

ID: 34228431

Infectious Diseases, Wastewater Surveillance - Host Site Description

Colorado Department of Public Health and Environment

Assignment Location: Denver, US-CO
Colorado Department of Public Health and Environment
Communicable Diseases Branch

Primary Mentor: Natalie Marzec, MD, MPH
Zoonoses and One Health Program Manager
Colorado Department of Public Health and Environment

Secondary Mentor: Rachel Jervis, MPH
Foodborne, Enteric, Waterborne, + Wastewater Diseases Program Manager
Colorado Department of Public Health and Environment

Work Environment

Hybrid

Assignment Description

The Communicable Disease Branch (CDB) at the Colorado Department of Public Health and Environment (CDPHE) includes respiratory diseases (COVID-19 and influenza), foodborne/enteric illness (including Hepatitis A), vaccine preventable disease, healthcare-associated infections, tuberculosis, emerging infections, zoonotic, and vectorborne diseases. CDB staff provide guidance and technical assistance to local health departments, hospitals, and health care providers.

The Fellow will be assigned to two programs within CDB: Zoonosis and One Health (ZOH) and Foodborne, Enteric, Waterborne, and Wastewater Diseases (FEWWD). ZOH will facilitate training on the epidemiology and investigation of over 20 zoonotic and vector-borne pathogens. With FEWWD, the fellow will participate in enteric disease surveillance and routinely investigate disease clusters and outbreaks. The combined work within these two program areas will provide ample opportunity for a CSTE Fellow to develop core skills and meet the required competencies of the program including elements of epidemiologic methods, communication, and public health practice, policy, and legal issues. Day-to-day activities of the Fellow will vary greatly based on the disease control issues occurring in Colorado at the time. The fellow will participate in responses to specific disease cases and outbreaks in the FEWWD and ZOH programs. The fellow will have the opportunity to work with other CDB programs, including responding to novel and emerging public health threats. Work will include case interviews, discussion with local public health agencies, participation in CDC and other national calls, calling health care providers, conducting reviews of medical records and site investigations and environmental assessments. As the Fellow is a trainee, he or she could be asked to work on unique CDB investigations including vaccine preventable diseases and healthcare associated events as time allows. Most recently our AEF assisted with CDB's mpox response as well as investigating an outbreak of non-tuberculous mycobacteria in a healthcare facility. The Fellow will participate in weekly staff meetings which will keep them involved in current activities and policies within the department. The Fellow, with training, will be allowed to take "epi call" with other epidemiologists on a rotating schedule. This allows for exposures to a broad range of topics that epidemiologists in CDB assist with.

Describe Statistical and Data Analysis Support, Such as Databases, Software, and Surveillance Systems Available to the Fellow

CDPHE staff utilize multiple databases including:

- EpiTrax houses information regarding individual cases of notifiable conditions; EpiTrax also serves as CDPHE's outbreak database and houses rabies, plague and tularemia animal testing information.
- ArboNET is an arbovirus database housed at CDC that Colorado contributes animal and human arbovirus data to.

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- Data Lakehouse contains current and historical Colorado data as well as West Nile virus mosquito surveillance data.

Within our branch we have staff that are skilled in data management using SAS, R and SQL, and happy to share their knowledge with trainees. We utilize REDCap for data collection and surveillance and Tableau for data visualizations and interactive webpages.

Projects

Surveillance Activity Title: Changing Epidemiology of Shigella

Surveillance Activity Description:

In the early 2000s, Shigella disproportionately impacted young children, many of whom were Latinx, in childcare facilities. Since then, we've seen an increase in Shigella among adults. We've investigated outbreaks of Shigella impacting people experiencing homelessness and associated with sexual transmission. Extensively Drug Resistant (XDR) Shigella is an increasing problem in Colorado and the U.S.

Surveillance Activity Objectives:

Objectives:

- Extract Colorado Shigella surveillance data
- Clean data
- Create summary statistics
- Create an analysis plan to evaluate if some populations are disproportionately affected by Shigella in Colorado
- Conduct analysis

Deliverables:

- Summary report for CDPHE
- Recommend updates to CDPHE's Shigella case investigation form and educational material
- Present on findings to Colorado Local Public Health Agencies
- If findings are noteworthy, submit abstract to national conference (CSTE and or InFORM)

Surveillance Activity Impact:

By assessing the changing epidemiology of Shigella, CDPHE can apply diversity, equity, and inclusion principles to Shigella surveillance, case interviews, and outbreak response.

