

## **National Biodefense Analysis and Countermeasures Center (NBACC)**

*1. Provide a description of your facility's experience hosting undergraduate students for internships, for example, number of interns hosted each summer, approximately how many years have you hosted interns.*

The NBACC has sponsored 6 summer internships for members of the DHS Scholars and Fellows Program since 2005. The students performed summer internships in DHS partner laboratories, working on NBACC or Biodefense-related projects. The National Biodefense Analysis and Countermeasures Center (NBACC) is a new national laboratory managed and operated by the Battelle National Biodefense Institute, LLC (BNBI) for the Department of Homeland Security (DHS). Even though our formal designation as a Federally Funded Research and Development Center (FFRDC) was less than a year ago, both the applied science programs and the senior staff at NBACC have experience with student employees, scholars, and fellows from DHS and other programs. The NBACC FFRDC hosted one teacher "extern" in our first six months and currently has mentors available for about four interns, scholars and fellows.

*2. Provide a description of additional benefits your facility can provide interns, for example, subsidized housing arrangements, local transportation allowance, professional lectures and seminars, social activities, etc.*

NBACC / BNBI manages and operates several thousand square feet of biocontainment laboratories at biosafety level (BSL)-2 and 3 conditions. A new 160,000 sq ft laboratory is under construction that will include facilities capable of operating at BSL-2, 3 and 4 conditions. NBACC has a monthly all-hands meeting that includes a scientific seminar and hosts biweekly seminars given by experts from the scientific community.

As the DHS participant in the National Interagency Confederation for Biological Research (NICBR) on Fort Detrick, NBACC coordinates laboratory assignments and scientific exchanges with the USAMRIID, USDA, and NIH (currently NCI is open and NIAID will be opening a facility soon). In addition, NBACC participates in the Scientific Interaction Subcommittee monthly meetings held to discuss the coordination of interactions among the medical research organizations collocated on the NICBR. The NICBR also host a weekly seminar series for summer students, providing seminars from campus scientists and free pizza for all students!

In the past, NBACC has provided local travel (commuters) and housing subsidies to students. Affordable summer housing at Hood College has been arranged for students living outside of the Baltimore-Washington DC area.

A monthly NBACC social outing is determined by employee input and has included professional baseball, "wine down Friday," Frederick's Friday night music fest, and a tailgate party for family and friends. The Washington DC and Baltimore metropolitan area provides many social and cultural opportunities, with both cities about an hour's drive from Frederick.

*3. Provide the name and contact information for the person that would be the primary point of contact for DHS S&T in administering internships at your facility.*

Dr. Sadie Coberley is the NBACC point of contact for coordinating student, scholar and fellows activities. She can be reached at coberleys@nbacc.net or 301-620-9980. Please copy Tina Eaton (eatont@nbacc.net) on all correspondence.

## DHS Summer Internship Program

### 1. Site Information

Battelle National Biodefense Institute, LLC (BNBI) manages and operates the National Biodefense Analysis and Countermeasures Center (NBACC) for the U.S. Department of Homeland Security (DHS). NBACC develops the science critical to the defense of the nation against bioterrorism. NBACC is a Federally Funded Research and Development Center (FFRDC) and is the first national laboratory built by the DHS Science & Technology directorate. The NBACC mission is to provide the nation with the scientific basis for awareness of biological threats and bioforensic analysis to support attribution of their use against the American public. NBACC is focused on developing and applying the right science to identify perpetrators of biological attacks and to help guide the nation's investments in vaccines, drugs, detectors, and other countermeasures to protect against biological terrorism.

The NBACC National Bioforensic Analysis Center (NBFAC) conducts analysis of evidence from biocrime scenes and bioterrorist attacks to attain a “biological fingerprint” to help law enforcement identify the perpetrators and determine the source, origin, and method of the attack. Designated by a Presidential Directive, NBFAC is the lead federal facility to conduct and facilitate the technical forensic analysis and interpretation of materials recovered following a biological attack, in support of the appropriate lead federal agency.

