GRC Annual Report 2017-2018: Soil-persistent *E. coli*

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Outline

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Project Overview

- *E. coli* has been found to persist stably in the soil
- Isolates were cultured from lysimeter leachate
- Strains were sequenced, resulting in 149 soil-persistent *E. coli* genome

Research Questions

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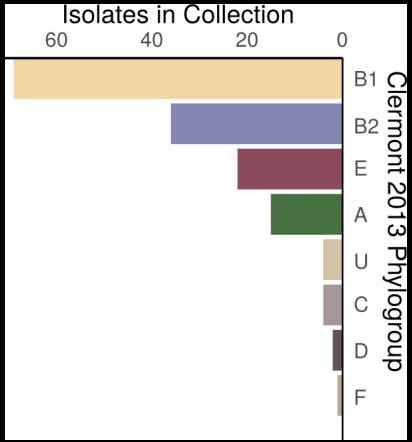
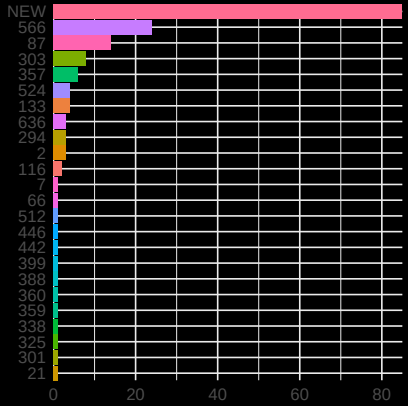
- What virulence factors are harboured by these strains?
- What can we infer about adaptation from these?
- Can we differentiate soil-persistent *E. coli* from recent contamination?

Phylogroups

Clermont 2013



Achtman 7 gene MLST



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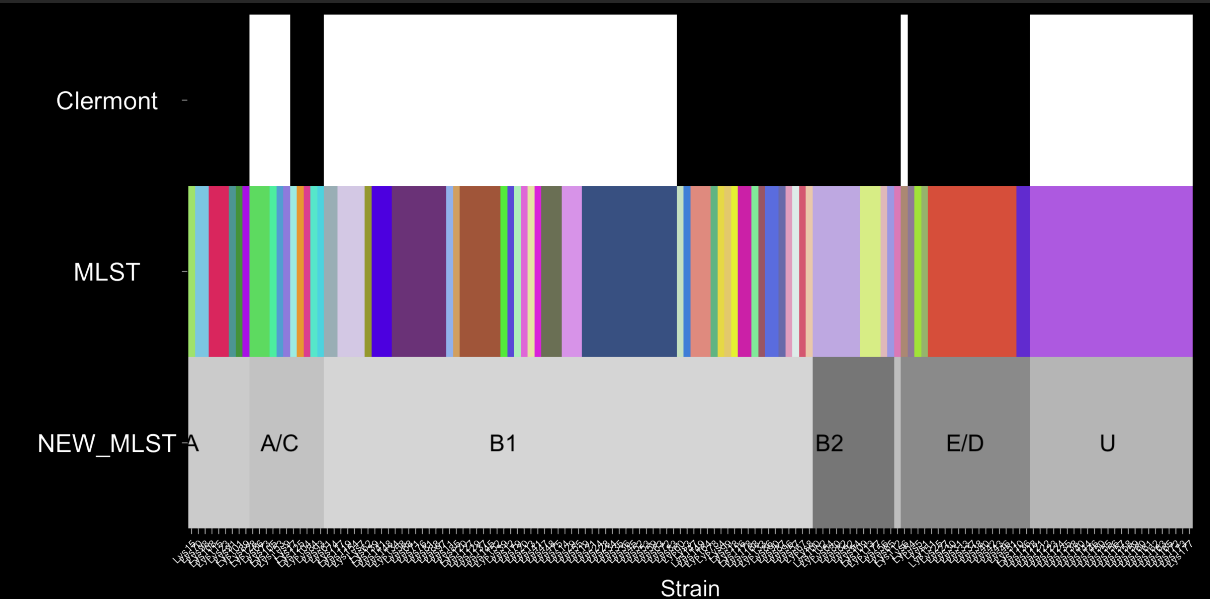
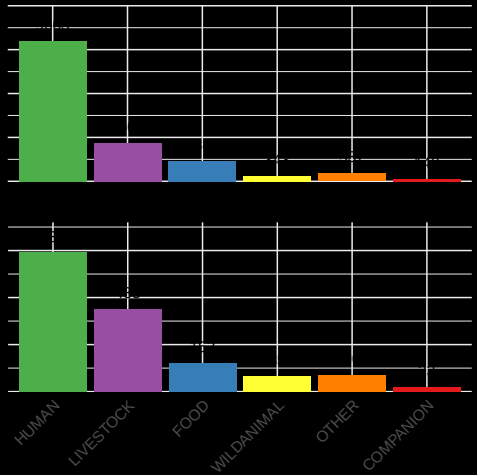


Phylogenetics Trees

Pangenome Analysis

- One isolate from each Achtman 7 MLST
- Total: 1193



Pangenome Analysis

	N	Core	total
Soil	149	2662	21,662
Enterobase	1193	1822	79,288
All	1342	1806	83,868

Detecting differential presence/absence

- Statistically compare traits to a pangenome

#1

Focus: Genomic characterization of Soil persistent *E. coli*

- Phylogenetic diversity
- Pangenome
- rRNA copy number survey
- *Correlations with growth-rate phenotypes*
- Survey of Cold-Shock Proteins
- Plasmid Survey

#2

Focus: Comparison of Soil-Persistent Strains to Enteric/Strains

- Pangenome of Soil and Enteric strains
- Sub-pangnomes by phylogroup, plasmid profile, etc
- Secondary metabolite production
- Regulatory regions