Surveillance System Evaluation Title: An evaluation of CDPHE's Influenza and RSV wastewater monitoring pilot project

Surveillance System Evaluation Description:

CDPHE added Influenza and RSV to its wastewater monitoring protocol for the 2023/2024 respiratory virus season. We used a sentinel surveillance site model monitoring at ten utilities across the state. An evaluation of this model will help determine if the monitored population is representative of the population of Colorado and where we need to make changes for future respiratory virus seasons.

Surveillance System Objectives:

Objectives:

- To evaluate the sentinel surveillance site model for flu and RSV
- To communicate evaluation findings to stakeholders, including the respiratory virus team and wastewater partners

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- Based on findings, suggest alternative sewersheds to monitor and/or additional monitoring locations

Deliverables:

- Report with findings of evaluation
- Presentation of findings for internal and external stakeholders

Surveillance System Impact:

Wastewater surveillance is an evolving field. In Colorado, we aim to provide data to help stakeholders make informed decisions about where to allocate resources and to determine their level of disease risk. An evaluation of this pilot project will help us determine if we are monitoring locations that represent Colorado's population and helping us achieve a sustainable program.

Major Project Title: Correlation of clinical data to respiratory virus targets (flu/RSV) in wastewater surveillance data for the 2023-2024 respiratory virus season

Major Project Description:

Perform a correlation analysis for clinical surveillance metrics to wastewater surveillance data for flu/RSV using 2023-2024 data. CDPHE always uses clinical data to compare to wastewater data to help determine what is happening with the level of disease in a community. 2023-2024 was the inaugural season of monitoring for flu/RSV in wastewater. This analysis will help determine if we chose the best clinical metrics for comparison and whether we are able to detect these targets in wastewater before we see them in clinical cases.

Major Project Objectives:

Objectives:

- Correlate clinical data with wastewater surveillance data for flu/RSV
- Communicate findings to stakeholders (Wastewater surveillance team and respiratory virus program team)
- Based on findings, suggest alternative clinical metrics for comparison

Deliverables:

- Develop a report with findings
- Develop a presentation of findings for internal stakeholders
- If no correlation exists, suggest alternative metrics for comparison or suggest the benefits for wastewater surveillance for these targets

Major Project Impact:

This analysis will help us understand the value of wastewater surveillance for respiratory virus targets. If a correlation is found, we can make a case for using wastewater surveillance data alone to help understand disease levels and risk in a community. Otherwise, this will give us the information we need to make changes to our current protocol to get the most out of the data for the next season.

**Additional Project #1 Title: Analysis of an unusually bad WNV season
Project #1 Type: Major Project**

Project #1 Description:

In 2023, the highest number of human West Nile virus cases since the introduction of the virus were reported. Local jurisdictions that perform mosquito surveillance for the disease also reported record breaking highs in both vector abundance and infectivity. CDPHE partners at CSU's Center for Vector-borne Infectious Diseases are investigating possible vector and virus contributors to this unusually severe season. The CSTE AEF would work with those CSU groups

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to determine human disease epidemiology and other factors that could be evaluated to round out CSU's projects and provide a true One Health view of the issue.

Project #1 Objectives and Expected Deliverables:

- Analyze human and mosquito WNV data from the 2023 season
- Summarize 2023 data
- Develop a strategy to compare 2023 data to prior years' data
- Coordinate with surveillance partners to incorporate additional non-public health data including additional mosquito testing, mosquito abundance data, veterinary case data, and ecological data
- Meet with CSU investigators to understand their work related to the 2023 season
- Determine what public health data is important to share with collaborators and become more familiar with policies surrounding data sharing
- Present a summary of the data in a public health forum:
 - A state-wide communicable disease epi update meeting
 - A national (CSTE) meeting
 - A regional vector-borne disease partners meeting (Rockies and High Plains Vectorborne disease center)

Deliverables:

- Summary report of West Nile virus surveillance in 2023
- Slide deck presentation for RaHP Vec partners
- Summary report of West Nile virus in a One Health context in partnership with CSU and LPHA colleagues

Project #1 Impact:

West Nile virus is the most commonly reported mosquito borne disease in the United States and Colorado reported the highest case count of any state in 2023. Mosquito borne disease activity depends on many factors related to mosquitoes, birds, humans, and the environment. Not only will this project provide information that will be used to target future disease control activities, it will also be an opportunity to attempt a more comprehensive One Health approach to a vector-borne disease.

