

U.S. Food and Drug Administration Center for Food Safety and Applied Nutrition (CFSAN)

U.S. Department of Education Minority Science and Engineering Improvement Program (MSEIP)

2022 Summer Internships



QUESTIONS/APPLY:

Application materials should be submitted online at FDA-DOE-InternshipProgram@fda.hhs.gov

File Name syntax:

Fname.Lname.Resume.pdf

Fname.Lname.PersonalStatement.pdf

***Students may select more than one project.**

Official or unofficial transcripts will be needed prior to accepting the internship.

Application Deadline: Monday, March 14, 2022, 11:59 PM, EST

Program Dates:

*May 31, 2022 - August 9, 2022 (10 weeks)

*Exact dates may change

Expenses:

Stipends, Housing, Meal and Travel allowances supported by MSEIP grant

Eligibility:

Students must be U.S. citizens and must be enrolled in a STEM degree program in a community college or four-year university when participating the program. Students must have **3.0 or above GPA.**

Locations: College Park, MD; Laurel, MD; Bedford Park, IL; and Dauphin Island, AL

Materials Required for Complete Application:

1. Updated **resume** including related courses/skills as mentioned in internship project descriptions and any additional experiences that qualify you for this research internship
2. A **personal statement** which includes the following:
 - a) Description of your **interests, career goals, coursework, and experiences** that qualify you for this program
 - b) **Identification of the FDA project(s) of interest (number and name)**
 - c) Contact information for **two references** (e.g., name, title, organization, email address, phone number)

Project Table of Contents

#1 Modernization of New Dietary Ingredient Database to Implement Analytics (Virtual option)	3
#2 Understanding Feedback from Healthcare Provider Consumers of CFSAN-Supported Educational Products (Virtual option)	4
#3 Preliminary Research to Begin Identifying and Addressing Gaps in Data: Evaluating Potential Exposures and Health Outcomes Related to Sugars and Toxic Elements in Fruit Juices by US Population Subgroup (Virtual option)	5
#4 Preliminary Research to Begin Identifying and Addressing Gaps in Data: Evaluating Potential Exposures and Health Outcomes from Allergens, Toxic Elements, and Other Hazards in CFSAN-Regulated Plant-Based Dairy, Meat, Poultry, and Fish Substitutes by US Population Subgroup (Virtual option)	6
# 5 Agricultural Water Comment Review (Virtual option)	7
#6 Regulatory Information for Food Additives and Color Additives (Virtual option)	8
#7 Smart Restaurant Design, Equipment, and Management Systems: A Literature Review (Virtual option)	9
#8 Examination of Practices to Minimize Produce Food Safety Hazards Associated with Buildings, Equipment and Tools and Sanitation (Virtual option)	10
#9 Build A Database for Diseases Claims for Dietary Supplements (Virtual option)	11
#10 Exploring a Modernized Approach to Food Chemical Safety (Virtual option)	12
#11 State Food Freedom Laws, Hunger Free Campus Statutes, Right to Food Amendments, and Retail Food License Exemptions: Implications for the Future of Retail Food Safety (Virtual option)	13
#12 Training Machine Learning Applications (Virtual option)	14
#13 Toxic Elements Data Analysis (Virtual option)	15
#14 Prevention Strategy Development (Virtual option)	16
#15 CERES Genetic Toxicology Database Enrichment (Virtual option)	17
#16 Studies of Permeability and Biomarker Modulation in An In Vitro Model of Intestinal Epithelial Tight Junctions After Exposure to Food Ingredients (Emulsifiers) and Dietary Supplements (Probiotics) (Virtual option)	18
#17 Assessment of Strain-Specific Survival of Listeria Monocytogenes on Vegetables During Freezing	19
#18 Assessment of a Strong Ion Exchange/Reversed-Phase Chromatography Column for the Analysis of Biogenic Amines by UPLC-ESI-MS/MS	20
#19 High Throughput and Improved Screening of Potential Shiga Toxin-Producing E. Coli Obtained From Bacteriological Agars	22
#20 Analysis of Total Diet Study Samples for Poly- and Per-Fluoroalkyl Substances	23
#21 Market Trends for Dietary Supplements with Claims and New Dietary Ingredients (Virtual option)	24
#22 Collation of CFSAN Foodborne Pathogen WGS Metadata from Disparate Research Projects (Virtual option)	25

2022 FDA (Center for Food Safety and Applied Nutrition Undergraduate Internship Program) MSEIP Internship for Minority Students
#1 Modernization of New Dietary Ingredient Database to Implement Analytics (Virtual option)

Research Project Description:

The Office of Dietary Supplements has been reviewing New Dietary Ingredient Notifications (NDINs) since 1995. There has been a recent modernization of the NDIN submission and review process that was developed in 2019. However, there is a need to bridge the gap between the old archival system (1995-2019) and the new system (2019-present) to modernize the ODSP records and develop and implement a system to analyze, evaluate and track metrics for the entirety of NDINs submitted to FDA. The outcome of this project is to use a modernized database to help ODSP make more informed regulatory decisions by identifying previously undetected trends or behaviors in the NDIN submission process.

