



How to Use WGS Public Databases

Part 2



January 12, 2021





Webinar Logistics

- Adjourn (60 minutes).
- Everyone will be muted during the initial presentation.
- All participants will be unmuted once the case studies section begins, as this portion is designed to be interactive. Please mute yourself when not speaking.
- Questions and comments can be submitted at any time via Chat box.
- There will be 2 important survey questions at the conclusion of this webinar. Your responses are appreciated.

The background is a teal-colored image featuring a close-up of a leaf with numerous water droplets. The leaf's veins are clearly visible, and the droplets are of various sizes, some reflecting light. The overall tone is a vibrant teal.

Meet the Speakers





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NCBI Pathogen Detection

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NCBI Pathogen Detection project

A centralized system that integrates sequence data for bacterial pathogens obtained from food, the environment, and human patients.

Goals:

- 1. to provide real-time analyses of isolates obtained from ongoing pathogen surveillance activities to answer the question: are these isolates clonally related?**
 - 2. to provide comprehensive information on the antimicrobial resistance genes found in these pathogens.**
- Public health and regulatory agencies in the US and internationally are collecting samples from clinical cases, from retail food products, and from industrial production facilities and environmental sites to facilitate active, real-time surveillance of pathogens and foodborne disease. The agencies sequence isolates and submit the data to NCBI, which analyzes the sequences against others in its database, including all genomes in GenBank, to identify closely related sequences. The aim is to uncover potential sources of contamination by linking isolates from food or the environment to human illness and to quickly report the sequence relationships to public health scientists in order to aid traceback investigations and outbreak response.



ncbi pathogens



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www.ncbi.nlm.nih.gov › pathogens ▼

Home - Pathogen Detection - NCBI

NCBI Pathogen Detection integrates bacterial pathogen genomic sequences originating in food, environmental sources, and patients. It quickly clusters and ...

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Isolates Browser

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Help

(The Pathogen Detection
Reference Gene Catalog help ...

Antimicrobial Resistance

National Database of Antibiotic
Resistant Organisms (NDARO ...

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About

The NCBI Pathogen Detection
project is a centralized system ...

Organism Groups

Species, Version, Publication Date*,
Latest Isolate Creation Date ...

Contributors

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Contributors. Major ...

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COVID-19 is an emerging, rapidly evolving situation.
Get the latest public health information from CDC: <https://www.coronavirus.gov>.
Get the latest research from NIH: <https://www.nih.gov/coronavirus>.
Find NCBI SARS-CoV-2 literature, sequence, and clinical content: <https://www.ncbi.nlm.nih.gov/sars-cov-2/>.

[Health](#) > Pathogen Detection

Pathogen Detection **BETA**



To assist the National Database of Antibiotic Resistant Organisms (NDARO), NCBI Pathogen Detection identifies the antimicrobial resistance, stress response, and virulence genes found in bacterial genomic sequences. This enables scientists to track the spread of resistance genes and to understand the relationships between antimicrobial resistance and virulence.

NCBI Pathogen Detection integrates bacterial pathogen genomic sequences originating in food, environmental sources, and patients. It quickly clusters and identifies related sequences to uncover potential food contamination sources, helping public health scientists investigate foodborne disease outbreaks.

NEW Pathogen Detection received the 2020 Federal Laboratory Consortium for Technology Transfer (FLC) [Interagency Partnership Award](#). For more info on how this

Learn More

[About](#)

[FAQ](#)

[Browser Factsheet](#)

[Antimicrobial Resistance Factsheet](#)

[Antimicrobial Resistance](#)

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Data Resources

[Isolates Browser](#)

Feedback

NEW Pathogen Detection received the 2020 Federal Laboratory Consortium for Technology Transfer (FLC) [Interagency Partnership Award](#). For more info on how this project is transforming food safety click [here](#).

