JOURNAL OF BACTERIOLOGY, June 1992, p. 3830–3831
0021-9193/92/113830-02$02.00/0

Vol. 174, No. 11

Location of the *hisGDCBHAFI* Operon on the Physical Map of *Escherichia coli*

PIETRO ALIFANO, M. STELLA CARLOMAGNO, AND CARMELO B. BRUNI*

Centro di Endocrinologia ed Oncologia Sperimentale del Consiglio Nazionale delle Ricerche, Dipartimento di Biologia e Patologia Cellulare e Molecolare "L Califano," Università degli Studi di Napoli, Via S. Pansini 5, 80131 Naples, Italy

The *his* operon, located at 44 min on the genetic map of *Escherichia coli* (1), encodes the eight enzymes concerned with the biosynthesis of the amino acid histidine (8). The *his* cistrons were shown by complementation assays of different auxotrophic strains to reside on two contiguous *Hin*dIII fragments, of 5.3 and 4.5 kb, derived from strain W3110 (2, 3, 5). The structural organization of the *his* operon was revealed by sequencing an 8-kb DNA region (4) derived from plasmid pHC9800 (6). The restriction pattern of the inserted *E. coli* DNA fragment deduced from the DNA sequence and experimentally verified matches the corresponding section of the Kohara restriction map (7) around kb 2100 for five of the eight enzymes (*Bam*HI, *Hin*dIII, *Eco*RI, *Kpn*I, and *Pst*I) (Fig. 1). The only exceptions are that the sequence lacks a *Bgl*I and a *Pvu*II site and that there are two additional restriction sites for *Eco*RV that generate two fragments of less than 100 bp which probably went undetected during construction of the physical map (7) (cf. Fig. 1B and C). These data establish the exact location of the *his* operon on the Kohara physical map. Moreover, the relative distance from the assigned *his* operon to the neighboring marker of the Kohara physical map, *sbcB* (Fig. 1A), appears to be consistent with that derived from the published linkage map of *E. coli* K-12 (1, 7).

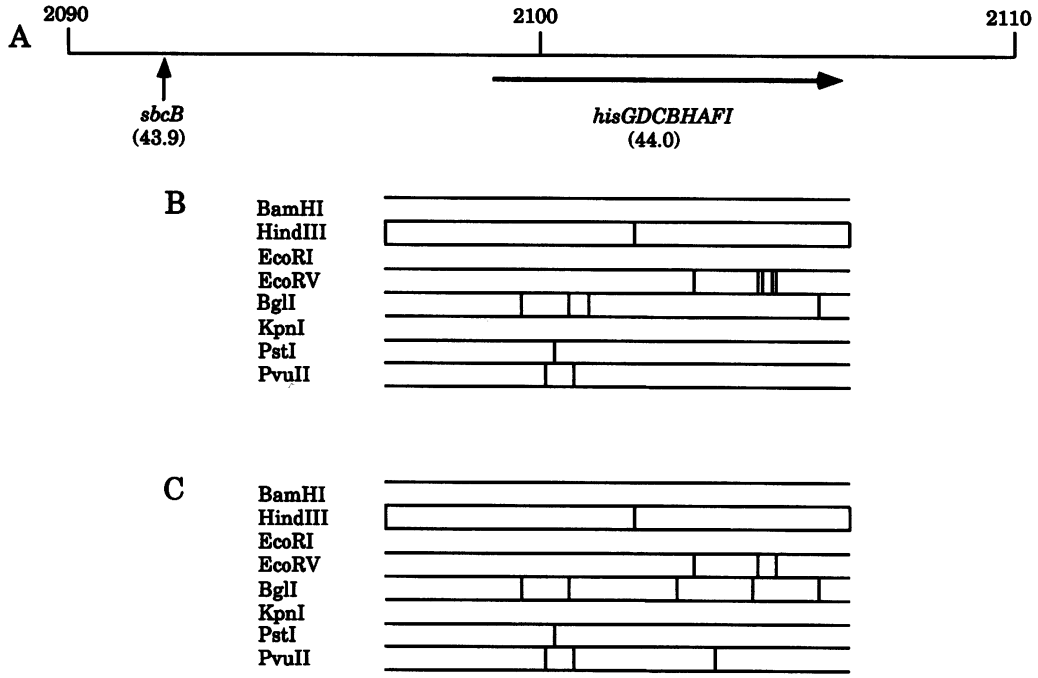

FIG. 1. Correlation of the physical map location of the *E. coli his* operon with its genetic map location and alignment with the physical map of *E. coli*. (A) The physical map location of *sbcB* in kilobase pairs was derived from reference 7. The genetic map locations of *sbcB* and *hisGDCBHAFI* in minutes are indicated by the numbers in parentheses as assigned in reference 1. The direction of transcription of the *his* operon is indicated by the arrow. (B) Restriction map of the DNA fragment containing the *hisGDCBHAFI* operon. (C) A section of the Kohara physical map (7) around kb 2100.

* Corresponding author.

REFERENCES

1. **Bachmann, B. J.** 1990. Linkage map of *Escherichia coli* K-12, edition 8. Microbiol. Rev. **54**:130–197.
2. **Borck, K., J. D. Beggs, W. J. Brammar, A. S. Hopkins, and N. E. Murray.** 1976. The construction in vitro of transducing derivatives of phage lambda. Mol. Gen. Genet. **146**:199–207.
3. **Bruni, C. B., A. M. Musti, R. Frunzio, and F. Blasi.** 1980. Structural and physiological studies of the *Escherichia coli* histidine operon inserted into plasmid vectors. J. Bacteriol.

142:32–42.

4. **Carlomagno, M. S., L. Chiariotti, P. Alifano, A. G. Nappo, and C. B. Bruni.** 1988. Structure and function of the *Salmonella typhimurium* and *Escherichia coli* K-12 histidine operons. J. Mol. Biol. **203:**585–606.
5. **Grisolia, V., M. S. Carlomagno, and C. B. Bruni.** 1982. Cloning and expression of the distal portion of the histidine operon of *Escherichia coli* K-12. J. Bacteriol. **151:**692–700.
6. **Grisolia, V., A. Riccio, and C. B. Bruni.** 1983. Structure and function of the internal promoter (*hisBp*) of the *Escherichia coli* K-12 histidine operon. J. Bacteriol. **155:**1288–1296.
7. **Kohara, Y., K. Akiyama, and K. Isono.** 1987. The physical map of the whole *E. coli* chromosome: application of a new strategy for rapid analysis and sorting of a large genomic library. Cell **50:**495–508.
8. **Winkler, M. E.** 1987. Biosynthesis of histidine, p. 395–411. *In* F. C. Neidhardt, J. L. Ingraham, K. B. Low, B. Magasanik, M. Schaechter, and H. E. Umbarger (ed.), *Escherichia coli* and *Salmonella typhimurium*: cellular and molecular biology, vol. 1. American Society for Microbiology, Washington, D.C.