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Kansas State University

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Corresponding Faculty Member: Martha Smith-Caldas (mscaldas@ksu.edu)

Potential Roles of Histidine Nucleotide Triad Binding Protein and Methyltransferase in Actinobacteriophages.

Brittney C Flaherty, Samantha J Weber, Karolina Borucki, Nick B Burket, Katie M Dickerson, Emily F Generaux, Peyton K Hastings, Chase A Johnson, Kaitlyn P Jones, Andrew J Kroll, Kyser D Meininger, Elijah C Nichols, Bella A Stark, Kaitlyn L Ward, Reese W Willis, Lake R Winter, Christopher D Herren, Martha R Smith-Caldas

It is estimated that an excess of 1031 bacteriophages exist within the biosphere. It is inevitable that bacteria would experience several infections from various phage simultaneously. Multiple phage infections within one host is a topic that is under-researched and unexplored in bacteriophage ecology. Here were discuss the functional role of Histidine Triad Nucleotide Binding Protein (HINT) within actinobacteriophages isolated at Kansas State University, and how it could be employed as a defense mechanism when two phages are competing inside the host. When present in a bacteriophage, HINT is known to have antiviral functions. This brings into question the evolutionary benefit of a virus containing an anti-viral gene. We hypothesize that the benefit of this function would enable one phage to exclude another phage in the host. When two or more phages come into conflict with each other, the phage with the ability to switch to a lytic cycle quicker will prevail within the host. In addition to the HINT gene, PinkCoffee contains two other genes, methyltransferase and immunity repressor, within its genome that would enable the bacteriophage to employ this competitive advantage. Methyltransferase is a gene that functions as the switch between the lytic and lysogenic cycles when the phage experiences environmental stressors. For example, if a host experienced infection by another phage that threatens or competes for the resources within the host, the host would then experience distress. This drastic shift in the environment would trigger the methyltransferase which would switch off the immunity repressor function, allowing the transition from a lysogenic to lytic cycle. During lytic reproduction, the phage would be able to quickly replicate, and distribute the HINT gene throughout the host, potentially enabling the host to use the antiviral functions to combat the competing phage causing the initial distress.