Specific project objectives to be performed by the intern:

- Identify the differences and similarities between both record tracking systems and develop a new approach to merge both systems into a comprehensive database
- Once the database is curated, analyze the data to understand trends in the NDINs. For example, how many probiotic NDINs were submitted to FDA in the past 10 years and what types of safety or identity signals were prevalent in the response letters? Are they specific to one strain?
- Based on the data evaluation, are there any internal ODSP protocols that can be developed to help in the review process? For example, the data indicates that botanicals are often submitted with history of use as Traditional Chinese Medicine or Ayurvedic uses but can we indicate any trends in specific botanical species and conditions of use that can help with understanding the safety of future submissions?

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

- Requires an applicant to be attentive to details
- Experienced with Microsoft software suite (e.g., Word, Excel, Access)
- Experience in analyzing datasets and evaluating data to summarize findings
- Coursework or research experience in sciences (e.g., Biology, Chemistry) to understand the methods and terminology

Location: CFSAN University Station, 4300 River Road, College Park, MD

#2 Understanding Feedback from Healthcare Provider Consumers of CFSAN-Supported Educational Products (Virtual option)

Research Project Description:

Healthcare providers are in position to offer additional insights (e.g., reports to a surveillance system) that could uniquely inform agency activities; furthermore, they can utilize information generated and distributed by CFSAN to positively impact clinical care (e.g., patient counseling, differential diagnoses, etc.). Healthcare provider education has been and continues to be developed and disseminated by CFSAN, often in partnership with other organizations (e.g., American Medical Association). These efforts present an opportunity to engage with healthcare provider consumers of CFSAN-supported educational products to better understand how such products have met their own needs and how they have impacted patient health. Data generated from evaluation tools will allow CFSAN to better develop future educational products for healthcare providers and to better communicate the impact of such products to stakeholders. The student would assist in new evaluation tool development, analysis of data derived from new and existing evaluations tools, and collaboration with internal stakeholders to facilitate progress.

Specific project objectives to be performed by the intern

- Familiarize self with existing educational/outreach products aimed at healthcare providers
- Assist in development of an evaluation tool to better assess reception and impact of such products
- Analyze data derived from new and existing evaluation tools Communicate results to internal stakeholders

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

Required: Completion of Statistics Course (3.0/4.0 or better)

Preferred: Completion of Public Health-related Course (e.g., Epidemiology)

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#3 Preliminary Research to Begin Identifying and Addressing Gaps in Data: Evaluating Potential Exposures and Health Outcomes Related to Sugars and Toxic Elements in Fruit Juices by US Population Subgroup (Virtual option)

Research Project Description:

Poor nutrition is a major contributor to cardiovascular disease, cancer, diabetes, and other chronic diseases. The American diet is low in vegetables and fruits, which are good for health, while high in added sugars, which can adversely impact health. The Nutrition Innovation Strategy is part of FDA's commitment to reduce the burden of chronic diseases through improved nutrition. This strategy aims to encourage industry in creating healthier food products and to help consumers identify healthier foods.

Children and adolescents consume nearly half of their fruit intake as juices, Pediatricians and pediatric dieticians have argued that drinking fruit juices is not as healthy as eating whole fruits. Fruit juices are a quickly absorbed source of calories since juices lack dietary fiber and contain elevated free sugars. In some children, drinking fruit juices may predispose them to excessive caloric intake and weight gain, while in other young children, excessive juice consumption may result in carbohydrate malabsorption, "toddlers' diarrhea," and undernutrition. Studies of fruit juice consumption and health outcomes in adults are mixed. While some studies have linked fruit juice consumption to excessive weight gain in adults, other studies show an association of consumption of 100% fruit juice with lower risks of being overweight and having dyslipidemia.

The FDA is also committed to reducing exposure to toxic elements, particularly heavy metals, from foods eaten by infants and young children. Heavy metal exposures can cause development and growth delays in children. In 2013, the FDA had set action levels of inorganic arsenic and lead for juices; yet, in 2019, Consumer Reports reported that it found "concerning levels" of cadmium, arsenic or lead in 47% of fruit juices that were tested. The FDA recently implemented its Closer to Zero plan, a science-based, iterative approach to decrease toxic element exposures in food.

The intern will contribute to evidence of use to Nutrition Innovation Strategy and Closer to Zero efforts by determining fruit juice intake in subgroups of the US population, identifying the sugar content and potential toxic element exposures in fruit juices, and examining the effect of fruit juice intake with biomarkers (for example, lipid levels, urine cadmium levels), anthropometric markers, and health outcomes.

Specific project objectives to be performed by the intern:

With direction from OAO DPHIA Epidemiology Branch staff as mentors, the intern's objective will be to conduct preliminary research on potential exposures and health outcomes from fruit juices by US population subgroup as follows:

- a) Search, identify, and screen data sources on sugar content of individual serving- sized fruit juices and potential chemical exposures from individual serving-sized fruit juices, including from packaging; summarize findings.
- b) Download and analyze National Health and Nutrition Examination Survey (NHANES) population-representative data from most recent cycle available on fruit juice intake by age-group, sex, race/ethnicity, income, other demographic attributes, biomarkers of exposures to chemicals identified in (a) and health status; create tables and graphs to summarize findings.
- c) Draft an abstract, presentation, poster, and report highlighting major results and recommendations for further research.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

- Course work in epidemiology, nutrition, chemistry, human biology/physiology Research and data analysis experience
- Experience in literature and/or systematic reviews
- Experience using software to develop visuals and presentations

