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The selection-induced His+ reversion in Salmonella typhimurium

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Abstract

It was previously shown that spontaneous reversion to His+ of the allele hisG46 Salmonella typhimurium occurs under the influence of histidine starvation. No pre-existing His+ revertants arisen in rich medium were observed. We have now shown that the pre-existing His+ revertants an seen under increased cell concentration (1010 cells/ml). At the same time, it was established that the selection-induced His+ reversion events of hisG46 begin to occur after 2-3 h of incubation on histidine starvation plates, and this process continues for about 4 days. In parallel, considerable DNA synthesis was observed for the initial hours of starvation. Chloramphenicol and novobiocin inhibited this DNA synthesis, whereas the addition of trace of histidine as well as novobiocin produced the delay of adaptive His+ reversion. It was found that adaptive reversion of hisG46 is recA-independent, although it requires some activity of RecA on the mucAB genetic background. Based on these data, we suggest that the cause of adaptive His+ reversion is the DNA replication operating under histidine starvation. Using a number of mutation models, we showed that histidine starvation did not increase the general mutation rate. It was also demonstrated that intragenic revertants and extragenic ochre suppressors of the allele hisG428 arise under the influence of histidine deprivation.

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Keywords

Adaptive mutation, Directed mutation, hisG428, hisG46, Histidine starvation, Reversion to His+, Salmonella typhimurium