

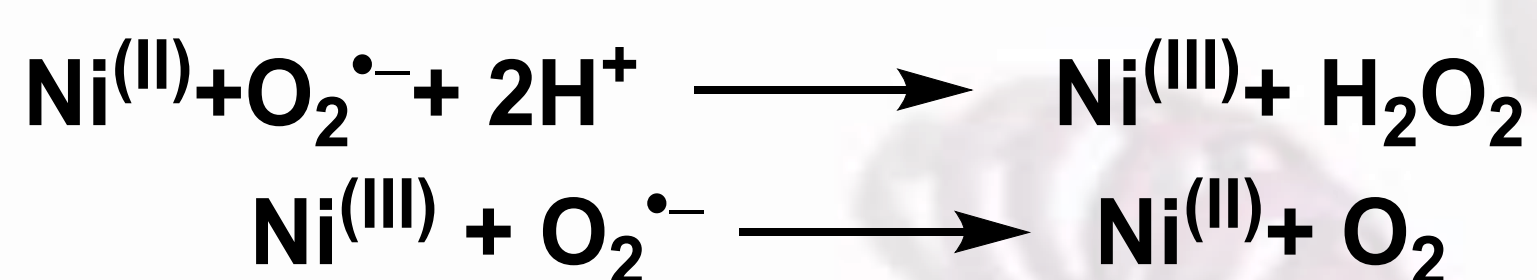
Synthesis and Characterization study of Biomimetic Tetradentate Ni complexes

Nirupama Singh
Department of Chemistry

Overview

Superoxide dismutases (SODs)-

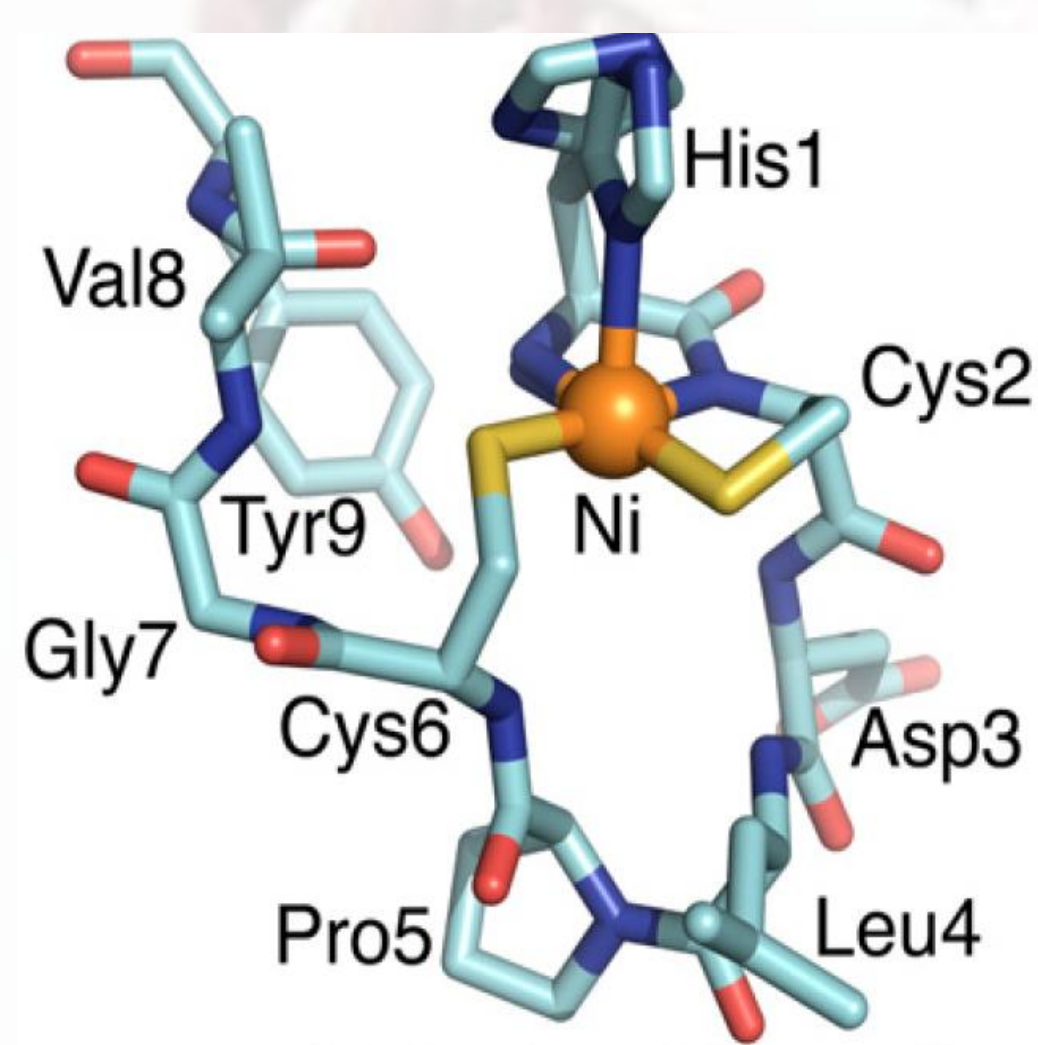
Group of metalloenzymes that catalyze the disproportionation of superoxides ($O_2^{\bullet-}$) into H_2O_2 and molecular oxygen and prevent the detrimental effects of superoxide radical.¹



