CURRICULUM VITAE

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Education

B.S. Chemistry. University of Calcutta, India, 1994
M.S. Biochemistry. University of Kalyani, India, 1996.
Ph.D. Microbiology, Bose Institute, Jadavpur University, Kolkata, India, 2004.

Post-doctoral research

2011-present: Research Associate at Boston VA Healthcare System, Brigham and Women's Hospital, Harvard Medical School, Boston, MA

Research area: *Mucosal immunity, inflammation and colorectal cancer*

Findings: Colorectal cancer is the third most common cause of cancer related mortality in the US**.** We identified the association between the inflammatory chemokine CCL20 and colorectal cancer promotion both in humans and in a preclinical mouse model. Our current study is directed at targeting this pathway by blocking the interaction betweenCCL20 and CCR6 by using both inhibitory antibodies to CCL20 and CCR6 and a pharmacoactive antagonist. It holds promise to be used at the translational level in treating patients with colorectal cancer. Our other research projects include a) investigating the role of the master transcriptional regulator RorγT in colorectal cancer b) investigating the role of IL-21 in colorectal cancer.

2008- 2011: Research Fellow at Brigham and Women's Hospital, Harvard Medical School, Boston, MA

Research area: *Mucosal immunity to lung pathogen Mycobacterium tuberculosis (Mtb)*

Findings: Tuberculosis is one of the world's primary public health concerns. We discovered that the immune molecule IFNγ acts as an anti-inflammatory agent that suppresses neutrophil mediated immunopathology in the lung during tuberculosis infection. This study bears high clinical significance as current studies are linking the abundance of neutrophils in the human bronchoalveolar lavage (BAL) with poor outcome of the disease. This finding partially answers the question why humans lacking IFNγ or its receptor (IFNγR) are susceptible to non-tubercule *Mycobacterium* infection.

2005- 2008: Research affiliate at Wadsworth Center, New York State Department of Health, Albany, NY,

a) Research area: *Immunity to tick borne disease ehrlichiosis*

Findings: Ehrlichiosis is prevalent in the southeastern and south-central US. It is caused by an intracellular gram-negative bacterium of *Ehrlichia* spp. This study demonstrated that both humoral and T cell mediated immunity is essential for clearing obligatory intracellular tick borne pathogen *Ehrlichia* in the host. This phase of study also, for the first time, identified T cell epitopes in the outer membrane protein 19 (OMP19) which could serve as potential targets for future vaccine development. It is significant as no vaccine is yet available for this disease. Furthermore, this work showed that chronic infection established by this pathogen blunted T cell mediated immunity.

b) Research area: *Crohn's disease*

Finding: This part of work in collaboration with a group of structural biologist lab identified that a protein of bacterial origin Pfit caused human T cell stimulation as superantigen.

PhD research

1997- 2004: Bose Institute, University of Jadavpur, Kolkata,

Research area: *Mucosal immunity to and molecular pathogenesis of enteric pathogen Vibrio cholerae*

Findings: Cholera is a recurrent severe diarrheal disease prevalent in Asia and Africa. Ph.D. research addressed how non-epidemic strains of *V. cholerae* can turn into epidemic causing ones via rapid molecular evolution by horizontal transfer of DNA. This study also investigated role of outer membrane protein OmpW, LPS in eliciting the mucosal host immune response, explored the structure, function and regulation of OmpW in the light of pathogen survival in both a nutrient-deprived environment and in a nutrient-rich host mucosa. In addition, from a diagnostic point of view, a methodology was developed for identification of *V. cholerae* strains which is now being used by all cholera laboratories worldwide.

Services

2011-present: F1000 - Associate Faculty Member

Reviews and writes commentaries on published papers in regards to recent developments and future prospects in the field of immunology

2014-present: Ad-hoc reviewer; European Journal of Immunology, Journal of Immunology, Molecular Immunology, Journal of Surgical Oncology.

2014- Guest editor: In special issue in the journal of 'Gastroenterology Research and Practice'

2011-present: Tumor tissue bank in-charge

In charge of maintaining tumor tissue bank by collecting tissue samples from various forms of gastrointestinal cancer patients which is immensely valuable for future studies in the quest of cancer biomarkers or matching the concurrent studies at Boston Veteran Affairs Healthcare system:

2014-present: **Seminars in-charge**
Coordinator of Annual Seminar Series at Boston Veteran Affairs Healthcare system

2004- 2005: Research and teaching staff
Involved in building a newly founded Biotechnology department at the Burdwan University in India by taking both theoretical and practical classes and development of courses in the fields of molecular biology, biochemistry, immunology, setting up the research facility as well.

