BBSRC Strategic Research Priority
Food Security
  • Microbiology

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PhD project title: Vibriophages: saviour or sinner in aquaculture
University of Registration: Leicester

Project outline

1. Project outline describing the scientific rationale of the project (max 4,000 characters incl. spaces and returns)

Vibrios are a diverse genera of Gram-negative bacteria that are widespread in the marine environment. The most well-known Vibrio species is **Vibrio cholerae**, as the causative agent of cholera. However, there are many other Vibrio spp that are also harmful and know to be pathogenic including **Vibrio parahaemolyticus** and **Vibrio vulnificus**. Both of these organisms are opportunistic human pathogens and are linked to seafood related deaths. In addition, **Vibrio anguillarum**, **Vibrio salmonicida** and **Vibrio damselae** are the causative agents of Vibriosis in aquaculture, which can result in very high mortality rates in fish farming.

Bacteriophages (viruses capable of infecting bacteria) offer the potential as both agents to control Vibriosis (lytic phages) and to increase the virulence of Vibrios (temperate bacteriophages). To combat Vibriosis in aquaculture, is necessary to understand how both temperate phages contribute to virulence and if lytic phages offer an alternative to traditional antibiotics. Recently we have predicted a huge diversity of temperate phages within the genomes of Vibrio spp, many of which carry virulence genes. Due the vast diversity of phages, predicting the exact region of prophages in bacterial genomes is notoriously difficult.

In this PhD the student will further characterise prophages within Vibrio spp and begin to evaluate the effectiveness of lytic phages to combat Vibriosis.

Objectives

1) Begin to induce temperate phages from selected Vibrios, to experimentally confirm bioinformatics predictions. Use the results of experimental validations to improve the models for predicting prophages
2) Generate Vibrio mutants that have been cured of “prophages” and determine if virulence is decreased
3) Isolate lytic phages against **Vibrio parahaemolyticus**, **Vibrio vulnificus**, **Vibrio anguillarum**, **Vibrio salmonicida** and **Vibrio damselae**.
4) Determine if lytic phages can be used to reduce Vibriosis in a model system of fish larvae.

Techniques that will be undertaken during the project
Microbiology – Phage isolation, culturing bacteria,

Molecular biology – construction of Vibrio mutants

High-throughput sequencing – sequencing of induced supernatants to identify temperate phage – bioinformatics analysis of this

Bioinformatics – prediction of prophage within Vibrio genomes. Refinement of algorithms to predict prophages in large datasets (Bioinformatics and quantitative skills)