

## Immunopathogenesis Laboratory Research in the School of Arts and Science

**Principal Investigator:** Tesfaye Belay, PhD

**Major Project:** *Exploring the Immunopathogenesis of Chlamydia Genital Infection in a Stress Mouse Model*

Research in our laboratory focuses on the understanding of the effects and mechanism(s) by which stress alters immune responses and subsequently leads to increased intensity of genital infection in a mouse model. Data from our laboratory demonstrated that exposure of mice to cold-water stress for 5 min per day for as long as 21 days results in elevated levels of norepinephrine or epinephrine in plasma, spleens and genital tract lysates. Moreover, decreased mRNA and protein level of cytokines and chemokines in genital tract lysates of stressed mice were detected. We have explored that cold-induced stress increases intensity of chlamydia genital infection and modulates i) the distribution pattern of immune cells in the different regions of the genital tract; ii) histopathology; and, iii) chlamydia-induced infertility in the mouse model. Currently, we are attempting to elucidate the mechanism(s) by which the stress hormone, norepinephrine, modulates the immune system. Thus, understanding the interaction between stress, the immune system and infection is significant for the management of chlamydia genital infection in humans.

### **Research Experience for Undergraduate Students**

As Principal Investigator (PI), I have received significant funding support from the West Virginia-IDEA Network of Biomedical Research Excellence (WV-INBRE), WV-Space Grant Consortium (WVSGC) and the Thurgood Marshall College Fund/Department of Energy (DOE). I have been training undergraduate students in basic biomedical research with a focus in microbiology and immunology. Student training includes biosafety; keeping records of laboratory supplies and inventory; animal handling and usage for research; basic microbiological methods; tissue culture; basic molecular biology methods (RNA/DNA isolation; quantitative PCR; gel electrophoresis; immunoassays (ELISA) development; and data maintenance in computers. The successful establishment of standard tissue culture for chlamydia inoculation and detection methods elevates the capacity for educating and training students in biomedical research. After training, the students become involved in performing experiments. In my lab, I have so far trained over thirty students during the academic year and summer sessions. Through WV-INBRE and the Health Science Technology Academy (HSTA) program, I have trained 9 undergraduates and high school students in biomedical research. I have also extended giving research training opportunities to McNair Scholars of Concord University students.

Several students present posters annually in the *WV-INBRE Summer Research Symposium*, *Research Day at the State Capitol*, the *Annual Biomedical Conference for Minority Students* and in the *General Meeting of the American Society for Microbiology*. Training and experience in research has benefited students in their preparation for professional training, graduate school or job placement.

**Pilot Project:** Starvation Adaptation of *Pseudomonas aeruginosa* in Water

*Pseudomonas aeruginosa* is well-adapted for growth in low nutrient environments, however its ability to survive under stressful environments is not well defined. During space flight, the immune system is affected by microorganisms, including *P. aeruginosa*, which pose health risks. We recently initiated investigating the viability of *P. aeruginosa* growing in water without nutrients. Ongoing research will identify and characterize the genes and proteins involved in the long-term existing ability of *P.aeruginosa* under starvation conditions in water.

*Research Participating Students (2015)*

- Brandon Kirby
- Jonathan Kinder
- Shane Musick
- Kaitlyn Thompson