Trainees supervised

Co-mentored surgical fellow **Mia Shapiro** at the Boston VA Medical Center and as responsible for training in all aspects of animal care and procedural work related to the experimental mouse models used in the lab. Additionally taught skills in immunology, molecular and cellular biology.

Co-mentored junior postdocs, undergraduate students and lab technicians throughout the research career.

Oral and Invited Presentations

1. ***Nandi B***, R. K. Nandy and A. C. Ghose. Structure and function of an outer membrane protein OmpW in *Vibrio cholerae*. 9th Asian Conference on diarrheal disease and Nutrition, New Delhi, India, **2001**. **Participated as speaker**.
2. ***Nandi B*** and Gary Winslow. Identification of T Cell epitopes in Ehrlichia outer membrane proteins that elicit protective immunity. 20th meeting of American Society for Rickettsiology and the 5th International Conference on Bartonella as Emerging Pathogens, Asilomar Conference Grounds,Pacific Grove, California, USA, **2006**. **Recipient of Travel Award and participated as speaker**.
3. ***Nandi B***. Role of Outer membrane protein OMP19 in eliciting humoral and T cell mediated immunity to tick borne disease Ehrlichiosis. **Invited as speaker** in institutional seminar at Bose Institute, Kolkata, India. **2007.**
4. ***Nandi B***, M. Chatterjee and Gary Winslow. Antigen presentation during acute and chronic ehrlichiosis is dependent on APC type and site of infection. 10th Annual Upstate New York Immunology Conference (UNYIC), New York, USA, **2007**. **Participated as speaker**.
5. ***Nandi B***. Interferon gamma regulates innate and adaptive immunity mediated lung pathology during tuberculosis in mice. **Invited as speaker** at MICROBIOLOGY/IMMUNOLOGY SEMINAR at Dartmouth Medical School, NH, USA**, 2011.**

Publications (times citation acc. to google scholar)

1. ***Nandi B***, Pai C, Huan Q, Rao P, Munshi NC and Gold JS.**2014**. CCR6, the sole receptor for the chemokine CCL20, promotes spontaneous intestinal tumorigenesis. **Plos One. Vol9:** e97566
2. Liu L, Chen H, Brecher MW, Li Z, Wei B, ***Nandi B***, Zhang J, Ling H, Winslow G, Braun J, Li H. **2013**. Pfit Is a Structurally Novel Crohn's Disease-Associated Superantigen. **Plos Pathogen. Vlo9**: e1003837
3. ***Nandi B*** and Behar SM. **2011.** Regulation of neutrophils by interferon-γ limits lung inflammation during tuberculosis infection. **J. Exp. Med.** 208(11): 2251-62**. (86)**
4. ***Nandi B***, Chatterjee M, Hogle K, McLaughlin M, Macnamara K, Racine R, Winslow GM. **2009**. Antigen display, T cell activation, and immune evasion during acute and chronic ehrlichiosis. **Infect. Immun.** 77(10): 4643-53. **(8)**
5. Bitsaktsis C, ***Nandi B***, Racine R, MacNamara KC, Winslow G. **2007**. T-Cell independent humoral immunity is sufficient for protection against fatal intracellular *ehrlichia* infection. **Infect. Immun.** 75(10):4933-41. **(42)**
6. ***Nandi B***, Hogle K, Vitko N, Winslow GM. **2007**. CD4 T-cell epitopes associated with protective immunity induced following vaccination of mice with an *ehrlichial* variable outer membrane protein. **Infect. Immun.** 75(11):5453-9. **(19)**
7. Yager E, Bitsaktsis C**, *Nandi B***, McBride JW, Winslow G. **2005.** Essential role for humoral immunity during *Ehrlichia* infection in immunocompetent mice**. Infect. Immun.** 73(12):8009-16. **(34)**
8. ***Nandi B***, Nandy RK, Sarkar A, Ghose AC. **2005**. Structural features, properties and regulation of the outer-membrane protein W (OmpW) of *Vibrio cholerae*. **Microbiology**. 151(Pt 9):2975-86. **(61)**
9. ***Nandi B***, Nandy RK, Vicente AC, Ghose AC. **2000**. Molecular characterization of a new variant of toxin-coregulated pilus protein (TcpA) in a toxigenic non-O1/Non-O139 strain of *Vibrio cholerae*. **Infect. Immun**. 68(2):948-52. **(44)**
10. ***Nandi B***, Nandy RK, Mukhopadhyay S, Nair GB, Shimada T, Ghose AC. **2000**. Rapid method for species-specific identification of *Vibrio cholerae* using primers targeted to the gene of outer membrane protein OmpW. **J. Clin. Microbiol.** 38(11):4145-51. **(195)**
11. Mukhopadhyay S, ***Nandi B***, Ghose AC. **2000**. Antibodies (IgG) to lipopolysaccharide of *Vibrio cholerae* O1 mediate protection through inhibition of intestinal adherence and colonisation in a mouse model. **FEMS Microbiol Lett**.185(1):29-35. **(16)**

