CONSIDER FOR TALK

2022 SEA Symposium Abstract

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Deep SEA Diving: An Advanced Phage Genetics Course

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Lehigh’s SEA-PHAGES program provides opportunities for first year and advanced undergraduates to extend their discoveries and investigations about Actinobacter phage genome structural diversity, host-phage interactions, phage gene structure/function, and phage biology into multiple courses throughout their academic career. Our advanced phage genetics students are involved in diverse sets of projects, including phage discovery, genome annotations, investigations of gene functions and immunity mechanisms protecting cluster N lysogens from heterotypic phage attack, cluster N *Mycobacterium* phage Butters gene function analyses using SEA-GENES methodologies, and investigations of lysogen establishment - deficient phages. Here, we report updates and new investigations undertaken by our advanced phage group. **I**. We have recently extended our interests in cluster N prophage biology to uncover genes required for defense by cluster N phage Smurph because its set of defenses extend over a larger and more diverse group of heterotypic phages compared to Butters. Deletion of Smurph genes 31-35 is in progress using Bacterial Recombineering Electroporated DNA (BRED) strategies. Mutant phages will be used to produce lysogens for use in immunity studies to compare plating efficiency profiles for heterotypic phages with profiles from a wildtype lysogen. **II**. The role of Kevin1 central variable region (CVR) gene 30 (predicted to encode a AAA ATPase) is also of interest because of its uniqueness within the CVR region compared to other known cluster N phage genomes. Preliminary evidence reveals that a Kevin1 *gene30* deletion mutant is inefficient in forming a lysogen, suggesting that the AAA ATPase may have a role in lysogen establishment. **III**. Annotation of newly discovered and sequenced phages NorZ (A1; revealed through DOGEMS 2021), Perplexer (A4), and Chomp (C1; proposed by EM morphotype and confirmed by DOGEMS 2021) from the 2021 cohort will be discussed. **IV**. Other advanced students, previously enrolled in SEA-GENES, are completing analyses of Butters gene functions. **V**. Further studies of lysogen-deficient cluster A1 phage Gyzlar are ongoing to potentially rescue this deficiency. **VI**. Expression of Roksolana (A6) *gene90* (annotated as a DNA methylase) for protein structural studies. Collectively, these ongoing research projects underscore the breadth of Lehigh’s advanced SEA-PHAGES Program.