Opportunity Title: USDA-ARS Research Opportunity in Host Parasite Interaction
Opportunity Reference Code: USDA-ARS-2021-0065

Organization U.S. Department of Agriculture (USDA)

Reference Code USDA-ARS-2021-0065

How to Apply ***Connect with ORISE...on the GO!*** Download the new ORISE GO mobile app in the Apple App Store or Google Play Store to help you stay engaged, connected, and informed during your ORISE experience and beyond!

A complete application consists of:

- An application
- Transcript(s) – For this opportunity, an unofficial transcript or copy of the student academic records printed by the applicant or by academic advisors from internal institution systems may be submitted. All transcripts must be in English or include an official English translation. Click here for detailed information about acceptable transcripts.
- A current resume/CV, including academic history, employment history, relevant experiences, and publication list
- Two educational or professional recommendations

All documents must be in English or include an official English translation.

Application Deadline 5/15/2021 3:00:00 PM Eastern Time Zone

Description ***Applications may be reviewed on a rolling-basis.**

ARS Office/Lab and Location: A research opportunity is currently available with the U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS), Beltsville Agricultural Research Center (BARC), Animal Parasitic Disease Laboratory (APDL) in Beltsville, Maryland (located in Metropolitan Washington, DC).

BARC has fully equipped modern laboratories located on a 6,000-acre campus only 12 miles from Washington, D.C. There are hundreds of scientists conducting agricultural research at the center. The center at Beltsville is one of many centers located throughout the United States. Our laboratory has access to a research dairy herd located within one mile from the main laboratory. We also have fully-equipped facilities housing small and large experimental animals. The University of Maryland at College Park, MD is located 4 miles from our research facility. In addition, the National Institutes of Health, American University, Johns Hopkins University, and Catholic University are in close proximity to our laboratory. This allows access to professional advice on scientific matters, to equipment, and availability to a full array of seminars, workshops, and conferences.

Research Project: We seek a motivated participant to advance our NIH and USDA-supported investigation of molecular determinants to host-specificity in zoonotic and anthroponotic parasites in the genus *Cryptosporidium.* The participant will combine comparative genomics and genome wide association tests to identify and validate candidate determinates using reverse genetics and CRISPR/Cas9-based gene knockout and complementation experiments in mice and human intestinal organoid cultures. By identifying virulence genes and therapeutic targets for

anti-*Cryptosporidium* drugs, the participant will pursue fundamental insights concerning eukaryotic microbiology and contribute new approaches to mitigating the harms imposed by these parasites, especially to children who suffer considerable illness and death from parasitic enteric disease.

Background:
Diarrheal diseases are the 2nd leading cause of morbidity and mortality in children worldwide (Kotloff, K.L. et al. Lancet 2013) and are responsible for 10.5% of the nearly 8 million yearly deaths of children under five years of age (World Health Organization, 2013). The most common protozoan agents responsible for persistent diarrhea are these enteroparasites: *Cryptosporidium*, *Cyclospora*, *Cystoisospora, Entamoeba*, and *Giardia*; of these, according to a recent Global Enteric Multicenter Study (GEMS), *Cryptosporidium* is the 2nd leading cause of severe diarrhea and mortality after rotavirus in young children in Africa and southern Asia (Kotloff, K.L. et al. Lancet 2013). In the absence of vaccines, prevention of these parasitic diseases relies solely on chemotherapy, which is far from perfect and limited by adverse drug effects. Interestingly, *Cryptosporidium* has a striking host specificity. Despite high genetic similarity, some species/genotypes, such as *C. parvum*, and *C. cuniculus*, have a wide host range and have emerged as zoonotic pathogens. Conversely, other *Cryptosporidium* species have a very narrow host range; examples include the human cryptosporidiosis agent *C. hominis* and mice adapted species *C. tyzerri*. One of the critical research gaps in the *Cryptosporidium* field is the poor understanding of the molecular mechanisms that determine this extraordinary host specificity. In our laboratory we will utilize comparative genomics and genome wide association test to identify the genetic determinants responsible for host specificity and validate the candidate determinates using reverse genetics including CRISPR/Cas9 based gene knockout and complementation in appropriate parasite genetic backgrounds. We will model the host specificity of *Cryptosporidium* using mouse and human intestinal organoid cultures. This study will fill the major gaps in our understanding of the molecular mechanisms of host specificity in *Cryptosporidium*, which could provide an attractive and feasible strategy to identify species-specific virulence genes and potential therapeutic targets for anti-*Cryptosporidium* drugs.

Learning Objectives: Throughout the course of this research project, the participant will improve his/her knowledge of molecular parasitology, comparative genomics and cell biology, gene/protein profiling and characterization. The participant will also be encouraged to present the results at scientific meetings.

Mentor(s): The mentor for this opportunity is Dr. Asis Khan (asis.khan@usda.gov). If you have questions about the nature of the research please contact the mentor(s).

Anticipated Appointment Start Date: Summer 2021. Start date is flexible and will depend on a variety of factors.

Appointment Length: The appointment will initially be for one year, but may be renewed upon recommendation of ARS and is contingent on the availability of funds.

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Level of Participation: The appointment is full-time.

Participant Stipend: The participant will receive a monthly stipend commensurate with educational level and experience.

Citizenship Requirements: This opportunity is available to U.S. citizens and Lawful Permanent Residents (LPR) only.

ORISE Information: This program, administered by ORAU through its contract with the U.S. Department of Energy (DOE) to manage the Oak Ridge Institute for Science and Education (ORISE), was established through an interagency agreement between DOE and ARS. Participants do not become employees of USDA, ARS, DOE or the program administrator, and there are no employment-related benefits. Proof of health insurance is required for participation in this program. Health insurance can be obtained through ORISE.

Questions: Please visit our Program Website. After reading, if you have additional questions about the application process please email USDA-ARS@orau.org and include the reference code for this opportunity.

Qualifications

The qualified candidate should have received a master's or doctoral degree in one of the relevant fields.

Preferred skills:

- Cell biology (cell isolation, cell culture and maintenance; in particular, organoid cell culture, phenotyping, maintenance, and functional characterization)
- Molecular cloning and protein expression/characterization (gene cloning, knockout using CRISPR/Cas9 system, protein expression, purification and characterization using cell-free and cell-based assays) and bioinformatics (knowledge and experience in genome and transcriptome sequencing, analysis, assembly and annotation)

Eligibility Requirements

- **Citizenship:** LPR or U.S. Citizen
- **Degree:** Master's Degree or Doctoral Degree.
- **Discipline(s):**
  - **Communications and Graphics Design** (2 👁)
  - **Life Health and Medical Sciences** (11 👁)