

COLD ADAPTATIONS IN METALLOBIOMOLECULES FROM ANTARCTIC BACTERIA

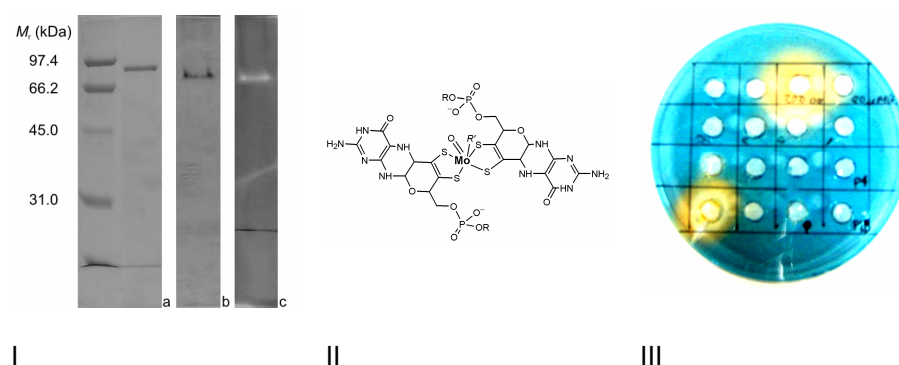
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Introduction. Prokaryotes that thrive in the Antarctic must adapt their biomolecular libraries (proteins, membranes, small molecules) to ensure that metabolic flux is maintained at frigid temperatures.

Methods. Here, we detail our recent results in the isolation and characterisation of a cold-adapted mononuclear molybdenum containing enzyme, periplasmic nitrate reductase (NapA), from a bacterium isolated from Antarctic sea-ice.

Results. The denaturing SDS-PAGE reveals a single subunit protein with a molecular weight of ~90 kDa (**Ia**) and appears as a single band in non-denaturing PAGE gels, stained both for protein (**Ib**) or *in-situ* nitrate reductase activity (**Ic**). Based upon sequence analyses and electronic and EPR spectroscopies, the metal-containing active site of the protein is of the form, **II**. When the same bacterium is cultured under iron-limited conditions, an iron-chelating molecule (siderophore) is produced (**III**).



Discussion. Studies of how NapA and related enzymes from the metallo-oxotransferase superfamily adapt to cold thermal extremes will provide insight into prokaryotic-modulated geochemical cycling (N, S and C) in Antarctic waters. The results of our studies into cold-adapted metallobiomolecules may lead to the development of energy friendly technologies and novel applications in biomedicine and bioremediation.