Michael Paul Bechill

Education

August 2004-
May 2008 **The University of Saint Francis, Fort Wayne, Indiana**
Bachelor of Science (B.S) in Molecular and Cellular Biology

August 2008-
May 2014 **The University of Toledo College of Medicine, Toledo, Ohio**
Doctorate of Philosophy (Ph.D.) in Medical Microbiology & Immunology

Research

August 2004-
May 2005 **The University of Saint Francis**
Program: Special Problems in Biology: Field Research
P.I.: Warren Pryor M.S.
Project: Studied the freshwater muscles of the Three Rivers System in Fort Wayne Indiana. Freshwater muscle species' shell size and thickness data were correlated via mathematical analysis and fit to ellipsoid values. The efforts of my PI are now part of the St. Joseph River Watershed Initiative.

June 2006-
August 2006 **The Medical University of Ohio**
Program: Summer Research Fellowship
P.I.: Han-Fei Ding, Ph.D.
Advisor: Hong-Juan Cui Ph.D.
Project: Studied the pediatric children's cancer Neuroblastoma addressing the hypothesis: *ΔMp73 counteracts N-Myc-induced susceptibility to apoptosis by inhibiting p53-dependent apoptotic signaling.*

June 2007-
August 2007 **University of Cincinnati**
Program: Summer Research Fellowship
P.I.: Dan Hassett, Ph.D.
Project: Collaborated with a clinical lab to investigate various clinical isolates from cystic fibrosis patients and evaluated virulence strategies of a battery of isolates including mucoid *Pseudomonas aeruginosa*, and *Staphylococcus aureus*.

June 2008-
August 2008 **Old Dominion University**
Program: Summer Research Fellowship
P.I.: Margie Mulholland, Ph.D.
Project: Investigated Chesapeake Bay and Gulf of Mexico algal blooms and whole water culture. My research included two research cruises, one on the Gulf of Mexico, the other transecting Chesapeake Bay to the Atlantic.

August 2008-
May 2014 **The University of Toledo College of Medicine**
Program: Predoctoral Fellowship
P.I.: R. Mark Wooten, Ph.D.
Project: My doctoral training has focused on multidisciplinary immunological, microbiological, cell biological, and spectroscopic approaches to dissect pathways by which innate immune cells respond to the virulence mechanisms of the Gram-negative bacteria *Burkholderia pseudomallei* (Bp). The etiological agent of melioidosis, Bp is responsible for roughly 40% of

septicemic mortality within endemic regions. The LD50 via inhalation is ≤10 organisms, making it a putative bioweapon for which no vaccine is available. Bp is adept at growing and persisting within macrophages, and we hypothesized that Bp lipopolysaccharide (LPS) inadequately activates macrophages, thus allowing evasion of intracellular clearance. Our preliminary structural analyses via thin layer chromatography (TLC), matrix-assisted laser desorption/ionization (MALDI-MS), electrospray ionization mass spectrometry (ESI-MS), and nuclear magnetic resonance (NMR) suggest Bp LPS contains unique structural moieties which may confer minimal macrophage activation, and *in vitro* data indicates that macrophage pre-stimulation with a prototypic LPS can elicit enhanced intracellular clearance of Bp. To better understand the protective mechanisms, a dose response comparison of LPS from different bacterial species (*Burkholderia pseudomallei, Burkholderia thailandensis, Salmonella Typhimurium,* and *Escherichia coli*) showed that Bp LPS elicits less mitochondrial activity, but similar toxic effects on macrophages as prototypic LPS species. Pre-stimulation of macrophages with prototypic LPS species for ≥6h did significantly enhance intracellular clearance of Bp, whereas pre-stimulation with Bp LPS conferred no protection. ELISA analyses indicated that prototypic LPS elicits a substantial upregulation of soluble inflammatory mediators associated with protective responses to melioidosis, and the kinetics for this upregulation correlated with the enhanced clearance in response to LPS pre-stimulation. Supernatant transfer studies from macrophages stimulated with protective-LPS species were able to confer similar protective effects to naïve macrophages subsequently infected with Bp. These finding indicate that Bp is unable to productively activate macrophages, and current studies are focused on delineating the differences in how Bp and protective-LPS species affect intracellular trafficking and killing of Bp by macrophages.

