U.S. FOOD & DRUG ADMINISTRATION

Office of New Drugs (OND)

ORISE on the Move

Special Feature: OND's 2022 Summer ORISE Program

What is OND's Summer ORISE* Program?

The OND Research Program is located within FDA's Center for Drug Evaluation and Research (CDER). OND is responsible for the clinical and nonclinical review of all new drugs and biologics that FDA approves for the American people. OND participates in FDA's ORISE Fellowship program to contribute to the development of FDA's future workforce.

> *"It was a great experience that helped me learn more and make a difference in the world."*

The ORISE Fellowship is a training program for college students and recent graduates. ORISE Fellows participate in mentor-led research projects to gain hands-on experience in the field of regulatory science. OND's regulatory science research projects address targeted questions and produce outcomes that facilitate new drug approvals. This focused approach makes OND's ORISE projects attractive to early career investigators as they typically result in resume-enhancing accomplishments.

OND's Summer ORISE Program is a mini-version of the full-year fellowship. Candidates apply in the spring. Fellows who are accepted into the program onboard at the beginning of summer and participate in research from May through September. The advertisement for the 2023 summer program can be found here: https://www.zintellect.com/Opportunity/Details/FDA-CDER-2023-0000.

The OND Summer ORISE Program has grown exponentially over the past 3 years. This program started in 2020 with 11 fellows. In 2022, the number increased to 27 fellows. This rise in participation was made possible by OND staff who volunteered to participate as mentors. OND would like to recognize the following mentors for their contribution to the program's success:

Xiaoqing Guo, PhD
Tao Chen, PhD
Nan Mei, PhD
Kevin Snyder, PhD
Blessy George, PharmD, PhD
Yang Yang, PhD
Prabha Viswanathan, MD
Mulugeta Yeruk, PharmD
Tamara Johnson, MD, MS
Leyla Sahin, MD
Wenming Xiao PhD
Christine Hon, PharmD
Mary Thanh Hai, MD
Kevin Bugin, MS, PhD, RAC
Abbas Bandukwala, MS
Kerry Jo Lee, MD
Luke Park, RPh, PharmD, BCNP
Ira Krefting, MD
Vishal Bhatnagar, MD

* ORISE: Oak Ridge Institute for Science and Education

PROJECT PERSPECTIVES

Special Feature: Deviation and characterization of reference materials for cancer mutation detection with Next Generation Sequencing (NGS) technology.

The perspective below highlights OND's largest summer research project from 2022. This effort was led by Wenming Xiao, PhD, who mentored three summer fellows. Dr. Xiao works in OND's Office of Oncologic Diseases.

Project Mentor
Wenming Xiao PhD

THERE IS AN URGENT NEED for OND

to conduct studies to support drug development of targeted therapies which may rely on broader genetic and immune-profiling based testing. In addition, this may allow and facilitate a more general class labeling approach for these devices and thus encourage drug development for related drugs which otherwise would not be able to rely on data from other companion diagnostics. One of our research projects is to build a general framework for FDA reviewers and scientists to perform analysis of cancer mutation profiling and B/T-cell receptor sequencing with Next Generation Sequencing (NGS) technologies.

Three summer fellows, Alex Chen; Jiazi Tian; and Matteo Simamora, were trained on the development of analytical applications on the PrecisionFDA, a cloud-based computational environment for FDA reviewers, researchers, and collaborators. Specifically, MiXCR, an adaptive immunity profiling software for fast and accurate analysis of raw B/T- cell receptor repertoire sequencing data; AscatNgs, a powerful tool determining copy number variation, ploidy, and tumor content; and a general workflow for sequence alignment and post-processing were established in conjunction with FDA staff and the summer fellows. These applications and workflow program will enable our office to perform B/T-cell receptor profiling and cancer copy number variation analysis with NGS technologies.

Summer Fellow
ALEX CHEN

What is your educational background (university, degree program)?

I am a second year at UC Berkeley pursuing a degree in data science.

