

## Biologically controlled mineralization of magnetite nanocrystals

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Magnetotactic bacteria (MTB) are a paraphyletic group of prokaryotes distinguished by their ability to mineralize nanocrystalline magnetite ( $\text{Fe}_3\text{O}_4$ ), greigite ( $\text{Fe}_3\text{S}_4$ ), and/or pyrite ( $\text{FeS}_2$ ) within intracellular, pseudo-organelles known as magnetosomes. This form of biomineralization is tightly regulated at the genetic level with the cell controlling chemical composition, size, shape, orientation, and magnetic anisotropy of the magnetosome crystals. In this study, we use antibodies to study a key biomineralization protein called Mms6 within the MTB *Magnetosprillum magneticum* AMB-1. The temporal appearance and spatial localization of Mms6 is examined using (i) confocal laser scanning microscopy of fluorescently labeled Mms-6 in whole cells, and (ii) transmission electron microscopy of gold-conjugated, immunolabeled Mms-6 thin sections. The results suggest that Mms6 is localized transiently within the magnetosome during crystal production and that it plays a direct role in the formation of magnetite crystals. We are investigating additional proteins from MTB with the goal of large scale, *in vitro* fabrication of nanocrystals with tuned magnetic response for medicinal or pharmaceutical applications.