

Strips Soil Columns

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Hypotheses

For Jared's first paper, there are three hypotheses:

H1

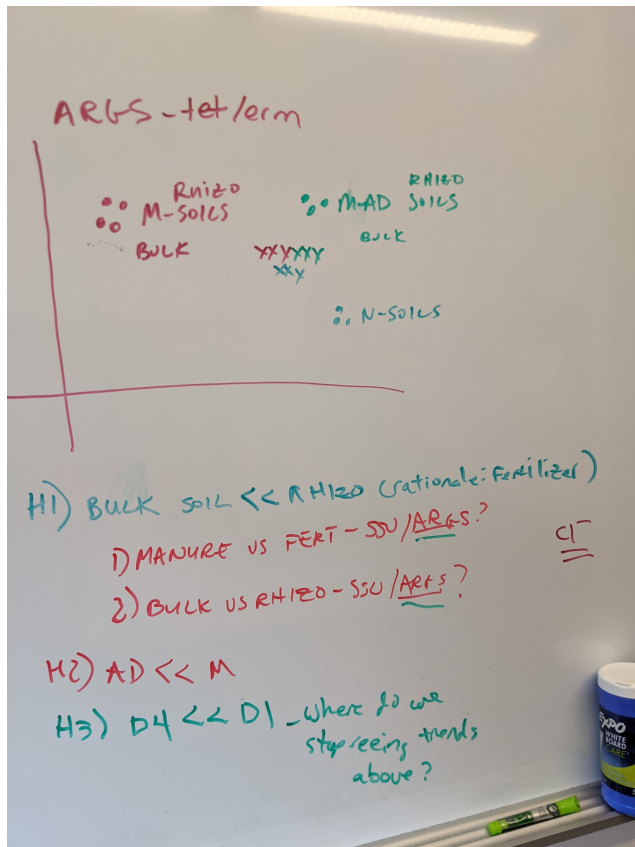
The composition of taxa (16S) and ARGs is different between bulk and rhizosphere soil following fertilizer and or manure applications

H2

AD swine manure runoff induces smaller shifts in 16S and ARGs in soil when compared to M runoff, but both AD and M elicit greater responses than mineral runoff

H3

With greater soil depth, there is less dissimilarity between bulk and rhizo 16S and ARG communities



Rationale

H1

The composition of taxa (16S) and ARGs is different between bulk and rhizosphere soil following fertilizer

Bulk vs. rhizosphere impact on SSU/ARGs

First, there is strong evidence for different bacterial community compositions between bulk and rhizosphere soils (Kuziyakov and Blagodatskaya 2015). In prairies, similar differences between bulk and rhizosphere soils has been observed, however, it must be noted that restored prairies can take decades before soil microbiomes are “mature” (Allison et al. 2005).

- What is the difference between rhizosphere and bulk:
 - Species/ARG counts?
 - Species/ARG diversity?
 - ARG mechanism?
 - Dominant phyla/ARGs?

Manure vs. fertilizer impact on SSU/ARGs

Fertilization and manure introduce nutrients and influence the abundance of ARGs. **In a pot study, manured soils had higher relative abundance of ARGs in bulk soil than in rhizosphere soil but**

the absolute abundance of ARGs (copies per gram of soil) was lower in bulk soil than most rhizosphere soils (Song et al. 2020).

Inputs of nutrients into soil increase the bacterial biomass, inherently increasing the number of indigenous resistance genes by stimulating growth of the bacterial biomass.

Bulk vs. Rhizo response to fertilizer is characterized by...

With differences between fertilizer type characterized by...

- M and AD
- AD does this less than M
-

H2

AD swine manure runoff induces smaller shifts in 16S and ARGs in soil when compared to M runoff, but b

H3

With greater soil depth, there is less dissimilarity between bulk and rhizo 16S and ARG communities

What does it all mean?

Our results will expand our understanding of the short term* threat/impact of different types of fertilizers on the quality of water infiltrating through perennial rhizospheres. We will expand on the understanding of the differences between manure and anaerobically digested manure, a byproduct of an expanding bio gas industry.

We will establish the differences between bulk and rhizosphere community and ARG response to manured runoff, contributing to our understanding of how prairie strips, a disproportionately beneficial and increasingly popular conservation practice, respond to manure runoff.

Finally we will

* Short term: our soils come from strips with at least 10 years of no manure directly applied

Questions to answer

1. What is the absolute number of ARGs in M and ADM?
2. Relative abundance of ARGs in runoff water and leachate?
3. Resistome in baseline soils?
4. How do numbers of ARGs change in leachate compared to runoff? How do ARGs change in soil following nutrient runoff?
5. What is the difference in ARG response between rhizosphere and bulk soil?
6. Is the response different based on treatment?
7. What are the differences in persistence of stimulated ARGs between bulk and rhizosphere communities?
8. What is the correlation between chloride concentration and ARG concentration in leachate? Is there a change in this relationship by column length?

Bibliography

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