What motivated you to pursue a summer ORISE fellowship at FDA?

I have been unsure if I wanted to pursue a double major in public health so I thought this fellowship with the FDA would be a perfect opportunity to experience the cross section of data science and public health.

What was the highlight of your summer ORISE fellowship?

The highlight of my summer fellowship was the opportunity to meet other ORISE fellows. Getting to know some of the peers that participated in the same program as me helped make me feel like I belonged in this community of student researchers.

> *"The skills I gained from this fellowship have amplified my educational background."*

Summer Fellow
JIAZI TIAN

What is your educational background (university, degree program)?

I am a Master Student of Biomedical Informatics at Harvard Medical School.

What motivated you to pursue a summer ORISE fellowship at FDA?

I was motivated by hands-on training in sequencing data analysis, being mentored in a professional community, and new knowledge of regulatory approaches. Meanwhile, this summer fellowship program provided me an opportunity to understand research for regulatory science in comparison to research performed in universities for discovery or understanding of biomedical informatics technologies.

> *"The training environment and team dynamic were great, friendly, and helpful."*

Describe how the skills or knowledge obtained in your summer ORISE fellowship will add to your formal education.

Creating cloud-based pipelines has given me a better understanding of how to efficiently process large sets of data. During the summer fellowship, I practiced coding in the Linux system and using different programming languages, such as R, Python, Bash, etc., which will definitely improve my coding skills. Furthermore, the project on genomics data manipulation provided me with a broad perspective in the field of biomedical informatics.

Summer Fellow
MATTEO SIMAMORA

What is your educational background (university, degree program)?

Vanderbilt University, Biomedical Engineering

> *I was truly immersed in a collaborative environment.*

Describe how the skills or knowledge obtained in your summer ORISE fellowship will add to your formal education.

I had the privilege of getting to learn how to script and code in the language R which I never would have been exposed to during my university time. This internship gave me the opportunity to get exposed to bioinformatics tool implementation and testing that gave me a first person view of their implications on the world of cancer research.

What is something you learned about FDA that you didn't know before?

Before having the opportunity to work at the FDA I was only aware of the guidance they provided to pharmaceutical companies about new drugs that were waiting approval. I had no idea the depth of the process and the complexity behind trying to get something approved. I also learned about how they are involved in almost every field of science that is pushing a frontier in innovation and the varying diverse academic backgrounds people are bringing to the FDA.

Additional Project Perspectives from OND's 2022 Summer ORISE Program

Summer Fellow
ARIEL ARMSTRONG, PhD.

Project Mentors: Kevin Bugin, MS, PhD, RAC and Mary Thanh Hai, MD

Office: OND Immediate Office

Project: Evaluating Diversity in Clinical Trials Supporting New Drug Approvals in 2021

Ariel's Perspective:

There is an ongoing conversation about the lack of diversity in clinical trial participants. The aim of my project is to look at the demographics of drug trials that have recently been approved to see, first, if the participants were representative of the US population who will most need the drug and, second, to see if we can find factors that correlate to increased or decreased diversity. The FDA is in a unique position of having the detailed protocol and demographic information from numerous sponsors that could be used to determine what does or does not work for improving diversity in clinical trials. The goal is that one day, in the hopefully not-to-far future, this information could be used to inform efforts to improve diversity recruitment.

Summer Fellow
APIPA WANASATHOP, PhD

Project Mentor: Yang Yang, PhD

Office: Office of Pharmaceutical Quality, Office of Testing and Research, Division of Product Quality Research

Project: Development of in vitro skin permeation test for spray sunscreens

Apipa's Perspective:

My current project is to evaluate the stability of in-house sunscreen formulations and assess the dermal absorption of the chemical sunscreen. FDA guidance recommends conducting in vitro skin permeability test (IVPT) to help select formulations for the clinical maximal usage trials. The result focuses on the dermal absorption will support the future product specific guidance in the regulatory review for chemical sunscreen products.

