

SUMAN GHOSH

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EDUCATION

Ph.D.	2009	Micro/Molecular Biology	University of Nebraska Lincoln
M.Pharm.	2000	Pharmaceutical Sciences	College of Pharmaceutical Sciences. India
B. Pharm.	1998	Pharmaceutical Sciences	Jadavpur University. India

POSITIONS

Post Doctoral Fellow	2010	Cell Biology/Genetics	Stowers Institute for Medical Research. MO
Research Fellow	2009	Infectious Disease	Harvard Medical School. MA
Lecturer	01-04	Pharmacy	Himalayan Pharmacy Institute. NBU. India
Senior Research Fellow	00-01	Natural Products	National Institute of Pharmaceutical Education and Research. India

RESEARCH EXPERIENCE

Nuclear architecture

I study factors involved in maintaining the size and shape of nuclear envelope. Cells maintain their nuclear shape round, failing which leads to unfaithful chromosome segregation, aberrant DNA transcription and have implications in cancer, aging, stress, and genetic disorders such as laminopathy, lipodystrophy etc. I use genetics, cell biology, microscopy, and biochemical tools to understand how nuclear membrane proteins change local lipid environment. I have identified Mps3, an integral membrane protein, regulate triacylglycerol and sphingolipid biosynthesis. Mps3 also help inserting macromolecular structures such as nuclear pore complex, spindle pole body by varying local lipid composition.

Another research focus in my current lab is the role of Mps3 in nuclear organization such as sister chromatid cohesion, telomere tethering, gene silencing etc. I am currently working on how Mps3 is acetylated by Eco1 (acetyl transferase) after Mps3 is localized to the inner nuclear membrane. Acetylation of Mps3 is critical for proper nuclear organization.

Hyphal morphology

Quorum sensing molecule: Earlier in the previous laboratories my research focus was how opportunistic fungal pathogen *Candida albicans* regulate its morphology between yeast, hyphae, and pseudohyphae which is required for virulence. *C. albicans* secrete various quorum sensing molecules such as farnesol and tyrosol which regulate hyphal morphogenesis. I have studied different physiological and genetic factors that regulate tyrosol and other aromatic alcohol biosynthesis.

***C. albicans* macrophage interaction:** When *C. albicans* reaches bloodstream, the first component *C. albicans* interacts with is macrophage. My research focus was to understand the mechanism *C. albicans* employ to switch from yeast to hyphae morphology inside macrophage, thereby piercing macrophage and disseminating in the bloodstream. *C. albicans* up regulate

arginine biosynthesis; thereby produce CO₂ which is critical for activating cAMP/PKA pathway. This pathway is well documented for activation hyphal morphology. I have also studied the macrophage responses before they die after *C. albicans* engulfment. Macrophage can recognize fungal cell wall components and farnesol by TLR2 and Dectin 1 and stimulate several inflammatory and regulatory cytokines.

Fungal-fungal interaction: In immune compromised patients there are always cases of concurrent infection by more than one pathogen. My focus was to study the interaction of *Aspergillus fumigatus* and *Candida albicans* using invertebrate model hosts. I identified gliotoxin, a well known secondary metabolite secreted by *A. fumigatus*, was responsible for killing *C. albicans*.

Natural Product Chemistry

My previous research expertise includes isolation and characterization of bioactive molecules from natural products. I used chromatography and spectroscopy techniques to purify compounds from medicinal plants. I reported methanolic extracts of *Gmelina arborea* (Roxb.) leaves had wound healing activity in rat model.

TEACHING EXPERIENCE

Teaching assistant in the University of Nebraska Lincoln. 2004 -2009. The laboratory courses I taught were:

- Freshman biology laboratory (BIOS101): General Biology class for non majors.
- Freshman microbiology laboratory (BIOS111): Biology of microorganisms. Comparative study of microorganisms, principles, and applications.
- Microbiology laboratory (BIOS314): Traditional microbiological techniques.