May 2013-
May 2014

The University of Toledo College of Medicine
Program: Predoctoral Fellowship
P.I.: Zhixing Kevin Pan, Ph.D.
Project: *Staphylococcus aureus* (Sa), a non-motile Gram-positive spherical bacteria, and its drug-resistant forms (i.e. MRSA and VRSA) are of high concern in hospital settings. Over 52% of sepsis cases in the United States are caused by Gram-positive bacteria. The incidence rate of sepsis and septic shock is ~18 million cases a year worldwide with a mortality rate ~30% resulting in an annual total cost of $16.7 billion in the United States. Development of alternative novel therapeutic strategies is urgently needed to control the overactive host response in sepsis. However, the molecular therapeutic targets during sepsis remain poorly understood. We aim to identify these molecular targets to not only advance our understanding of the complex regulatory mechanism of host response, but also to spur the development of novel therapeutic strategies for the treatment sepsis and septic shock. Our studies have focused on of MAP kinase phosphatase-1; an inducible regulatory protein. Thus far we determined that live and heat-killed Sa is able to induce MKP-1 expression in macrophages. Additionally, our preliminary studies suggest Sa can induce MKP-1 expression *in vivo*. Knockout of MKP-1 results in significantly higher levels of TNFα, IL-1β, IL-8, and IL-10 gene induction during Sa infection of macrophages. Pharmacological induction of increased MKP-1 expression by rolipram results in significantly decreased levels of TNFα. Toll-like receptor (TLR2) is required for MKP-1 induction by Sa. Together, these finding indicate Sa is able to induce MKP-1 production through TLR2 and that MKP-1 is required to negatively regulate gene expression of multiple inflammatory cytokines.

Abstracts & Presentations

Bechill M.P., Mance A.A., Salari S., Isailovic D., Wooten R.M. - *Burkholderia pseudomallei* lipopolysaccharide possesses unique Lipid A and is unable to elicit inflammatory responses necessary for intracellular clearance by macrophages.

Various versions of the above project were presented in oral and poster format at the following meetings:

- **4th Annual Ohio Center for Innovative Immunosuppressive Therapeutics Research Symposium**, Toledo, OH, April 2013; Oral.
- **2013 Graduate Research Forum,** Toledo, OH, March 2013; Poster.
- **19th Annual Midwest Microbial Pathogenesis Conference**, Milwaukee WI, September 2012; Poster.
- **2012 Graduate Research Forum,** Toledo, OH, March 2012; Poster.
- **3rd Annual Ohio Center for Innovative Immunosuppressive Therapeutics Research Symposium**, Toledo, OH, December 2011; Oral.
- **18th Annual Midwest Microbial Pathogenesis Conference**, Ann Arbor, MI, October 2011; Poster.
- **2nd Annual Midwest Graduate Research Symposium,** Toledo, OH, March 2011; Poster.
- **2011 Graduate Research Forum,** Toledo, OH, March 2011; Poster.
- **2nd Annual Ohio Center for Innovative Immunosuppressive Therapeutics Research Symposium**, Columbus, OH, November 2010; Oral.
- **2010 Graduate Research Forum,** Toledo, OH, March 2010; Poster.
- **1st Annual Midwest Graduate Research Symposium,** Toledo, OH, March 2010; Poster.

Meetings Attended

In addition to the presentations, the following meetings were attended:

- **4th Annual Midwest Graduate Research Symposium,** Toledo, OH, April 2013.
- **3rd Annual Midwest Graduate Research Symposium,** Toledo, OH, March 2012.
- **97th Annual Meeting – The American Association of Immunologists,** Baltimore, MD, May 2010.
- **Ohio Branch American Society for Microbiology Spring Meeting,** Cincinnati, OH, April 2010.
- **1st Annual Ohio Center for Innovative Immunosuppressive Therapeutics Research Symposium,** Sandusky, OH, July 2009.
- **2009 Graduate Research Forum,** Toledo, OH, March 2009.

