

To: Sabbatical Leave Committee
From: Pushpa Murthy, Chemistry MTU
Subj: Sabbatical Leave Report
Date: 6 April 2007

P. Murthy

I was on sabbatical leave during the semesters Fall 2005 and Spring 2006. A report of my activities during this period is described below.

Development of phosphate sensor: My research group has initiated work on the development of an enzymatic phosphate sensor. I established collaboration with a research group at the University of Michigan, Ann Arbor. A fluorescent-labeled phosphate binding protein with high specificity for phosphate and good binding ability has been cloned at the Univ. of Michigan in Ann Arbor. We have started initial work with the phosphate binding protein at MTU. My interaction with CAMBIA, Australia

Development of research collaborations with scientists in Australia: I traveled to Canberra (March-April 2006), to develop research collaborations with scientists at the Council of Scientific Research Organization (CSIRO) and CAMBIA. A number of gibberellin receptor site mutants have been generated in CSIRO and these will be used for signal transduction studies. My interaction with CAMBIA is connected with the detection of phosphate in plants, an off shoot of the project above. The applicability of the phosphate sensor to CAMBIA research interests is also being explored.

Publications: During my sabbatical leave period, the following papers have been published or submitted for publication:

Cuihua Xue, Sonali P. Jog, Pushpalatha P. N. Murthy, and Haiying Liu (2006) Synthesis of highly water-soluble fluorescent conjugated glycopoly(p-phenylene)s for lectin and *Escherichia coli*. *Biomacromolecules*, 7, 2470-2474.

P.P.N. Murthy Identification of inositol phosphates by NMR spectroscopy: unraveling structural diversity. Proceedings of the Bouyoucos conference on Biogeochemical interaction of inositol phosphates in the environment. (In press)

Bakul Dhagat Mehta, Sonali P. Jog, Steven C. Johnson and Pushpalatha P.N. Murthy (2006) Lily pollen alkaline phytase is a histidine phosphatase similar to mammalian multiple inositol polyphosphate phosphatase (MINPP), *Phytochemistry*, 67, 1874-1886.

B.G. Garchow, S.P. Jog, B. D. Mehta, J.M. Monosso (posthumous), P.P.N. Murthy (2006) Alkaline phytase from *Lilium longiflorum*: purification and structural characterization. *Protein Express. Purif.* 46, 221-232.

P. P. N. Murthy (2006) Structure and nomenclature of inositol phosphates, phosphoinositides, and glycosylphosphatidylinositols. Subcellular Biochemistry series: Volume 39, *Biology of Inositols*

and Phosphoinositides (Eds. A. N. Lahiri and B.B. Biswas), Plenum Publishing Co. Ltd., London, pp 1-20.

P. Yang, P.P.N. Murthy, R.E. Brown (2005) Synergy of intramolecular hydrogen bonding network in myo-inositol-2-phosphate: theoretical investigations into the electronic structure, proton transfer and pKa. *J. Amer. Chem. Soc.* **127**, 15848-15861.

S.P. Jog, B. G. Garchow, B. D. Mehta, P.P.N. Murthy (2005) Alkaline phytase from lily pollen: Investigation of biochemical properties. *Archives of Biochemistry and Biophysics* **440**, 133-140

P. Yang, B. Spiess, P.P.N. Murthy, R.E. Brown Influence of metal cations on the intramolecular hydrogen-bonding network in phosphorylated compounds. (Submitted to *J. Phys. Chem.*)

The following gene sequences were submitted to NIH database:

Lilium longiflorum alkaline phytase isoform 2 mRNA, complete cds.
AUTHORS Mehta,B.D., Jog,S.P., Johnson,S.C. and Murthy,P.P.N.
TITLE Alkaline phytase from lily pollen: Cloning, characterization and expression
Submitted (07-MAR-2006) Chemistry, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931, USA

Lilium longiflorum alkaline phytase isoform 1 mRNA, complete cds.
AUTHORS Mehta,B.D., Jog,S.P., Johnson,S.C. and Murthy,P.P.N.
TITLE Alkaline phytase from lily pollen: Cloning, characterization and expression
Submitted (07-MAR-2006) Chemistry, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931, USA

Proposals submitted: The following proposals were submitted during this period:

Fluorescent conjugated polymers for proteins cells, viruses and DNAs (25 Feb. 2006) H. Liu (PI), P. Murthy (Co-PI), NIH, Oct 2006-Oct 2009

Carbon nanotube arrays for bacteria H. Liu (PI); P. Murthy (PI), Y.K. Yap (Co-PI); M. Thompson (Co-PI) USDA, Jan 2007- Dec 2007 Fundeed

Monolayers for proteins cells, and virus (20 Oct. 2005) H. Liu (PI), P. Murthy (Co-PI), NIH, Aug-2006-July-2009

Biotechnological production of a novel alkaline phytase from plants – optimization of yield and biocatalytic activity (19 Jan 2006) P. Murthy Council of Plant Biotechnology Research Jan 2007- Dec 2008.

Nanosensors for proteins, cells and virus (20 August 2005) H. Liu (PI), P. Murthy (Co-PI), Y.K. Yap, Co-PI), M. Thompson (Co-PI) NIH, May 2006- Apr 2009.

Presentations: I presented the following talks during this period:

Identification of inositol phosphates by nuclear magnetic resonance spectroscopy: unraveling structural diversity. Soil Science Society of America, Inositol phosphates in the soil-plant-animal system. Sun Valley Idaho, 21-24 August 2005. Invited talk.

Unique alkaline phytase from lily pollen: cloning, characterization, and differential expression. Bakul Dhagat Mehta and P.P.N.Murthy; Soil Science Society of America, Inositol phosphates in the soil-plant-animal system. Sun Valley Idaho, 21-24 August 2005 (Poster)

Cloning, characterization and expression of alkaline phytase from lily pollen. Sonali Jog, Bakul Dhagat Mehta and Pushpalatha P.N. Murthy, ACS National meeting, Washington, D.C., 28 Aug. - 2 Sept. 2005 (Poster)

Inositol phosphates and phytic acid: Structure, conformation, enzymology, and molecular biology. Bose Institute, Kolkotta, India. (Invited talk)

Biotechnological production of a novel alkaline phytase – a commercially important enzyme; Council of Plant Biotechnology Research annual meeting, Washington D.C. 28 Feb. 4 March, 2006 (poster)

Phytic acid and Phytases: Structure, biochemistry and molecular biology. CSIRO, Plant Industry, Canberra, Australia. March 2006.

Inositol Phosphates and Phytases: Structure, biochemistry and molecular biology. CAMBIA, Canberra, Australia. March 2006

The sabbatical leave period allowed me to complete previous research projects, publish the research results obtained, initiate new areas of research in phosphate sensors and signal transduction, and write a number of grant proposals. It has been a productive period for my research. I will be glad to answer any additional questions you may have.