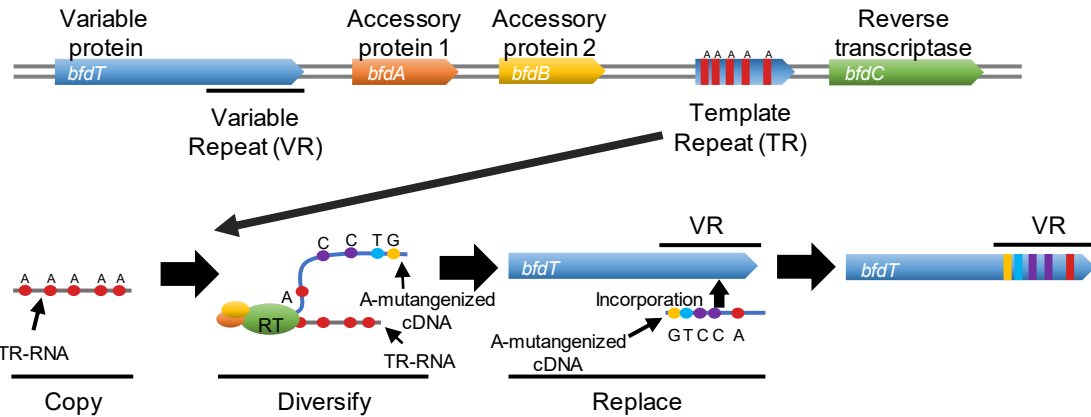


The role of accelerated evolution in the gut microbiome

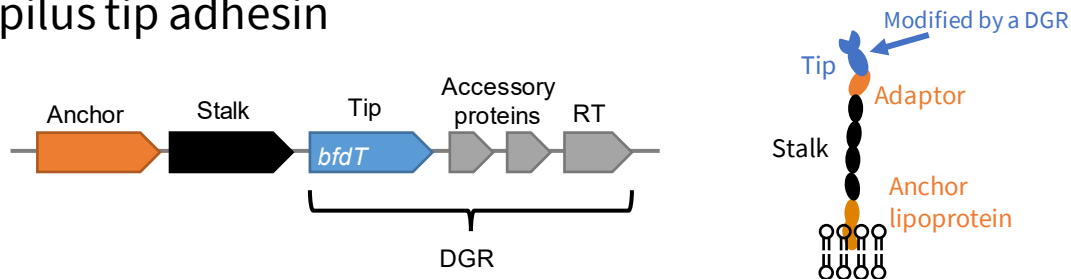
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 PI: Jeff F. Miller, PhD

Background

Diversity generating retroelements (DGRs) are capable of hypermutating protein domains



