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Singers and Soda: The discovery and characterization of A. globiformis phages Pitbull, MissAmericana, RootBeer, DoctorPepper, and MellowYellow

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In the Fall of 2023 five bacteriophages Pitbull (FQ), MissAmericana (EM2), Rootbeer (FA), DoctorPepper (AW), and MellowYellow (AP2) were sequenced out of 46 discovered phages isolated by Purdue University undergraduates using A. globiformis B-2979. These bacteriophages showed notable morphological and genetic diversity from each other as well as previously sequenced phages with the same bacterial host. Of the five sequenced phages, all were siphoviridae, except MissAmericana which was podoviridae. However, Pitbull, MissAmericana, and Rootbeer all exhibited lysogenic properties during initial isolation in which they developed bacterial colonies inside of phage plaques. Their genome size and numbers of genes had a range of approximately 39 to 73 kbp and 51 to 125 genes, respectively. Pitbull, MissAmericana, and MellowYellow all had less than five other members in their (sub)clusters, indicating especially novel genomes. Approximately 60% of genes in MissAmericana and MellowYellow were reverse genes. Additionally, 20% of Pitbull’s genes were orphams, indicating a high degree of gene novelty. Select genes and gene regions from the five bacteriophages were further investigated using a combination of AlphaFold, PyMol, Phamerator, HHPred, PhagesDB, custom Python scripts, and DeepTMHMM.