



The Enterics Strike Back

To protect and promote the health and safety of the people of Wisconsin



WISCONSIN DEPARTMENT
of HEALTH SERVICES

Clinical Labs and Their Impact on Food Safety

Lynn Roberts, DVM, MPH
Epidemiologist

Enteric and Waterborne Diseases Unit
Division of Public Health

September 2024



A Really Bad Headache

Early 2024

Presentation



Jennifer, female, 49 years old*



Returned from Florida vacation 14 days ago



Complained of a bad headache to brother

*Not the case-patient's name. Details changed.

Presentation



- Brother found her in bed unconscious the next morning
- Brother called emergency medical services (EMS), and Jennifer was transported to local emergency department

*Not the case-patient's name. Details changed.

Presentation

- EMS found Jennifer unresponsive, with increased respiratory effort and hypertension
- Intubated and sedated upon ED presentation, blood pressure quickly improved



Presentation

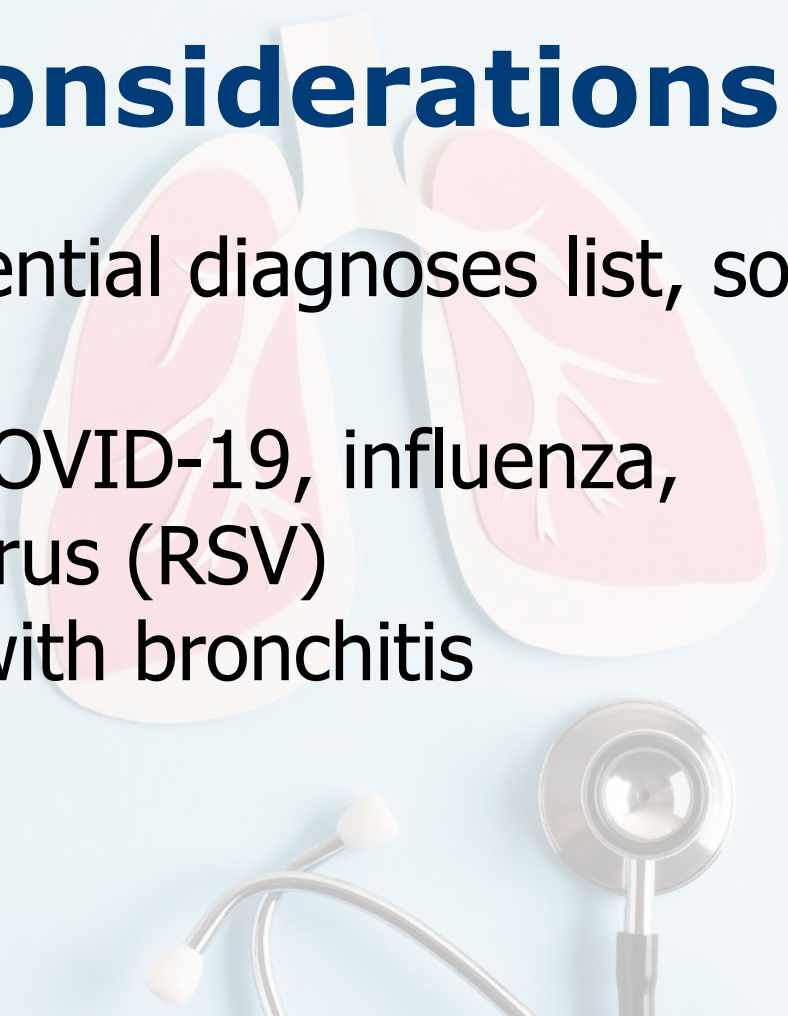
- **Immediate concern:** acute hemorrhagic stroke
 - Head CT performed; no acute hemorrhage identified
 - Diffuse paranasal sinus disease observed

History

- Medical records: Jennifer visited urgent care eight days before her headache started
 - Shortness of breath and flu-like symptoms started the day she returned from Florida
 - Diagnosed with bronchitis and prescribed treatment
- Patient is morbidly obese
- No other medical history available

Diagnostic Considerations

- Stroke is off the differential diagnoses list, so what else to consider?
- Respiratory disease: COVID-19, influenza, respiratory syncytial virus (RSV)
 - Recently diagnosed with bronchitis
 - Pneumonia?



