Effect of salt on bacteria-phage system

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Phage contamination is a serious problem in industrial fermentation processes employing bacteria. This problem has not been solved yet, although much work has been done. With the recent development of recombinant DNA technology, genetically modified bacteria have been increasingly employed for the large-scale production of useful substances. Studies on the prevention of phage contamination and the control of phages in industrial processes are currently of importance.

We isolated two new phages from culture lysates of a genetically modified serine-producing Escherichia coli K-12 and designated S1 and S2.

Effect of salt on phage has not been studied yet in relation to phage control. Therefore, we investigated the effects of salt on phages and their host bacteria, using phages S1 and S2 and Escherichia coli K-12.

Salt completely inhibited the growth of bacterial cells at 0.8 M and more. Under these concentrations, colony-forming activity of cells decreased. This loss of colony-forming activity was not the results of cell death, because the colony-forming ability was restored after treatment with betaine. Salt did not affect the infectivity of free phage and the adsorption of phage onto cells. Salt completely inhibited the growth of phages at 0.7 M and more. The number of infective center decreased with phage S1, but not with phage S2. Since salt exhibited little selective action in this system, it cannot been used in the conventional manner when fermenting culture is infected with phage.

Then, the combination effect of salt and higher temperature on the growth of phages and their host bacterial cells was investigated. At 42°C lower concentrations of salt inhibited the phage growth and decreased the number of infective center with phage S1. However, with phage S2 this was not true.