There are mainly three classes of SODs exist:

- Cu/Zn SOD
- Fe and Mn SOD
- NiSOD (recently discovered)

NiSOD is a unique type of SOD originally isolated from *Streptomyces* species. Unlike other SODs that contains metal cofactors in N/O coordination; NiSOD on the other hand posses a cysteine-rich active site.



NiSOD metal-binding hook²

The objective of our research is to design and study small N-rich functional mimics of NiSOD that provide insights to:

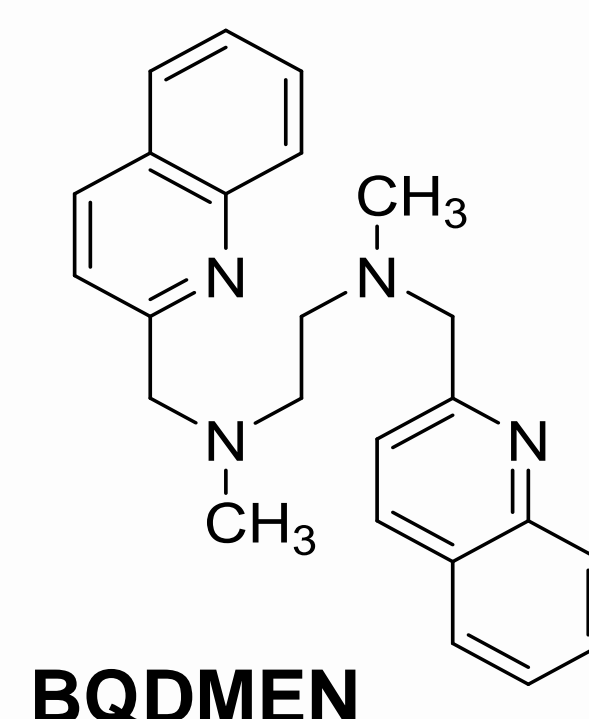
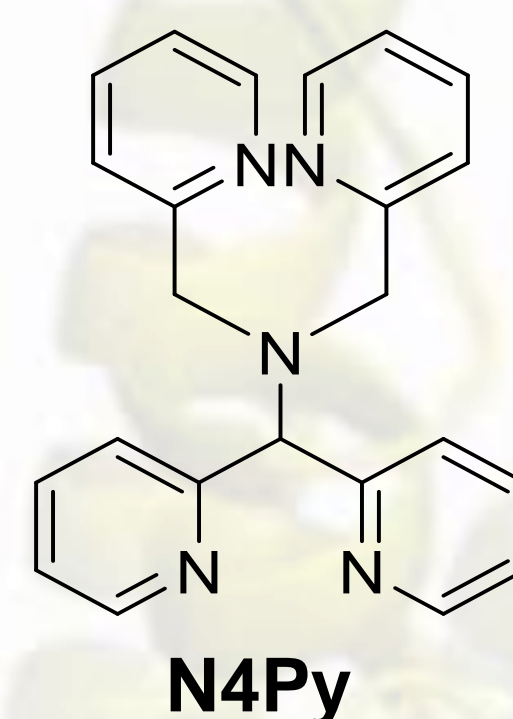
- The mechanism of SOD catalysis by NiSOD
- Structural/electronic basis for Ni-thiolate bond stability toward catalytic conditions

