Genomic Characterization of Bacteriophage BC01 against *Bacillus cereus*

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Introduction

Recently, *Bacillus cereus* commonly exists in nature and is well-known to be responsible for several food poisoning outbreaks. Because of its high probability of causing food poisoning, there is increasing consumer anxiety related to the safety of food. Therefore, new methods of ensuring food safety are required. Some phages have been designated as Generally-Recognized-As-Safe (GRAS) by the US Food and Drug Administration (FDA). Moreover, the FDA recommends the spraying of phage culture on the food surface, which is cheaper than using synthetic antibiotics.

Aim

The aim of the present study was to isolate and identify a phage with activity against *B. cereus*, which was reported to frequently contaminate infant formula and baby foods as an opportunistic foodborne pathogen*. B. cereus* might be effectively controlled by the phage identified in this study, which could then be applied as a biocontrol agent in the food manufacturing process or extended storage.

Methods

Bacteriophage particles were analyzed with transmission electron microscopy. Factors influencing adsorption were carried out with a double-layer plaque assay. Sodium dodecyl sulfate-polyacrylamide gel electrophoresis was conducted to measure the size of major structural proteins. The complete genome of the phage was analyzed.

Results

Bacteriophage particles (100-nm icosahedral head and 200-nm contractile tail) were identified as *Myoviridae*. ΦBC01 had host specificity to *B. cereus*. Major structural proteins of ΦBC01 showed two abundant bands of 99 kDa and 56 kDa, respectively. The 158,385-bp genome sequence of ΦBC01 was determined: 56 of the 305 open reading frames were annotated indicating involvement in bacteriophage DNA manipulation, cell lysis, packaging, structural proteins, and others.

Conclusion

In this study, we focused on the molecular characteristics of the phage and its physiological stabilities to environmental factors. This basic study of a *B. cereus* phage is expected to provide critical reference information to achieve better control of the food-associated pathogen in the manufacturing of liquid- or powder-type foods.