[Find isolates now!](#)

Examples:

1. Search for isolates encoding a mobile colistin resistance gene and a KPC beta-lactamase
search: [AMR_genotypes:mcr* AND AMR_genotypes:blaKPC*](#)
2. Search for Salmonella isolates from the USA
search: [geo_loc_name:USA AND taxgroup_name:"Salmonella enterica"](#)

Explore the Data

Species	New Isolates	Total Isolates
Salmonella enterica	70	320,901
E.coli and Shigella	63	137,635
Campylobacter jejuni	49	57,920
Listeria monocytogenes	8	40,286

[See more organisms...](#)

Data Resources

[Isolates Browser](#)

NEW [Microbial Browser for Identification of Genetic and Genomic Elements \(MicroBIGG-E\)](#)

[Reference Gene Catalog](#)

[Isolates with antibiotic resistant phenotypes](#)

[Download analysis results \(FTP\)](#)

Submit

[How to submit data](#)

[How to submit antibiotic resistance phenotypes](#)

[How to submit beta-lactamases](#)

[NCBI Submission Portal](#)

 **Feedback**

NCBI Pathogen Detection Database: number of isolates for main pathogens

PATHOGEN	CLINICAL (human clinical)	ENVIRONMENTAL/OTHER (non-human clinical)
SALMONELLA	215,320	105,581
E. COLI/SHIGELLA	89,834	47,801
L. MONOCYTOGENES	12,783	27,503
CAMPYLOBACTER	25,287	32,633



Case Studies: Interactive Portion

- All participants will be unmuted once the case studies section begins, as this portion is designed to be interactive. Please mute yourself when not speaking.
- If background noise becomes distracting, we may have to manage questions and comments via the Chat box.
- Any questions and comments can be submitted through the Chat box at any time.




Investigation Notice

Posted on November 10, 2020 at 5:15 PM ET

CDC, public health and regulatory officials in several states, and the U.S. Food and Drug Administration (FDA) are investigating several multistate outbreaks of *E. coli* O157:H7 infections. This investigation notice provides information on a third ongoing *E. coli* O157:H7 outbreak.

Latest Outbreak Information



- 12 people infected with the outbreak strain of *E. coli* have been reported from 6 states.
 - 5 ill people were hospitalized. No deaths were reported.
- Laboratory testing identified the outbreak strain in a sample of Tanimura & Antle romaine lettuce in a single-head package.
 - The sample was collected and tested by the Michigan Department of Agriculture and Rural Development (MDARD) as part of its routine sampling.
 - On November 6, 2020, Tanimura & Antle [recalled](#)  its packaged single-head romaine lettuce.
- There is not enough epidemiologic and traceback information available at this time to determine if ill people got sick from eating Tanimura & Antle romaine lettuce. The investigation is ongoing to determine if additional products may be contaminated with the outbreak strain of *E. coli*.

At A Glance

- [Reported Cases: 12](#)
- [States: 6](#)
- Hospitalizations: 5
- Deaths: 0
- Recall: Yes

Multistate Outbreak of *E. coli* O157:H7 Infections Linked to Romaine Lettuce (Final Update)

[Español \(Spanish\)](#)

Posted June 28, 2018 3:30 PM EST

This outbreak appears to be over. *E. coli* is an important cause of illness in the United States. More information about *E. coli*, and steps people can take to reduce their risk of infection, can be found on the [E. coli and Food Safety web page](#).

