Abstract:

Bacteriophage isolation from environmental samples has been performed for decades using principles set forth by pioneers in microbiology. The isolation of phages infecting Arthrobacter hosts has been limited due to the low success rate of many previous isolation techniques. This has resulted in an underrepresented group of Arthrobacter phages available for study. The enrichment technique developed at Cabrini College, unlike many others, uses a filtered extract free of contaminating bacteria as the base for indicator bacteria growth, Arthrobacter sp. KY3901, specifically. By first removing soil bacteria the target phages are not hindered by competition with native soil bacteria present in initial soil samples. This enrichment method has resulted in fourteen unique phages that belong to six different clusters from several different soil types. Different types of phages were even produced from the same enriched soil sample isolate. The growth characteristics of these phages have been examined and they have a variety of ideal growth temperatures and calcium chloride concentrations. These phages have also been examined with several genome analysis tools including DNA Master and Phamerator from the Department of Biological Sciences at the University of Pittsburgh. The results of this analysis may shed light on the genes that function in virulence, bioremediation or growth characteristics.

Background:

Various species of Arthrobacter are ubiquitous in soil and display pleomorphic, Gram variable rods or cocci when grown in aerobic culture. Arthrobacter is a highly diverse genus of bacteria and is known for its ability to survive in harsh conditions and degrade nitrogenous environmental toxins (Mongodin et al, 2006). Of particular interest is Arthrobacter's ability to break down atrazine and other s-triazine rings commonly used as herbicides and pesticides (Strong, 2002).

Previous attempts at isolating Arthrobacter phages from soils have been met with limited success. Past enrichment strategies included lengthy incubations or studies resulted in little characterization of the phages found with these methods (Germida & Casida, 1981). Arthrobacter phage isolation done in the past has been focused mainly on developing methods for phage typing of Arthrobacter soil isolates or for control of microbial growth in industrial processes (Brown et al, 1978; Petrovski et al, 2011). No research has been done until now to broadly characterize the phages available for study. The enrichment technique developed at Cabrini College, unlike many others, uses a filtered extract free of contaminating bacteria as the base for indicator bacteria growth, Arthrobacter sp. KY3901, specifically. By first removing soil bacteria the target phages are not hindered by competition with native soil bacteria present in initial soil samples. This enrichment method has resulted in fourteen unique phages that belong to six different clusters from several different soil types. Different types of phages were even produced from the same enriched soil sample isolate. The growth characteristics of these phages have been examined and they have a variety of ideal growth temperatures and calcium chloride concentrations. These phages have also been examined with several genome analysis tools including DNA Master and Phamerator from the Department of Biological Sciences at the University of Pittsburgh. The results of this analysis may shed light on the genes that function in virulence, bioremediation or growth characteristics.

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