

Genetic and Environmental Effects on Bacteria and Bacterial Virus Evolution and Coevolution

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- 1. Horizontal Gene Transfer
- 2. Some Data

Horizontal Gene Transfer

The movement of genetic material
from one organism to another in the
absence of reproduction

Some Questions

- 1. What is the relative importance of horizontal gene transfer for adaptation?
- 2. What is the rate at which transfer occurs, versus the rate at which transfer is observed?
- 3. What are the constraints on transfer.

Cuatro Ciénegas Assets

- 1. Ecologically isolated.
- 2. Moderately large and diverse environmental structure.
- 3. Phosphate limited.

Some hypotheses

- 1. Cuatro Ciénegas *Bacillus* are promiscuous.
- 2. Virus-mediated transfer (transduction) is less important in Cuatro Ciénegas.

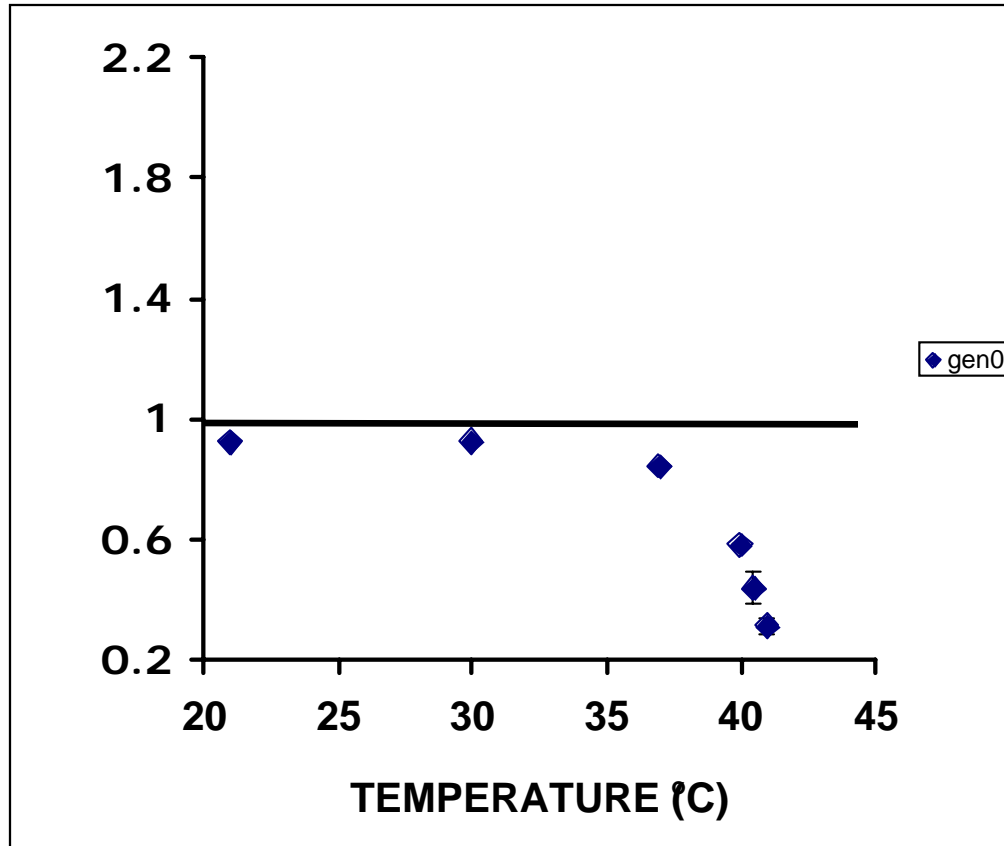
The system is a bacteria and bacterial virus system: *Escherichia coli* and phages T4 and T7.

