P014 Novel nitric oxide dioxygenase, SHP (*Sphaeroides Heme Protein*), and new detoxification mechanism

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SHP (*Sphaeroides* Heme Protein) is an oxygen-binding cytochrome, found in at least 16 different photosynthetic and metal-reducing bacteria. Like other oxygen-binding cytochromes, it not only binds oxygen but also nitric oxide with similar rates (k_{on} for O_2 = 0.17 $\mu M^{-1}s^{-1}$, k_{on} for NO = 0.12 $\mu M^{-1}s^{-1}$). SHP is the only known c-type cytochrome to have asparagine as a sixth heme ligand. A possible redox partner for SHP is another cytochrome known as DHC (DiHeme Cytochrome c). In our previous studies we have shown that, in low salt conditions, DHC binds tightly to SHP and transfers electrons rapidly to it. However, the biological function of SHP is still not clear. An examination of the Integrated Microbial Genomes data base reveals that the genes for SHP/DHC/Cyt *b* are adjacent to one another in a gene neighbourhood, and that their mRNAs are up-regulated (~ 10 fold) when nitrite is the electron acceptor. Using biochemical methods, we have demonstrated that SHP with oxygen bound can react rapidly with nitric oxide to form nitrite. Furthermore, wild-type *Shewanella* exhibits a higher nitric oxide tolerance than the SHP/DHC/Cyt b knockout strain. Therefore, a possible function for SHP would be to act as a nitric oxide dioxygenase. To support this idea we suggest a new reaction mechanism for NO detoxification starting with the nitric oxide-binding ferrous form of SHP.