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ABSTRACT

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Lederberg, Joshua, University of Wisconsin, Madison, Wis.: Gene control of B-galactosidase in Escherichia coli. -- A large series of B-galactosidase mutants of E. coli was obtained by irradiating heavy cell suspensions on the indicator medium, EMB Lactose Agar. The mutants were compared phenotypically and genetically (see Genetics 32: 505). Most of the mutants involved the locus Lac_1 and were phenotypically alike (lactose-, methyl galactoside slow). Altogether, however, at least seven and probably ten distinct loci were found, mutation at any one of which leads to the loss or alteration of galactosidase. Two of the mutant types have additional effects: Lac_5- fails to split maltose or to ferment gluconate; Lac_3- to split maltose or to ferment glucose, galactozymase remaining intact. Several distinct mutations which partially "suppress" Lac_3- have been found, leading to such phenotypes as Lac-Mal-Glu+, Lac+Mal-Glu-, and even Lac-Mal+Glu-. While the latter suggests the direct or phosphorylative utilization of maltose, other evidence suggests that lactose is initially split by galactosidase. An allele of Lac_3- has been found which is temperature-sensitive, showing different thresholds for the fermentation of sorbitol, of glucose or maltose, and the splitting of lactose, and pointing to the pleiotropic effect of the mutation. The complex gene-enzyme patterns suggest that some mutations have indirect effects on the production of one or more enzymes. It will be difficult, therefore, to point to a given gene as the source of specificity of a given enzyme, even though its mutation leads to the loss of that enzyme.