Involvement of methyltransferases enzymes during the energy metabolism of the anaerobic archaeon methanosarcina semesiae sp. Nov.

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Abstract

The methyl group transfer from dimethylsulfide (DMS), trimethylamine and methanol to 2-mercaptoethanesulfonic acid (coenzyme M) were investigated from cell extracts of Methanosarcina semesiae sp. nov. to evaluate whether the enzyme systems involved were constitutive or inductive. The extracts from cells grown on DMS exhibited methanogenic activity exclusively with DMS and methanethiol. Likewise when cells were pre-grown on trimethylamine or methanol the extracts only produced methane from the respective metaboilic substrate. Dimethylsulfide:methyl-coenzyme M transferase activity was dependent on ATP, but hydrogen did not stimulate activity. The fact that ATP could be replaced by the reductant Ti(III)-citrate indicates that reductive activation of methyl transfer reaction in DMS conversion proceeds in a manner similar to methyltransferases involved in methanol and trimethylamine conversion, but with a different reduction source. This source appears to be limited since sometimes the cell extracts were totally inactive in the presence of ATP, while still being activated with Ti(III)-citrate. It was concluded that enzymes involved in methyl transfer reactions are specific for each substrate; DMS, trimethylamine and methanol and have to be induced. Further investigations are recommended to corroborate the current study.