Diagnostic considerations

- Drug overdose
- Congestive heart failure
- Sepsis
- Meningitis
- Dehydration
- Electrolyte disturbance
- Rhabdomyolysis
- Diabetic ketoacidosis?



Diagnostic testing

- **Venous blood gases**
 - $p\text{CO}_2 = 60 \text{ mmHg} = \text{respiratory acidosis}$
- **Chest radiographs**
 - Suspicious for right lower lobe infiltrate
- **Quadruplex respiratory PCR panel**
 - Positive for RSV

Diagnostic testing

- **Complete blood count (CBC)**
 - Significant leukocytosis of 27,000 cells/ μ L
 - Slightly hemoconcentrated
- **Blood chemistry**
 - Potassium and creatinine within normal limits (WNL)
 - Creatine kinase, BUN, and glucose elevated
 - No anion gap acidosis

Diagnostic testing

- **Prothrombin time WNL**
- **Troponin WNL**
- **Urinalysis**
 - Glucosuria and ketonuria, no infection
- **Urine drug screen:** negative



Diagnostic testing

- **Lumbar puncture performed**
 - Cerebral spinal fluid (CSF) had an elevated cell count of 277, mostly neutrophils
 - Protein elevated
- **Samples of CSF sent to lab for a rapid meningoencephalitis panel and culture**

Diagnostic testing

- **MRI of the brain performed**
 - Eight-millimeter abscess observed at the posterior horn of the right lateral ventricle
 - Neurosurgery service did not recommend surgical intervention



Assessment

- Multifactorial acute respiratory failure and respiratory acidosis
 - RSV infection
 - Obesity hypoventilation syndrome
 - Suspected sleep apnea
 - Sepsis
 - Meningoencephalitis

Assessment

- Meningoencephalitis, unknown etiology
- Acute on chronic pansinusitis
- RSV infection

Plan

- Admit patient to intensive care unit
- Patient will continue on intubation and mechanical ventilation
- Continue vancomycin, ceftriaxone, ampicillin, acyclovir, and ribavirin
- Await CSF testing results for medication changes



Enteric and Waterborne Diseases Unit

Enteric Epi of the Day

- Monday through Friday during business hours
- Voicemail: 608-267-7143
- Email: DHSDPHEnterics@dhs.wisconsin.gov



Karen Boegler



Sarah Koske



Lynn Roberts



Kim Zelton

What Do We Cover?

- *Campylobacter*
- *Cryptosporidium*
- *Cyclospora*
- *E. coli*: STEC, ETEC, EPEC
- *Giardia*
- Hemolytic uremic syndrome
- *Listeria*
- *Salmonella*
- *Shigella*
- Typhoid/paratyphoid fever
- *Vibrio* and cholera
- *Yersinia*

What Do We Cover?

- Outbreaks
 - Acute gastroenteritis (norovirus)
 - Foodborne
 - Waterborne
 - Other diarrheal disease outbreaks

Navigating the DHS site

The screenshot shows the homepage of the Wisconsin Department of Health Services. The browser address bar displays dhs.wisconsin.gov. The navigation menu is expanded, showing the following categories and sub-items:

- About DHS
- Data & Statistics
- Diseases & Conditions**
 - A-Z Listing of Topics
 - Childhood Communicable Diseases
 - Chronic Disease Prevention
 - COVID-19
 - Disease Prevention
 - Disease Reporting**
- Health Care & Coverage
 - Fight the Bite
 - Food Poisoning
 - Fungal Infections
 - Illnesses Spread by Animals
 - Illnesses Spread by Mosquitoes
 - Illnesses Spread by Ticks
- Long-Term Care & Support
- Prevention & Healthy Living
 - Illnesses Spread by Water
 - Immunizations
 - Invasive Bacteria
 - Mental Health
 - Outbreaks Under Investigation
 - Respiratory Viruses
- Partners & Providers
- Certification, Licenses & Permits
 - Sexually Transmitted Diseases
 - Skin Infections
 - Substance Use Disorders

