

Calditocaldarchaeol: A new biomarker specific for the archaea, Sulfolobales in hydrothermal system

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Lipids are recognized as useful biomarkers for determining microbial flora and estimating its biomass. In particular, bacterial (eubacterial) fatty acids are quite useful for such purposes. However, archaea do not contain fatty acids but ether lipids. Although the isoprenoids derived from the ether lipids by their partial degradation have already been used for biomarkers indicating the presence of archaea, such degradation loses the information from polar groups of the ether lipids. The groups can indicate their producer more clearly because several archaea have specific polar group in their ether lipids, for instance, calditol for the order Sulfolobales, gulose for the genus *Thermoplasma*.

Calditocaldarchaeol and glucopyranosylcalditocaldarchaeol are good candidates for more producer specific biomarkers, because both compounds contain calditol residue, which is specific for the order Sulfolobales. In this investigation, it was examined that the compounds can act as biomarkers for the order Sulfolobales, as fatty acids for bacteria. The compounds were tried to search for as intact as possible in the surface sediments collected from the three hot springs located in the Kirishima area.

Enrichment cultures revealed the habitation of the close relatives of the order Sulfolobales in the three hot springs. The populations of the archaea in the hot springs varied not remarkably in all the year round. For all sampling sites, the amounts of the compounds extracted from the surface sediments were about two or three orders of magnitude greater than those of estimated values for those contained in the cells alive in the sediments, indicating that the most of the compounds is the lipid preserved in the sediments. In this case, the compounds give the informations of the archaeal activities of the past, rather than those of the present. The hydroiodic acid degradation of the residue of the sediments, followed by reduction, yielded isoprenoids scarcely, suggesting that the incorporation of ether lipids into kerogen has not yet occurred in the term of some decades. These results indicate that calditocaldarchaeol and glucopyranosylcalditocaldarchaeol can be useful biomarkers specific for the order Sulfolobales for not only the indicator of their presence but other purposes, such as the estimation of biomass of them for instance.