Environmental Implications of Metal Binding by the Novel Chalkophore Methanobactin

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Some methanotrophs, or methane-oxidizing bacteria, produce a novel chalkophore for copper collection ("chalko" is Greek for copper) called methanobactin. To date, two general forms of MB have been characterized (Figure 1). Copper is bound by MB via an N_2S_2 ligand set associated with two heterocyclic rings.

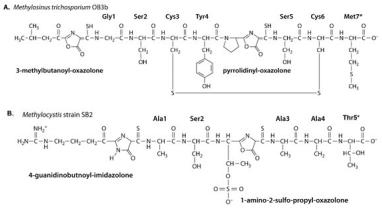

Fig. 1. Examples of (A) Group I and (B) II MBs [1]

With this ligand set, other metals, e.g., mercury, are also strongly bound. MB also enables methanotrophs to bind and degrade methylmercury (MeHg), despite these bacteria not having the canonical organomercurial lyase (MerB). Although MB is required for methanotrophic-mediated MeHg degradation, it is not sufficient. Rather, MB serves a delivery device that enables methanotrophs to take up MeHg where it is degraded by some other mechanism. Here we discuss the affinity and transformation of copper and mercury by MB and subseqent uptake of metal-MB complexes by methanotrophs. Further, we provide evidence on the mechanism responsible for MeHg degradation in methanotrophs. From the data collected, MB-mediated mercury detoxification is a hitherto unidentified but important mechanism contolling mercury availability and toxicity *in situ*. Thus MB has many potential applications beyond copper acquisition.

[1] Semrau et al. (2018). Appl Environ Microbiol E02289-17