EFFECTS OF TEMPERATURE ON SPONTANEOUS AND INDUCED MUTATIONS IN ESCHERICHIA COLI*

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The frequency of spontaneous mutations in Drosophila has been shown to increase, in general, with increasing temperature, and the temperature coefficients reported range from about 2 to 5.[1] These findings played an important part in the early definition of mutation as a definite molecular rearrangement.[2] Very little is known of the response to post-treatment temperature of mutations induced by radiation or chemicals. Two kinds of effects could be investigated in this connection: the effect of temperature on the frequency of induced mutations, and the effect of temperature on the pattern of delayed appearance of induced mutations. In the latter category, Auerbach[3] has described an increase in the frequency of mustard-induced mosaics at low temperatures, which she ascribes to the stabilization by cold of metastable genic configurations induced by the mutagen, leading to extended delay in the shift to the stable mutant condition. Similar effects of temperature on the delayed action of mutagens in Neurospora and Aspergillis found in unpublished experiments by the authors are mentioned by McElroy and Swanson,[4] in support of the concept of mutation via metastable intermediates.

The hereditary change from sensitivity to resistance to bacteriophage in *Escherichia coli* can be followed with a degree of quantitative precision and technical ease that makes it a promising material for an investigation of temperature effects on spontaneous and induced mutation. This report is a preliminary account of such a study.

MATERIAL AND METHODS

Cultures of strain B/r of *Escherichia coli* were grown in a synthetic medium known as "A",[5] with aeration, for 18–24 hours, diluted with saline to an approximate titer of 10^8 cells per ml., and irradiated with 800 ergs per mm.^{2} of ultra-violet light. Irradiation was carried out at room temperature, using a G. E. germicidal lamp, with mechanical agitation during the exposure. Yellow light was used to illuminate all operations following the ultra-violet treatment. After irradiation, aliquots of the treated suspensions were plated on nutrient agar plates and incubated at 37°, 25°, or 16°C. At various intervals of time, sets of six plates were withdrawn from the incubator and chilled rapidly in the freezing compartment of a refrigerator to arrest growth. Two of the six plates were washed with 10 ml. of