Resources

- Reporting requirements and methods
- Investigation protocols
- **Public health interventions and prevention measures (“EpiNets”)**

The screenshot displays the 'Disease Reporting' page for 'Communicable diseases and other notifiable conditions'. The page features a navigation menu at the top with categories like 'About DHS', 'Data & Statistics', 'Diseases & Conditions', 'Health Care & Coverage', 'Long-Term Care & Support', 'Prevention & Healthy Living', 'For Partners & Providers', and 'Certification, Licenses & Permits'. The main content area is titled 'Category I' and contains a paragraph explaining that the following diseases are of urgent public health importance and must be reported immediately. Below this text is a table of 'Category I Diseases' with columns for the disease name and associated report numbers. At the bottom, there is a sidebar with expandable sections for 'Category I', 'Category II', 'Category III', and 'Case reporting methods and contact information'.

g.htm

About DHS | Data & Statistics | Diseases & Conditions | Health Care & Coverage | Long-Term Care & Support | Prevention & Healthy Living | For Partners & Providers | Certification, Licenses & Permits

Home > Diseases & Conditions > Disease Reporting

Disease Reporting

Communicable diseases and other notifiable conditions

[Close all](#) [Open all](#)

Category I

The following diseases are of urgent public health importance and shall be reported IMMEDIATELY by telephone to the patient's [local health officer](#), or to the local health officer's designee, upon identification of a case or suspected case. In addition to the immediate report, within 24 hours, complete and fax, mail, or submit a case report electronically through the Wisconsin Electronic Disease Surveillance System (WEDSS), or by other means. Public health intervention is expected as indicated. See [Wis. Admin. Code, § DHS 145.04\(3\)\(a\)](#) and [Wis. Stat. § 252.05](#)

Category I Diseases

| Category I Disease | Notes |
|--|------------|
| Anthrax | 1, 4, 5 |
| Botulism (<i>Clostridium Botulinum</i>) including foodborne, infant, wound, and other | 1, 2, 4, 5 |
| Carbapenemase-producing carbapenem-resistant Enterobacterales (CP-CRE) As of April 25, 2022, this is a Category II disease | 1, 2, 7 |
| Cholera (<i>Vibrio cholera</i>) | 1, 3, 4 |
| Diphtheria (<i>Corynebacterium diphtheriae</i>) | 1, 3, 4, 5 |

[Close all](#) [Open all](#)

- Category I +
- Category II +
- Category III +
- Case reporting methods and contact information +

EpiNets

Local and tribal health departments are responsible for determining when patients in high-risk settings are permitted to return to work

LHDs | LICHS | PCA Portal | SOS SharePoint | WSLH | Child Care Licensing... | NORS | CDC | Listena Data Entry | Search - Uploa

ditions | Coverage | Support | Living | Providers | Permits

Poisoning > E. coli (Diarrhea Causing)

E. coli (Diarrhea Causing)

IV. PUBLIC HEALTH INTERVENTIONS AND PREVENTION MEASURES

A. In accordance with Wis. Admin. Code § [DHS 145.05](#), local public health agencies should follow the methods of control recommended in the current editions of *Control of Communicable Diseases Manual*, edited by David L. Heymann, published by the American Public Health Association, and the American Academy of Pediatrics' *Red Book: Report of the Committee on Infectious Diseases*, unless otherwise specified by the state epidemiologist.

B. Educate the public about proper handwashing after using the toilet, changing diapers, assisting another with toileting, handling contaminated clothing or linens, before cooking, or when associating with high-risk individuals.

