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University of California, Los Angeles

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Corresponding Faculty Member: Jordan Parker (jordan.p.parker@kp.org)

Conservation of the Lysis Cassette in Mycobacterium and Gordonia Phages

Mirrat Adil, Alyssa Howell, Samantha Joseph, Jessica Porrelli, Andrew Kapinos, Canela Torres, Amanda C Freise, Jordan Moberg Parker

Bacteriophages, viruses that infect bacteria, are equipped with genes that facilitate lysis of their host bacterium. During host lysis, bacteriophages utilize proteins of their lysis cassette to break down their hosts’ cell walls and release virions. Mycolic acid layers present in the cell walls of Mycobacterium and Gordonia hosts necessitate specialized lysis cassettes in their respective phages. These lysis cassettes consist of genes encoding holin, lysin A, and lysin B proteins, which contribute to the degradation of peptidoglycan and mycolic acid layers in the cell wall. Although these genes have been previously characterized, intercluster and intracluster comparisons between the lysis cassettes of Mycobacterium and Gordonia phages have not been widely studied. Here we identified extensive intracluster and limited intercluster similarities in lysis cassettes through Phamerator analyses, corroborated with dot plot and phylogenetic tree analyses on individual lysin A and lysin B amino acid sequences. The results suggest that lysis cassette synteny exists within clusters, and the amino acid sequences of lysin A and lysin B genes are relatively conserved across phages of the same cluster. These findings are indicative of potential horizontal gene transfer between these phages and enhance our understanding of the lysis cassette and its evolution within phages. Furthermore, lysis cassettes may be utilized in phage therapies to target pathogenic bacteria since they are critical to the phage lytic cycle and phage-host interactions.