Opportunity Title: FDA Whole Genome Sequencing Fellowship
Opportunity Reference Code: FDA-CFSAN-2019-0036

Organization U.S. Food and Drug Administration (FDA)

Reference Code FDA-CFSAN-2019-0036

How to Apply

A complete application consists of:

- An application
- Transcripts – Click here for detailed information about acceptable transcripts
- A current resume/CV, including academic history, employment history, relevant experiences, and publication list
- One educational or professional recommendation. Your application will be considered incomplete, and will not be reviewed until one recommendation is submitted.

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

If you have questions, send an email to ORISE.FDA.CFSAN@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 10/4/2019 3:00:00 PM Eastern Time Zone

Description

***Applications will be reviewed on a rolling-basis.**

A research opportunity is currently available at the U.S. Food and Drug Administration (FDA), Center for Food Safety and Applied Nutrition (CFSAN), Office of Regulatory Science (ORS) located in College Park, Maryland.

Whole genome sequencing is an essential tool for tracing which bacteria have contaminated foods and identifying whether these bacteria pose serious public health threats because they carry virulence factors. Closing bacterial genomes provide a comprehensive view of their genetic composition that allows the generation of: 1) high quality reference genomes for source tracking during a foodborne outbreak investigation, 2) understanding long-term evolution of foodborne pathogens, 3) new insights in drug resistance and transmission of mobile elements carrying antimicrobial resistance markers, and 4) information about the contribution of DNA modification on pathogenesis. Currently, the only instrument that can reliably complete that task is the Pacific Bioscience (PacBio) Sequencer. Unfortunately, this equipment is expensive, requires specialized laboratories, needs significant quantities of DNA, and produce reads of around 30 kilo base(kb) in size at a time, making it challenging to correctly assemble the genomes of bacteria and the plasmids they may carry if they have high repetitive regions (e.g. E. coli). We need accessible technology that can produce longer reads so we can quickly help solve these problems. We propose to evaluate a relatively new alternative to SMRT sequencing, the MinION (Oxford Nanopore), which needs much less DNA to run, and can produce much longer reads. The MinION has been in testing for several years, is much less

expensive, can be carried in one hand, and can be operated by regular lab staff. We will test the efficiency and accuracy of the MinION on strains of Escherichia coli and Clostridium botulinum.

We would like to sequence 200 selected strains (100 STECs E. coli from diverse serotypes and 100 C. botulinum representing groups I (proteolytic serotypes A-G) and II (non-proteolytic), isolated from both clinical and food samples) using an alternative platform: the MinION and GridION nanopore sequencer (Oxford Nanopore, Oxford, UK). Our goal is to develop a pipeline that could be used by other FDA researchers to perform real-time calling for sequences of interest, suitable for metagenomics, studies of antimicrobial resistance and virulence, and the detection/identification of BoTN toxins. We believe that such a MinION-based pipeline can help reduce the cost of closing genomes and simultaneously enable more laboratories to perform such analyses, since it would eliminate barriers posed by cumbersome technologies that require specialized bioinformatics.

Under the guidance of a mentor, the participant will be trained in the following research activities:

- Test and evaluate MinION and GridION using systems for sequencing complete bacterial genomes and to develop a pipeline to analyze the output data as an alternative to the PacBio for rapid detection of virulence markers (Ecoli), antimicrobial resistance features (Ecoli), and toxin genes (Cbot) among food isolates and shotgun metagenomics samples
- Test the effectiveness of new MinION sequencing kits and flow cells using 8 genomes that have already been sequenced by PacBio or Sanger methods
- Data captured in reports and presentation in meetings
- Perform experiments as designed by the principal investigator (PI)
- Maintain a detailed report and present to PI
- Maintain the MiSeq and MinION laboratory, inventories of chemicals and reagents
- Collaborate with PI in growing cultures, inoculating food products with bacterial cultures, and extracting DNA using various protocols
- Participate in writing of publications
- Evaluate the MinION nanopore system for sequencing complete bacterial genomes and to develop a pipeline to analyze the output data as an alternative to the PacBio for rapid detection of virulence markers (Ecoli), antimicrobial resistance features (Ecoli), and toxin genes (Cbot) among food isolates and shotgun metagenomics samples
- Evaluate the utility of MinION nanopore sequencing for analysis of metagenomic samples and determine its detection limit

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This program, administered by ORAU through its contract with the U.S. Department of Energy to manage the Oak Ridge Institute for Science and Education, was established through an interagency agreement between DOE and FDA. The initial appointment is for one year, but may be renewed upon recommendation of FDA contingent on the availability of funds. The participant will receive a monthly stipend commensurate with educational level and experience. Proof of health insurance is required for participation in this program. The appointment is full-time at FDA in the College Park, Maryland, area. Participants do not become employees of FDA, DOE or the program administrator, and there are no employment-related benefits.

Completion of a successful background investigation by the Office of Personnel Management is required for an applicant to be on-boarded at FDA. OPM can complete a background investigation only for individuals, including non-US Citizens, who have resided in the US for a total of three of the past five years.

FDA requires ORISE participants to read and sign their FDA Education and Training Agreement within 30 days of his/her start date, setting forth the conditions and expectations for his/her educational appointment at the agency. This agreement covers such topics as the following:

- Non-employee nature of the ORISE appointment;
- Prohibition on ORISE Fellows performing inherently governmental functions;
- Obligation of ORISE Fellows to convey all necessary rights to the FDA regarding intellectual property conceived or first reduced to practice during their fellowship;
- The fact that research materials and laboratory notebooks are the property of the FDA;
- ORISE fellow’s obligation to protect and not to further disclose or use non-public information.

Qualifications

The qualified candidate should have received a master's or doctoral degree in one of the relevant fields. Degree must have been received within five years of the appointment start date.

Preferred skills:

- Sequencing experience
- Extensive Microbiology or molecular biology active lab experience
- Experience and knowledge of next generation sequencing and basic Bioinformatics tools and where to source them from
- Previous experience with foodborne pathogens in a laboratory setting

Eligibility Requirements

- **Citizenship:** LPR or U.S. Citizen
- **Degree:** Master's Degree or Doctoral Degree received within the last 60 month(s).
- **Academic Level(s):** Postdoctoral or Post-Master's.

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- **Discipline(s):**
  - **Environmental and Marine Sciences** (1 👁)
  - **Life Health and Medical Sciences** (45 👁)