Bacteroides sp. contain a DGR that modifies a Type V pilus tip adhesin

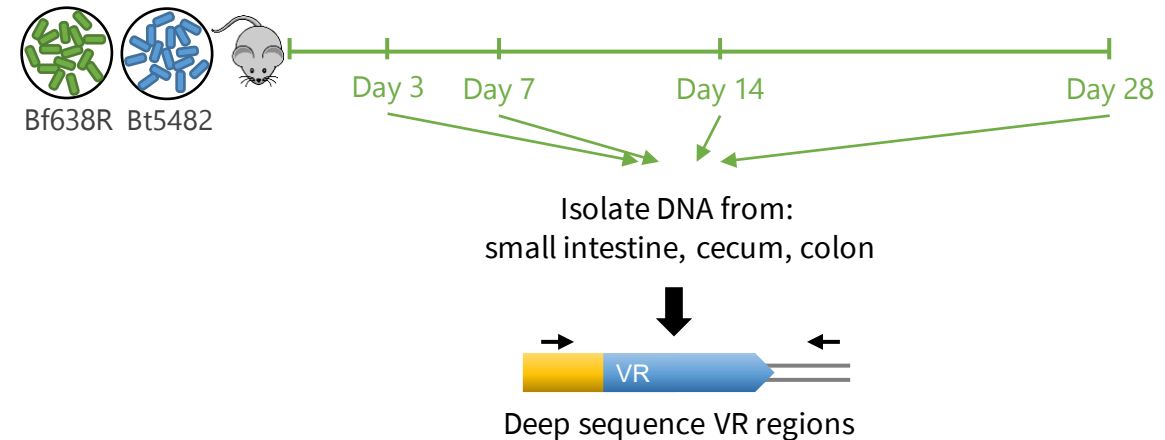


Hypothesis

Within the competitive environment of the gut microbiome, **accelerated evolution** mediated by DGRs increases the fitness of *Bacteroides sp.*

Methods

Germ-free Swiss Webster mice were mono-associated or co-associated with *Bacteroides* strains harboring DGRs



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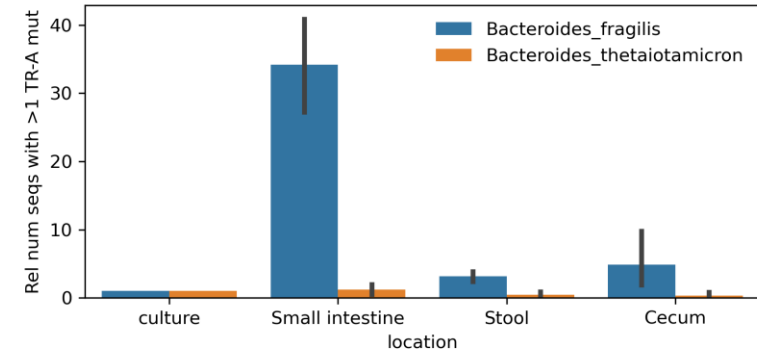
Results

- VR sequences are selectively mutated at TR-As:

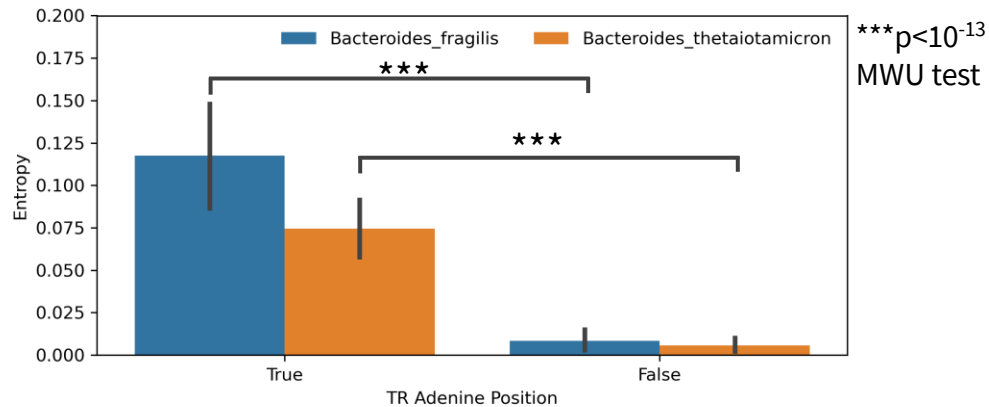
```

      ** ** * ** **      **      **      **
TR: --TTCCGAACAACCAGAACAACGGTCGCAACCTGAACCTCAACTCGTCG--
VR: --TTCCGCACAACCAGTACTACGGTCGCAACCTGGCCTTCAACTCGTCG--
    --TTCCGTACAGGCCAGTACCACGGTTGCACCCTGGACTTCTCTCGTCG--
    --TTCCGTACAGGCCGGTACCACGGTTGCACCCTGGACTTCTCTCGTCG--
    --TTCCGTACAGGCCAGTACCACGGTTGCGCCCTGGACTTCTCTCGTCG--
    --TTCCGTACAGGCCAGTGCCACGGTTGCACCCTGGACTTCTCTCGTCG--
    --TTCCGTACAGGCCAGTACCACGGTTGCACCCTGGACTTCTCTCGTCG--
    --TTCCGTACAGGCCAGTACCACGGTTGCACCCTGGACTTCTCTCGTCG--
    --TTCCGTACAGGCCAGCACCACGGTTGCACCCTGGACTTCTCTCGTCG--
    
```