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#4 Preliminary Research to Begin Identifying and Addressing Gaps in Data: Evaluating Potential Exposures and Health Outcomes from Allergens, Toxic Elements, and Other Hazards in CFSAN-Regulated Plant-Based Dairy, Meat, Poultry, and Fish Substitutes by US Population Subgroup (Virtual option)

Research Project Description:

Plant-based meat/poultry/seafood mimic the appearance, flavors and textures of meat, poultry or seafood, and plant-based milk products are made from legumes, nuts, cereals, or seeds. Plant-based food products have exploded in popularity. Consumers are more aware that plant-based diets reduce the risk of obesity, diabetes, cardiovascular disease, and cancers, and thus perceive plant-based foods as healthy. For example, plant-based meat patties, compared to beef patties, contain more fiber, no cholesterol, and fewer calories. However, plant-based foods may have health hazards not recognized by consumers. Plant-based meat/poultry/seafood and dairy often contain food allergens, especially the major food allergens soy, wheat, and tree nuts. Some plant-based food products are high in sodium, associated with increased risks of high blood pressure, strokes and cardiovascular disease. Plant-based protein products are processed foods, like baked goods, sugar-sweetened beverages, or cured meats. Processed food consumption contributes to obesity, cancer, and cardiovascular disease. It is unclear if plant-based protein products are less hazardous than other processed foods.

The FDA regulates plant-based meat/poultry/seafood alternatives and plant-based milks. In 2021, Congress has directed the FDA to assess the labeling of plant-based foods in the market and the FDA has prioritized drafting guidance for industry the labeling of plant-based milk alternatives.

The intern will contribute to the evidence base informing that work and related efforts by identifying and describing health outcomes and adverse effects associated with plant-based food products in the scientific literature and in public health and regulatory surveillance systems.

Specific project objectives to be performed by the intern:

With direction from OAO DPHIA Epidemiology Branch and Signals Management Branch staff as mentors, the intern's objective will be to conduct preliminary research on potential exposures and health outcomes from allergens, toxic elements, and other hazards in plant-based dairy, meat, poultry, and fish substitutes. The tasks for each product category will be as follows:

- (a) Search, identify, and screen epidemiologic literature for health effects of plant-based dairy, meat, poultry, and fish substitutes; create standard literature table to summarize findings.
- (b) Extract and conduct descriptive analysis of data from the CFSAN Adverse Event Reporting System concerning plant-based dairy, meat, poultry, and fish substitutes; create tables and graphs to summarize findings.
- (c) Draft an abstract, presentation, poster, and report highlighting major results and recommendations for further research.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

- Course work in epidemiology, nutrition, chemistry, human biology/physiology Research and data analysis experience
- Experience in literature and/or systematic reviews
- Experience using software to develop visuals and presentations

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

5 Agricultural Water Comment Review (Virtual option)

Research Project Description:

This is a regulatory project not a research project. OFS desires 2-3 interns for this effort.

A proposed regulation related to the use of agricultural water used to grow produce was published on 12/6/2021. The regulation proposes to require farms to conduct comprehensive assessments that would help them identify and mitigate hazards in water used to grow produce. The proposal is open for 120 days from publication for public comment. Following the close of the public comment period, OFS will need to review each comment and consider the comment in development of the final rule.

Specific project objectives to be performed by the intern:

- Review the comments submitted to the public docket and organize/group the comments by common theme/issue.
- Summarize the comments in a manner that allows the comments to be searched and analyzed for response.
- Assist in the development of responses, as appropriate, to the comments to be incorporated in the preamble of the final regulation and in changes to the codified language of the regulation.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

- Course work leading to a Bachelors in Science, in the fields of Biology or Microbiology or other food science field.
- Course work related to hydrology is desired.

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#6 Regulatory Information for Food Additives and Color Additives (Virtual option)

Research Project Description:

This project will help improve the accuracy and completeness of the regulatory data used by the Office of Food Additive Safety (OFAS) in its mission to ensure the safety of food additives, color additives, and food packaging materials. These data will also be published on the FDA's web site so that they can be used by our stakeholders (others in FDA, at other agencies, as well by industry and the general public) to support the safety assessment of food chemicals. During this research, the participant will learn about food ingredients, food packaging substances and color additives, and the regulatory processes for approving these substances for use in the U.S. food supply.

1. Compile summary information for historical (1999 and earlier) final rules resulting from food additive petitions (FAP), color additive petitions (CAP), and GRAS affirmation petitions (GRP). This summary should include the original final rule citation in the Federal Register, and related Federal Register citations (including, but not limited to, the corresponding filing notices, corrections and confirmations of effective date) and docket numbers, such that it can be included in our web database at <https://www.cfsanappsexternal.fda.gov/scripts/fdcc/?set=FinalRules>. Include links to the Federal Register citations and to dockets, where available. (Links should be available at least back to 1994.)
2. Review the regulatory information listed on our web site for the Substances Added to Food dataset to determine if any additions or deletions should be made for the regulations or substances listed, at <https://www.cfsanappsexternal.fda.gov/scripts/fdcc/?set=FoodSubstances>.
3. In conjunction with the above research tasks, also determine if updates should be made to our internal STARI (Scientific Terminology and Regulatory Information) database for chemical substances.

