Discussion Club 2018-09-04: Mobile elements in Soil-persistent *E. coli*

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Outline



 $\mathsf{Background}$

What does 10 years look like to E. coli?

Mobile Genetic Elements

The End

 ${\sf Background}$

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



What types of E. coli are able to persist in soil?



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- What virulence factors are harboured by these strains?



- What types of E. coli are able to persist in soil?
- 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?

What does 10 years look like to *E. coli*?

- (5.9 / 2) * 365.25 * 10
- pprox 10k generations
- Bååth 1998
- (assuming generation time roughly equals half of turnover rate)

Hypotheses



Highly diverse soil communities and environmental pressures favour rapid adaptation over incremental changes

-> Adaptations will occur more rapidly because of mobile elements rather than mutations to core functions

Mobile Genetic Elements

Insertion Sequence (IS) (Transposon)



A DNA lolipop containing a transposase and promoter.

- Size: <1.5Kb
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- Maintenence: genome replication
- Mobility: encoded transposase

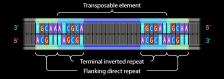


Figure: Soil E. Coli MLST

Transposon (Non-Composite Transposon) (Tn)



A DNA lolipop containing a transposase and promoter, and other accessory genes

- Size: <1.5Kb
 </p>
- Maintenence: genome replication
- Mobility: encoded transposase

Transposon (Composite Transposon) (Tn)



A DNA fragment with IS sequences on each end

- Size: <1.5Kb
 </p>
- Maintenence: genome replication
- Mobility: encoded transposase

Integrons



Integrases used to shuffle around gene cassettes

Prophages



Virus integrated into the host genome

- Size: <1.5Kb
 </p>
- Maintenence: genome replication
- Mobility: codes for a

Genetic (Chromosomal) Islands

- Size: >10Kb
- Maintenence: genome replication
- Mobility: moved by phage

Phage-inducible Chromosomal Islands

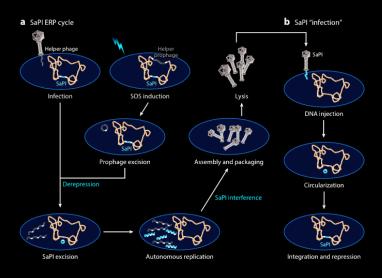


Phage parasites

- Size: 5 − 15Kb
- Mobility: moved by phage

Phage-inducible Chromosomal Islands





Plasmids



Usually circular DNA bits

- Size: <1Kb − 1Mb
 </p>
- Maintenence: self-replicating or integrating
- Mobility: Conjugation (directly or indirectly)

The End

Source



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https://www.nature.com/scitable/topicpage/
transposons-the-jumping-genes-518
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transposons-the-jumping-genes-518
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