Plan II Master's Defense

Date: Wednesday, July 23, 2014
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Location: SEC 2438

"Assessing Myo-Inositol-1-Phosphate Synthase Expression in Photosynthetic Complexes of *Chlamydomonas reinhardtii*"

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Abstract -Myo- inositol 1-phosphate synthase (MIPS) is the only known enzyme capable of catalyzing the conversion of glucose- 6-phosphate into inositol phosphate. This enzymatic reaction is the rate limiting step in inositol phosphate metabolism. The importance of this biosynthetic pathway is evolutionary conserved across the three domains of life, eukaryota, bacteria, and archaea. Derivatives of inositol have been identified in all eukaryotic organelles studied to date. These derivatives have been shown to play crucial roles in numerous cellular processes, including signal transduction, cell wall and membrane biosynthesis, stress response, hormone transport, and phosphate metabolism.

Previous studies of MIPS expression in the unicellular green alga (*Chlamydomonas reinhardtii)*, and in plants (*Arabidopsis thaliana* and *Phaseolus vulgaris*) detected MIPS expression in thylakoids. Given the function of thylakoids in chloroplasts and the fact that inositol can contain many high-energy phosphate bonds in the form of inositol-pyrophosphate, we hypothesize that MIPS may have a role in ATP biosynthesis. We predict that MIPS may associate with the ATP synthase complex in thylakoids.

To test this prediction, biochemical studies, including purification of chloroplasts, subcellular fractionations, western blotting analyses, native gel analyses, and co-immunoprecipitation experiments, were performed to assess MIPS expression in the four photosynthetic complexes (Photosystem I, Photosystem II, Cytochrome b_6f, and ATP synthase complex) of *Chlamydomonas reinhardtii*.

Results of these experiments suggest that MIPS may be expressed in all four photosynthetic complexes of *Chlamydomonas reinhardtii*, implicating a requirement for readily available phosphate and inositol in thylakoid membrane functions. These findings require additional biochemical analyses to provide solid support for the crucial roles inositol phosphate is reported to play in chloroplast metabolism and in photosynthesis.