CHARACTERISTICS OF TRANSFECTION OF BACILLUS SUBTILIS PHAGES M2 AND Nf

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Bacteriophages M2 and Nf are small DNA-containing phages which can infect Bacillus strains (1, 2). As biological and physical properties of these two phages examined were very similar, we investigated further the manner of their transfection. The present communication deals with dose-response in transfection of these two phages, and other results on the phages will be published elsewhere.

Bacteriophages used in the experiments were M2, Nf, and SPP1. The methods of propagation, purification of these phages, preparation of transfecting DNAs from the phages, and the procedures of transfection were all the same as those described by HIROKAWA (3). The preparation of transfecting DNAs did not contain detectable number of the phage particle. Bacillus subtilis 222 (highly transfectable derivative of strain 15–171 trp arg) was used as the host strain for propagation of phage SPP1 and as the recipient strain of transfection in the main. Bacillus subtilis GSY 908 argC4 hisA1 rec 4) (4), a recombination-deficient strain, served as the recipient of transfection in specific experiments. For propagation of phages M2 and Nf, Bacillus amyloliquefaciens HW (3) was used as the host strain.

Previously, TAKAGI et al. (1) reported that the frequencies of M2 transfection varied with multi-power of the DNA concentration in comparison with the dose-response relationships of transformations with single and two unlinked markers. In the present study, however, the dose-response of M2 transfection showed a single-powered relationship within a wide range of DNA concentration from 0.001 to 1 µg/ml (Fig. 1). The dose-response of Nf transfection was very similar to that of M2, as will be seen in Fig. 1.

In another experiment, test was made to see whether both of phages M2 and
Nf could utilize a recombination-deficient strain, GSY 908, as the recipient in transfection or not. As indicated in Table 1, both of these phages could utilize the strain as the recipient in transfection, though the transfection of phage SPP1 could not occur in this strain. The two characteristics mentioned above about the transfection of phages M2 and Nf are what had been reported for the transfection of phage φ29 (3). The transfection process of phages M2 and Nf, similarly to that of φ29, does not involve the recombination mechanism of recipient bacteria, which is deficient in GSY 908.

The other unique property of phage φ29 transfection (3) is the protease sensitivity in transfecting DNA, and this property was also found as an attribute of
M2 and Nf transfections. The detail of the result will be reported elsewhere. Although \( \phi 29 \) differs from M2 and Nf in immunological response and also in the pattern of DNA fragments obtained by restriction endonucleases (6), it can be said that they may all belong to one category of phages, because the physical and biological properties of these phages, such as morphology of virions, molecular weight of DNA, and response to protease and to inhibitor of DNA synthesis, 6-hydroxyphenylazouracil, are very similar.

Recently, HIROKAWA et al. (5) have shown that a single power in dose-response of \( \phi 29 \) transfection resulted from the end-to-end aggregation of the transfecting DNA. As a cause for the single-power in dose-response of transfection of phages M2 and Nf, the possible usage of the aggregated transfecting DNA remains.

REFERENCES