Impact

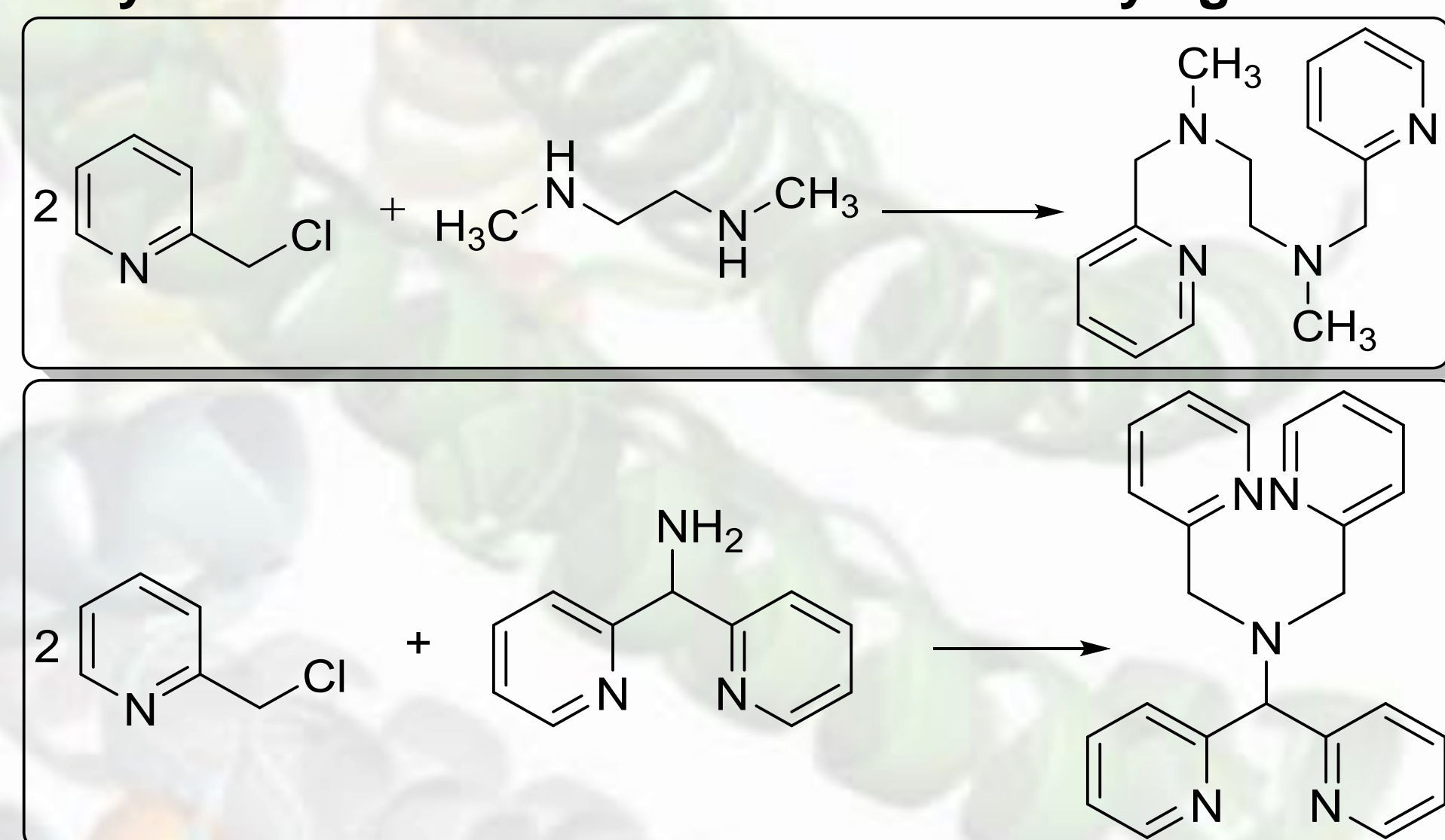
- SOD plays a pivotal role in controlling cellular level of reactive oxygen species (ROS). Thorough understanding of NiSOD mechanism will allow generation of functional synthetic NiSOD analogue that can be use to prevent cell apoptosis.
- This approach can lead us toward new strategies to enhance the ROS-scavenging systems of the cell.
- Earlier study³ suggests potential impact that NiSOD can have in the field of neurodegenerative diseases in which cellular damage due to ROS is the key factor.

Preliminary outcomes

- Recently we designed three tetradentate ligands in our lab by using different synthetic routes.
- These ligands were characterized using NMR Spectroscopy. The results are still underway.



Synthetic schemes of BPMEN and N4Py ligands-



Future pathway

- As a future plan of our ongoing research, we are planning to design small bio-inspired complexes of Nickel (Ni) as a metal center.
- These synthetic analogues will be studied by using different spectroscopic techniques and modified accordingly to establish as a potential biomimetic catalysts.

Acknowledgements

Special thanks to-

- Dr. Anusree Mukherjee for her continuous support and helpful suggestions
- Dr. Bernhard Vogler for his help in NMR interpretation
- We thank UAH College of Science for their generous support with funding

References

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