THE SPECIFICITY OF GENOMIC SITES AFFORDING REGISTRY WITH THE FERTILITY EPISOME IN ESCHERICHIA COLI K12

Thomas S. Matney, Eugene P. Goldschmidt, and Nancy S. Erwin

Department of Biology, The University of Texas

M. D. Anderson Hospital and Tumor Institute,

Houston 25, Texas

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In presenting a segmented-genomic model for E. coli K12, Matney and Felkner (1962) predicted that the linkages between segments might be identified as specific sites which have an affinity for the fertility episome. The limited number of F- attachment sites predicted by the segmented model could be established experimentally by demonstrating that Hfr mutants involving the same attachment site, and thus, having the same origin and sequence of marker transmission, have been isolated more than once for F^+ cultures. This paper presents evidence of such repetition in Hfr mutants.

The mating strains of E. coli K12 used in this study are described in Table 1. The relative map positions of the mutations, together with the origin and direction of marker transmission by the Hfr strains, are shown in Figure 1. Entrance time determinations were performed according to the membrane filter procedures outlined by Matney and Achenbach (1962a and b).

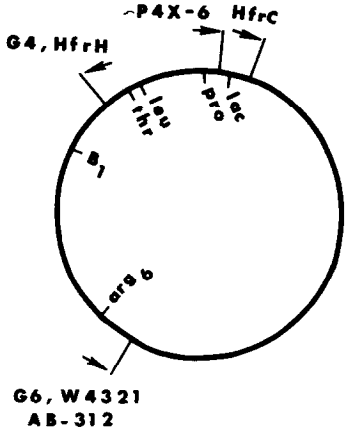
Hfr strains W4321, G6 and AB-312 were crossed with an F^- strain which had a mutation in the arg_6 locus. The arg_6^+ allele

TABLE 1

Strain Designation	Mating Type	Mutations Present	Source
AB-312	Hfr	B_1^-, thr$^-$, leu$^-$	Taylor/Adelberg
W4321	Hfr	met$^-$	Richter/Lederberg
Hfr H	Hfr	met$^-$	Hayes
P4X-6	Hfr	met$^-$	Jacob/Wollman
Hfr C	Hfr	met$^-$	Cavalli
G4, G6	Hfr	his$^-$	Our laboratories
273	F$^-$	arg_6^-, B_1^-, thr$^-$, leu$^-$, lac$^-$	Derived from PA265 Maas/Jacob
97	F$^-$	pro$^-$	Our laboratories

Symbols correspond to synthesis of thiamine (B_1), threonine (thr), leucine (leu), methionine (met), histidine (his), arginine-6 (arg_6), and proline (pro); to fermentation of lactose (lac).

Fig. 1



was admitted by each of these males after 9-1/2 minutes of mating, as shown in Figure 2. It may be concluded that each of the Hfr mutants has the same origin of genomic transmission and each resulted from an association of the fertility particle with the same genomic site.

Fig. 2

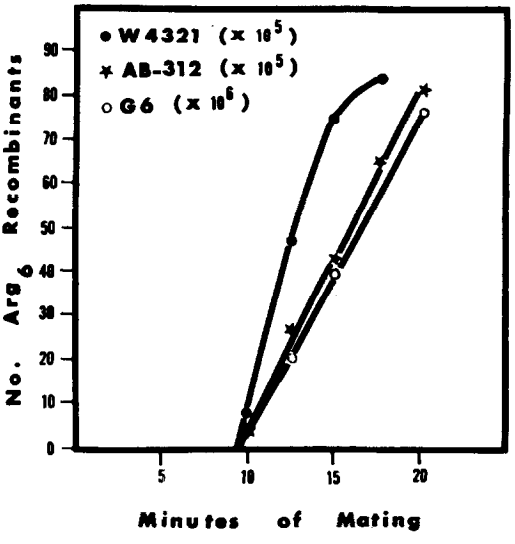


Fig. 3

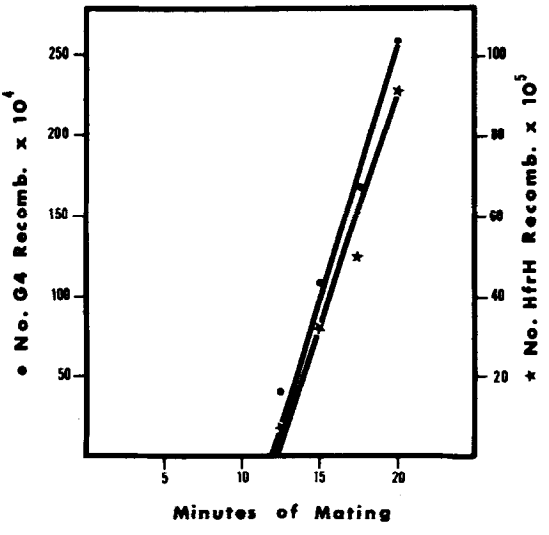
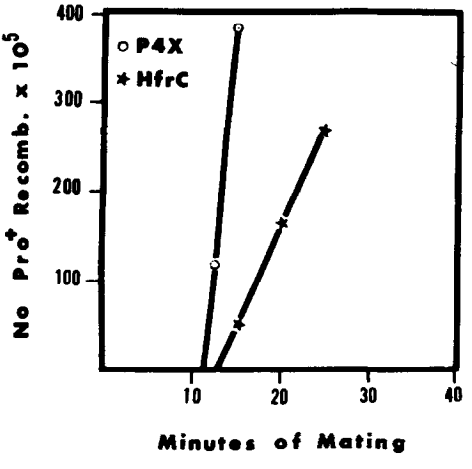


Fig. 4



The kinetics of thr$^+$ and leu$^+$ entrance from the G4 and Hfr H donors into a thr$^-$ and leu$^-$ recipient are presented in Figure 3. These two Hfr mutant isolates seem to involve the same F-attachment site.

As controls, the entrance kinetics for pro$^+$ were determined for P4X-6 and Hfr C. As shown in Figure 1, two F-attachment sites are involved in these males. Analysis of appropriate recombinants confirmed that lac resided in the segment bounded by the P4X-6 and Hfr C F-attachment sites.

From this study, which was prompted by the segmented-genomic model, it may be concluded that there are a limited number of specific genomic sites which afford registry with the fertility episome.

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