Highlights

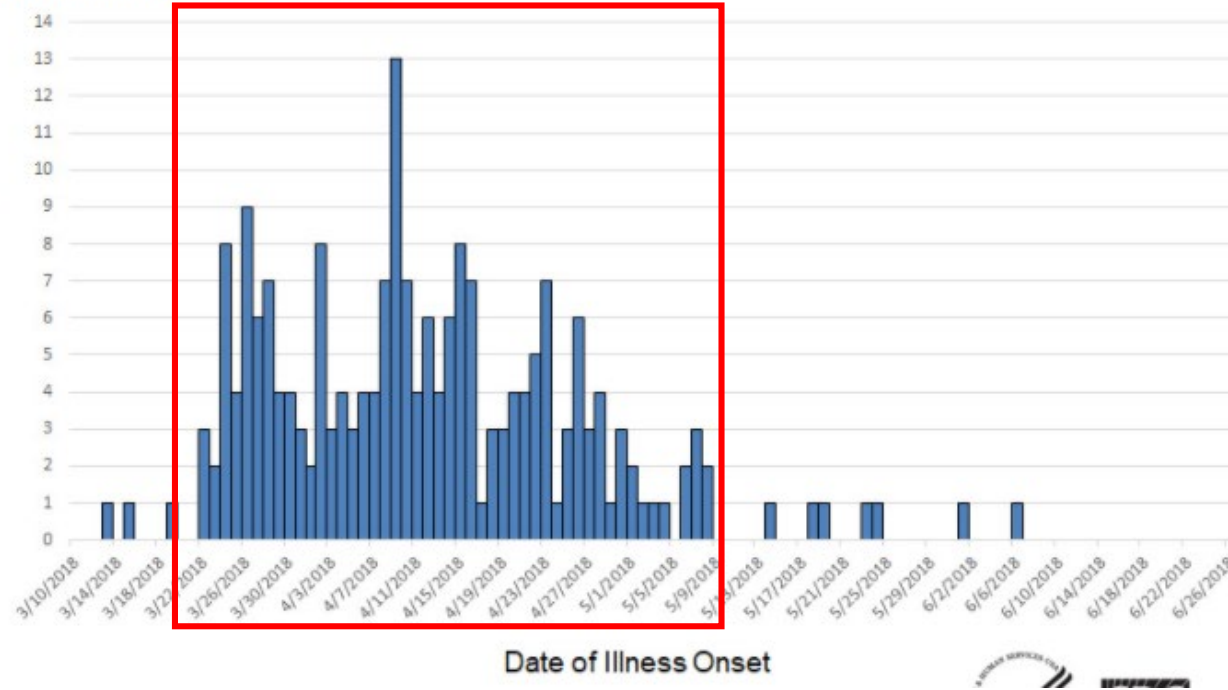
- This outbreak appears to be over as of June 28, 2018.
- CDC, public health and regulatory officials in several states, and the [U.S. Food and Drug Administration](#) (FDA) investigated a multistate outbreak of *E. coli* O157:H7 infections.
 - 210 people infected with the outbreak strain were reported from 36 states.
 - 96 people were hospitalized, including 27 people who developed a type of kidney failure called hemolytic uremic syndrome.
 - 5 deaths were reported from Arkansas, California, Minnesota (2), and New York.

At A Glance

- Case Count: [210](#)
- States: [36](#)
- Deaths: 5
- Hospitalizations: 96
- Recall: No



People infected with the outbreak strain of *E. coli* O157:H7, by date of illness onset*



The FDA and state and local regulatory officials traced the romaine lettuce to many farms in the Yuma growing region. The FDA, along with CDC and state partners, started an environmental assessment in the Yuma growing region and collected samples of water, soil, and manure. CDC laboratory testing identified the outbreak strain of *E. coli* O157:H7 in water samples taken from a canal in the Yuma growing region. WGS showed that the *E. coli* O157:H7 found in the canal water is closely related genetically to the *E. coli* O157:H7 from ill people. Laboratory testing for other environmental samples is continuing. FDA is continuing to investigate to learn more about how the *E. coli* bacteria could have entered the water and ways this water could have contaminated romaine lettuce in the region.

According to the FDA, the last shipments of romaine lettuce from the Yuma growing region were harvested on April 16, 2018, and the harvest season there has ended. Contaminated lettuce that made people sick in this outbreak should no longer be available.



Investigation Notice

Posted on December 18, 2020 at 3:00 PM ET

This outbreak is over. Learn how you can prevent getting sick from *E. coli*.

CDC, public health and regulatory officials in several states, and the U.S. Food and Drug Administration (FDA) investigated several multistate outbreaks of *E. coli* O157:H7 infections. This outbreak is different from two other *E. coli* O157:H7 outbreaks that occurred at the same time ([E. coli outbreak linked to leafy greens](#) and [E. coli outbreak with unknown source 3](#)).