Specific project objectives to be performed by the intern:

- Curate data on OFAS final rules from petitions for the Final Rules database, working backwards from final rules published in 1999 and before, with accuracy and thoroughness.
- Check regulations and substances for a subset of those listed in the Substances Added to Food database for accuracy.
- Cross-check information found for the Final Rules and Substances Added to Food with the internal STARI database, and propose updates to STARI, if needed.
- Learn about the regulatory processes used by OFAS for food additives and color additives; become familiar with 21 Code of Federal Regulations (CFR), searching Federal Register citations, searching substances in OFAS databases and knowledgebases.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

- Knowledgeable of using Excel and/or MS Access for organizing and comparing data, and a desire to learn more about data management
- Course work that includes chemistry, and chemical nomenclature.

Location: CFSAN University Station, 4300 River Road, College Park, MD

#7 Smart Restaurant Design, Equipment, and Management Systems: A Literature Review (Virtual option)

Research Project Description:

This project will involve working alongside subject matter experts within the Retail Food Protection Staff to conduct a literature review on the state and use of smart kitchen design, smartkitchen equipment, and smart restaurant management systems in retail food establishments and the implications on food safety.

As automation continues to expand within the retail food industry, innovative use of smart design, smart equipment, and smart management systems has emerged to improve efficiency and reduce human error. CFSAN's Retail Food Protection Staff (RFPS) is attempting to better understand the implications of smart kitchen design, smart kitchen equipment, and smart restaurant management systems for food safety in retail food establishments.

This information will be used to inform decisions regarding FDA's New Era of Smarter Food Safety Blueprint topic 3.2.4 *Encourage and explore use of new digital tools and incentives that prompt desired behaviors, such as hand washing and manual temperature monitoring (i.e., managerial controls).*

Specific project objectives to be performed by the intern:

- Conduct a literature review investigating the impact of smart kitchen design, smart kitchen equipment, and smart restaurant management systems on retail food safety.
- Prepare a review paper and presentation describing the findings

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

Applicant should be familiar with social science research methods and conducting scientific literature reviews; coursework in Public Health, Public Policy, English, Social Science, and/or Communications; attention to detail; self-motivation; data management and analysis.

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#8 Examination of Practices to Minimize Produce Food Safety Hazards Associated with Buildings, Equipment and Tools and Sanitation (Virtual option)

Research Project Description:

The intern will contribute to policy work related to buildings, equipment and tools and sanitation. The intern will perform literature searches, summarize findings and organize references related to specific topics, such as practices to minimize contamination in buildings during produce packing and holding, and practices to prevent contamination for produce equipment and tools, and practices to minimize contamination related to toilet and handwashing facilities.

Specific project objectives to be performed by the intern:

Project objectives include:

- Advance policy consideration of practices to minimize produce food safety hazards related to buildings, equipment and tools and sanitation;
- Complete literature searches and summarize scientific findings related to specific topics, such as specific food safety practices to minimize contamination in buildings used for produce growing, harvesting, packing and holding activities; and
- Add and update reference databases related to produce food safety topics for buildings, equipment and tools and sanitation.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

- Background and interest in life sciences, such as biology, horticulture, food or animal science, etc.
- Basic understanding of how to conduct scientific literature reviews, such as awareness of search engines to identify credible, scientific sources.
- Solid written and oral communication skills; and
- Detail-oriented.

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#9 Build A Database for Diseases Claims for Dietary Supplements (Virtual option)

Research Project Description:

This project will require the intern to build a database of warning letters containing products that are marketed as dietary supplements and contain disease claims. The purpose of the project is to help increase consistency among reviews of product claims and to provide support for future review of potential disease claims.

Specific project objectives to be performed by the intern:

- 1) Review all warning letters related to dietary supplements;
- 2) Identify those warning letters containing disease claims;
- 3) Group the warning letters by diseases claims in accordance with directions from the Office of Dietary Supplement Programs (ODSP) Regulatory Information Branch; and
- 4) Prepare a database or other repository containing all warning letters containing disease claims.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

ODSP is seeking an intern with a science major (e.g., biology, health, or nutrition), in the third or fourth year of undergraduate work. Specific work experience is not required.

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#10 Exploring a Modernized Approach to Food Chemical Safety (Virtual option)

Research Project Description:

The project is within CFSAN's Office of Executive Programs (OEP) and involves supporting a cross-functional initiative related to food chemical safety. The President's Fiscal Year (FY) 2022 Budget request for FDA identifies addressing emerging food-related chemical and toxicological issues as a priority for increased funding, and there are several projects that the Center is interested in tracking and prioritizing.

The initiative involves supporting ongoing and new projects that encompass the work of the Office of Food Additive Safety, Office of Food Safety, Office of Analytics and Outreach, Office of Compliance, and Office of Regulatory Science with input from offices such as the Office of Regulations and Policy and the Communications and Public Engagement Staff. Given the size and scope of these projects, project management is critical for success, and this role will support that effort.