C. Exclude symptomatic patients from high-risk settings including food handling, providing patient care or child care, or attending a child care facility or 4K program.

1. Individuals should not return to high-risk settings following exclusion until they have been cleared by their LHD. Return to high-risk activities for a person diagnosed with a STEC infection routinely requires evidence of two stool specimens negative for Shiga toxin-producing *E. coli* by culture or CIDT be provided to the LHD. Stool specimens for clearance (test of cure) should be collected 1) after the individual is asymptomatic and 2) at least 48 hours after discontinuing of antimicrobial therapy. Specimens should be collected at least 24 hours apart.
2. Exclusion, restriction, and reinstatement criteria used by the LHD for infected individuals who are food employees should meet [Wisconsin Food Code](#) criteria, and may be more restrictive than the Wisconsin Food Code.

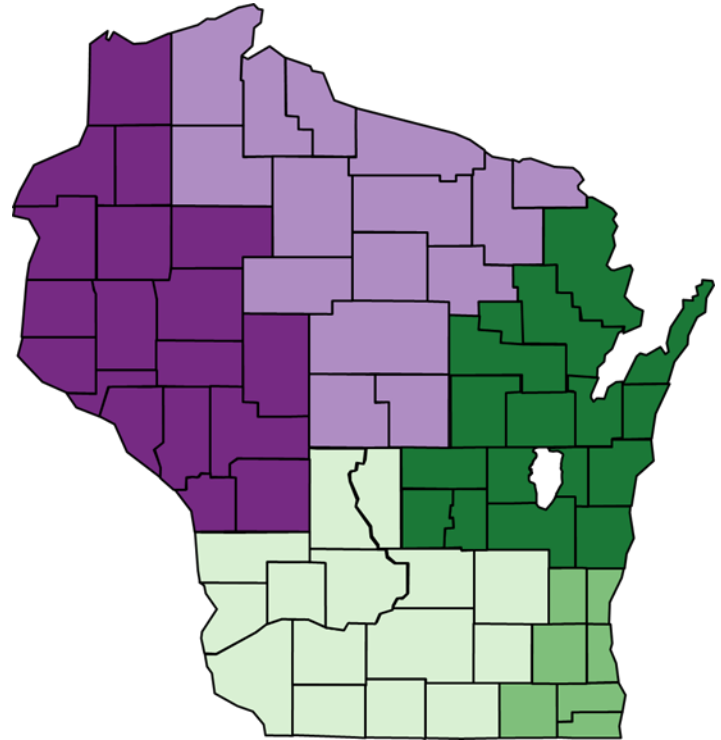
D. Follow-up should be conducted with child care facilities, 4K programs and other public or private group child settings where a STEC patient 1) spent time during the 7 days prior to illness onset, or 2) spent time while symptomatic, or 3) spent time after symptom resolution but before having verified negative stool specimens. Particular attention should be given to case finding, outreach, and education in settings with diaper-aged children or young children (approximately 5 years and under) whose hand hygiene may be unreliable and where risk of person-to-person transmission is more likely.

Provider information

| | |
|----------------|---|
| Surveillance | + |
| Case Reporting | + |

Wisconsin Public Health

- 96 local and tribal health departments (LTHDs)
- Five public health regions
- Wisconsin Department of Health Services (DHS), Division of Public Health (DPH), aka “the state”



LTHDs Have the Power

- Wisconsin is a “home rule,” or decentralized state
- **LTHDs have primary responsibility for:**
 - Enforcing public health statutes and rules
 - Investigating cases or arranging for the investigation of cases

LTHDs Have the Power

- **DHS (“the state”) is responsible for:**
 - Guidance, consultation, subject matter expertise
 - Surge capacity and support
 - Overseeing statewide surveillance

Surveillance and Outbreak Support (SOS) Team

- **Purpose:** Improve Wisconsin's enteric disease surveillance and outbreak response by:
 - Assisting LTHDs and DHS
 - Conducting timely and complete enteric interviews



SOS Team Helps with:

- Interviewing patients diagnosed with reportable enteric and waterborne diseases
- Interviewing people during enteric and waterborne outbreak disease investigation
- Data support

A person wearing a white lab coat is holding a white plate of food. The plate contains a variety of items including a fried chicken drumstick, a piece of bread, some green peas, and a slice of tomato. In the background, there are blurred figures of other people and a buffet line with metal trays of food. The overall scene suggests a public health or clinical setting where food is being served or sampled.