Final Outbreak Information

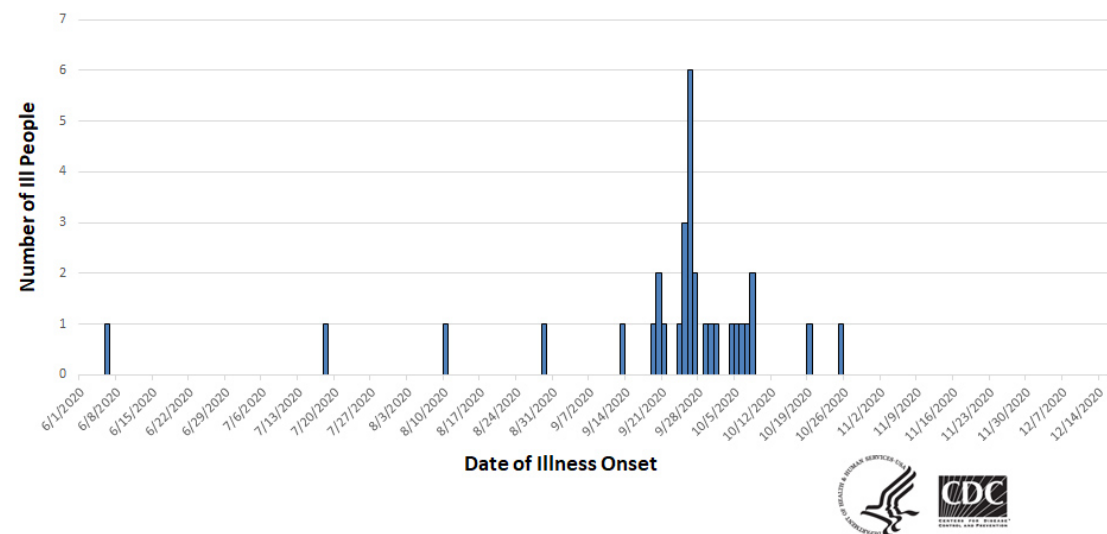


- As of December 18, 2020, this outbreak is over.
- A total of 32 people infected with the outbreak strain of *E. coli* O157:H7 were reported from 12 states.
 - Illnesses started on dates ranging from June 6.

At A Glance

- [Reported Cases](#): 32

People infected with the outbreak strain of *E. coli* O157:H7, by date of illness onset*



*n=32 for whom information was estimated or reported as of December 16, 2020.

The strain of *E. coli* O157:H7 causing illness in this outbreak has previously caused outbreaks linked to different sources, including an [outbreak linked to romaine lettuce in 2018](#). However, food linked to a previous outbreak alone is not enough to prove a link in another outbreak of the same strain. This is because different foods can be contaminated by the same strain of bacteria.

Outbreak Investigation of Salmonella Stanley: Wood Ear Mushrooms - Dried Fungus (September 2020)

CDC declares outbreak over. FDA's investigation is complete.

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The FDA, along with CDC and state and local partners, investigated a multistate outbreak of Salmonella Stanley infections linked to wood ear mushrooms imported by Wismettac Asian Foods, Inc. of Santa Fe Springs, CA. Wood ear mushrooms are a dried mushroom, also commonly labelled or referred to as Kikurage, Dried Black Fungus, Dried Fungus, or Mu'er/Mu Er/Mu-Err.

Wismettac Asian Foods, Inc. acted quickly upon being notified of the positive test result and recalled all wood ear mushrooms within shelf life on September 23, 2020.

Recommendation

Wood ear mushrooms imported by Wismettac Asian Foods, Inc. were only sold to restaurants and were not available directly to consumers. Although these items have been recalled, restaurants that received recalled products should use extra vigilance in cleaning and sanitizing any surfaces that may have come in contact with the recalled product, to reduce the risk of cross contamination. All recalled product should be thrown out.

Product Images



Recall Information

On September 23, 2020, Wismettac Asian Foods, Inc. recalled Shirakiku brand imported dried fungus. This product was labeled as Shirakiku brand Black Fungus (Kikurage) with UPC Code 00074410604305, imported from China. Product was distributed in six packs of five-pound bags to restaurants in AR, CA, CO, CT, DE, DC, FL, GA, HI, IA, IL, IN, LA, MA, MD, MI, MN, MO, MS, NC, NV, NJ, NY, OH, OR, PA, SC, TN, TX, VA, WA, and WI.

As part of this investigation, the California Department of Public Health (CDPH) collected samples of wood ear mushrooms, imported by Wismettac Asian Foods, Inc., from one of the restaurants where ill patients reported eating. On October 1, 2020, CDPH reported that genetic testing, or whole genome sequencing, determined that the Salmonella present in the samples matched the outbreak strain.

Multistate Outbreak of Listeriosis Linked to Packaged Salads Produced at Springfield, Ohio Dole Processing Facility (Final Update)

Posted March 31, 2016 9:00 AM ET

This outbreak appears to be over. However, *Listeria* remains an important cause of serious, life-threatening human illness in the United States. For more information about *Listeria* and steps that people can take to reduce their risk of infection, visit [CDC's *Listeria* webpage](#).