I was Head Teaching Assistant in BIOS111 from 2008-2009 when along with teaching I also mentored other teaching assistants and prepared laboratory examination questions.

Lecturer in Himalayan Pharmacy Institute, North Bengal University (State University). India. 2001 -2004. I used to teach the following classes:

- Natural Product Chemistry for Bachelor of Pharmacy 4th year (Lecture and laboratory course designed for seniors). Study of isolation and characterization techniques used to purify drugs from natural resources.
- Pharmacognosy for Bachelor of Pharmacy 3rd year (Lecture and laboratory course designed for sophomores). Study of chemistry of drugs from natural resources.
- Pharmacognosy for Bachelor of Pharmacy 1st year (Lecture and laboratory course designed for freshmans). Study of drugs from natural sources such as plants and other natural resources.
- Pharmaceutical Analysis for Bachelor of Pharmacy 4th year (Lecture and laboratory course designed for seniors). Chromatography, spectroscopy.

LEADERSHIP AND MENTORING

2011 Currently mentoring Alexander Smith. Undergraduate student. University of Missouri Kansas City.

- 2010 Supervised V. K. Chaithanya Ponnaluri. Graduate student. Pharmaceutical Sciences at the University of Missouri Kansas City.
- 2008–09 Mentored and supervised Nina Howe and Katie Volk. Undergraduate students. Dental School of University of Nebraska Medical Center. They have both coauthored in a scientific publication with me.
- 2007–08 Mentored and supervised Jake T. Cooper. Undergraduate student. Biological Sciences at the University of Nebraska Lincoln. He was coauthor of a scientific publication with me.

COLLABORATION

- Dr. Ruth Welti (Professor); and Mary Roth (Lab manager). Kansas Lipidomics Research Center. I collaborated with them for lipidomics study of various yeast nuclear envelope protein mutants.
- Dr. Aaron P. Mitchell (Professor. HHMI); and Shantanu Ganguly (graduate student). Carnegie Mellon University. I studied and analyzed quorum sensing molecules by GC/MS secreted from several *Candida albicans* mutants defective in biofilm formation. I was coauthor in their publication.
- Dr. Thomas M. Petro. (Professor). Dental School of University of Nebraska Medical Center. I studied cytokine and chemokine responses of macrophages after engulfment by *Candida albicans*. I was the first author of a publication resulting from this project.

JOURNAL REVIEW

Research in Microbiology – Pasteur, Fontis Media.
 Fungal Biology – Elsevier.
 Journal of Applied Microbiology – Wiley
 Letters in Applied Microbiology – Wiley

PROFESSIONAL ASSOCIATION

Association for the Advancement of Science (AAAS).
 American Society for Microbiology (ASM).

AWARDS AND GRANTS

2008	Jessie Lee Scholarship Fund for Research. University of Nebraska Lincoln	\$1500
2008	National level Travel grant award. American Society for Microbiology	\$500
2008	Adela and Harold Holck Travel Fellowship Award. University of Nebraska Lincoln	\$500
2007	Jessie Lee Scholarship Fund for Research. University of Nebraska Lincoln	\$1500
2006	Adela and Harold Holck Travel Fellowship Award. University of Nebraska Lincoln	\$500