The Path from Clinical Testing to Public Health Action

Our Surveillance System

- Wisconsin Electronic Disease Surveillance System (WEDSS)
- Web-based
- Lab reports and web reports for reportable conditions automatically sent to WEDSS
- State and local health department staff get automated notifications

1WW Home Page

ATLAS PUBLIC HEALTH

My Case Load

Logged in as: Roberts, Lynn

Disease Incident

Patient: Doe, Jennifer
DOB: 01/01/1975

Patient LISTEN

* Disease Being Reported

Name
* Last Name * F
Doe

Future Client No.

Address Number & Street
100 Main St

City
Anytown

Census Tract
N/A

Country of Birth

Home Telephone
608-555-5555

E-mail Address
jenniferdoe@gmail.com

Work/School Location

* Gender
Female

Marital Status

WEDSS Reporter -

Wednesday, August 28,

SENDING LAB

PATIENT CLASS

ADMIT DATE
07/23/2023 19:57

ACCESSION #

SPECIMEN COLLECTED DATE
07/24/2023 01:27

SPECIMEN SOURCE
CEREBROSPINAL SPECIMEN

SPECIMEN NOTES

Body Site:
Cerebrospinal Fluid Specimen

Collection Method
Non-blood

RELEVANT CLINICAL INFORMATION REPORTED
07/28/2023 03:24

TEST ORDERED: Concurrent

RESULT

BKR LISTERIA MONOCYTOGENE NAAT

L monocytog D CSF QI NAA+non-p Inpatient

Performing Organiz

WEDSS Reporter - LabReport

Thursday, August 29, 2024

Lab Report 12:08:46 PM

Order Status: Final

PATIENT NAME

PATIENT ID # DOB AGE GENDER

ETHNICITY RACE

PATIENT ADDRESS

PATIENT PHONE # WORK PHONE #

NEXT OF KIN INFORMATION
Relationship: Spouse

Name:

Address:

Home Phone:

ORDERING FACILITY REFERRING PHYSICIAN

TEST ORDERED: Bacteria Spec Aerobe Cult-AEROBIC CULTURE WITH GRAM STAIN

Identification was performed using Mass Spectrometry. This test was developed and its performance characteristics determined by the Wisconsin Diagnostic Laboratories Microbiology Department. It has not been cleared or approved by the U.S. Food and Drug Administration. This test is used for clinical purposes. It should not be regarded as investigational or for research. This Laboratory is certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA) as qualified to perform high complexity clinical laboratory testing.

| RESULT | VALUE | UNITS | REFERENCE RANGES | ABNORMAL | RESULT STATUS |
|-------------------------------|---------------------------|-------|------------------|----------|---------------|
| BKR CULTURE | LISTERIA MONOCYTOGENES | | | Abnormal | Final |
| Bacteria ID test Islt QI Cult | LISTERIA MONOCYTOGENES | | | Abnormal | Final |
| | 1+ Listeria monocytogenes | | | | |
| | Inpatient | | | | |
| Performing Organization | | | | | |
| Performing Organization | | | | | |

Wisconsin Department of Health Services

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First Steps

- LTHD contacted as soon as possible after WEDSS notification received
- Interview questionnaire specific to listeriosis provided
- LTHD asked to ensure specimens/isolates are forwarded to the Wisconsin State Laboratory of Hygiene (WSLH)
- SOS Team support provided on request

Listeriosis is Hard to Investigate

- Initial laboratory results for Jennifer were received one day after she presented to the ED
- Was in a “medically induced coma” when LTHD spoke to brother four days later
- Jennifer lived alone and her siblings could not answer the interview questions for her
- Investigation status: **stalled**

Further Testing at WSLH

WSLH's culture report confirmed the clinical laboratory's culture results.

