

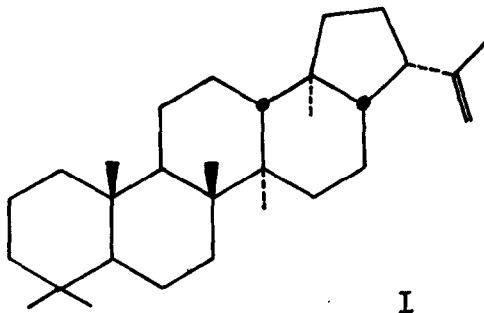
THE IDENTIFICATION OF HOP-22(29)-ENE IN PROKARYOTIC ORGANISMS

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Until recently a distinguishing feature of prokaryotic organisms, the blue-green algae and bacteria, was their apparent inability to produce steroids or triterpenoids. Earlier this year we reported¹ the formation and identification of squalene, and a mixture of 4,4-dimethyl,4-methyl and 4-desmethylsterols by the bacterium Methylococcus capsulatus grown in a mineral salt medium with methane as sole carbon source. An accompanying triterpene (0.3-0.6% dry weight) was also characterised at that time, but not identified.



The mass spectrum of the triterpene showed the molecular ion m/e 410, base peak m/e 69, intense ions at m/e 189 and 191, and low intensity ions at m/e 395, 367, 354, 342, 299 and 231. These results suggested a pentacyclic skeleton of the hopane type. Comparison of this mass spectrum with spectra of likely hopenes determined under identical conditions showed that our unknown triterpene could be assigned unambiguously the structure hop-22(29)-ene(diploptene)(I). This was further confirmed by comparison of glc behaviour on nonpolar (SE 30) and polar (PEG 20M) phases.

A recent paper² recorded the presence of an unidentified triterpene in three blue-green algae, namely Nostoc sp., Lyngbya estuarii and Chroococcus turgidus. Comparison of the

published mass spectrum with those obtained during the present work show that this triterpene is also hop-22(29)-ene. While this manuscript was in preparation a report appeared³ of the occurrence of this triterpene in an unidentified thermophilic bacterium.

The formation of such triterpenes by prokaryotic organisms had been previously unsuspected and these findings have important implications for organic geochemistry. Firstly they greatly extend the range of types of organism potentially detectable by the use of isoprenoids as "biological markers".⁴ Secondly, triterpenes with the hopane skeleton have previously been encountered mainly in ferns and lichens, suggesting a botanic origin for the hopane derivatives encountered in Messel Shale.⁵ The presence of these compounds in the blue-green algae, which are implicated in the formation of such deposits, suggest an alternative origin.

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