

Haloarcula strains regulate transcription of two types of 16S rRNA genes by growth temperatures

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Translation is the process in which ribosome creates protein. The ribosome consists of two major components, the small and large subunits. In prokaryotes, small subunit of ribosome is composed of 16S rRNA and some ribosomal proteins. Many microbiologist use the 16S rRNA gene sequence for phylogenetic analysis and identification of prokaryotes. Previous studies have reported that the 16S rRNA gene sequence is naturally inscribed with the temperature adaptations of the prokaryotic host. This observation was based on the high correlation between the growth temperatures of prokaryotes and the guanine-plus-cytosine (G+C) contents of the 16S rRNA sequences. Thermophilic and hyperthermophilic prokaryotes generally have high G+C contents of 16S rRNA genes (56-69%). In contrast, mesophilic and psychrophilic prokaryotes have relatively low G+C contents of 16S rRNA genes (51-59%).

Haloarcula strains, belonging to a diverse group of salt-loving organisms in the archaeal phylum Euryarchaeota, have two types of 16S rRNA genes on the genome. These 16S rRNA genes indicate different sequences and G+C contents. Here, we proposed a hypothesis that *Haloarcula* strains preferentially expresses the high G+C contents of 16S rRNA gene (58%), having the stability to heat, during growth in high temperature, whereas they express low G+C contents of 16S rRNA gene (56%) during growth in low temperature. In order to verify this hypothesis, we surveyed transcriptional responses of *Haloarcula* strains in a wide range of temperature conditions by using RT-qPCR method. As the result, high G+C contents of 16S rRNA gene showed significant upregulation in high temperature conditions (40 to 55°C). In contrast, low G+C contents of the 16S rRNA gene expressed at significantly higher levels in low temperature conditions (25 to 35°C). The results suggest that *Haloarcula* strains regulate the transcription of two types of 16S rRNA genes by growth temperatures.

Keywords: halophilic archaea, 16S rRNA, G+C contents, translation, environmental temperature