Honors & Awards

The University of Toledo College of Medicine

- *Semi-finalists: 2013 Graduate Research Forum,* Toledo, OH, March 2013; Poster.
- Invited Speaker: National Association of Graduate and Professional Students (NAGPS) Midwest Regional Conference. Title of Presentation: *The Midwest Graduate Research Symposium: Our lessons came from the journey not the destination.* Columbus, OH, April 2012
- Recipient: University of Toledo Graduate Council resolution of gratitude for dedication and service as a member of the Graduate Council Executive Committee. May 2012

The University of Saint Francis

- 4th Place in University of Cincinnati College of Medicine's Capstone Poster Symposium
- Certificate of Honor For Special Achievement in Biology from The University of Saint Francis 2006, 2007, & 2008
- Record in F2 Fruit Fly Production/ Solo Project Biology
- Student Body Vice President in Student Government Organization 2006
- Who's Who Among Students in American Universities & Colleges
- Member of the National Deans List 2005 & 2006

- Accepted into the National Scholars Honor Society

Professional/Leadership Experience

Graduate Student Association

- Vice-President, 2009-2010
- President, 2010-2012
- Demonstrations of my leadership are outlined chronologically:
  - Instituted a representative general assembly
  - Conceptualized and composed the organization's website
  - Co-Founded an annual regional symposium: The Midwest Graduate Research Symposium
  - Designed a graduate student travel reimbursement program
  - Served on multiple university and faculty committees
  - Negotiated an annual budget increase of 4,089% from $3,676 to $154,000

Graduate Faculty & University Committees

- Graduate Council, 2009-2012
  - Curriculum Committee 2009-2010
  - Graduate Council Executive Committee, 2010-2012
  - Academic Standing Committee, 2010-2012
  - Graduate Student Affairs Committee, 2010-2012
  - Ad Hoc Bylaws and Constitution Review Committee, 2011-2012
- Board of Trustees' Best Practices Sub-Committee, 2012

Academic/ Teaching Experience

Laboratory Teaching

December 2004-May 2006 — **Laboratory Assistant - A&P I & II and Microbiology**
Location: The University of Saint Francis, Fort Wayne, Indiana
Course Numbers: BIOL 221, BIOL 222, BIOL 261, BIOL 262, & BIOL 223
Course Titles:

- Human Anatomy & Physiology I
- Human Anatomy & Physiology II
- Advanced Human Anatomy & Physiology I
- Advanced Human Anatomy & Physiology II
- Introduction to Microbiology

Number of Students: ~20 per class

October 2009-October 2013 — **Teaching Assistant - Medical Student Bacteriology Labs**
Location: The University of Toledo Health Science Campus
Course Number: INDI#783
Course Title: Infection & Immunity
Number of Students: ~30 per class

Classroom Teaching

November 2004-March 2008 — **Science Symposium Assistant**
Location: The University of Saint Francis, Fort Wayne, Indiana
Number of Students: ~40 per class

December 2004-May 2008 — **Planetarium Staff & Student Educator**
Location: The University of Saint Francis, Fort Wayne, Indiana
Number of Presentations: 100 per year
Presentation Titles:

- Zubenelgenubi's Magical Sky: Pre-K - 1st grade
- A Solar System Adventure Tour: grades 2-4th
- StarGazer: grades 5 - Adult
- Aurora: grades 5 - Adult
- Explorer's of Mauna Kea: grades 5 - Adult
- Explorer's of the International Space Station: grades 5 - Adult
- Welcome to the Universe: all ages
- Star of Bethlehem: all grades

Number of Students: 10-50 per show

Professional Memberships

2010-Present	The American Association for the Advancement of Science (AAAS)
2012-Present	National Association of Graduate and Professional Students (NAGPS)

Publications

Mulye M.D., **Bechill M.B.,** Grose W., Ferreira V.P., Lafontaine E.L., Wooten R.M. - Delineating the importance of serum opsonins and the bacterial capsule in affecting the uptake and killing of *Burkholderia pseudomallei* by murine neutrophils and macrophages. *Manuscript Submitted Under Review PLOS Neglected Tropical Diseases.*

Bechill M.P., Wooten R.M. - *Burkholderia pseudomallei* lipopolysaccharide is unable to elicit inflammatory responses necessary for intracellular clearance by macrophages. *Manuscript in preparation.*

Bechill M.P., Mance A.A., Salari S., Isailovic D., Wooten R.M. - Comparative structural analysis of *Burkholderia pseudomallei* and *Burkholderia thailandensis* lipid A reveals unique species-specific composition. *Manuscript in preparation.*

Bechill M.P., Worth R.G., Wooten R.M., Yusen L., Pan Z.K. - *Staphylococcus aureus* induction of MAP kinase phosphatase-1: a critical negative regulator of inflammatory cytokine gene expression. *Manuscript in preparation.*