At this point, WSLH performs their sequencing magic.

WEDSS Reporter - LabReport

Thursday, August 29, 2024 Lab Report 12:13 41 PM

WEDSS
Electronic Disease Surveillance

SENDING LAB
Wisconsin State Laboratory of Hygiene (52D0661989)
2601 Agriculture Dr
Madison, WI 53718
(800) 862-1013

ORDER STATUS: Final

ORDER # [REDACTED] GENDER F

PLACER ORDER # [REDACTED]

ETHNICITY [REDACTED] RACE [REDACTED]

PATIENT ADDRESS [REDACTED]

PATIENT PHONE # [REDACTED] WORK PHONE # [REDACTED]

ORDERING FACILITY [REDACTED] REFERRING PHYSICIAN [REDACTED]

LABORATORY SEND OUTS [REDACTED]

ACCESSION # [REDACTED]

SPECIMEN COLLECTED DATE 07/24/2023 01:27 SPECIMEN RECEIVED DATE 07/28/2023

SPECIMEN SOURCE Bacterial Isolate RESULT

SPECIMEN NOTES

Body Site: CSF

RELEVANT CLINICAL INFORMATION REPORTED 08/07/2023 13:49 REASON FOR STUDY RESULTED 08/07/2023 13:49

TEST ORDERED: REFERRED ISOLATE-PUBLIC HEALTH

| RESULT | VALUE | UNITS | REFERENCE RANGES | ABNORMAL | RESULT STATUS |
|------------------------------|-----------------------------|-------|------------------|----------|---------------|
| PUBLIC HEALTH CULTURE RESULT | Identified by submitter as: | | | | Final |
| Bacteria XXX Cult | Listeria monocytogenes | | | | Final |

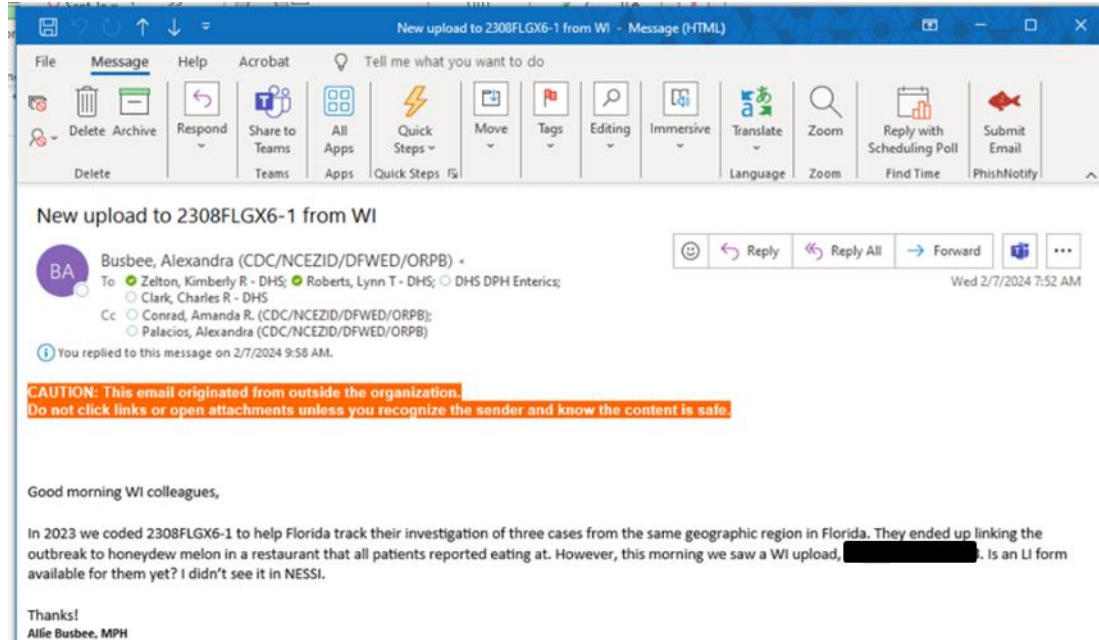
| RESULT | VALUE | UNITS | REFERENCE RANGES | ABNORMAL | RESULT STATUS |
|------------------------------|------------------------|-------|------------------|----------|---------------|
| PUBLIC HEALTH CULTURE RESULT | LISTERIA MONOCYTOGENES | | | Abnormal | Final |
| Bacteria XXX Cult | Listeria monocytogenes | | | Abnormal | Final |
| | Listeria monocytogenes | | | | |