- DGRs are active in a strain- and location-dependent manner within the mouse GI tract



- Nucleotide entropy is increased at TR-As:



- VR sequences converge to the same AA sequences

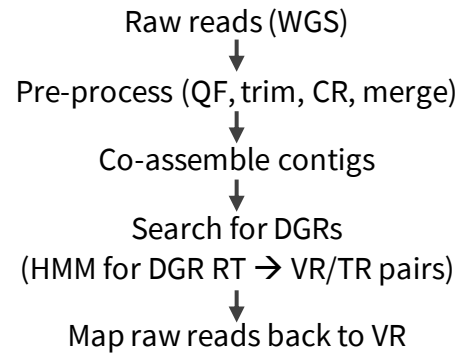
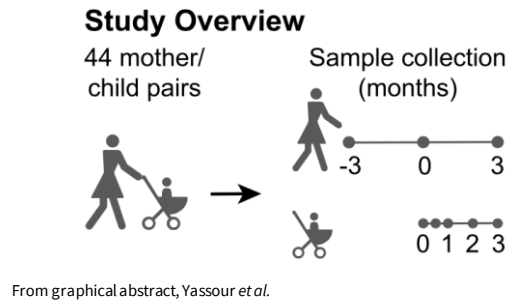


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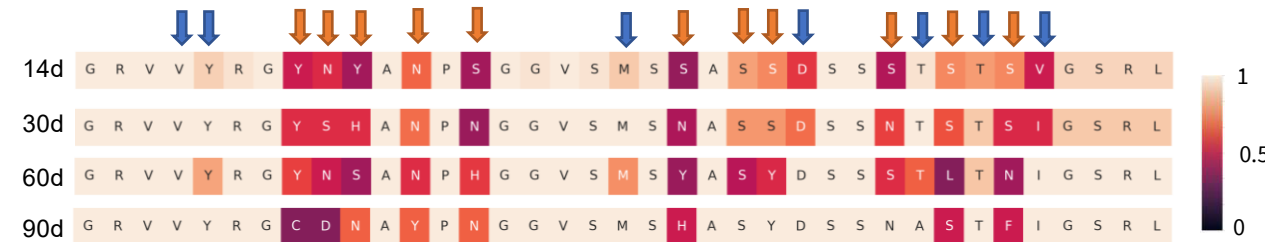
Results (Computational)

Using data from Yassour *et al.*, Cell Host Mic. 2018



Results(cont.)

Example of an actively diversified VR in an infant



Developing statistical methods to categorize active vs inactive DGRs

Future directions

Examine the effects of increased competition in the mouse gut microbiome by:

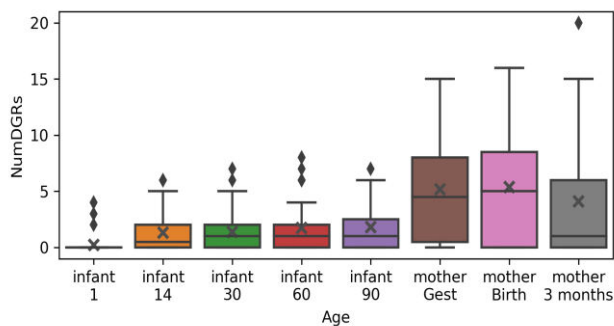
- Utilizing additional *Bacteroides sp.* (*ovatus*, *uniformis*, *finegoldii*)
- Utilizing FMT with *Bacteroides* spike-in

Control for random mutations by with ΔRT strain

Categorize DGR activity in mother-infant dataset

Examine transmission of DGRs between mother and infant

There is a positive correlation with the number of bacteria with DGRs and infant age



Most DGRs within infants are harbored by Bacteroidales