Specific project objectives to be performed by the intern:

We are seeking a summer intern to provide project management support to the lead project manager with the following:

- Sitting in on all project status meetings/project team meetings
- Working with the lead project manager to take notes during project status meetings/project team meetings, and developing a project meeting summary or recap to disseminate to all project team members
- Arranging meetings with subject matter experts to discuss specific projects or inquiries
- Potentially adding data into the project management task tracking system with the assistance of the lead project manager
- Meeting regularly with the lead project manager to discuss project status, deliverable status, project next steps, etc.
- Drafting emails for the lead project manager to send out to the project team, or project team members

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

We are looking for a candidate that has:

- Excellent oral, written, and communication skills
- Science or policy background a plus (but not mandatory)
- Any type of project management experience or coursework a plus (but not mandatory)

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#11 State Food Freedom Laws, Hunger Free Campus Statutes, Right to Food Amendments, and Retail Food License Exemptions: Implications for the Future of Retail Food Safety (Virtual option)

Research Project Description:

This project will involve working alongside subject matter experts within the Retail Food Protection Staff to investigate and conduct content analysis of state food freedom laws, hungerfree campus statutes, right to food amendments, and retail food license exemptions within the United States and explore implications for the future of retail food safety.

As more states allow for retail food business types to operate outside of traditional mechanisms of regulatory oversight, the implications of such actions on food safety remains unclear and unexplored. Understanding the basis, rationale, and direction of such efforts is important to inform future policy analysis and food safety efforts.

CFSAN's Retail Food Protection Staff (RFPS) is attempting to better understand and document:

- The basis and rationale for existing state food freedom laws, hunger free campus statutes, right to food amendments, and retail food license exemptions and implications for the future of retail food safety.

This information will be used to inform decisions regarding the technical assistance provided to regulatory retail food safety professionals by FDA, to better understand policy diffusion, prioritize research, and evaluate the need to develop and issue policy advice.

Specific project objectives to be performed by the intern:

Identify and examine state food freedom laws, hunger free campus statutes, right to food amendments, and retail food license exemptions within the United States and prepare a report on similarities/differences in the basis, rationale, and content within each category.

Prepare a policy brief describing the implications for the future of retail food safety at the state, local, tribal, and territorial level.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

Applicant should be familiar with social science research methods and conducting scientific literature reviews; coursework in Public Health, Public Policy, English, Social Science, and/or Communications; attention to detail; self-motivation; data management and analysis.

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#12 Training Machine Learning Applications (Virtual option)

Research Project Description:

The Warp Intelligent Learning Engine (WILEE) is a Division of Science and Technology initiated project to develop a data product that will provide the Office of Food Additive Safety with an advanced data driven risk based decision-making tool. This tool will leverage Artificial Intelligence (AI) technologies to integrate and process a large variety of data sources, generating reports with quick insights that will significantly improve our time-to-results in predicting and analyzing market and regulatory trends that directly affect products under the Office's regulatory purview. At completion, WILEE will have multiple modules that enhances the Office's capacity for postmarket surveillance and signal detection.

The intern will use sample training data to develop a novel method(s) that enables the Office to automatically generate a large corpus of training data that can be viewed and further refined using expert opinion from CFSAN scientists. These refined training set(s) will be used to train WILEE's other machine learning predictive algorithms. The project will include developing a user interface that will provide easy access to the generated training data and the ability to correctly tag the record, either affirming the prediction made by the machine learning algorithm or indicating that machine learning algorithm needs modification.

Specific project objectives to be performed by the intern:

1. Develop and train a machine learning algorithm to enable automatic tagging of data to be used as training data for other machine learning applications.
2. Develop a user interface in Django to enable access to and tagging of the training data.
3. Develop dashboards in SAS Visual Analytics to enable on-demand analysis of data in the WILEE knowledgebase.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

This project will benefit from applicants with a STEM or Public Health education and some experience in programming using either Python, R or SAS. The ability and willingness to learn new programming languages will be instrumental to the success of the project.

Location: CFSAN University Station, 4300 River Road, College Park, MD

#13 Toxic Elements Data Analysis (Virtual option)

Research Project Description:

The purpose of the project will be to help us compile and analyze data for toxic elements to help direct compliance activities and make recommendations for prevention strategies in known or emerging commodities for plant products including spices, produce, juices, bottled water, and alcoholic beverages.

The information from this project will potentially help to support prevention strategies and the “Closer to Zero” and “Machine Learning” center initiatives. There are multiple sources of toxic element data within CFSAN (i.e., Total Diet Study, Laboratory Flexible Funding Model) and outside CFSAN. These sources have not been compared or combined for analysis. Research result may have a broad impact. For example, basic statistical analyses may inform our understanding of achievability for low levels of toxic elements or highlight food commodities that may need further research. Results may fill gaps needed for adequate risk assessments for emerging food commodities where CFSAN may not have data.

Specific project objectives to be performed by the intern:

1. The intern will work alongside SMEs to compile and analyze data from FDA and other sources.
2. The intern will also review peer-reviewed research to recommend additional approaches for the control and prevention of toxic element contamination in foods and beverages.

Qualifications of the applicant that will increase the likelihood of the project’s success (e.g., applicable course and lab work, research or work experience, etc.).

- Courses: chemistry, statistics, computer programming (preferred, not required)
- Skills: Excel, literature review, computer programming skills (preferred, not required), familiarity with databases and large spreadsheets

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#14 Prevention Strategy Development (Virtual option)

Research Project Description:

This is a regulatory project not a research project. The Office of Food Safety (OFS) desires 1-2 interns for this effort.

To aggressively respond to outbreaks, OFS is developing strategies to employ measures to prevent future outbreaks from the same or similar scenarios.