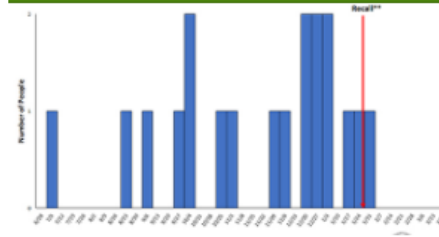
Highlights

- This outbreak appears to be over. However, *Listeria* remains an important cause of serious, life-threatening human illness in the United States. For more information about *Listeria* and steps that people can take to reduce their risk of infection, visit [CDC's *Listeria* webpage](#).
- CDC, several states, and the U.S. [Food and Drug Administration](#) (FDA) investigated a multistate outbreak of *Listeria monocytogenes* infections (listeriosis).
 - A total of 19 people infected with the outbreak strain of *Listeria* were reported from nine states.
 - All 19 people were hospitalized, and one person from Michigan died as a result of listeriosis. One illness was reported in a pregnant woman.
 - Whole genome sequencing (WGS) performed on *Listeria* isolates from all 19 ill people showed that the isolates were closely related genetically.

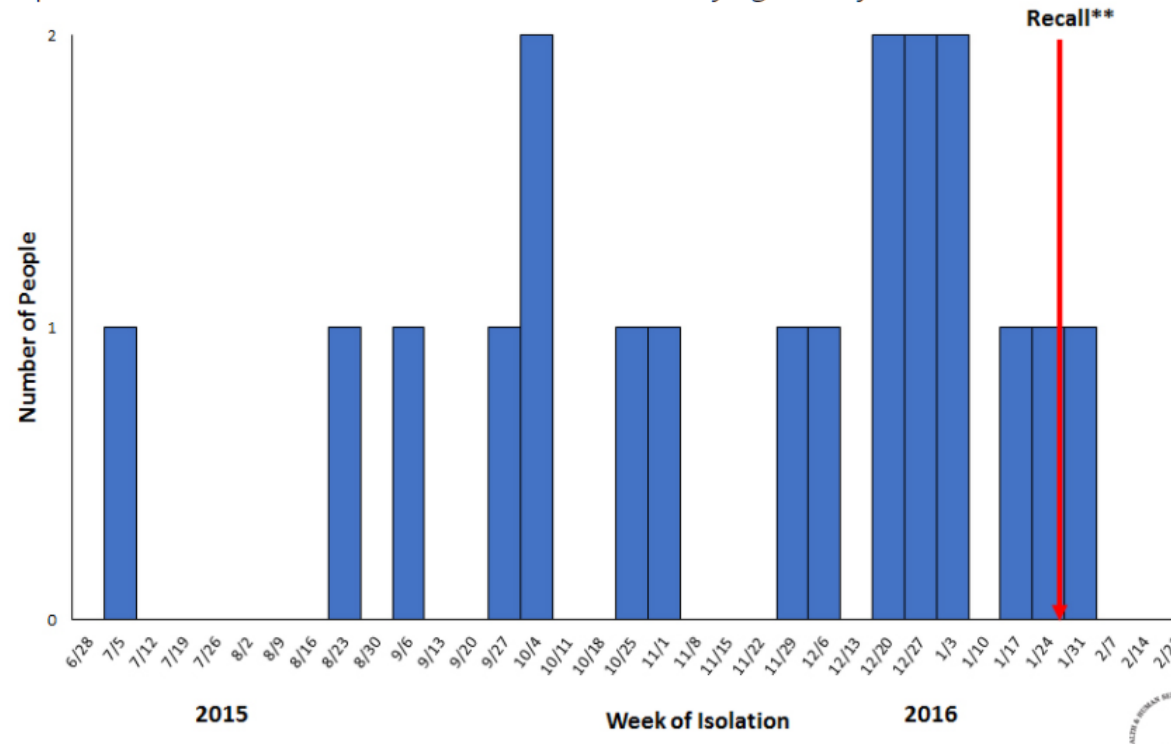
At a Glance:

- Case Count: [19](#)
- States: [9](#)
- Deaths: 1
- Hospitalizations: 19
- Recall: [Yes](#)

CLICK TO VIEW EPI CURVE GRAPHS.



