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Discovery and Identification of Lakshmi Bacteriophage from Plano, Texas

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Bacteriophages are an abundant type of virus with the ability to infect and kill bacteria while using them to replicate through lytic or lysogenic processes. Bacteriophages play a key role in the regulation of bacterial populations in various environments and are being explored as potential tools in phage therapy. The aim of this study was to isolate, characterize, and manually annotate the genome of the bacteriophage Lakshmi collected from the Arbor Hills Nature Preserve in Plano, Texas. Lakshmi was isolated from an enriched soil sample on Arthrobacter sp. ATCC 21022. Plaque assays, spot tests, and serial dilutions were used to purify the lysate; tape measure protein polymerase chain reaction (TMP PCR) of Lakshmi DNA and transmission electron microscopy (TEM) were performed to determine phage characteristics. Lakshmi DNA was sequenced at the Pittsburgh Bacteriophage Institute. Various bioinformatics tools, including PECAAN, GeneMarkS, Phamerator, BLASTP, HHPred, TMHMM, and SOSUI, were used to determine open reading frames and predict gene function. Lakshmi belongs to cluster AK and displays Siphoviridae morphology, with a head diameter of approximately 50 nm and a tail length of 100 nm. Its genome has 44018 base pairs, a GC content of 60.8%, and 60 confirmed genes. Twenty-nine of these genes code for proteins that have determined functions, including minor tail proteins, membrane proteins, and helix-turn-helix DNA binding domain. The annotation of the Lakshmi phage will advance current understanding of bacteriophage diversity, and further bioinformatic analysis can be performed to explore the structure and function of predicted proteins.