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Effect of Temperature on the Formation of L-Amino Acid Oxidase in the Bacterial Cells

By

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During the study of L-amino acid oxidation by bacteria, it was found that the oxidative activity was markedly influenced by the temperature of growth. Although the cells grown at 37°C were usually employed in early work, higher oxidative activities were found in the cells when the growth temperature was lowered. In the present paper the results of experiments on the effect of temperature on the *in vivo* formation of L-amino acid oxidase are reported.

Proteus vulgaris was cultured on the ordinary peptone broth-agar slants at 24° or 37°C for different periods of time. Then the bacteria were harvested, washed three times with 0.9% saline and suspended in the same solution. These suspensions were subjected to experiments. L-Leucine, L-histidine and DL-alanine were used as substrate in a concentration of M/30. Oxygen uptake was measured by Warburg manometer and the activities were represented by Q_{O_2} .

The oxidative activities of these amino acids by the cells grown for different time and at different temperature were shown in Fig. 1. The activities of cells grown at 24°C were found to be significantly greater compared with the cells grown at 37°C, especially in the case of oxidation of L-leucine and L-histidine. Furthermore, the activities of cells grown at 24°C were higher at earlier stages of growth: maximum activities were shown after 10 hours of culture. The rate of L-leucine oxidation by the cells grown at 37°C was maximum after 18 hours of culture.

Above results were obtained under the reaction temperature at 30°C. Subsequently experiments were carried out by changing the reaction temperature. As shown in Fig. 2, oxidative activities of both kinds of cells grown at 24° and 37°C were found to be higher at 37°C than at 24°C. Therefore, a possibility is excluded that the enzyme of amino acid oxidation in the bacteria is especially sensitive to high temperature. The rates of oxygen uptake were linear during one or two hours in all experiments. When the suspensions of

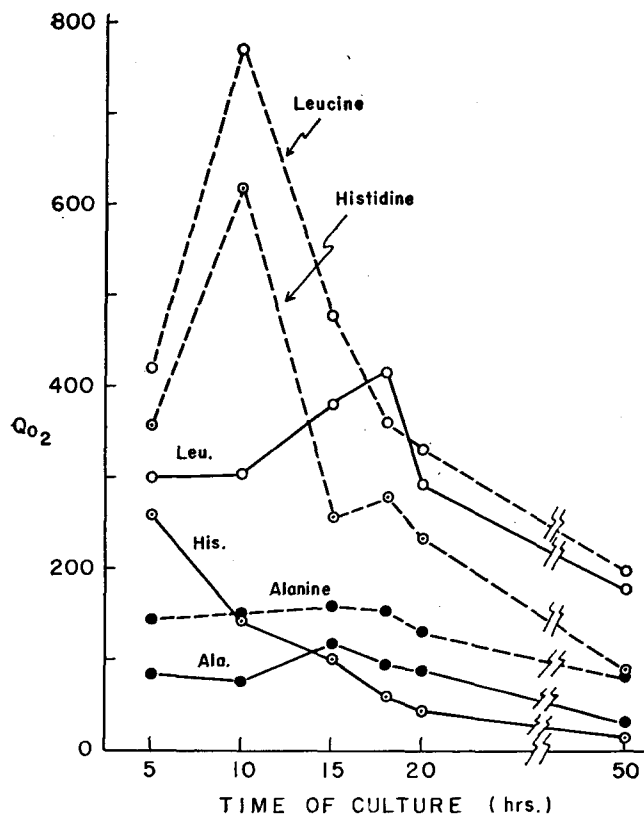


Fig. 1. Oxidations of amino acids by *Proteus vulgaris* grown at 24°C and 37°C. Solid line, cells grown at 37°C; broken line, cells grown at 24°C.

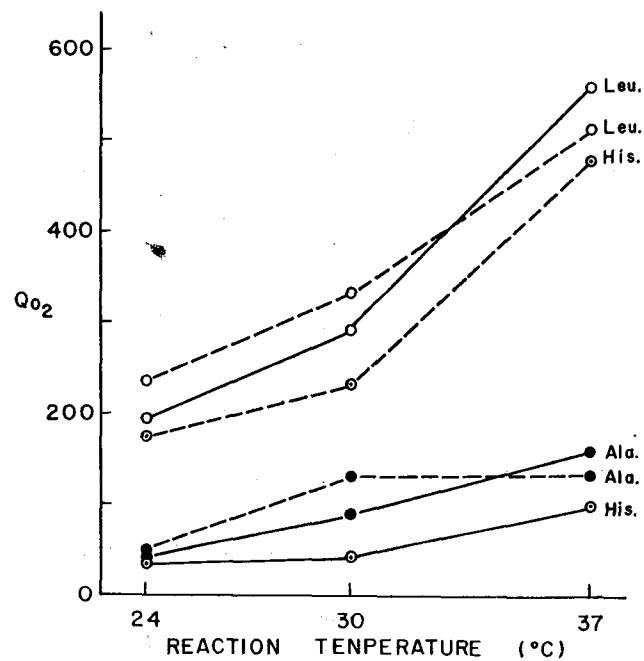


Fig. 2. Oxidations of amino acids by *Prot. vulgaris* at different temperatures.

washed cells grown at 24° or 37°C were preserved at 37° and 24°C, respectively, the activities did not varied after 20 hours.

In conclusion, the results of the present study seem to show that the formation of L-amino acid oxidase in bacterial cells is accelerated when the bacteria are grown at lower temperatures than 37°C.