Additional Project #2 Title: Foodborne, Enteric, + Waterborne Disease outbreak response

Project #2 Type: Major Project

Project #2 Description:

Foodborne outbreaks are a cornerstone of epidemiology. The outbreak investigation and analysis skills gained investigating foodborne outbreaks can be applied to other disease groups and work.

Project #2 Objectives and Expected Deliverables:

Objectives:

- Shadow two or more outbreak investigators on outbreaks'
- Become familiar with foodborne, enteric, and waterborne disease surveillance in Colorado
- Learn to use the Colorado Electronic Disease Reporting Systems (CEDRS)
- Become familiar with Whole Genome Sequencing and learn how it is used to detect and investigate outbreaks
- Participate in weekly lab-epi meetings about Whole Genome Sequencing
- Become familiar with Colorado's Outbreak Database
- Lead outbreak investigations:
 - Complaint-based outbreaks (typically local outbreaks such as a wedding or church picnic)
 - Surveillance-based outbreaks (typically multi-state and associated with a widely distributed product)

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- Follow the steps in an outbreak investigation
- Detection
- Case definition
- Forming a team
- Develop hypothesis
- Conducting an epidemiologic study
- Environmental health assessment: fellow will join EH professionals on environmental assessments
- Laboratory testing: the fellow will use laboratory results
- Disease control measures
- Outbreak reporting
- Collaborate with local public health agencies

Deliverables:

- Outbreak documentation (linelists, summaries, etc)
- Outbreak data entered into outbreak database
- Present outbreak updates on staff meetings

Project #2 Impact:

Prompt and thorough investigation of foodborne, enteric, and waterborne disease outbreaks are essential to reducing the number of illnesses in a single outbreak and preventing future outbreaks.

Please Describe the Fellow’s Anticipated Role in Preparedness and Response Efforts – Include Activities and Time Allocation (Required Competency of Fellowship)

We will involve the fellow in setting up the emergency wastewater surveillance system and its possible deployment. This effort aims to enroll all Colorado wastewater utilities serving 3,000 people or more in our emergency system. When the need arises, we will contact the utilities in an affected region to ask them to begin collecting wastewater samples for us to test for a public health pathogen of concern. If the system is deployed, the fellow will have an opportunity for communication with the wastewater utilities, analyzing results, and relaying results back to utilities.

The fellow will be encouraged to collaborate on disaster planning (including concurrent disaster planning) with CDPHE’s Office of Emergency Preparedness and Response and take emergency preparedness trainings offered by CDPHE. The fellow will have the opportunity to contribute to the development of preparedness exercises.

Please Describe the Fellow’s Anticipated Role in Cluster and Outbreak Investigations – Include Activities and Time Allocation (Required Competency of Fellowship)

The fellow will conduct outbreak investigation as part of the major activity and participate in outbreak investigations of other pathogens and non-communicable diseases. The fellow will have the opportunity to contribute to new, emerging responses. Past fellows have contributed to mpox, highly pathogenic avian influenza, measles response, non-tuberculous mycobacteria, Brucella RB51 infection in a dairy cow.

Please Describe the Fellow’s Anticipated Role in the COVID-19 Response – Include Activities and Time Allocation

The fellow will be incorporated into the COVID-19 pandemic response, including opportunities to work with the CDPHE Office of Emergency Preparedness and Response, Immunization Branch, and COVID-19 Epi response.

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Please Describe Opportunities for Fellows to Work in Health Equity as well as Incorporating Diversity, Equity, and Inclusion into their Work

The fellow will have opportunities to take DEI trainings and apply DEI principles into their work. For example, the Surveillance Activity (Changing epidemiology of Shigella) will include assessing if disproportionately affected populations have higher rates of Shigella. It will also include opportunities to make improvements to CDPHE's Shigella case investigation form and educational materials.

During work on outbreak investigations, the fellow will have the opportunity to work with CDPHE's team of cultural navigators to ensure that public health communication and education are culturally relevant. CDPHE also has a group of epidemiologists devoted to working with disproportionately affected populations. The fellow will have an opportunity to work with this group, contribute to their projects, and make public health more equitable in Colorado.

Other, unanticipated opportunities are likely to arise. For example, our current CSTE fellow actively participated in a CDC EpiAid about people experiencing homelessness in Denver. The fellow conducted field interviews and is actively involved in data analysis.