

E. coli O157:H7 and Spinach – 2006

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E. coli O157:H7 and Leafy Greens

- History of leafy greens and outbreaks
- Timeline of first days of spinach investigation
- Epidemiologic and lab investigation findings
- Environmental investigation findings
- Findings from current and past leafy green investigations
- Conclusions/Next Steps
- Policy implications
- Questions

E. coli O157:H7 and Leafy Greens

- 22 leafy green associated E. coli O157:H7 outbreaks in the last 12 years.
 - Of the 12 that have been traced, all 12 indicate a California source of the leafy greens.
 - Most, but not all, have traced to fields in the Salinas Valley.
 - Most recent outbreaks have traced to the Central Valley.

September 13, 2006

- CDC calls FDA to alert them to the situation of matching *E. coli* O157:H7 PFGE in two states
- State of Wisconsin calls FDA to alert them of an outbreak of O157:H7 in WI
- FDA notifies CDHS

September 14, 2006

- **Thirteen states reporting 45 cases**
 - 8 HUS
 - 1 death
- **High percentage of cases reported exposure to fresh, bagged spinach**
 - Multiple brands identified by ill individuals but Dole Baby Spinach implicated by a high percentage of cases
- **FDA advises consumers to not eat bagged fresh spinach**
- **FDA and CDHS initiate call with Natural Selections**
- **CalFERT investigators dispatched to Natural Selections to begin investigation**

September 15, 2006

- Twenty states reporting 95 cases
 - 44 hospitalized
 - 14 HUS
 - 1 death
- Ill individuals report exposure to fresh spinach, bags and clam shells.
- FDA advises consumers to not eat “prepackaged” fresh spinach
- CalFERT investigators dispatched to two other firms identified by a small number of cases

September 15, 2006

- Natural Selections announces voluntary recall of all fresh spinach-containing products after calls with FDA and CDHS.
- Phone calls between CDHS, FDA, and three firms on Sept 15 to review possible relationships/connections.

September 16, 2006

- Nineteen states reporting 102 cases
 - 44 hospitalized
 - 16 HUS
 - 1 death
- Ill individuals report exposure to fresh spinach, bags and clam shells in grocery stores and in restaurants
- FDA advises consumers to not eat “fresh spinach” or “fresh spinach-containing products”

September 21, 2006

- Twenty three states reporting 157 cases
 - 83 hospitalized
 - 27 HUS
 - 1 death
- FDA and CDHS announce that contaminated spinach likely came from one of three counties in California.
- Traceback identifies numerous potential ranches and fields from which contaminated spinach may have been grown

September 21, 2006

- Positive spinach sample in New Mexico matched outbreak strain
 - The spinach was eaten by one of New Mexico's patients before becoming sick.
 - The package of spinach that tested positive was "Dole Baby Spinach, Lot Code P227, Best if Used by August 30."

October 12, 2006

- CDHS and FDA announce narrowing of investigation to four ranches in two counties (from nine in three counties) as supplying spinach to Natural Selections for Lot Code P227.
- Environmental samples matching the outbreak strain found on one of the four ranches.

Leftover Product Testing

■ Lot Code P 227

–13/17 (76%) opened bags with lot code P227 obtained from ill consumers tested positive.

■ Other Lot Codes

–0/25 opened bags with other lot codes from ill consumers tested positive.

E. coli O157:H7 and Spinach

■ Environmental samples collected

- Approximately 850 environmental samples collected by the California Food Emergency Response Team (CalFERT).
 - water, soil/sediment, cow and wild pig feces, field product, finished product, environmental samples from processors

■ Environmental testing results

- *E.coli* O157:H7 found on all 4 ranches
 - (cattle feces near the ranch on 3 of the 4)
- 25 *E. coli* O157:H7 isolates from one ranch matched the outbreak strain
 - 2 stream water/sediment
 - 1 dust/dirt from pasture
 - 7 wild pig/wild pig feces
 - 15 cow feces

E. coli O157:H7 and Spinach- Observations to Date

- **Ranch with matching isolates is primarily a beef cattle operation that leases a small amount of land for crop production.**
- **Cattle feces, feral pig feces, and stream water/sediment tested positive for the outbreak strain on one of the implicated ranches.**
- **A stream runs through the property and includes riparian areas that are ideal habitat for wildlife.**
- **Large population of feral pigs in and around the ranch.**
- **Well water used for irrigation. Well sits in a slight depression in the middle of the field. May have connections to a well closer to the stream.**
- **Local investigation continues**
 - **Processing facility**
 - **Fields and ranches**

