
Burning the midnight oil: Can phages reduce bioremediation efficiency of hydrocarbonoclastic bacteria?

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Abstract

Hydrocarbonoclastic bacteria are known to biodegrade hydrocarbons of both natural origin and anthropogenic sources. These bacteria are widely distributed across the biosphere. They are generally present at low abundance, but their populations can increase dramatically in response to the sudden availability of large amounts of oil.

The most emblematic representative of hydrocarbonoclastic bacteria is the marine gammaproteobacterium *Alcanivorax borkumensis*. This strain is found throughout the global ocean and is capable of degrading both aliphatic and aromatic hydrocarbons.

Since its discovery in 1998, *A. borkumensis* has generated significant interest in the field of biotechnology for its potential in bioremediation. However, despite numerous attempts on polluted sites, bioaugmentation using *Alcanivorax* species has never achieved the same efficiency observed under laboratory conditions.

The most widely accepted explanation is interspecific competition with more adapted to local environmental conditions indigenous bacteria.

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We propose an alternative hypothesis: given the cosmopolitan nature of *Alcanivorax*, viral predation may be a key factor limiting its success in bioaugmentation.

During the EVOHE2019 expedition in the Gulf of Gascogne, we isolated the first lytic phage infecting *A. borkumensis* SK2, named Albi-1 (for *Alcanivorax borkumensis* virus 1). This phage belongs to the Corticoviridae, a viral family with only three members described to date.

Albi-1 is capable of drastically reducing the abundance of its host and maintaining it at very low levels, likely impairing its ability to degrade hydrocarbons.

Ongoing work aims to analyze the genome of Albi-1 and determine the extent to which the virus affects the bioremediation capabilities of *A. borkumensis*.

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