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SUBJECT OF INVESTIGATION

6 GENETIC ANALYSIS OF MICROORGANISM BY MIXED  
INFECTION OF ACTIVE PHAGE PARTICLES  
AND PHAGE OR BACTERIAL DNA

RESPONSIBLE INVESTIGATOR

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In the previous experiment, it could be known that *S. gallinarum* doubly infected with active phage  $\phi_{10s}$  particles and purified DNA extracted from phage  $\phi_1$  could yield a few recombinant type phage between  $\phi_{10s}$  and  $\phi_1$  besides a majority of normal  $\phi_{10s}$  progeny phages.

In this case it must be mentioned that phage  $\phi_{10s}$  is unrelated with  $\phi_1$ , the donor phage of DNA sample, so that there are no probability of occurrence of such recombinant type phage from the double infection of  $\phi_{10s}$  and also active  $\phi_1$  phage particles, if any, survived in DNA sample.

On the other hand, among such newly obtained recombinant type phages there some particles endowed with the ability of lysogenic conversion of salmonella O(I) antigen which is one of genetic character of  $\phi_1$ , the donor phage of DNA, but not of phage  $\phi_{10s}$ .

My chief research required in this Contract is the genetic and chemical analysis of the genetic factor concerning the lysogenic conversion of salmonella O(I) antigen by mixed infection method of active other phage particles and DNA sample extracted and purified from phage  $\phi_1$ .

Before setting forth research on this line, I believe, it will be more fruitful in future experiment to clarify much more genetic markers of  $\phi_1$  phage, the donor of DNA, and  $\phi_{10s}$  phage or more precise relationship between both phages.

On this viewpoint, I have just started my research by the study on the analysis of another genetic character of phage  $\phi_1$ : the host controlled variation observed in this phage cultured through one of its sensitive host bacteria.

Here is summarized the results of experiments carried out during the past two months.

1) The phage  $\phi_1$  cultured by Sg, one of strain of *Salmonella gallinarum*-- $\phi_1$ (Sg)--forms plaque on indicator Sg in good efficiency of plating, e.o.p., but can not form plaque in such a good e.o.p. on indicator S<sub>4</sub>S, one of the delysogenized strain of *S. typhimurium* S<sub>4</sub>.

The proportion of plaques on S<sub>4</sub>S formed by  $\phi_1$ (Sg) to those of the same phage on Sg is about  $10^{-5.505}$ .

2) On the other hand, the phage  $\phi_1$  cultured by S<sub>4</sub>S-- $\phi_1$ (S<sub>4</sub>S)--can forms plaque on S<sub>4</sub>S almost in the same good efficiency as well as on Sg.

3) This restricted phage  $\phi_1$ (Sg), however, can also adsorb to indicator S<sub>4</sub>S but in a little lower rate than that to Sg. Its K value, velocity constant of adsorption to indicator S<sub>4</sub>S and Sg are  $4.7 \times 10^{-10}$ ml/min and  $2 \times 10^{-10}$ ml/min respectively.

4) Whether DNA of  $\phi_1$ (Sg) phage is or is not injected into S<sub>4</sub>S cell will be a future problem. However, it seems to

occur also in this case since at least 5 minutes after adsorption of  $a_1(S_8)$  onto  $S_4S$  the superinfection of  $a_1(S_4S)$  is mutually excluded.

5) The analyses of the fate of DNA of  $a_1(S_8)$  injected into  $S_4S$  will be carried on by several methods.

Of course the mixed infection of  $S_4S$  with DNA extracted from  $a_1(S_8)$  and active phage particles of  $a_1(S_4S)$  will be attempted.