REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHB-25-02

Blast Overpressure Indicators of Exposure

PROJECT DESCRIPTION: Blast overpressure (BOP) is defined as an instantaneous rise in atmospheric pressure resulting from an explosion. Animal studies have shown that BOP leads to brain injury and subsequent neurological effects. In the military, repeated exposures to low level BOP is associated with heavy weapon training and use. Identifying and characterizing BOP induced brain injury is critical to establish guidelines to protect the warfighter. Recent actions by the Department of Defense (DoD) have focused on protecting the warfighter from BOP induced brain injury and guidelines have been established for single, high level blast exposure. However, research on the health effects resulting from repeated low-level BOP in military members is lacking. The goal of this project is to utilize machine learning natural language processing technology to collect data on potential biomarkers of BOP injury from published literature and DoD resources and perform meta-analysis to identify the most promising biological indicators of low-level blast exposure, and BOP-induced injury. Additionally, cognitive and physiological metrics will be identified that can be used alongside biomarkers to gain a better understanding of BOP induced brain injury.

LEARNING OBJECTIVE: Students will support literature review analysis to understand the etiology of BOP-induced brain injury. Additionally, students will develop critical thinking, experimental design, data analysis and scientific writing skills.

ACADEMIC LEVEL: Masters; Doctoral

DISCIPLINE NEEDED:

- Biology (General)
- Psychology

RESEARCH LOCATION: Wright-Patterson Air Force Base, Dayton, Ohio

RESEARCH MENTOR: Christin M. Duran, Ph.D.
Chemical Engineering, Case Western Reserve University, 2015

Dr. Christin M Duran (Grabinski) has a PhD in chemical engineering, a professional certification in industrial hygiene, and over 18 years of research experience. During her tenure at AFRL, Dr. Duran has served as a principal investigator and lead of multiple multidisciplinary teams with expertise in a broad range of topics, including field exposure sampling, aerosol transport, sensor performance evaluation, microscopy, computational modeling, and biomarkers. She has earned multiple scientific achievement awards, including the AFRL Science and Engineering Early Career Award (2020), 711th HPW Annual Technology Management Award (2019), MHSRS Team Research Accomplishment Award (2019), and USAF School of Aerospace Medicine Annual Innovation Award (2018). Dr. Duran is an active member of the American Industrial Hygiene Association and is currently serving as the Secretary-Elect on the Real-time Detection Systems Subcommittee. Dr. Duran is a co-author on 23 peer-reviewed journal articles, 3 patents, 34 government reports, and 80 conference presentations.

The material was CLEARED on 04 Nov 2024; Case Number: AFRL-2024-6170.

RESEARCH MENTOR: Jennifer Schwanekamp-Kerr, Ph.D.
Molecular Genetics, Microbiology, and Biochemistry; University of Cincinnati, 2017

Dr. Jennifer Schwanekamp is a senior research scientist in the Human Effectiveness Directorate at the 711th Human Performance Wing, Air Force Research Laboratory. Her research focuses on Airmen/Guardian health protection and interventions aimed at preserving human performance through identifying strategies to protect health and prevent injury. This includes evaluating the effect of exposure hazards on human health and performance and identifying interventions to preserve performance. Dr. Schwanekamp specializes in exposure research working with human subjects.