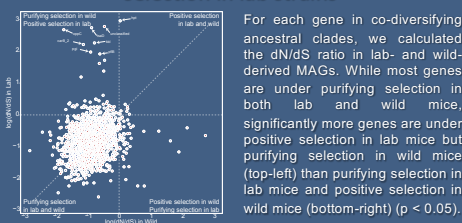


Methods

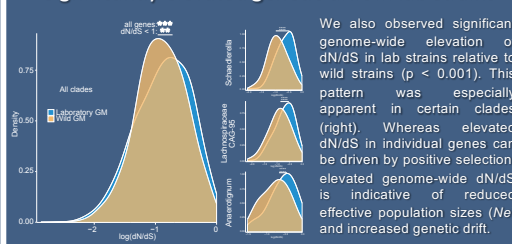
Close interactions between species over evolutionary timescales will lead to congruence between symbiont and host phylogenetic trees



Altered genomic signatures of positive selection in lab strains



Significantly elevated genetic drift in lab strains



Conclusions

We found that laboratory mice have retained > 25-million-year-old symbiont lineages that co-diversified with rodents, and that these ancestral symbionts have experienced elevated levels of genetic drift during the last 100+ years of captivity.

The observation that lab strains from ancestral, co-diversifying taxa display increased genetic load provides an evolutionary basis for their reduced fitness when competed in germ-free mice against relatives from wild mice. These findings suggest that genetic drift—rather than positive selection—has been the predominant evolutionary force driving divergence of lab mouse microbiotas from wild ancestors.

References

- Bowerman et al. (2021) Effects of laboratory domestication on the rodent gut microbiome. *ISME Communications*. DOI: 10.1038/s43705-021-00053-9
- Rosshart et al. (2021) Laboratory mice born to wild mice have natural microbiota and model human immune responses. *Science*. DOI: 10.1126/science.aaa43
- Images created with BioRender.com



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