The NBACC National Biological Threat Characterization Center (NBTCC) conducts studies and laboratory experiments to better understand current and future biological threats; to assess vulnerabilities and conduct risk assessments; and to determine potential impacts to guide the development of countermeasures such as detectors, medicines, vaccines, and decontamination technologies. Biennially the NBTCC delivers to the President the *Bioterrorism Risk Assessment*—a comprehensive evaluation of the risks to the nation posed by bioterrorism.

The Coordination of Outreach, Reachback, and Evaluation (CORE) support is designated as the NBACC lead for surveillance of the rapid progress in science and technology and provides direct scientific support to DHS. CORE combines scientific learnings with NBACC knowledge for identification and evaluation of emerging trends that may alter our nation's understanding of the risk associated with a particular biothreat. Communication of the identified advancements facilitates integration of new information into existing and future strategies designed to deliver the science critical to defend the nation against bioterrorism.

For more information, visit our website: <http://www.bnbi.org>

### 2. & 3. Project Descriptions and Mentors

- **Project Title:** Utility of Synthetic Positive Mutagenized Controls

Project Description: Intern will assist in a project comparing the utility of using DNA positive mutagenized controls cloned from native template to DNA positive mutagenized controls developed using synthetic technologies. Project involves side by side testing of these two types of controls using Real Time PCR platforms to establish the limit of detection, identification by restriction digest, and DNA sequencing using Sanger methods.

Mentor: Jennifer Goodrich, PhD and Mike Inskeep  
NBACC Directorate: NBFAC  
Start/End Date Flexibility: Flexible  
Clearance: Unclassified

- **Project Title:** Development of Fluorescence Assays for Bacterial Strain Differentiation

Project Description: We have obtained several different commercial plasmids (pAmCyan-Blue, pDsRed-Express- Red, pZsGreen-Green) that fluoresce when in bacteria. One useful purpose of these plasmids can be for strain differentiation such as in mixed bacterial population studies and as control strains for various assays. These plasmids could be electroporated or transformed into appropriate strains of bacteria. Strains at the BSL-2 laboratory level to be transformed could include attenuated strains such as *F. tularensis* LVS and *Y. pestis* D27, as well as several enteric species including *E. coli* O157:H7, *Salmonella*, and *Shigella*. The level of fluorescence can be determined as well as the stability of the plasmid after subcultures and under different conditions (selection with antibiotic and non-selective).

Mentor: David Karaolis, PhD  
NBACC Directorate: NBFAC  
Start/End Date Flexibility: Flexible  
Clearance: Unclassified

- **Project Title:** Emerging Technologies Surveillance for Detection of Adventitious Agents

Project Description: The purpose of this project is to identify and evaluate novel or emerging technologies capable of detecting previously uncharacterized or adventitious biological agents. Such technologies are critical for detecting biological contaminants, previously unknown biological organisms, or advanced biothreat agents. The project will focus on monitoring literature and establishing methods to identify and prioritize technologies contributing to the detection of biological organisms of biodefense interest. Findings will be communicated in prepared reports to brief NBACC scientists and for consideration in future biodefense evaluations and applications.

Mentor: Sadie Coberley, PhD  
NBACC Directorate: CORE  
Start/End Date Flexibility: Flexible  
Clearance: Unclassified

- **Project Title:** Literature Review on Non-Filovirus Hemorrhagic Fever Viruses

Project Description: Viral Hemorrhagic Fevers, in addition to Marburg and Ebola viruses, pose potential bioterrorism threats. Examples of non-filovirus hemorrhagic fever viruses include: Junin, Congo Crimean Hemorrhagic Fever, Hantavirus, and Machupo. For this project, the literature will be reviewed and a report will be prepared on each of these other hemorrhagic fever viruses of interest. Subtopics would be replication, animal models, routes of infection, disease characteristics, and stability.

Mentor: Rick Kenyon, PhD  
NBACC Directorate: NBTCC  
Start/End Date Flexibility: Flexible  
Clearance: Unclassified

- **Project Title:** State of the Art Literature Review on Biopesticide Technologies

Project Description: Many technologies are involved in the development and use of biological organisms for pest control. The sophistication of technologies employed for biopesticides vary and may contribute to and/or mitigate bioterrorism. The objective of this project would be to conduct a review of the scientific and technical literature and prepare a report on the state of the art for biopesticide development in support of biodefense efforts.

