

**Request for Statements of Interest  
Pacific Northwest Cooperative Ecosystem Studies Unit  
Project Number W912HZ-19-SOI-0034  
Project to be initiated in 2019**

**Project Title: Development of Genomics and Behavioral Assays for Understanding Neurotoxicity of Chemicals and Effects on Performance**

Responses to this Request for Statements of Interest will be used to identify potential investigators for studies to be sponsored by the Engineer Research and Development Center (ERDC) to provide research for the development of genomic approaches and behavioral assays to understand the potential neurotoxicity of chemicals and effects on performance and decision-making. Approximately \$70K is expected to be available to support this project for the base year and up to \$140K additional funds per year for two (2) option years. This would provide potential funding of \$210K (based on funding availability) over the anticipated 3-yr project life.

**Introduction**

Performance and decision-making can be affected by exposure to chemicals that exert neurotoxicity. Exposure to neurotoxicants can also lead to changes in behavior, which could be linked to altered performance. The gut microbiome can also be altered by chemical exposure, thus its influence on behavior through the gut-brain axis could potentially be modified after chemical exposure, leading to increased neurotoxicity and behavioral changes. Behavioral assays have been developed to better understand the potential health hazards of neurotoxicants and their effects on performance and decision-making. Furthermore, the effects of the gut microbiome on neurotoxicity and behavior through the gut-brain axis can be explored by using metagenomic analyses. Abnormal behavior after exposure to contaminants is a very good indicator and measure of sublethal effects and can be indicative of reduced performance and altered decision-making. Changes in microbial diversity within the gut microbiome and behavioral effects can be indicators of chemical exposure. However, understanding the contribution of the gut microbiome to changes in behavior is challenging because little is known about how the information flows through the gut-brain axis.

ERDC has developed methods to link behavioral outcomes to chemical impacts that are suitable for hazard assessment. Specifically these developments used directed laboratory studies that examined individual chemical effects on behavior and transcriptomics analyzing potential outcomes that would adversely impact fish or human performance. This project is focused on analyzing zebrafish adults that have been exposed to model chemicals for changes in behavior and gut microbiome composition in order to better understand the potential effects of chemicals on performance and decision-making as well as the influence

of the gut microbiome on neurotoxicity.

### **Project Description**

This project will determine changes in behavior that can be linked to neurotoxicity and potential effects on performance and decision-making. The project is focused on one species, the zebrafish (*Danio rerio*), as well as on gut microbiome composition after chemical exposure. The ultimate goal is to understand the neurotoxic effects of chemicals on zebrafish behavior and performance as well as to elucidate the potential implication of the gut microbiome on neurotoxicity through the gut-brain axis.

The outcome of this project will be the development of a neurobehavior pathway that links chemical exposure to zebrafish adult behavior as well as to changes in the gut microbiome, endpoints that can be used to evaluate effects on performance and decision-making.

### **Public Benefits**

The primary goal of this research is to understand the effects of chemicals on neurobehavior and the potential adverse effects on performance and decision-making. This project will benefit the public by increasing public awareness by identifying effects of performance and decision-making caused by exposure to chemicals. This project will educate the public about environmental exposures and will assess the effects of chemicals on performance and health using an animal model. It will also provide useful information for local, state, and federal hazard assessment offices. Therefore, by understanding the linkages between chemicals and neurobehavioral adverse effects, this project will provide many environmental and health benefits to the public. Additionally, these findings will be incorporated into classes that collaborators teach.

### **Brief Description of Anticipated Work**

- Analysis of behavioral and apical data of zebrafish after exposure to stressors.
- Gut microbiome analysis after stressors.
- Analysis of influence of stressor and gut microbiome on zebrafish performance and decision-making
- Technical Transfer. All data and protocols will be subject to peer-review for publication. Provide a manuscript on zebrafish behavioral changes after stressor exposure and a manuscript on the gut microbiome influence on neurotoxicity. Present results to a wide variety of stakeholders.

### **Government participation**

ERDC personnel will work cooperatively with the investigator to identify issues related to the development of behavioral assays and integration into an adverse outcome pathway. An ERDC representative will be available for meetings with the investigator whenever necessary. USACE will

provide technical review of all products and co-author journal articles and facilitate and participate in coordination and meetings with collaborators as needed to disseminate results from these studies.

**Materials Requested for Statement of Interest/Qualifications:**

Please provide the following via e-mail attachment.

(Maximum length 2 pages, single spaced 12 pt. font)

1. Name, Organization and Contact Information
2. Brief Statement of Qualifications including:
  - a. Biographical Sketch
  - b. Relevant past projects and clients with brief description of project
  - c. Staff, faculty and students available including area of expertise
  - d. Brief description of capabilities to successfully complete this project

Note: A proposed budget is NOT requested at this time.

**Review of Statements Received**

Based on a review of the Statements of Interest received, an investigator or investigators will be invited to prepare a study proposal. Statements will be evaluated based on investigators specific experience and capabilities in areas related to the study requirements. Additionally, the evaluation method and selection criteria for research and development awards must be: 1) The technical merits of the proposed research and development; and 2) Potential relationship of the proposed research and development to the Department of Defense missions.

**Please send responses or direct questions to:**

U.S. Army Engineer Research and Development Center (ERDC)  
ERDC Contracting Office (ECO)  
3909 Halls Ferry Road  
Vicksburg, MS 39180

**Timeline for Review of Statements of Interest**

Review of Statements of Interest will begin after the SOI has been posted on the CESU website for 10 working days.