# Effectiveness of bacteriophages against bloater-causing bacteria *Enterobacter cloacae* in a model food system

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## Abstract

Cucumber fermentations are one of the most important vegetable fermentations in the United States and Europe. *Enterobacter cloacae* and other gas-producing bacteria can cause bloater defect (the gas pockets or hollow cavities formed in fermented cucumbers) which lowers the quality and the yield of fermented cucumbers, thereby resulting in significant economic losses to the pickling industry. Cost-effective strategies to control *E*. *cloacae* and other microbiota need to be developed. Using bacteriophages (phages) to eliminate undesired bacteria is an emerging and promising biocontrol method. Our lab recently isolated two phages, Φ107E and Φ115E, infecting *E*. *cloacae* strains 107E and 115E, respectively. In this study, we measured 1-step growth curve of phage Φ107E at a multiplicity of infection (MOI) of 0.01 and 37°C in cucumber juice. The data showed that the eclipse period (not including 10-min adsorption) is only 10 min and the burst size is 28 virions per infected cell. We also evaluated the effectiveness of the two phages as biocontrol agents against *E*. *cloacae* in cucumber juice. The infection with Φ107E at MOI of 100 or 1 effectively eliminated its host within 2 or 3 hours, indicating very high lytic activity against its host. The infection with Φ115E at MOI of 0.2 or 0.02 caused more than 3 log unit reduction in its host concentration within 2 or 3 hours. But thereafter, phage-resistant bacterial mutants emerged. Thus, phage Φ107E has a greater potential to be used in commercial cucumber fermentations to eliminate its host in order to reduce bloater defect.