The subtle difference between heterotrophic sulphur-oxidizing bacteria and chemolithoheterotrophs

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The oxidation of reduced sulphur compounds can be performed by many bacteria, some fungi and a few yeasts. These organisms can be classified into four separate groups: autotrophs, mixotrophs, chemolithoheterotrophs and heterotrophs able to oxidize sulphur compounds. This study concentrates on the difference between the two types of heterotrophic bacteria that are able to oxidize sulphur compounds. The chemolithoheterotrophs, in contrast to the 'true' heterotrophs, can make use of the energy liberated by the oxidation of sulphur compounds. A chemolithoheterotroph therefore should show a higher biomass yield when grown on a mixture of an organic and a sulphur substrate than when grown on the organic substrate alone. To substantiate this, the physiological properties of a recently isolated organism, *Thiobacillus* Q (Gottschal and Kuenen, 1980), are dis-

cussed. The true chemolithoheterotrophic nature of the organism was not apparent in batch culture. The growth yield was not enhanced by the addition of thiosulphate to an acetate-containing mineral medium, even though up to 30% of the thiosulphate was oxidized. Under carbon and energy limitation in the chemostat the yield did increase from 73 mg cell carbon per litre when grown on 10 mM acetate to 91 mg cell carbon per litre when grown on 10 mM acetate plus 5 mM thiosulphate. These studies affirm that quantitative chemostat studies are necessary to establish the role of inorganic oxidations in energy metabolism by microorganisms, as stated by Kelly and Kuenen (1984). Many heterotrophic organisms have been described in the literature that can oxidize sulphur compounds (mainly thiosulphate). Seldom or never have chemostat experiments been included. Our results with *Thiobacillus* Q indicate that these organisms are all potential chemolithoheterotrophs.

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