

The origin of His⁺ revertants of *Salmonella typhimurium* obtained on selective medium

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SUMMARY

The spontaneous reversion to His⁺ of the *Salmonella typhimurium* alleles *hisD3052* and *hisG46* was investigated. In fluctuation tests, the expected "jackpot" distribution of His⁺ revertants was not observed. The experimental distributions were close to Poisson distribution. The redistribution test showed no significant differences in the His⁺ colony counts between spread and unspread plates. An attempt at indirect selection of His⁺ revertants in fluid medium failed. It was also shown that the mean number of His⁺ reversion events and the mean number of revertants per plate were similar. At the same time, kanamycin-resistant mutants had jackpot distribution. Selection for His⁺ revertants (histidine starvation) did not increase mutation to Kan^r.

Key-words: Mutation, *Salmonella typhimurium*, Histidine; Environmental mutagenesis, His⁺ revertants, Distribution of mutants, Selective factor, Poisson distribution.

INTRODUCTION

According to classical genetics, mutagenesis is random and unguided. The selective factor does not directly affect the origin of the corresponding mutation. Methods using bacteria were developed for testing this notion, as follows: the fluctuation test of Luria and Delbrück (1943), the redistribution test of Newcombe (1949), the replica method of the Lederbergs (1952) and the sib selection in fluid media of Cavalli and Lederberg (1956). Each of these tests employed lethal selection (resistance to phage or antibiotics) in which there was a phenotypic lag between the occurrence and expression of mutation. Thus, several generations are required before the cell can survive exposure to selective

factor. Therefore, the classical works certainly did not exclude the existence of mutations caused by selection, as Cairns *et al.* (1988) noted.

Recently, several authors have shown that certain spontaneous mutations occur more frequently under conditions of selection (Shapiro, 1984; Cairns *et al.*, 1988; Hall, 1988, 1990). In contrast to random, pre-adaptive mutations, mutations arising under the influence of selective factors might be called "adaptive". Thus, Shapiro (1984) showed that excision of bacteriophage Mu to fuse the *ara* and the *lac* operons in *Escherichia coli* occurred only on arabinose-lactose medium. Cairns *et al.* (1988) suggested that Lac⁺ reversion in *E. coli* could be induced by selective conditions, since the distribution of