CONSIDER FOR TALK

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Digging for Diesel: A functional analysis of cluster A3 phage Dieselweasel

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DieselWeasel is a lysogenic A3 phage with 87 genes, including 4 TRNAs. The evidence collected from bioinformatics tools such as PECAAN,Phaster and BLAST have shown that Dieselweasel can potentially integrate into mycobacterial species other than M.smegmatis. By ensuring adhesion to host receptors during the initial phases of infection, Minor Tail proteins are essential in the determination of host range in these bacteriophages. Mycobacteriophage Microwolf, a related A3 mycobacteriophage, is known for possessing a broad host range, but subcluster identification is not sufficient to identify host range. Therefore, we utilized Blastp to determine whether DieselWeasel (A3) or Chupacabra (A10) have a minor tail protein sequence similar to Microwolf. The alignment showed that Dieselweasel and Chupacabra have the same structure in the Gp5 protein sequence as Microwolf, indicating that these phages may also possess broad host-range. Further, it was discovered that Dieselweasel may have the potential to integrate into other medically important mycobacterial species other than M.smegmatis. Analyzing the genome of M. tuberculosis and M. abscessus (a multi-drug resistant and nontuberculous mycobacteria), it was found that the ATTB site of M.abscessus has a 98-100% similarity to that of the ATTP site of Dieselweasel, inidcating the potential for Dieselweasel to form prophages in M.tuberculosis and M. abscessus. Disimilarity between the M. abscessus-derived prophages and Dieselweasel indicate that Dieselweasel may integrate into these bacterial genomes even in the face of superinfection. As a lysogenic phage, Dieselweasel and related phages use a stoperator system to inhibit lytic replication during lysogeny. Stoperators sole purpose throughout these sites are prevent lytic-associated gene transcription. Dieselweasel was discovered to possess the same Stoperator sequence as other A3 cluster phages (GTTCTCTGTCAAG). 9 Stoperators were located in Dieselweasel throughout the 87 genes with the associated Immunity Repressor found at gene #77. Similarly, A2 Mycobacterium phage Phaded also uses a stoperator system using the sequence (GGTGGATGTCAAG), similar to other A2 cluster phages. Six different stoperator sites and an immunity repressor were found in Phaded, of the 91 genes present in the phage. Additionally, as Dieselweasel is a lysogenic phage, it has fewer TRNA than most lytic phages such as HyRo(C1) and Alice(C1). Collectively the evidence suggests that Dieselweasel has potential for use in the detection and molecular manipulation of a broad range of mycobacterial species.