People infected with the outbreak strain of *Listeria monocytogenes*, by week of isolation date*



As part of a routine product sampling program, the Ohio Department of Agriculture collected a Dole brand Field Greens packaged salad from a retail location and isolated *Listeria*. This packaged salad was produced at the Springfield, Ohio Dole processing facility. In January 2016, WGS showed that the *Listeria* isolate from the packaged salad was closely related genetically to isolates from ill people. This information helped link the illnesses to Dole brand packaged salads produced at the Dole processing facility in Springfield, Ohio. Additionally, the Public Health Agency of Canada confirmed the presence of *Listeria* in packaged salads produced at the Dole Springfield, Ohio processing facility.

Links to SNP clusters mentioned in the case-studies

2020 bagged romaine lettuce recall:

https://www.ncbi.nlm.nih.gov/pathogens/tree#Escherichia_coli_Shigella/PDG000000004.2278/PDS000035114.39?key=15IU6JaKU_4AtGAYYdQBxZgE8fuRFt9v5xGXePY1rX_vMKFwwTA

2018 and 2020 *E. coli* O157 outbreaks:

https://www.ncbi.nlm.nih.gov/pathogens/tree#Escherichia_coli_Shigella/PDG000000004.2265/PDS000059979.98?key=1JpckH3yulbrzltgiqzqLEWCLAcDd70OhXD1GZRUzx6NUcMRo1E

2020 Salmonella recall - mushrooms

<https://www.ncbi.nlm.nih.gov/pathogens/tree#Salmonella/PDG000000002.2034/PDS000059933.38?key=DkCE6F2KmP7LtKsYqtTKUEsolvexFwduPxBPes40dX43MXlxGTE>

2016 Listeria outbreak - bagged salad:

<https://www.ncbi.nlm.nih.gov/pathogens/tree/#Listeria/PDG000000001.1994/PDS000024934.52?key=56lIP6NdZikx6VFFUIkwAKxKxXV5rVTUbKocw32OJsRkiyrLSos>

Outbreak of *E. coli* Infections Linked to Romaine Lettuce

Final Update

[Español \(Spanish\)](#)



Food Safety Alert

Posted January 9, 2019 at 4:30 PM ET

This outbreak appears to be over. *E. coli* is an important cause of illness in the United States. More information about *E. coli*, and steps people can take to reduce their risk of infection, can be found on the [E. coli and Food Safety web page](#).

CDC, public health and regulatory officials in several states, [Canada](#), and the [U.S. Food and Drug Administration \(FDA\)](#) investigated a multistate outbreak of Shiga toxin-producing *Escherichia coli* O157:H7 (*E. coli* O157:H7) infections linked to romaine lettuce from the Central Coastal growing regions in northern and central California. This outbreak appears to be over.

Advice to Consumers, Restaurants, and Retailers



On December 13, 2018, Adam Bros. Farming, Inc., in Santa Barbara County [recalled](#) [\[PDF – 10.1 KB\]](#) red leaf lettuce, green leaf lettuce, and cauliflower harvested November 27-30, 2018, because they may be contaminated with *E. coli* O157:H7. Do not eat, sell, or serve any

- [This outbreak appears to be over as of January 9, 2019.](#)
- Sixty-two people infected with the outbreak strain of Shiga toxin-producing *E. coli* O157:H7 were reported from 16 states and the District of Columbia.
 - [Illnesses started on dates ranging from October 7, 2018, to December 4, 2018.](#)
 - Twenty-five people were hospitalized, including two people who developed hemolytic uremic syndrome, a type of kidney failure. No deaths were reported.
- The [Public Health Agency of Canada](#) identified ill people infected with the same DNA fingerprint of *E. coli* O157:H7 bacteria in Canada.
- [Epidemiologic, laboratory, and traceback evidence](#) from the United States and Canada indicated that romaine lettuce harvested from the Central Coastal growing regions of northern and central California was the likely source of the outbreak.
- The FDA, along with CDC and state partners, investigated farms and cooling facilities in California that were identified in traceback. [CDC identified the outbreak strain of *E. coli* O157:H7 in sediment collected within an agricultural water reservoir on an Adam Bros. Farming Inc. farm in Santa Barbara County, which was identified in the traceback investigation.](#)

At A Glance

- [Reported Cases:](#) 62
- [States:](#) 16
- Hospitalizations: 25
- Deaths: 0
- Recall: Yes



Q&A Session



Thank You!