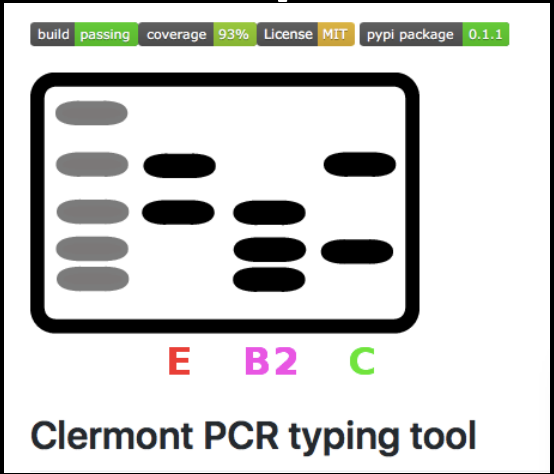
Addition Papers

Potential Foci:

- Virulence
- AMR
- Plasmids/Prophages/Other mobile elements

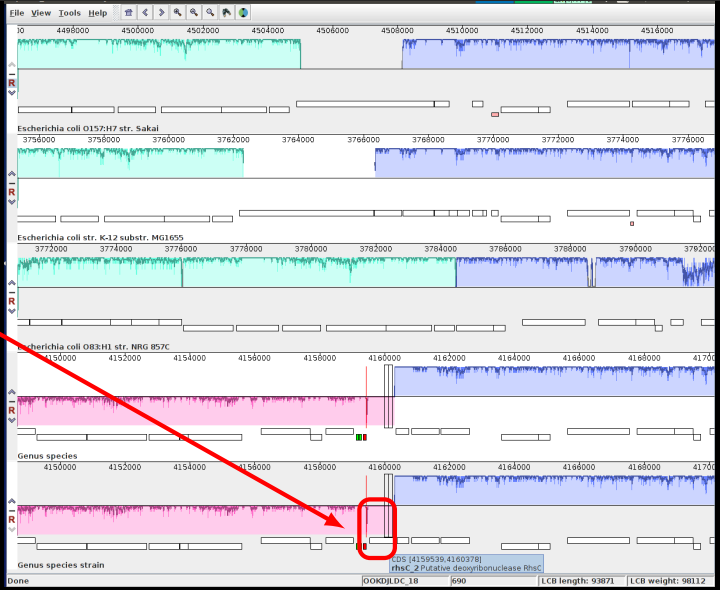
ClermontPCR

github.com/nickp60/clermontpcr



annofilt: Assessing Assemblies

Partial



annofilt

`nickp60.github.io/annofilt/`

1. Select trusted complete genomes
2. Create reference pangenome
3. Find genes next to contig borders
4. Blast against pangenome
5. Reject hits $< 90\%$ of CDS length

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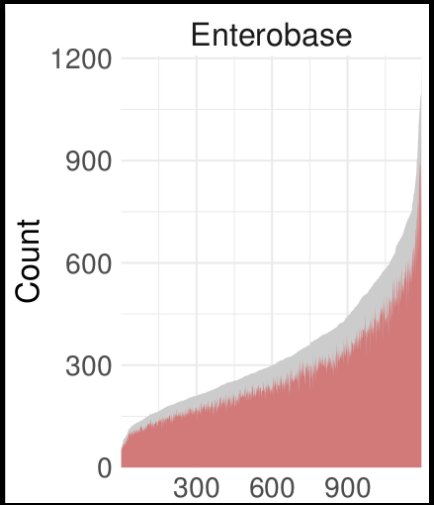
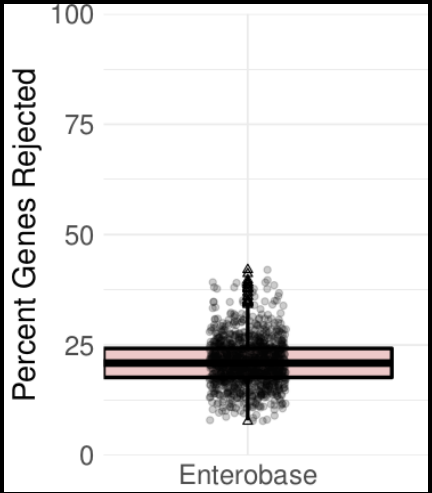
annofilt performance





Articles

Published:

Dessì, et al. "Thermophilic versus mesophilic dark fermentation in xylose-fed fluidised bed reactors: Biohydrogen production and active microbial community" International Journal of Hydrogen Energy, 43(11), 10.1016/j.ijhydene.2018.01.158. 2018

Waters, et al. "riboSeed: leveraging prokaryotic genomic architecture to assemble across ribosomal regions" Nucleic Acids Research, 10.1093/nar/gky212. 2018

In Preparation:

Nolan, et al. "Pathogen survival in anaerobic co-digestion of slurry with organic waste" Frontiers

Submitted:

Somorin, et al. "Loss of Curli in Soil-Persistent Escherichia coli is Mediated by a c-di-GMP Signalling Defect and suggests biofilm-independent niche specialisation" Frontiers

Taught Modules

- *Probability (fa16)*
- *Probabalistic Models for Bio (sp17)*

Supervisor Assessed Modules

- Visit JHI
- Journal Club
- Organize Meeting
- Present Poster
- Present Talk
- Write a Paper
- Workshop Participation

Assorted Activities

- Organized and co-led Software Carpentry Workshop
- Participated at an NCBI Biohackathon
- Presented talk at Environ 2017
- Presented poster and talk at SGM 2018
- Contributed to open-source projects (as needed)