BRIEF REPORT

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Turnover of Proteins in the Extreme Thermophile

Thermus flavus

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ABSTRACT. Thermus flavus contained a limited fraction of short-lived protein when growing in a complex medium; the residual proteins were stable. When incubated in buffer, the residual protein fraction was also degraded. The extent of the short-lived protein fractions was increased by increasing the temperature.

The first publication on protein turnover in a thermophilic bacterium indicated the existence of a rapid and extensive degradation of proteins (Bubela and Holdsworth 1966). Further studies failed, however, to confirm that observation as a general phenomenon in all thermophiles (Epstein and Grossowicz 1969). This communication brings evidence that the extent of protein turnover in growing cells of Thermus flavus is rather restricted and that its kinetics is similar to that in the mesophiles.

The organism, isolated from hot springs in Kamchatka, USSR (Loginova and Egorova 1977), belongs to a group of extreme thermophiles growing at temperature above 60 °C. The culture was cultivated in the complex PPY medium (20 % potato extract, 0.5 % peptone and 0.1 % yeast extract Difco; Loginova and Egorova 1977). The cultivation proceeded in a shaken water bath at 65 °C, unless otherwise stated. The grown culture was centrifuged and resuspended in the potato extract diluted 1 : 20 with 40 mM phosphate buffer (pH 7.6). After 30 min of growth U-14C-L-leucine (7.8 GBq/mmol, 50 kBq/mL) was added and cultivation proceeded for further 20 min. Pulse-labelled cells were collected by centrifugation, washed and transferred to either the complex PPY medium, or to the 40 mM phosphate buffer (PB), both supplemented with 5 mM DL-leucine. The culture was then incubated at the indicated temperature and the kinetics of protein turnover was followed according to the procedure described before (Chaloupka and Strnadová 1982). The slopes were calculated by linear regression.

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Fig. 1. Degradation of proteins in the growth medium (PPY) at different temperatures (°C, numbers at lines); left: the general course of protein degradation; right: the degradation of the short-lived fraction; $d$ proportion of total proteins degraded, $d' - d$ proportion of short-lived protein remaining.

Fig. 2. Degradation of proteins in the starvation medium (PB); for symbols see Fig. 1.