It Takes Two to Tango: Gene Duplication in *Burkholdaria thailandensis* Leads to Community Behaviors

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GOAL

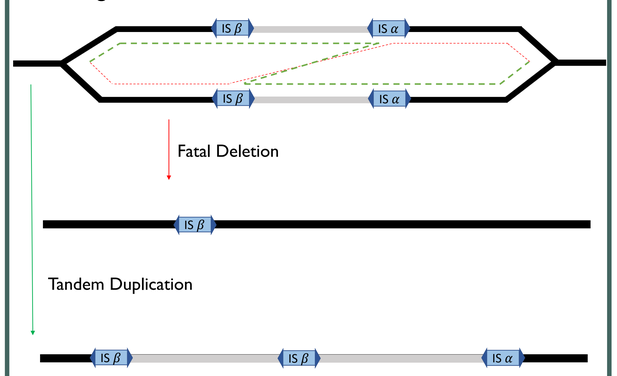
Identify which of the 161 gene(s) duplicated in *B. thailandensis* provide advantages in colony biofilms.

BACKGROUND

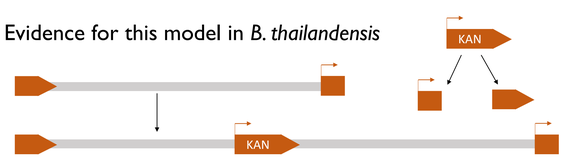
DNA sequences can be duplicated or deleted, resulting in a different copy number of a gene or genes, which influences protein abundance, and often creates variable phenotypes[1,2]. DNA duplications and deletions occur at orders of magnitude more frequently than point mutations[1,2].

Burkholderia thailandensis E264 is capable of duplicating a 210 kb region of DNA that encodes for 161 genes. This duplication is dynamic, can be selected under different conditions, and occurs via homologous recombination.

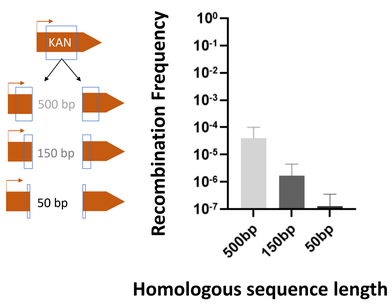
Homologous Recombination Model:



Evidence for this model in *B. thailandensis*



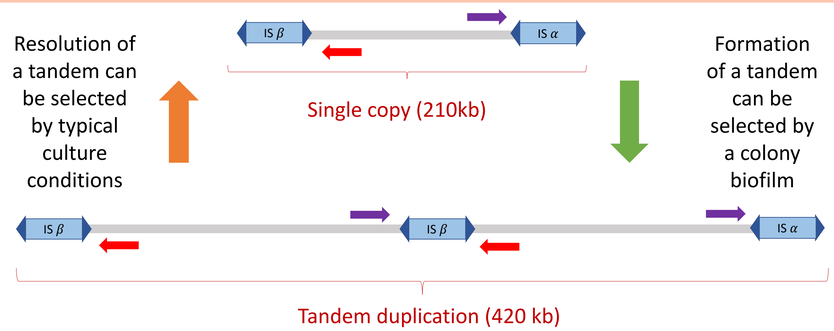
Replaced IS elements with portions of the kanamycin resistance gene and measured the proportion of kanamycin resistance colonies:



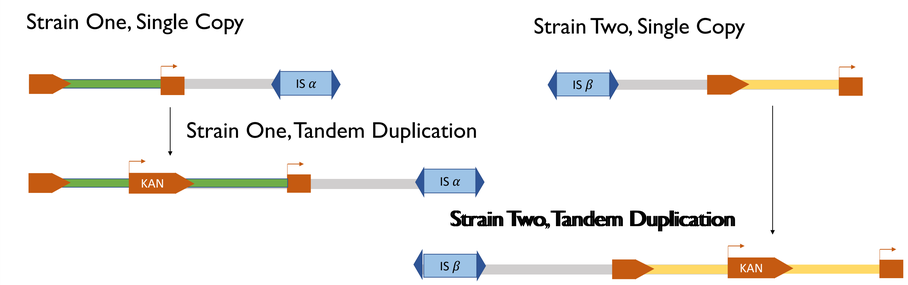
1. Sandegren, L. & Andersson, D. I. Bacterial gene amplification: implications for the evolution of antibiotic resistance. Nat. Rev. Microbiol. 7, 578–588 (2009).
2. Andersson, D. I. & Hughes, D. Gene amplification and adaptive evolution in bacteria. Annu. Rev. Genet. 43, 167–195 (2009).

Proposed Experiment: Divide and Conquer

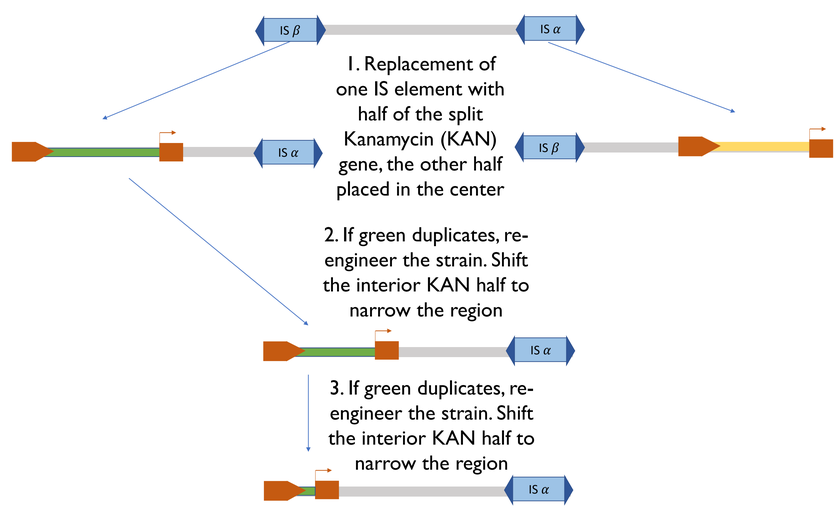
Duplication Dynamics



Duplication within Engineered Strains

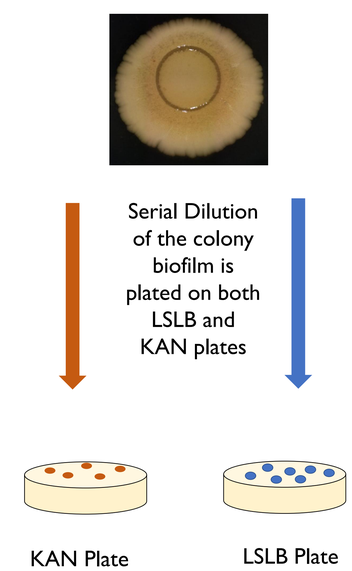


Division of the Region and Engineering Strains



4. Either Yellow or Green contains the gene(s) of interest within the region indicated in Step 3
Gene deletion will be used to determine the gene(s) involved

Methods, Possible Outcomes, and Conclusions



Outcomes	Conclusions
Either strain one or strain two duplicates	Gene(s) located on either the right or left half sufficiently provide an advantage in biofilm conditions
Both strain one and strain two duplicate	One gene is sufficient to provide an advantage in biofilm conditions
Neither strain one nor strain two duplicate	One or more gene(s) from each half are required to provide an advantage in biofilm conditions

Alternative approach: Large Scale Deletion and Complementation