

GENETIC RECOMBINATIONS IN ENTEROBACTERIA

COMMUNICATION IV. THE STUDY OF THE GENETIC STRUCTURE
OF SHIGELLA HYBRIDS (PHAGE AND VIRULENCE RELATIONSHIPS)

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Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 56, No. 10,
pp. 65-66, October, 1963
Original article submitted December 25, 1962

In previous communications we have described the isolation of recombinants obtained by crossing strains *Escherichia coli* HfrH, HfrH λ^+ , HfrC, and HfrR with strains of *Shigella flexneri*, and the results of studies of their biochemical and serological properties [1-3]. The object of the present investigation was to continue the study of these lactose-positive recombinants of *Sh. flexneri* and to determine their virulence in relation to phages of the T group and to phage λ .

EXPERIMENTAL METHOD

The relationship between the strains and phages was determined in the usual manner by means of meat-peptone agar, poured into Petri dishes in a thick layer. The dishes were then marked out into 8 zones. To each dish was added 0.1 ml of the 18 h broth test cultures, and after saturation of the agar, a drop of the particular phage was applied to the center of each zone by means of a fine Pasteur pipet. The dishes were incubated for 24 h at 37°. All seven phages of the T group and phage λ were used in the experiments.

The virulence of the strains was also determined in the usual manner (different doses of microorganisms were taken and each dose was used to inoculate 5 albino mice). The animals were kept under observation for 3 days.

EXPERIMENTAL RESULTS

The experiments showed that *E. coli* HfrH and HfrH λ^+ are sensitive to all the phages used. Strains 2047 and 730 of *Sh. flexneri* are resistant to all the phages; strain 2043 is sensitive to phages T₁ and T₂; strain 2050 to phage T₂; strains 5030 and 866 to phages T₂, T₅, and T₆; strain 845 to phage T₆; strain 3584 to phages T₅ and T₆; strain 628 to phages T₁, T₂, T₅, and T₆; and strain 2046 to phages T₁, T₂, T₄, and T₆.

The recombinants 2047-r-1 - 2047-r-5, in contrast to the original strain, are sensitive to phages T₁, T₂, and T₆; hybrid 2050-r-1,2 to phages T₁, T₅, and T₆; the recombinants 2040-r-3 - 2050-r-9, 14, 15, 19, 20, 23, 25, 27, 28 to phages T₅ and T₆; hybrids 2050-r-10, 12, 21, 22, 26 to these and also to phage T₃; and hybrids 2050-r-13, 16, 17, 18 - to phage T₆ only.

Hybrid 5030-r, in contrast to the original strain, is sensitive to phages T₁ and T₃, and hybrid 5030-r-5 to phage T₃.

The recombinants 3584-r-1 and 3534-r-22 are sensitive to phages T₁, T₂, T₄, and T₇, and hybrids 3584-r-3, 7, 8, 9, 13, 14, 17, 19, 25 and 3584-r-34 to these and also to phages T₃, T₇, and λ ; hybrid 3584-r-2 to phages T₂, T₃, and T₄; and hybrids 3584-r-4, 20, 21, 27, 31, 32 to phages T₁, T₂, T₃, and T₄. A similar phenomenon of acquired sensitivity to various phages of the T group and to phage λ has also been observed in other hybrid strains of *Sh. flexneri*, Nos. 3584, 628, 2046, and others.

In the hybrids the transmission of a varied degree of phase-sensitivity from E. coli to Sh. flexneri is observed.

The virulent properties were tested in 105 strains (16 strains of Sh. flexneri, 4 strains of E. coli, and 85 strains of recombinants).

The minimal lethal dose of Sh. flexneri strains 2050 and 3584 is 700 million bacterial cells, strain 2047 — 800 million, strains 2055 and 5008 — 850 million, strains 713 and 737 — 900 million, strains 2048, 759, 777, and 832 — 1 billion, and strains 5030, 845, 2046, 751, and 605 — 1 billion 250 million bacterial cells.

In strain E. coli HfrH λ^+ the minimal lethal dose is 1 billion 250 million bacterial cells, in strains HfrH and HfrC — 1 billion 750 million cells, and in strain HfrR 1 billion 800 million bacterial cells.

In the case of the recombinants 751-B-1, 5008-r-4, and 5008-r-10 the minimal lethal dose is 1 billion bacterial cells; hybrid 3584-r-34 — 1 billion 200 million; recombinants 845-r-3, 759-r-5, 759-r-6, 759-B-1, 759-B-3, 5008-r-1, 832-B-5, 768-B-2, 768-B-4, and 2050-k-19 — 1 billion 250 million; hybrids 5008-r-5, 2055-B-1 — 1 billion 300 million; recombinants 2047-r-1, 2047-B-5, 5030-r-1, 5030-r-5, 845-r-2, 2048-r-1, 2048-r-3, 2046-r-5, 759-r-1, 759-B-2, 751-r-1, 751-r-2, 751-r-3, 737-B-10, 2050-r-15, 2050-M-5, 3584-r-25, 3584-M-20, 768-B-1, 768-B-3 — 1 billion 500 million; hybrids 5030-r-10, 845-r-1, 2048-r-7, 2046-r-1, 2046-r-4, 2046-r-10, 751-B-5, 751-B-9, 737-r-1, 737-r-3, 737-r-6, 737-B-1, 737-B-5, 605-B-1, 605-B-3, 605-B-4, 713-B-12, 832-B-9, 2047-B-1, 2047-B-3, 2047-B-6, 2050-r-1, 2050-r-6, 2050-r-10, 2050-r-27, 2050-M-1, 2050-M-10, 2050-k-3, 2050-k-18, 2055-M-1, 2055-M-4, 2055-B-2, 2055-B-3, 3584-r-1, 3584-r-5, 3584-M-1, 3584-M-5 — 1 billion 750 million; and in recombinants 605-B-2, 777-B-1, 777-B-4, 777-B-9, 713-B-1, 713-B-4, 713-B-8, 832-B-1, 832-B-3, 832-B-6, 832-B-12, 3584-r-15, and 3584-M-15 — 2 billion bacterial cells.

Hence a loss of virulence was observed in the tested recombinants formed by crossing E. coli and Sh. flexneri.

SUMMARY

Hybrids formed as a result of crossing between E. coli and Sh. flexneri showed transmission of a varied degree of phage sensitivity and loss of virulence.

LITERATURE CITED

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2. A. A. Abidov, Byull. éksper. biol., 9, 76 (1963).
3. A. P. Pekhov and A. A. Abidov, Byull. éksper. biol., 5, 88 (1963).

All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. Some or all of this periodical literature may well be available in English translation. A complete list of the cover-to-cover English translations appears at the back of this issue.