Identifying and implementing effective preventive interventions to an emerging foodborne disease is critical, as the public health and economic costs are directly related to the time between its emergence and its mitigation. The success in identifying and implementing interventions is a function of our ability to rapidly and accurately identify and characterize foodborne hazards, root causes of the problem, and impacted distribution chains. We can better target interventions through subsequent collection, analysis, and dissemination of analytical data. This data can further help supply chain participants and public health agencies identify and implement actions and controls that will be most impactful and least disruptive to the supply chain.

Specific project objectives to be performed by the intern:

As part of a team, analyzes highly complex outbreak investigation data (root cause investigation data related to growing, harvesting, packing, manufacturing, or holding activities) to determine appropriate post response activities and preventive measures to be employed to prevent similar outbreaks in the future.

As part of a team, evaluates the adoption of new and emerging technologies to address complex and novel situations in growing, harvesting, packing, manufacturing or holding processes of food for human consumption contributing to foodborne illness outbreaks.

As part of the team, participates in the development of reports from analyses of surveillance data, literature reviews, and other information to address failings in the food safety system contributing to outbreaks.

Qualifications of the applicant that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.).

Course work leading to a Bachelor's in Science, in the fields of Biology or Microbiology or other food science field.

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#15 CERES Genetic Toxicology Database Enrichment (Virtual option)

Research Project Description:

The intern will learn how FDA's Office of Food Additive Safety (OFAS) regulates food additives and food packaging materials and how different types of toxicity tests are used to support this effort. In conjunction with learning how FDA regulates these materials, the intern will assist with the collection of toxicology data from OFAS legacy records for incorporation into the Chemical Evaluation and Risk Estimation System (CERES). Updated and detailed toxicology information in CERES is used by OFAS scientists to support their scientific evaluations of food additives and packaging materials through read across, filling data gaps, and computational toxicology analyses. Utilizing legacy data in this manner is in line with the 3Rs (Replacement, Reduction, and Refinement) as it reduces the need for additional testing potentially involving animal studies.

Specific project objectives to be performed by the intern:

- Learn how the OFAS regulates food additives and food packaging materials.
- Develop experience and understanding of OFAS data systems (CERES, FARM, STARI, etc.) to leverage the information across these systems to collect a holistic record of the scientific information and data on food additives and food contacts.
- Develop knowledge of various genetic toxicology testing protocols to accurately capture the data and endpoints reported in toxicological study reports. This requires developing familiarity with FDA guidance and OECD test guidelines.
- Perform specialized investigative research and provide scientific guidance and advice on
- subjects related to legacy data harvesting, data management, and operation of OFAS data systems.
- Evaluate the new CERES Toxicology Data Entry Tool by suggesting changes to the user interface, analyzing the current state of the tool, and identifying areas for future development.

Qualifications of the applicant that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.).

- 3 or more semesters with coursework related to toxicology or biology
- Attention to detail
- Organizational skills
- Effective verbal and written communication

Location: CFSAN University Station, 4300 River Road, College Park, MD

#16 Studies of Permeability and Biomarker Modulation in An In Vitro Model of Intestinal Epithelial Tight Junctions After Exposure to Food Ingredients (Emulsifiers) and Dietary Supplements (Probiotics) (Virtual option)

Research Project Description:

The objective of this research project is to expand in vitro research capabilities in order to develop and utilize newer technologies for assessment of the human gut mucosal responses to common food ingredients (emulsifiers) and dietary supplements (probiotics/ live microbial ingredients).

Specific project objectives to be performed by the intern:

- Assist in the establishment of the experimental model for combined exposures.
- Assist in assessment of cell epithelial barrier integrity
- Assist in assessment of biomarkers (expression of tight junction and mucin genes) of epithelial integrity at the RNA and protein levels
- Assist in the analysis of the secreted immune biomarkers
- Assist in the analysis of the experimental samples for dietary supplement/probiotics in response to treatments

Qualifications of the applicant that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.).

- Basic pipetting techniques
- Lab experience in general molecular biology, biology, chemistry, biochemistry, or immunology

Location: CFSAN MOD-1 Building, 8301 Muirkirk Road, Laurel, MD

#17 Assessment of Strain-Specific Survival of *Listeria Monocytogenes* on Vegetables During Freezing

Research Project Description:

Freezing is a common method used to preserve and extend the shelf-life of various food products, including vegetables. While some frozen foods are ready-to-eat, frozen vegetables should be cooked prior to consumption. Recently, foodborne outbreaks due to *Listeria monocytogenes* in the U.S. and Europe have been associated with frozen corn, peas, and vegetable mixes. It is known that *L. monocytogenes* is capable of surviving for long periods of time in frozen food products with no loss in population. This study will evaluate the survival of *L. monocytogenes* on vegetables during frozen storage and examine any strain-specific differences observed. Survival of *L. monocytogenes* will be compared against *Salmonella enterica* and *Escherichia coli* (EHEC). Differences in strain-specific survival phenotypes of *L. monocytogenes* will be evaluated genetically using whole genome sequencing (WGS). Differences in survival will be further examined using transcriptomic analysis to ascertain differential gene regulation during freezing. This study will aim to fill a data gap on the mechanisms by which foodborne pathogens, specifically *L. monocytogenes*, survive on vegetables during freezing.

Specific project objectives to be performed by the intern:

The applicant will examine the survival of different strains of *L. monocytogenes* on frozen vegetables, including corn and green beans, during storage. The applicant will be involved in all aspects of this objective including preparation (experimental design, making media, food preparation, and culturing strains), performing the experiments (inoculation, sampling, enrichments, and plate count assays), generating the data, graphing results, and statistical analysis

Qualifications of the applicant that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.).