Findings from current and past leafy green investigations

- **Pre-harvest/harvest phases of production is the most likely opportunity for introduction of contamination (water, workers, wildlife, manure).**
- **Post harvest (cooling, processing, shipping) practices may contribute to spreading the contamination over thousands of bags and/or may permit growth of the organism.**

Findings from current and past leafy green investigations

- Environmental and farm investigations can include multiple distributors and processors and dozens of farms if no specific lot code information can be obtained.
- Improved traceability systems are needed.
- New sampling and high throughput testing methods for environmental samples should be developed and validated.
- Tests are needed to determine if manure has been applied to fields and if so, what species.
- Source tracking techniques, to identify the animal species from which the environmental pathogens are isolated, do not appear to be fully validated at this time.

Conclusions

Spinach Outbreak 2006

- An estimated 4,000 cases of *E. coli* O157 infection associated with one lot of bagged spinach.
- Quick actions likely averted additional cases.
- Large amount of resources dedicated to investigation and communication during the event.
- Investigation is ongoing to define routes and sources of potential contamination.
- This was the 22nd outbreak of O157:H7 linked to leafy greens in the last 12 years.

Overall Conclusions

- The presence of *E. coli* 0157:H7 in the agricultural environment, e.g. cattle waste, water, certain wildlife is known; in this current 2006 Spinach outbreak, animal waste and water may be important contributing factors.
- Over the past twelve years, 22 outbreaks associated with leafy greens from CA; Of those, this is the first outbreak where clinical isolates were matched (PFGE, two enzymes) to finished product and environmental samples.

Overall Conclusions

- Of the eight hundred plus environmental samples, cattle feces, wild pig feces, soil associated with the cattle area and surface water taken on or in the vicinity of one ranch matched the clinical outbreak strain; additional E. coli 0157:H7 positive samples (multiple ranches) were also found. Observations from the investigators and the CDC water expert suggest that the contamination of wells via exposure to contaminated ground water should be examined further.

Overall Conclusions

- We believe the cause of these leafy green food borne illness outbreaks is complex – no one element or vector is solely responsible. Fixing “the one thing identified” won’t give appropriate assurances that no future outbreaks will occur; A comprehensive, science-based plan for all growers and processors is needed.

Overall Conclusions

- This is an industry wide issue – one that needs a comprehensive, integrated research plan to address many elements including: E. coli presence/survival in the environment; organism uptake into the lettuce leaf; proximity of carriers and routes of direct and indirect contamination, human infectious dose, etc. For fresh leafy greens there currently is no “kill step” to eliminate E. coli 0157 without affecting product sensory attributes; Minimizing contamination in the field and distribution of any contamination during harvest is critical to assuring a safe product. Our observations conclude that current treatments at the processing plant alone will not assure safe product.

Overall Conclusions

- Finished product testing is one means of verifying that current good agricultural and manufacturing practices are working – however, testing alone does not provide total assurance of a safe product. As learned during this recent spinach outbreak, specific analytical methodology is important to detection.
- There are food safety programs from other food industries (e.g. RTE deli meats) that the leafy greens industry could use as a model.

Overall Conclusions

- **FDA and CA DHS FDB are committed to assuring the safety of fresh fruits and vegetables. It is our goal to continue to work with the industry, yet we cannot stand by while food borne illness outbreaks associated with leafy greens occur each year; the consuming public demands action – It is time for a change in policy, in regulation and in industry practice.**

Next Steps

- Issue final report.
- Continue search for research funds, ensure coordination of leafy greens research and prompt distribution of research findings.
- Examine options to minimize the likelihood of further outbreaks including:
 - More regulations?
 - More inspections?
 - More testing?
 - Monitor effectiveness of marketing agreement and marketing order?

Policy Implications

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- **Clearly, more has to be done to minimize the risk of future leafy green associated outbreaks.**
- **Research needs are extensive and research funding is minimal in this area.**
- **Solutions must include specific, standardized, measurable, verifiable on-farm practices and new processing procedures for leafy greens.**

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Questions?