LECTURE SERIES:
Interfaces of Chemistry, Life Sciences and Physics

Friday, October 3, 2014
At 3:30 p.m.
Room 207, Buller Building

Biosynthesis of the [NiFe]-Hydrogenase Enzymes By the Nickel Accessory Protein HypB: A Tale of Two Sites

Professor Deborah Zamble

(*Department of Chemistry, University of Toronto*)

Abstract

[NiFe]-hydrogenase enzymes, which catalyze the reversible formation of hydrogen gas from protons and electrons, are vital components of energy metabolism in many bacteria including *Escherichia coli* (*E. coli*) and *Helicobacter pylori* (*H. pylori*). Catalysis by the [NiFe]-hydrogenase occurs at an intricate, bimetallic center composed of nickel and iron ions coordinated to both protein and non-protein ligands [1]. Biosynthesis of this metalloenzyme requires the cooperative activity of a team of accessory proteins that gather the individual components and assemble the metallocenter in the active site of the hydrogenase precursor protein [2, 3]. It is not known how the transition metal cofactors are correctly incorporated into the enzyme precursor protein.

Our studies are currently focused on the insertion of nickel, which is the final component delivered to the hydrogenase active site. A key protein required for nickel transfer into the hydrogenase enzyme is the GTPase HypB. We are using a combination of in vitro and in vivo methods to examine the activities of HypB and to investigate how these activities are modulated by the other accessory proteins. HypB binds transition metal ions at two distinct sites that have been extensively characterized, and there is a clear link between metal binding and the GTPase activity of the protein. In addition, HypB interacts with other accessory proteins in a manner that suggests that they cooperate during the pathway. The results lead to a model for specific nickel delivery to the hydrogenase enzyme that involves different roles of the two metal sites of HypB.

1. Fontecilla-Camps JC, Volbeda A, Cavazza C, Nicolet Y (2007) *Chem. Rev*. 107:4273-4303
2. Kuchar J, Hausinger RP (2004) *Chem. Rev.* 104:509-526
3. Li Y, Zamble DB (2009) *Chem. Rev.* 109:4617-4643

For questions & comments contact: Prof. M. Khajehpour (Mazdak.Khajehpour@umanitoba.ca)

UNIVERSITY OF MANITOBA