Identification and Characterization of Freshwater Vibrio Phages from Pittsburgh, Pennsylvania

Bina, Rachel (School: North Allegheny Senior High School)

Vibrio cholerae is a bacterium that causes the severe diarrheal disease cholera. V. cholerae exists as two strains: environmental and toxigenic. Environmental strains cannot cause cholera and are found in aquatic ecosystems worldwide, including North Park Lake in McCandless, Pennsylvania. Toxigenic strains are found primarily in underdeveloped regions of the world where they cause 3-5 million cholera cases each year, resulting in ~110,000 deaths. People acquire cholera by consuming food or water containing toxigenic V. cholerae. V. cholerae is developing antibiotic resistance which makes treatment more difficult. Phage therapy is a medical technique that uses phages instead of antibiotics to treat bacterial infections. Phages are viruses that exclusively target bacteria, serving as predators for disease causing bacteria. The hypothesis proposed was if V. cholerae was present in North Park Lake, then phages targeting V. cholerae should also be present. Water from North Park Lake was mixed with growth media inoculated with V. cholerae previously isolated from North Park Lake. After growth, the culture supernatants were tested for V. cholerae phages by plaque assays. Twelve phages were identified, purified, and tested against environmental and toxigenic V. cholerae. One phage, named RBPh7, was found to kill toxigenic V. cholerae that are responsible for ongoing cholera epidemics in the developing world. Electron microscopy placed RBPh7 in the Siphoviridae family. These results proved the hypothesis - V. cholerae phages are present in North Park Lake. Significantly, phage RBPh7 discovered in this study has potential to be used in phage therapy for cholera.

Awards Won: