Cytochrome c Nitrite Reductase (CcNiR or NrfA)

- assimilatory denitrifying bacteria: $[\text{NO}_2^-] + 8\text{H}^+ + 6e^- \rightarrow [\text{NH}_4]^+ + 2\text{H}_2\text{O}$
- dimeric $\alpha_2$ enzyme, each subunit five heme c groups
- uses $[\text{NO}_2^-]$ as oxidant, with reducing $[\text{HCO}_2^-]$ or $\text{H}_2$ to create $\text{H}^+$ gradient
- takes electrons from quinol pool, via membrane-bound tetraheme NrfH
- four $2\times$Nhis form e.t. chain, one active site with NLys
- $[\text{NO}_2^-]$ binds via N to Fe$^{\text{II}}$, H-bonds to nearby His, Tyr, Arg
- mechanism via intermediate $[\text{NO}^+] [\text{NO}^-]$ and $\text{NH}_2\text{OH}$ adducts

![Diagram of Cytochrome c Nitrite Reductase](PDB 1FS7, PDB 2E80, PDB 2E81)
Intact complex of two NrfA dimers interacting with membrane-bound NrfH: NrfAH (PDB 2J7A)

- NrfH is dimer of tetra(heme c) units
- Interacts with NrfA assymmetrically, with each chain of four NrfH hemes forming a path from menaquinol binding site to one heme on one side of a NrfA dimer
- Last heme in NrfH bound by NrfA LysN, forming bridge between proteins