Improvement of ectoine production by inhibiting glycogen synthesis in Methylomicrobium alcaliphilum 20Z

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Methane, main component of shale gas and natural gas, is one of the major components that affects global warming. For methane bioconversion, this research aims to produce ectoine(1,4,5,6-tetrahydro-2-methyl-4-pyrimidinecarboxylic acid), which is widely used in the several industries using methanotrophic Methylomicrobium alcaliphilum 20Z. To increase ectoine production, several genetic engineering were performed prior to this study, in which deleted ectD and ectR genes. To further improve ectoine production, glgA, glycogen synthase, was deleted from metabolically engineered M.alcaliphilum 20Z to enhance central metabolic flux instead of glycogen synthesis. But there was no change in glycogen and ectoine production. Therefore, we constructed a recombinant strain by deleting glgA2, an alternative to glgA, from the engineered M. alcaliphilum 20Z in which the glgA gene was removed. As a result, glycogen production was sharply decreased, while ectoine production was increased in the double mutant(ΔglgAΔglgA2). This result can be speculated that carbon flux flows more into the central metabolic pathway instead of glycogen production, leading to increasing ectoine production.