PUBLICATIONS

1. Jennifer M. Friederichs[†], **Ghosh S[†]**, Smoyer CJ, McCroskey S, Miller BD, Weaver KJ, Delventhal KM, Unruh J, Slaughter BD, Jaspersen SL. The SUN protein Mps3 is required for spindle pole body insertion into the nuclear membrane and nuclear envelope homeostasis. *PLoS Genetics*. In Press.
2. Jeffrey J. Coleman[†], **Ghosh S[†]**, Okoli I, Mylonakis E. Antifungal activity of microbial secondary metabolites. *PLoS One*. 2011;6(9):e25321. Epub 2011 Sep 22.
3. Ganguly S, Bishop AC, Xu W, **Ghosh S**, Nickerson KW, Lanni F, Patton-Vogt J, Mitchell AP. Zap1 control of cell-cell signaling in *Candida albicans* biofilms. *Eukaryot Cell*. 2011 Sep 2.
4. **Suman Ghosh**, Howe N, Volk K, Tati S, Nickerson KW, and Petro TM. *Candida albicans* cell wall components and farnesol stimulate the expression of both inflammatory and regulatory cytokines in the murine RAW264.7 macrophage cell line. *FEMS Immunol Med Microbiol*. 2010 Jul 11. Oct. 60(1):63–73. doi: 10.1111/j.1574-695X.2010.00717.x.
5. **Suman Ghosh[†]**, Navarathna DHMLP[†], Roberts DD, Cooper JT, Atkin AL, Petro TM, and Nickerson KW. Arginine induced germ tube formation in *Candida albicans* is essential for escape from murine macrophage cell line RAW264.7. 2009. *Infect. Immun. Apr.* 77(4):1596–605. Epub 2009 Feb 2.
6. **Suman Ghosh**, Kebaara BW, Atkin AL, and Nickerson KW. Regulation of aromatic alcohol production in *Candida albicans*. 2008. *Appl. Environ. Microbiol.* Dec. 74(23):7211–8. Epub 2008 Oct 3.
7. Annie Shirwaikar, **Ghosh S** and Rao PGMC. 2003. Effect of *Gmelina arborea* (Roxb.) Leaves on Wound Healing in rats. *Journal of Natural Remedies*. 3: 45–48.

Manuscripts in preparation/submitted

1. **Suman Ghosh[†]**, Gardner JM[†], Friederichs JM, Smoyer CJ, Chisholm RD, Lee K, Workman JL, and Jaspersen SL. Acetylation of the SUN protein Mps3 by Eco1 regulate its function in nuclear organization. (Submitted)
2. **Suman Ghosh**, Swetha Tati, and Kenneth W. Nickerson. Aromatic alcohols induce pseudohyphae in a GCN4 dependent manner in *Candida albicans*.
3. **Suman Ghosh**, Bessie Kebaara, Kenneth W. Nickerson, and Audrey L. Atkin. Regulation of Aro80p is critical for virulence in *Candida albicans*.

[†] Equal contributing first authors

PRESENTATIONS

Poster presentation

1. The SUN protein Mps3 is required for spindle pole body insertion into the nuclear membrane and nuclear envelope homeostasis. Midwest Yeast Meeting. Northwestern University. Evanston. IL. September 2011.
2. Acetylation of the SUN protein Mps3 by Eco1 regulates its function in nuclear organization. Yeast chromosome structure, replication and segregation. Carefree. Arizona in August 2010.

3. Aromatic alcohols induce pseudohyphae in a GCN4 dependent manner in *Candida albicans*. Gordon Research Conference. Cellular and Molecular Fungal Biology. Holderness. New Hampshire in June 2010.
4. SUN protein Mps3 is acetylated by Eco1 that regulates its function in nuclear organization. Gordon Research Conference. Cellular and Molecular Fungal Biology. Holderness. New Hampshire in June 2010.
5. Arginine induced germ tube formation is essential for escape from macrophage in *Candida albicans*. 2008. Great Plain Infectious Disease Meeting. Kansas University. 2008.
6. Feedback Regulation of Aromatic Alcohols in *Candida albicans* 9th Candida and Candidiasis. ASM Conference in Jersey City, New York in March 24 – 28, 2008.
7. Is Tyrosol a Quorum Sensing Molecule? 8th Candida and Candidiasis. ASM Conference in Denver, Colorado in March 13 – 17, 2006.

Podium presentation

1. Arginine induced germ tube formation is essential for escape from macrophage cell line RAW264.7 in *Candida albicans*. 2008. Microbiology Meeting. Microbiology initiative. University of Nebraska Lincoln. 2008.
2. Biosynthesis of aromatic alcohols reveals a complex regulatory network in *Candida albicans*. 2007 Microbiology Meeting. Microbiology initiative. University of Nebraska Lincoln. 2007.