Gene-specific selective sweeps in prokaryotes

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The possibility for alleles to go to fixation independently is essential for adaptation and speciation. There is growing evidence of the role of genetic recombination in maintaining non-clonal diversity in prokaryotes. Population genomics suggests the possibility of gene-specific selective sweeps in prokaryotes (gene sweeps, the process where a beneficial allele drives to fixation purging the allelic diversity only locally on the chromosome). This observation contradicts modeling results that empirically observed recombination rates and selection effects cannot cause gene sweeps. Negative frequency-dependent selection (NFDS) has been suggested to cause gene sweeps in prokaryotes. However, there is indirect evidence that gene sweeps can happen even in laboratory populations, where apparent sources of NFDS are absent. Thus, the question holds whether gene sweeps are possible in bacteria and what the mechanisms of their formation are. I propose evolution experiments to study the formation of gene sweeps in prokaryotes. In these experiments, I will compare recombination-proficient and deficient populations of a naturally recombinogenic bacterium Bacillus subtilis to study whether recombination causes gene sweeps using lineage tracking. On EvoLunch, I will talk about the problem of gene-specific selective sweep formation in prokaryotes and propose laboratory experiments to address it.