LYSOGENICITY OF ESCHERICHIA COLI STRAIN K- 12

Esther M. Lederberg, Dept. Genetics, University of Wisconsin

Lysogenicity, or latent virus, is of frequent occurrence in enteric bacteria, but has been little emphasized in recent genetic work studies with E. coli. It is of interest, therefore, that E. coli strain K-12 is lysogenic, but that the latent phage is demonstrable only with the help of a sensitive indicator strain.

The lysogenicity of K-12 was first discovered with W-518, isolated as a mutant for an unrelated character from UV-treated Y-87. It was noticed that streaks of mixtures of W-518 with K-12 and its derivatives resulted in W-518 growth that was nibbled and plaqued. The plaques are due to a phage, lambda, which is carried by most K-12 derivatives in latent form, and to which W-518 is unique unqiuely sensitive. High titers (2×10^9) of lambda have been obtained by inoculating W-518 cultures with plaque material.

The plaques of lambda are best observed on EMB agar plates (no sugar), because the cell debris is distinctively stained. The plaques are relatively indistinct compared to T phages, and turbid with growth in the center. Isolates from the central growth usually yield lysogenic cultures resistant to lambda.

Three phenotypes can be recognized, and will be designated by number in the following discussion:

(1)	Lysogenic, lambda-resistant	e.g.	K-12
(2)	Non-lysogenic, lambda-sensitive		W-518
(3)	" " lambda-resistant		W-1027

Type 3 has been obtained from irradiated type 1, as well as from type 1 crosses, in low yield. All three types can be recovered from W-518 cultures exposed to lambda. Type 3 has remained stable, both to lambda and to radiation. That is, it cannot be converted to a lambda-carriertype by exposure to lambda. Crosses were carried out among these phenotypes in order to determine which, if any, loci are responsible for these characters, in addition to particulate, cytoplasmic ~~zurii~~ factors.

Crosses of type 1 and 2 yielded many sensitive prototrophs. When this cross was repeated, using a Het stock as the lysogenic parent, to give delayed segregation of the diploid zygotes, several sensitive diploids were obtained. Upon segregation, only type 2 was obtained.

Reinfection with lambda was compared in diploids and in haploid segregants. It was relatively simple to derive lysogenic cultures from the haploids, but continual, repeated exposure of confirmed diploids to lambda was required before the eventual isolation of an infected diploid. The latter gave only type 1 segregants. From these observations we may infer some sort of interruption in the transmission or multiplication of the virus when introduced into a diploid host cell.

W-1027 x Y-40/6 was a type 3 x 1 cross in which lactose fermentation and resistance to T1 and T6 were also segregating. The results established a definite locus, V "lambda" , tentatively placed between V6 and B-M on the current linkage map. In a comparable cross involving Het, most of the diploids were type 3; 4/150 were lysogenic, type 1. 100 Lac^+ and 100 Lac^- segregants each from one lysogenic and one non-lysogenic diploid were tested. All of them were identical in lambda-type with the corresponding diploid. No sensitives were recovered.

The preliminary results establish a single locus, the alleles of which differ in the ability to propagate lambda. Type 3 may be considered as carrying one allel; types 1 and 2 the other. The latter may be genically identical, but cytoplasmically different.

To test this hypothesis and to clarify the functions of V "lambda", these crosses are being studied further. In particular, the identification of a recombinant from 1 x 3, which would be non-lysogenic and resistant to lysis by lambda, but capable of becoming a lambda-carrier, would materially alter the picture we have now. In addition, information on the adsorption, growth and liberation of lambda is being sought.

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