12. Sarkar A, Nandy RK, Nair G. ***Nandi B***, Ghose AC. **2000**. A search for the presence of the virulence factor genes in *Vibrio cholerae* and other *Vibrio spp*.. **The Infect. Dis. Rev**. Suppl 3.P-193.

Manuscripts in preparation

1. ***Nandi B,*** Shapiro M, Prabhala R, Munshi NC, and Gold JS.**2014.** Role of CCL20 in inducing tumor associated macrophage infiltration and development of colorectal cancer.
2. Shapiro M***, Nandi B***, Prabhala R, Munshi NC, and Gold JS. **2014**. Role of RorgT in development of colorectal cancer.

Personal statement

I am an immunologist and microbiologist. Currently, I have been working as research associate in the field of inflammation and colorectal cancer at Boston Veteran Affairs Healthcare System, BWH, and Harvard Medical School. I started my research career by having doctorate in the field of microbiology at Bose Institute, India. Here I studied a deadly diarrheal disease cholera caused by gastrointestinal non-invasive bacteria *Vibrio cholerae* prevalent in India, other parts of South-east Asia and Africa. My study addressed the structure, function relation and regulation of an outer membrane protein (OMP) OmpW in regards to pathogenicity and survival of the cholera pathogen in the host. The research investigated immunogenicity of that protein in the host gut mucosa. This phase of work also demonstrated dynamic molecular evolution of the bacteria that is posing constant threat of epidemic outbreaks in this region. Of note, here, I developed a novel diagnostic tool to identify cholera strains quickly which is being used by cholera laboratories worldwide. Upon finishing with initial training in host and mucosal pathogen interaction I moved to New York State Dept. of Health, Albany, NY where I trained with Prof. Gary Winslow, a renowned scientist in the field of tick-borne disease, ehrlichiosis, caused by bacteria of *Ehrlichia spp*., prevalent in southeastern and south-central part of USA. No vaccine is yet developed against it. Here I applied my Ph.D. expertise in studying outer membrane protein (OMP) and tested surface exposed OMPs of the pathogen *Ehrlichia* as vaccine candidate. Eventually, I succeeded in mapping the T-cell epitopes on OMPs and used both OMP B-cell and T-cell epitopes as a vaccine candidate in the experimental host. This tenure of study also demonstrated that chronic infection by this pathogen can render the T-cell mediated immunity nonfunctional. Later, I moved on to study another crucial disease tuberculosis, second to HIV/AIDS as disease severity at Brigham and Women's' Hospital, Harvard, Medical School. Here, I studied the lung mucosal immunity to *Mycobacterium tuberculosis* and demonstrated that host can generate IFNγ independent immunity to tuberculosis but in its absence host is highly susceptible to neutrophil mediated immunopathogy which has high clinical significance as current studies are linking abundance of neutrophil with poor disease outcome. With all these experiences I am back to study gut mucosal immunity but in the context of colorectal cancer. Here my work already demonstrated that a potent proinflammatory chemokine CCL20 and its cognate sole receptor CCR6 interaction promote gastrointestinal cancer both in humans and in experimental mouse model. Currently, we are targeting this pathway by using biological or chemical antagonist to this interaction for drug development for

colorectal cancer with a promise of future translational use. Throughout my academic endeavor I developed deep insight by teaching students and doing research and training fellows in the field of host immunity to infection and tumor as well with experiences in using experimental mice models of diverse genetic background, their generation by cross breeding and in translational work by working with human tissues. With this I wish to teach in the field of Immunology and Microbiology and study role of inflammation in immunopathology and cancer as well.

References

1. Gary Winslow, Ph.D.

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