Properties of Newly Isolated Metal-mobilizing *Sulfolobus*-like Organisms

GERTRUD HUBER and KARL O. STETTER

Lehrstuhl für Mikrobiologie, Universität Regensburg, Universitätsstr. 31, D-8400 Regensburg, Federal Republic of Germany

Sulfolobus strains are able to grow autotrophically by the oxidation of sulfur or ferrous iron and are capable of mixotrophic growth on these substrates when the autotrophic media are supplemented with organic carbon, e. g. in the form of yeast extract. They also grow heterotrophically on yeast extract, certain sugars and amino acids (*Brock*, 1978; *Brierley* and *Brierley*, 1973). In addition, *Sulfolobus brierleyi* and a few *Sulfolobus*-like organisms with an upper growth temperature limit of 70 °C are known to use mineral sulfides (e. g. pyrite, chalcopyrite) as substrates (*Brierley*, 1974; *Marsh* et al., 1983). In our hands, however, *S. brierleyi* shows this ability only in the presence of low amounts of yeast extract. None of the other *Sulfolobus* strains from the German Culture Collection and 30 *Sulfolobus*-like isolates from W. Zillig and from our laboratory, which had been obtained by enrichment on a combination of sulfur and yeast extract, were able to use natural ores as energy sources with or without the addition of yeast extract.

Subsequent to direct enrichment on sulfidic ores, several *Sulfolobus*-shaped organisms were isolated by serial dilutions from samples taken from Italian (TH 2) and Islandic (VE 2, Kra 23, NA 4) solfatara fields. All these isolates grow chemolithoautotrophically on an ore mixture containing pyrite, chalcopyrite, sphalerite and pitchblende. Isolates TH 2, Kra 23 and NA 4 can also use sulfur as an energy source, both with and without the addition of yeast extract. TH 2 can, alternatively, grow heterotrophically on yeast extract. Isolate VE 2 shows an upper growth temperature limit of 85 °C, which is the highest temperature known thus far at which microbial metal mobilization can take place. The GC-content of isolate TH 2 is 45 mol%, and is therefore about 8% higher than that of *Sulfolobus acidocaldarius* (37 mol%) and of *Sulfolobus solfataricus* (38 mol%).

References

Brierley, C. L., Brierley, J. A.: A chemoautotrophic and thermophilic microorganism isolated from an acid hot spring. Can. J. Microbiol. *19*, 183–188 (1973).

Brierley, C. L.: Molybdenite-leaching: use of a high-temperature microbe. J. Less-Common Met. *36*, 237–247 (1974).

Brock, T. D.: The Genus *Sulfolobus*. In: Thermophilic Microorganisms and Life at High Temperatures, pp. 117–179 (*T. D. Brock*, ed.). New York, Springer-Verlag (1978).

Marsh, R. M., Norris, P. R., Le Roux, N. W.: Growth and mineral oxidation studies with *Sulfolobus*. In: Recent progress in biohydrometallurgy , pp. 71–81 (*G. Rossi* and *A. E. Torma*, eds.). Iglesias, Associazione Mineraria Sarda (1983).