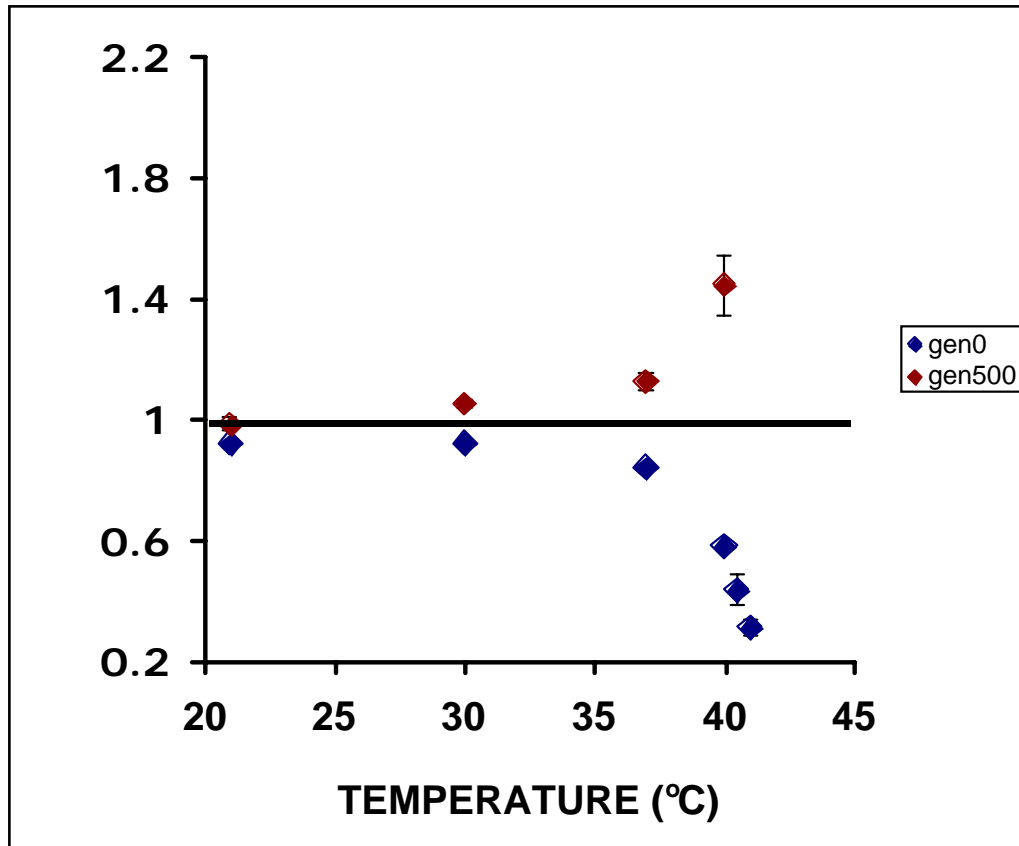
The effects of resistance to the viruses on competitive ability of *E. coli*

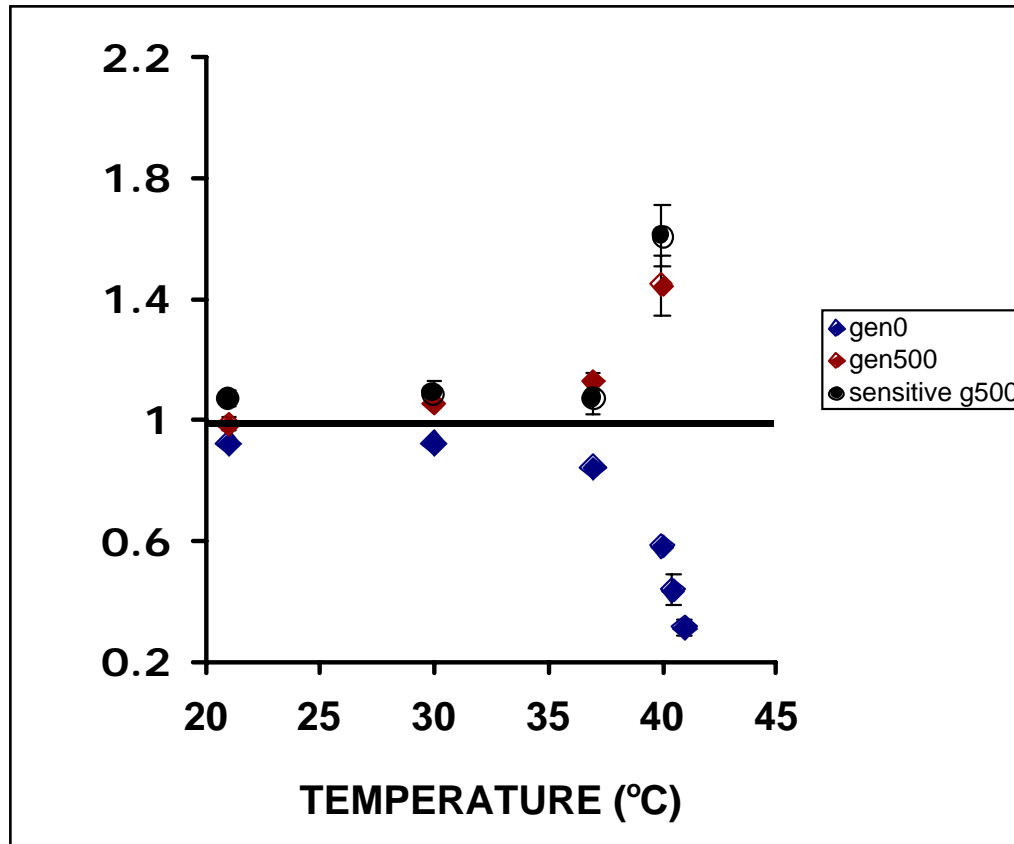
Phage Resistance

Occurs by changes in bacterial outer surface, loss of the receptor that the phage binds to when attaching to a bacterial cell.

Incurs a fitness cost in the absence of the phage.







Results

Cost of resistance is affected by thermal environment. (Pleiotropic consequences of resistance are environmentally dependent)

Recovery of fitness is affected by thermal environment. (Epistasis is environmentally dependent)

Summary

Cuatro Ciénegas is an ideal site to study Horizontal Gene Transfer in bacteria.

Resistance to bacterial viruses, a major mode of horizontal gene transfer, has fitness costs that are affected both by the environment and subsequent adaptation.

Collaborators

HGT members

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