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A Unique Absentee: Mycobacteriophage Benvolio’s Lack of an Integrase Gene

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Mycobacteriophage Benvolio was isolated at Virginia Tech from local soil using *Mycobacterium smegmatis* as a host. Benvolio produced slightly turbid plaques at 37° C and was assumed to be a temperate phage. All evidence from characterization experiments including PCR of the tape measure protein gene, tail length, and a restriction digest suggested that Benvolio belonged to the A2 subcluster. Genome sequencing revealed that Benvolio was indeed a member of the A2 subcluster and that the phage lacks an integrase gene. The majority of A2 phages, including several of Benvolio’s close relatives, have an integrase gene making them capable of utilizing the lysogenic cycle (temperate phage). Benvolio, like closely related Echild, contains ParA and ParB genes close to the location of the missing integrase gene. The ParAB genes are believed to form a putative partitioning cassette which conveys the ability to form lysogens. Lytic phages are sought after as candidates for phage therapy since they are more likely to destroy the target bacteria rapidly. Benvolio warrants further study to determine whether or not it can truly form stable lysogens without an integrase gene.