What's the deal with aminobacteriohopanepentol in marine systems?

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Methane, a potent greenhouse gas, plays an important role in regulating climate. Past fluctuations in methane have been shown to greatly affect the global carbon cycle, especially during release of methane from precarious marine reservoirs, gas hydrates [1]. Aerobic methane oxidation (AMO) is a major sink for methane in the global carbon cycle, and may moderate the release of gas hydrate methane into the atmosphere.

One of the aims of our ERC AMOProx project is to be able to trace past AMO activity using bacteriohopanepolyols (BHPs) as biomarkers for aerobic methanotroph bacteria. Type I methanotrophs (from the class *Gammaproteobacteria*) are generally associated with aquatic systems whilst Type II methanotrophs (class *Alphaproteobacteria*) are widespread in terrestrial settings. 35-aminobacteriohopane-30,31,32,33,34-pentol (aminopentol; Fig. 1, **I**) is only significantly synthesised by type I methanotrophs [2,3]. However, not all Type I methanotrophs make aminopentol, and the frequent absence of aminopentol in strictly marine systems (settings not under the influence of land-sea transport, i.e. active methane seeps) has lead us to question whether the methanotrophs thriving at these sites are not synthesising what was considered, at the start of our ERC project, to be the most likely candidate for an AMO biomarker in marine settings. Preliminary results from laboratory microcosm experiments suggest that a more suitable proxy for past marine AMO could be a ratio of two other (less specifically methanotroph) amino-BHPs, aminotetrol and aminotriol (Fig. 1, **II** and **III**).

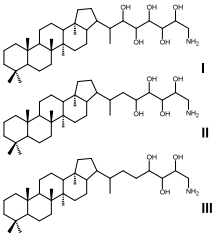

Figure 1: Chemical structures of amino-substituted bacteriohopanpolyols: (I) aminopentol, (II) aminotetrol, and (III) aminotriol.

[1] Dickens, 1999. *Nature* **401**, 752-755. [2] Cvejic, J.H. *et al* 2000. FEMS *Microbiol. Lett.* **182**, 361-365. [3] van Winden *et al* 2012. *Geochim. Cosmochim. Acta* **77**, 52-61.