Multistate Outbreak of \textit{E. coli} O157:H7 Infections Linked to Romaine Lettuce- United States, October – December 2018

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Outbreak Detection

- October 29, 2018: PulseNet codes STEC cluster (1810MLEXH-1)
  - Ten *E. coli* O157:H7 infections from 3 states
  - Three very similar PFGE *XbaI/BlmI* pattern combinations

- NCBI pathogen detection pipeline query
  - Isolates are highly related to historical leafy green STEC outbreak 1712MLEXH-1

- CDC and state colleagues initiated a multistate investigation to identify the outbreak source
Hypothesis Generation

Activities during 11/1/2018 to 11/19/2018:

- 34 cases from 11 states
  - Case definition now includes 6 PFGE pattern combinations
  - cgMLST indicate cluster isolates are within 0-2 alleles
  - Highly related cases in Canada
  - NHGQ and state routine enteric forms used to assess exposures

- Notable exposures reported by ill people:
  - 24/25 (96%) report consuming any leafy greens
  - 13/16 (81%) report consuming romaine lettuce specifically
  - Two restaurant sub-clusters identified in MI and CA with some reporting romaine salad exposure

- FDA and state partners worked to traceback romaine lettuce exposures to the farm level
Romaine Traceback Investigation

- Traceback information from the FDA indicated ill people in this outbreak ate romaine lettuce harvested from the Central Coastal growing regions of northern and central California
- Adam Bros. Farming, Inc. in Santa Maria was one of the farms identified in the traceback investigation
November 20, 2018: First CDC Food Safety Alert

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

Food Safety Alert
Late November, 2018: Environmental Investigation

- FDA, CDC, and state partners investigated farms and cooling facilities in California that were identified in romaine traceback.

- CDC analyzed water and sediment samples from an Adam Bros. Farming, Inc. farm, one of the farms identified during romaine traceback.

- *E. coli* O157:H7 found in an Adam Bros Farm agricultural water reservoir highly related by WGS to outbreak strain.
WG5 Results

- cgMLST tree of highly related STEC isolates within 0-4 alleles
- Includes 2016, 2017, and 2018 clinical isolates
- Environmental isolates from Adam Bros. Farm

Legend:
- Historical isolates
- Environmental isolate

0-4 alleles
WGS Clade of Concern: A Timeline

1611MLEXH-1
- 20 cases
- Vehicle: unknown

1712MLEXH-1
- 25 cases
- Vehicle: leafy greens

1810MLEXH-1
- 62 cases
- Vehicle: romaine lettuce
Case Definition

- Infection with *E. coli* O157:H7
- Isolation date during 10/1/2018 to 1/9/2019
- PFGE XbaI/BlnI pattern combination
  - EXHX01.7535/EXHA26.5334
  - EXHX01.7220/EXHA26.5597
  - EXHX01.7535/EXHA26.5597
  - EXHX01.7220/EXHA26.5334
  - EXHX01.7549/EXHA26.5334
  - EXHX01.7551/EXHA26.5334
  - EXHX01.2382/EXHA26.5334
  - EXHX01.7572/EXHA26.5334
  - EXHX01.7581/EXHA26.5334
  - EXHX01.7580/EXHA26.5334
Outbreak Summary

People infected with the outbreak strain of *E. coli* O157:H7, by state of residence, as of January 9, 2019 (n=62)

- 62 cases from 16 states and DC
- Onset dates ranged from October 7, 2018 to December 4, 2018
- Patient ages ranged from 1 to 84 (median 25 years)
- 66% of patients female
- 46% of patients were hospitalized, 2 developed HUS, and no deaths were reported

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

*n=62 for whom information was reported as of January 9, 2019. Some illness onset dates have been estimated from other reported information.*
Conclusions

- **Role of WGS in the investigation**
  - Linked current outbreak to a cluster in 2016 and an outbreak in 2017 associated with leafy greens in the U.S.
  - WGS link to 2017 leafy green outbreak informed the investigation, hypothesis generation, and traceback strategy with a focus on romaine lettuce
  - Confirmed genetic relatedness of 10 different PFGE pattern combinations

- **FDA/CDC/CA farm investigation and isolation of the WGS outbreak strain**
  - Key to identifying one of the farm level sources for reoccurring STEC outbreaks of the same WGS strain
  - Provides additional evidence that water contamination may be an important factor in STEC outbreaks associated with romaine lettuce
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