The applicant should have completed coursework in biology, microbiology, and/or food science. Prior laboratory experience is beneficial.

Location: CFSAN Moffett Building, 6502 South Archer Rd, Bedford Park, IL

#18 Assessment of a Strong Ion Exchange/Reversed-Phase Chromatography Column for the Analysis of Biogenic Amines by UPLC-ESI-MS/MS

Research Project Description:

Time/temperature abuse of uncooked seafood can result in the growth of bacteria capable of catalyzing the decarboxylation of naturally occurring amino acids producing biogenic amines, low molecular weight organic bases with aliphatic and aromatic functional groups. The presence, therefore, of biogenic amines is often used as an indicator of seafood decomposition. The most ubiquitous example is the decarboxylation of histidine to histamine. The effects of histamine toxicity are well-documented and referred to as Scombrototoxin Fish Poisoning (SFP), or Histamine Poisoning when associated with fish consumption. Our goal for this research is to assess the relationship between the presence of various biogenic amines and the degree of seafood decomposition resulting from time/temperature abuse. Current AOAC methods for the detection of biogenic amines involve chemical derivatization steps that can be time-consuming, costly, and inefficient. In this study, we are developing a robust analytical method for the determination of six underivatized biogenic amines (putrescine, cadaverine, histamine, agmatine, tryptamine, and tyramine) in seafood matrices using liquid extraction followed by Solid Phase Extraction (SPE) for sample clean-up, Ultra Performance Liquid Chromatographic (UPLC) separation via mixed-mode Ion Exchange/Reversed-Phase (IE/RP) resin, and detection and quantitation by Electrospray Ionization Tandem Mass Spectrometry (ESI-MS/MS). The combination of a mixed-mode IE/RP chromatography column for the retention and separation of the biogenic amines without chemical derivatization has shown early success, but there is significant room for improvement in the robustness and general utility of the method. In particular, the mixed-mode IE/RP chromatography column currently being used contains ion exchange sites on the stationary phase that are classified as 'weak', meaning they are subject to protonation/deprotonation as the pH of the mobile phase changes. The project for a student intern will be to evaluate the effectiveness of a mixed-mode IE/RP chromatography column containing a stationary phase with 'strong' ion exchange groups, i.e., charged stationary phase sites that are resistant to changes in the pH of the mobile phase.

Specific project objectives to be performed by the intern:

Determine the effectiveness of a mixed-mode IE/RP UPLC column containing 'strong' stationary phase ion exchange groups on the retention and separation of six underivatized biogenic amines. This objective includes the following:

- Development of analytical laboratory skills
 - Preparation of solutions
 - Preparation of standards and development of calibration curves
 - Liquid extraction of seafood matrices
 - Maintaining a laboratory notebook
 - Adherence to required safety protocols
- Use of solid phase extraction (SPE) for seafood matrix sample clean-up
- Operation of UPLC-ESI-MS/MS
 - Assessment of chromatographic performance indicators – resolution, peak symmetry, retention
 - Understanding basic mass spectrometric principles

Qualifications of the applicant that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.).

Mandatory qualifications

- Successful completion of General Chemistry I and II lectures/labs
- Interest in using chromatographic and mass spectrometric analytical instrumentation
- Basic lab techniques, such as weighing solids, delivering known volumes using volumetric pipets, and preparing quantitative solutions using volumetric flasks

2022 FDA (Center for Food Safety and Applied Nutrition Undergraduate Internship Program) MSEIP Internship for Minority Students

Preferred qualifications

- Successful completion of any upper-level chemistry courses, such as Organic I/II, Analytical, or Instrumental Analysis
- Other relevant lab techniques, such as using a centrifuge, decanting a supernatant, or calibrating and using a pH meter

Location: CFSAN Gulf Coast Seafood Laboratory, 1 Iberville Drive, Dauphin Island, AL

#19 High Throughput and Improved Screening of Potential Shiga Toxin-Producing *E. Coli* Obtained From Bacteriological Agars

Research Project Description:

Despite advancements in agar development, selecting Shiga toxin-producing *E. coli* (STEC) in the presence of generic *E. coli* and other background flora using the currently available selective and differential bacteriological agars is still challenging and often disappointing. This is especially true for non-O157:H7 STEC given their phenotypic diversity but likely presence in environmental samples such as water, scat, sediment, manure, etc. An especially notable issue as the collection of such samples is now standard practice during FDA outbreak investigations.

Largely, FDA Bacteriological Analytical Manual laboratory methods have not been updated to address non-food samples, so this presents an opportunity to evaluate options such as pooling of colonies to allow for the less laborious screening of individual colonies while increasing the number of colonies tested. If time allows other steps in the typical laboratory STEC workflow could be evaluated for improvement.

Specific project objectives to be performed by the intern:

- pooling of potential STEC colonies and the inclusion of other steps to increase the likelihood of recovery of STEC from difficult matrices such as ultrafiltered water, soil, and manure
- Support, as needed for high-priority, emergency response to any relevant outbreaks involving Shiga toxin-producing *E. coli* during the appointment period
- Assist PI in preparing reports, technical abstracts, and manuscripts for publication

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

The project requires some experience with basic laboratory practices like record keeping of data, culturing bacteria, preparing reagents, and pipetting of liquids. The person selected should possess a basic level of proficiency with MS Excel and Word for report writing and data management. Completed coursework in Microbiology or a biology-related field is desirable.