Summer Fellow
EMILY CIBOREK, PhD

Project Mentor: Blessy George, PharmD, PhD

Office: OND, Office of Immunology and Inflammation, Division of Pharm-Tox for Immunology and Inflammation

Project: Assessment of Physiologically Based Pharmacokinetic Modeling for Predicting Fetal Exposure to Maternal Drugs

Emily's Perspective:

Almost half of pregnant women use four or more drugs during their pregnancy due to increasing maternal age and higher incidence of illness in pregnancy. However, the pharmacokinetic (PK) studies to inform dose adjustment in pregnancy is lacking. Ethical and safety concerns for the fetus may detract women from taking the necessary treatment and/or enrolling in clinical trials. Part of this project seeks to collect PK data from published studies and build a searchable database for utilization by clinicians, reviewers, and modelers. The database will highlight commonly studied attributes in the pregnant population, trends in drug PK changes in pregnancy, and where data gaps exist.

Summer Fellow
TAI HUYNH, PhD

Project Mentor: Tao Chen, PhD

Office: National Center for Toxicological Research, Division of Genetic and Molecular Toxicology

Project: Acute, reproductive, and genetic toxicities of N-nitrosodiethylamine evaluated in Caenorhabditis elegans

Tai's Perspective:

Due to recent detection of several N-nitrosamines (a known mutagenic and carcinogenic class of chemical) in FDA regulated drug, the FDA wants to closely examine the toxicological effects of N-nitrosamines on cellular systems. Due to the difficulty of the in vitro system for metabolic activation of N-nitrosamines, more studies using in vivo systems are required. However, rodent models are expensive and slow prompting us to look for other in vivo models. Our lab decided to investigate if Caenorhabditis elegans would be a good model to cheaply and quickly assess possible toxicities of food and drug products. The results from this study are being compared with those from other in vivo and in vitro toxicity studies to determine whether C. elegans can be a good alternative testing methodology for assessing toxicity of N-nitrosamines. So far, the collected data has been very promising and will help elucidate the toxicological effects of N-nitrosamines and help support regulations and guidelines to address the public concerns over this type of contaminations in drugs.

Professional Development Opportunities Available to OND's Summer Fellows

OND collects feedback from former fellows and uses that information to continuously improve the program. The activities described below were developed based on input we received from previous OND ORISE fellows. We're proud to report that this approach is working. **In 2022, 100% of OND's summer ORISE fellows agreed or strongly agreed that the OND Summer ORISE Program met their expectations.**

Want to learn more?

Open full-year fellowship opportunities are posted at https://orise.orau.gov/fda/

ORISE Fellow Open Exchange Hours

These fellow-focused virtual networking events provide an opportunity to informally interact. The goal is to generate a sense of community by introducing our ORISE fellows to peers conducting research on other OND mentor-led projects.

ORISE Summer Student Research Presentation Day

This Office-wide event gives OND's summer fellows an opportunity to hone their scientific communication skills by co-developing a research presentation with their mentor.

Regulatory Drug Development Course

This 8-week course is offered in the summer to OND's ORISE fellows. It provides an opportunity for them to learn more about the regulatory processes managed by FDA. Topics include both scientific and regulatory considerations for new drug development.

Peer-Mentor Program

Each summer fellow is assigned a peer-mentor who is responsible for helping them acclimate more easily to FDA. These mentors are senior OND ORISE fellows who volunteer their time to meet regularly and provide guidance or answer questions. OND would like to recognize the following peer-mentors as they played a significant role in the success of OND's 2022 Summer ORISE Program:

C M Sabbir Ahmed, MS, PhD
Guanming Chen, MS, PhD
Danielle Jateng, MS, PhD
Susan Butler, PhD
Daniall Masood, MS
Xuan Tai Tram, PharmD
Margaret VanHeusen, MS

Like what you see?

*The next edition of **OND ORISE on the Move** will be released in 2024!*