
Title

Prophages carrying Zot toxins on different Vibrio genomes: A comprehensive assessment using multilayer networks

Abstract

Vibrios, a group of bacteria that are among the most abundant in marine environments, include several species such as *Vibrio cholerae* and *Vibrio parahaemolyticus*, which can be pathogenic to humans. Some species of *Vibrio* contain prophages within their genomes. These prophages can carry genes that code for toxins, such as the zonula occludens toxin (Zot), which contribute to bacterial virulence. Understanding the association between different *Vibrio* species, prophages and Zot genes can provide insights into their ecological interactions. In this study, we evaluated 4619 *Vibrio* genomes from 127 species to detect the presence of prophages carrying the Zot toxin. We found 2030 potential prophages with zot-like genes in 43 *Vibrio* species, showing a non-random association within a primarily modular interaction network. Some prophages, such as CTX or Vf33, were associated with specific species. In contrast, prophages phiVCY and VfO3K6 were found in 28 and 20 *Vibrio* species, respectively. We also identified six clusters of Zot-like sequences in prophages, with the ZOT2 cluster being the most frequent, present in 34 *Vibrio* species. This analysis helps to understand the distribution patterns of zot-containing prophages across *Vibrio* genomes and the potential routes of Zot-like toxin dissemination. © 2024 John Wiley & Sons Ltd.

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Bacterial Proteins; Bacterial Toxins; Endotoxins; Genome, Bacterial; Phylogeny; Prophages; Vibrio; Vibrio parahaemolyticus; bacterial protein; bacterial toxin; endotoxin; zonula occludens toxin, Vibrio cholerae; bacterial genome; genetics; phylogeny; prophage; Vibrio; Vibrio parahaemolyticus; virology

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