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Biomineralization of intracelllar amorphous calcium carbonates (ACC) by bacteria: molecular mechanisms, evolutionary history and environmental significance

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The biomineralization of amorphous calcium carbonates (ACC) has been abundantly documented in eukaryotes. ACC appears as a key precursor phase in the formation of most carbonate biominerals and its solubility and chemistry control, to a great extent, biomineralization processes and the physico-chemical properties of the biomineral endproducts. Interestingly, biomineralization of intracellular ACC has been reported in an increasing number of prokaryotes: environmentally and phylogenetically diverse cyanobacteria [1]; the gammaproteobacterium *Achromatium* [2]; a newly described magnetotactic bacterium affiliated to the Alphaproteobacteria [3]. It has been proposed that these bacteria may have a significant impact on local geochemical cycles of alkaline earth metals and carbon (e.g., [4]). Moreover, at least some of these bacteria may serve for the development of new bioremediation routes of radioactive earth alkaline metals such as Ra or ^{90}Sr [5]. Yet, the molecular mechanisms involved in the bacterial biomineralization of ACC remain poorly known [6]. Here, I will present the discovery of a new gene specifically involved in the biomineralization of ACC in cyanobacteria. The function of this gene will be discussed. Moreover, I will show how it allows an efficient further detection of the phylogenetic diversity of this biomineralization process within cyanobacteria as well as inferences about its evolutionary history. Last, I will analyze and speculate about the potential relationships between ACC biomineralization in these different organisms.

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