Novel Patescibacteria enriched from marine microalgal cultures and characterized by metagenomics

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Abstract

Patescibacteria are a very large group of enigmatic bacteria that comprise an entire superphylum of "microbial dark matter". This huge microbial diversity has been little explored. No *Patescibacteria* have been isolated in pure culture although a few species have been successfully enriched in co-culture. There are a few metagenomic sequences available for *Patescibacteria* and the common themes that are emerging in these genomes are that *Patescibacteria* have very small genomes less than 1 Mb, limited metabolic capabilities, are generally unable to synthesize amino acids, and lack the genes needed for electron transport and the TCA cycle. These characteristics strongly suggest that *Patescibacteria*may be obligate symbionts or parasites. Intriguingly, despite their small genomes and limited metabolism, *Patescibacteria* have been found in metagenomic datasets from many marine samples. The role of *Patescibacteria* in coastal and open ocean microbial communities is completely unknown. In a serendipitous discovery, we found that cultures of the microalga *Nannochloropsis oceanica* IMET1 that were grown under high carbon dioxide conditions specifically to sequester carbon dioxide from power plant flue gases were very highly enriched in *Patescibacteria*. We took advantage of this discovery to obtain high-quality full genome sequences from two distinct novel genera of *Patescibacteria* and revealed new insights into these bacteria, with implications for marine microbial ecology and use of microalgae for carbon sequestration.

Keywords: Novel marine bacteria, Patescibacteria, carbon capture, marine micro algae, Nannochloropsis

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