DOWNLOAD PDF THE ROLE OF HEME D1 IN DENITRIFICATION STUART J. FERGUSON.

Chapter 1 : Research - Ferguson Group

The Role of Heme d1 in Denitrification. Stuart J. Ferguson; Nicholas J Watmough The formation of a heme d1 -nitric-oxide complex as an intermediate of nitrite reduction was demonstrated by.

Research Cytochrome cd1 nitrite reductase One of the important respiratory processes carried out by many species of bacteria is denitrification. This involves the sequential reduction of nitrate, nitrite, nitric oxide and nitrous oxide to dinitrogen gas and is an essential part of the biological nitrogen cycle. Inadequate rates of denitrification have adverse effects on the environment, e. Each of the reduction reactions is catalysed by a separate enzyme that is linked to the respiratory chain of the bacterium. Our work aims to understand how these enzymes of denitrification function and are assembled, with particular emphasis on the enzyme cytochrome cd1 nitrite reductase. We have solved, in collaboration with V. Hajdu, the structure of this enzyme and shown that it contains two different heme groups, one of which, d1 heme, is unique to this enzyme. The biogenesis pathway for d1 heme is an enigma. Disulphide bond pathways A pathway exists in the bacterial periplasm for disulphide bond isomerisation. It functions in introducing disulphide bonds into certain proteins, which increase stability, and also plays a role in the maturation of cytochromes c. These proteins bind to heme via cysteine residues that need to be reduced for the attachment reaction to occur. Proteins that catalyse the oxidation of cysteine residues eg. DsbA in the periplasm occur alongside others that function in their reduction eg. DsbD making the pathway complex. There are a number of proteins involved in these processes and, using diverse experimental approaches, we examine structure-function relationships in this pathway. Cytochrome c biogenesis C-type cytochromes are essential proteins found in virtually all organisms and have many functions including electron transfer, varied catalytic roles and signalling apoptosis. These proteins contain one or more heme groups linked to the protein via covalent bonds. There are at least five different systems observed in nature for attaching the heme cofactor to the protein and none of these are fully understood. We have made progress in understanding the function of the cytochrome c maturation operon in E. We study these proteins in order to understand this complex post-translational modification pathway in which both the cytochrome and its heme cofactor have to be transported across the cytoplasmic membrane into the periplasm. The Ccm proteins are all membrane-bound. We also utilise several cytochromes for spectroscopic studies of heme binding and covalent bond formation. The heme chaperone CcmE CcmE functions in the cytochrome c maturation pathway in many Gram-negative bacteria and plant mitochondria by binding the heme cofactor in the periplasm before the heme is tranferred to the apocytochrome for covalent attachment. Unexpectedly, the heme binding observed in CcmE itself is covalent and involves a histidine residue. The structure of the heme-free form of CcmE is known from the work of others but the heme-bound form is not. We employ different types of spectroscopy to examine the binding of heme by the chaperone and explore the function of this novel protein in heme transfer reactions. Nitrate transport An essential step in denitrification is the uptake of nitrate into the bacterial cytoplasm. How this occurs is currently unknown. We have identified in Paracoccus pantotrophus a transmembrane protein called NarK that is involved in nitrate transport. NarK is a complex protein as it has 24 predicted transmembrane helices organised in two domains which seem to have different transport functions. We aim to elucidate the precise functions of the domains of this protein using various experimental approaches.

Chapter 2 : Publications Authored by Stuart J Ferguson | PubFacts

CHAPTER 25 The Role of Heme d 1 in Denitrification Stuart}. Ferguson AbstractHeme d l is found only in a bacterial periplasmic enzyme, cytochrome cd\> that catalyses reduction of nitrite to nitric oxide.*

Chapter 3 : Table of contents for Tetrapyrroles

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Abstract. Heme d 1 is found only in a bacterial periplasmic enzyme, cytochrome cd 1, that catalyses reduction of nitrite to nitric calendrierdelascience.com unique features of the d 1 heme include saturation of two of the pyrrole rings and presence of two carbonyl groups.

Chapter 4 : - NLM Catalog Result

The site of nitrite reduction is the d 1 heme, which is synthesized under anaerobic conditions by using nirECFD-LGHJN gene products. In vivo studies with an unmarked deletion strain, Î" nirF, showed that this gene is essential for cd 1 assembly and consequently for denitrification, which was restored when the Î" nirF strain was complemented.

Chapter 5 : Publications - Ferguson Group

Stuart J Ferguson. Vilmos FÃ¼lÃ¶p. The Role of Heme d1 in Denitrification. Chapter. Dec ; Stuart J. Ferguson; Cytochrome cd1 nitrite reductase (cd1) from Paracoccus pantotrophus is a.