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#20 Analysis of Total Diet Study Samples for Poly- and Per-Fluoroalkyl Substances

Research Project Description:

In order to determine the risk of Poly- and Per- Fluoroalkyl Substances (PFAS) in foods to humans, more data is needed on their presence in the general food supply. FDA's Today Diet Study (TDS) program collects the most highly consumed foods in the US diet from 6 different regions in the United States twice a year. Currently a portion of these samples are sent to the Center for Food Safety and Applied Nutrition (CFSAN) for PFAS analysis. The results are then sent to the Office of Analytics and Outreach (OAO) where risk assessments are performed for the samples with positive detections. This project would focus on assisting with the continued analysis of TDS samples in the CFSAN laboratory.

Specific project objectives to be performed by the intern:

- Get trained on the current analytical method used at CFSAN for PFAS in foods
- Assist with sample preparation of TDS samples
- Get trained on the instrument to be able to load and run samples

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

- Chemistry background either in coursework or lab work – Analytical Chemistry preferred but not required
- Experience with basic lab equipment: scales, centrifuge
- Experience with pipetting

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#21 Market Trends for Dietary Supplements with Claims and New Dietary Ingredients (Virtual option)

Research Project Description:

Fill gap in risk assessment/regulatory oversight: the Office of Dietary Supplement Programs (ODSP) regularly initiates enforcement initiatives for dietary supplement (DS) products that are making disease/drug claims or contain a violative dietary ingredient. This research/regulatory project will evaluate current market trends for DS products that are making disease claims for identified classes of diseases or specific violative dietary ingredients. Information for the identified products will be collected and organized to support the issuance of a warning letter when products satisfy the criteria outlined for inclusion in one or more warning letter initiatives.

Specific project objectives to be performed by the intern:

- Increase and/or improve organizational skills in communication, quantitative thinking, and teamwork.
- Examine and observe government operations and decision making from a risk-based methodology.
- Meet professional federal government experts and potential mentors who can provide guidance, feedback, and support.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

Students at colleges or universities that are studying in any of the following program areas: quality assurance or a related college program or degree that includes or is leading to at least 30 semester hours in one or a combination of the following: consumer laws, biological sciences, food science, chemistry, pharmacy, physical sciences, food technology, nutrition, medical science, engineering, epidemiology, veterinary medical science, legal investigations, law enforcement, or related scientific fields that provided knowledge related to agency work.

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD

#22 Collation of CFSAN Foodborne Pathogen WGS Metadata from Disparate Research Projects (Virtual option)

Research Project Description:

FDA's Center for Food Safety and Applied Nutrition (CFSAN) researchers have collected large numbers of environmental food borne pathogen isolates as part of various research projects. Many of these isolates have had whole-genome sequencing (WGS) performed on them and the WGS data deposited at the National Center for Biotechnology Information (NCBI) where it is visible in NCBI's public facing Pathogen Browser. The isolates are deposited with a minimal amount of metadata. However, much more is known about the provenance of these isolates, but that information is contained in disparate locations spread across CFSAN (e.g., ORS Division of Microbiology). This makes the more informative data of particular use to public health difficult and time-consuming to retrieve as part of inquiries from CFSAN's Office of Analytics and Outreach (OAO), Bioinformatics and Biostatistics Staff (BBS) into signals involving recent clinical isolates and said research isolates in the public database.

In order to make best use of all the metadata associated with research isolates, it is necessary to bring the metadata together in one place and properly organize it. This can only be done with a manual collection, review, and organization of the various data sets collected. This internship will begin this process of populating a proper database with this detailed metadata, including exact collection location and date information is uniformly coded for all isolates where it is available. This database will be organized and presented in a way that makes it easy to query and use to answer questions about the signals within the WGS database by providing source and context of the metadata.

The use of metadata from these research isolates will provide information about possible links to outbreak isolates where we have limited or no information in the public database concerning the source of new isolates. This will allow us to track down potential outbreak sources more quickly and potentially resolve outbreaks earlier. A recent example of such a situation involved a large cluster with a new subcluster of concern. This large cluster contains a substantial number of isolates collected from research on the DelMarVa peninsula but pulling together all of the metadata on these isolates is cumbersome and probably duplicates efforts from the last time we had to do this. This project will reduce the time and effort required in situations like this, and speed up our response efforts for outbreaks and clusters of concern.

Specific project objectives to be performed by the intern:

The intern will be expected to collect and organize information spread across a multitude of research projects. The applicant will structure the data in way that is uniform and can be readily used in a programmatic way.

Specific deliverables:

- a. Table or SQLite database of research environmental isolates and relevant metadata.
- b. Isolates updated in GIMS.
- c. Plots/maps characterizing the metadata.

Qualifications of the student that will increase the likelihood of the project's success (e.g., applicable course and lab work, research or work experience, etc.):

- a. Background in a quantitative field of study.
- b. Experience with data analysis and statistics/mathematics.
- c. Experience with map data and GIS.
- d. Experience with data analysis software (R/Python/etc.).

Location: CFSAN Wiley Building, 5001 Campus Drive, College Park, MD