Mentor: Lloyd P. Hough, PhD  
NBACC Directorate: NBTCC  
Start/End Date Flexibility: Flexible  
Clearance: Unclassified

- **Project Title:** Genetic and Biochemical Basis of Antibiotic-Resistance

Project Description: Pathogen resistance to antimicrobials is a serious concern to the U.S. public health and biodefense communities. The objective of this project will be to review the scientific literature and prepare a presentation/briefing distilling the genetic and biochemical basis of antimicrobial resistance in pathogens for broad audiences, including healthcare providers and policy and decision makers.

Mentor: Lloyd P. Hough, PhD  
NBACC Directorate: NBTCC  
Start/End Date Flexibility: Flexible  
Clearance: Unclassified

- **Project Title:** Characterization of Naturally Occurring Antibiotic-Resistance in *B. anthracis*

Project Description: Ongoing projects are aimed at screening *B. anthracis* culture collections for strains that are antibiotic-resistant for the purpose of biodefense efforts, including risk assessment and knowledge for countermeasure development. In order to better understand the occurrence, basis, and impact of antibiotic resistance in *B. anthracis*, several strains will be characterized through a combination of biochemical and genetic methods, including genomic sequencing. Characterization of the mutations that confer antibiotic resistance will enable the development of robust tests to support detection and characterization of antibiotic-resistance.

Mentor: Lloyd P. Hough, PhD  
NBACC Directorate: NBTCC  
Start/End Date Flexibility: June-August  
Clearance: Unclassified/FOUO

- **Project Title:** Environmental Stability of *Yersinia*

Project Description: This project will consist of two phases. The initial phase will include a literature review of the environmental stability and persistence of *Yersinia* species. This phase will attempt to identify gaps in our understanding of the *ex-vivo* niche of *Yersinia* species and compare and contrast the members of the species with the plague causing organism *Yersinia pestis*. This phase will also plan on experiments to identify and close the gaps directly related to the threat posed by *Y. pestis* persistence in the environment. The goal of this phase of the project is to produce a review appropriate for publication in a peer reviewed journal and an internal report with additional information related to the mission of the NBTCC. Depending on project timelines, experience of the candidate, and availability of laboratory space, the second phase of the project will consist of investigating the gaps identified in the initial phase of this project. These experiments will be initiated in the BSL-2 environment using non-select agents and vaccine strains. Experience with *Yersinia*, or other enteric gram-negative pathogens is desired but not required. Laboratory experience with bacterial or viral pathogens is preferred.

Mentor: Matthew Bender, PhD  
NBACC Directorate: NBTCC

Start/End Date Flexibility: Flexible  
Clearance: Unclassified

#### **4. Internship Experience**

Participants in summer internships at NBACC work directly with NBACC scientists toward developing strategies to defend our nation against bioterrorism and biocrime. Interns have the opportunity to learn about the skills and expertise needed to conduct biodefense research within this organization and about potential future training and career opportunities. Additionally, interns have the ability to establish connections with researchers from a broad range of scientific and analytical fields. For example, NBACC is the DHS participant in the National Interagency Confederation for Biological Research (NICBR) on the Fort Detrick campus. As such, NBACC coordinates laboratory assignments and scientific exchanges with the USAMRIID, USDA, and NIH (currently NCI is open and NIAID will be opening a facility soon). The NICBR hosts a weekly seminar series for summer students, providing talks given by NCIBR campus scientists. In addition, NBACC operates as a hub, and reaches out to numerous government and academic institutions through collaborations. This creates possible collaboration opportunities for interns with scientists from numerous government and academic institutions. Depending on the specific NBACC project, interns also may attend conferences and workshops on homeland security issues, expanding their knowledge of their research project topic as well as providing them with an opportunity to network with scientific leaders.

In addition to integration with the professional community, there are numerous social opportunities for DHS summer interns. NBACC colleagues organize a monthly social outing. Activities have included attending professional baseball games, enjoying Frederick's Friday night music fests, and hosting tailgate parties for family and friends. The Frederick community has much to offer visitors in the area (<http://www.fredericktourism.org/Index.aspx>). Frederick is about an hour drive to the Washington, DC, and Baltimore metropolitan areas, which provide additional social and cultural opportunities.