Methylation of membrane proteins is involved in chemosensory behavior of Halobacterium halobium

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Like in other bacteria (e.g. Escherichia coli, Bacillus subtilis), behavioral responses to chemical stimuli have been observed in Halobacterium halobium (1).Stimulus transduction and adaptation in E. coli have been shown to depend on methylation and demethylation of membrane proteins (2,3). The donor for the methyl group is S-adenosyl methionine (4). In accordance to that, in Halobacterium halobium ethionine was found to inhibit the response of the cells to attractants (1). Methylation of membrane proteins related to chemoresponses has now been identified.

Protein biosynthesis in H. halobium was inhibited by puromycin (5) prior to the addition of 3-H- or 14-C-labelled methionine. The cells were stimulated by addition of glucose, an attractant, or phenol, a repellent. Methylation and demethylation reactions were stopped with formaldehyde. Purified membranes were subjected to SDS-gel electrophoresis on Laemmli gels. The gels were cut into slices and radioactivity was determined in a liquid scintillation spectrometer. On each gel only one peak of radioactivity was found. Methyl incorporation into a membrane protein in the presence of the attractant was significantly higher than in unstimulated cells while less radioactivity was found in membranes of cells stimulated by the repellent. Only the methyl group of methionine and not the entire molecule was transferred to one or more membrane proteins, since cells incubated with L-(1-14-C)-methionine instead of L-(methyl-14-C) methionine or L-(methyl - 3-H) methionine failed to incorporate radioactivity. These findings suggest that methylation and demethylation of membrane proteins are involved in the chemosensory system of H. halobium.

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