Performing Organization: Wisconsin State Laboratory of Hygiene
Performing Organization Address: [REDACTED]

New Developments

About two weeks later, WGS data was uploaded to PulseNet.

Soon after, CDC emailed DHS to report that a Wisconsin case of listeriosis matched cases from an old Florida outbreak.



Investigation: Renewed!

- Early 2023: Florida Department of Health identified four *Listeria* cases that reported eating at Bob's Big Boy Buffet in Swampsville, FL, before illness*
- FDH swabbed multiple locations throughout the restaurant and took samples of food from the buffet
- All swabs and all case-patients matched a sample of honeydew

*Bob's Big Boy is a restaurant chain that is only found in the Los Angeles area. Swampsville, FL, surprisingly, does not exist.

“Someone Jinxed Us”

FDH worked closely with Bob’s owners to remediate the restaurant. Suggestions included:

- Replacing cracked flooring that was hard to clean and could easily harbor *Listeria*
- Changing a wooden shelf in the walk-in fridge to stainless steel to facilitate cleaning
- And more

Success Story?

- For the last year, FDH believed they had corrected the problems that led to Bob's 2023 listeriosis outbreak
 - In fact, they considered it a huge success story for their department
- Until Jennifer's isolate was sequenced in 2024 and matched **all of the 2023 isolates**

Success Story?

- Armed with the Bob's Big Boy name and the location of Swampsville, the Wisconsin LTHD called Jennifer again
- Jennifer was discharged and doing well.
- She confirmed that she traveled to Florida for 10 days and returned about two weeks before she was hospitalized

Success Story!

- Jennifer was pretty sure she'd eaten at Bob's Big Boy Buffet but had to check when and where.
- After contacting traveling partner, who still had the receipt for their meal, Jennifer reported she had eaten fruit from the Swampsville location of Bob's two days before returning to Wisconsin.

1,300 Miles Between Us

- FDH returned to Bob's Big Boy for further investigation.
- Swabs from buffet surfaces, a seafood deli salad, the floor of the walk-in fridge, and the wooden shelf still in the walk-in all matched the 2023 outbreak and Jennifer's 2024 isolate.

A scientist in a clinical laboratory setting, wearing a blue hairnet, face mask, and gloves, is focused on examining a petri dish under a microscope. The lab bench is cluttered with various glassware, including a flask with blue liquid, several petri dishes, and test tubes in a rack. The background shows shelves with more lab equipment, creating a professional and sterile environment.

Clinical Labs are Crucial to Protecting Public Health

Clinical Labs Save Lives

- Clinical laboratory specimens are the foundation of food safety not only in Wisconsin, but throughout the United States
- Without these specimens, WSLH could not perform the granular subtyping necessary to link cases across time and distance

Clinical Labs Save Lives

- Jennifer's isolate allowed us to pinpoint the food safety issues that led to her illness
- The next case that matched FDH's 2023 outbreak might not have survived
 - Listeriosis is like playing Russian roulette

Questions welcome

Lynn Roberts, DVM, MPH

608-800-2803

lynn.roberts@dhs.wisconsin.gov

