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What makes Bacteriophages beautiful: classification and analysis of OneDirection, a new CZ6 Bacteriophage

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Bacteriophages are highly abundant bacteria-infecting viruses. Because they target bacterial populations, they are a powerful tool for eradicating antibiotic resistant bacterial infections, such as MRSA. OneDirection is an Actinobacteriophage which was isolated from a soil sample in Pittsburgh that infects *Gordonia terrae*. After DNA purification and amplification, the genome of OneDirection was sequenced by illumine sequencing by the Pittsburgh Bacteriophage Institute and characterized using Phamerator, Starterator, HHpred, NCBI BLAST, PECAAN, GeneMark, Glimmer, TMHMM, and SOSUI. The genome of OneDirection is 40,444bp long, contains 68 genes, and consists of 65.6% GC content. The presence of genes known to function in the lysogenic cycle were identified. Furthermore, OneDirection forms small, hazy halo-like plaques on lawns of *Gordonia terrae*. Therefore, OneDirection is hypothesized to be a temperate phage. OneDirection belongs in the CZ6 cluster with the phages Faith5x5 and Moosehead. OneDirection contains 5 genes that are classified as orphams by Starterator, 4 of which have no assigned function. One orpham, gp33, appears to encode an immunity repressor. We hypothesize that this immunity repressor may provide superinfection immunity to OneDirection lysogens. Interestingly, gp33 is identical to genes found in cluster CY1 and CZ1, but not in other CZ6 Actinobacteriophages. This could indicate that an ancestor of OneDirection acquired this region of DNA from another bacteriophage. Our research will build on existing knowledge of bacteriophage protein functions, applications, and evolution.