

# **E. coli O157:H7 Spinach Outbreak 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

# 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.
    - Two recent outbreaks have traced to the Huron and Bakersfield area.

# 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**

# CaIFERT

- **CALFERT (California Food Emergency Response Team)** is an emergency response team consisting of investigators and analysts from FDA San Francisco and Los Angeles District Offices and the California Department of Health Services Food and Drug Branch.
- The CaIFERT was established in 2003 to assure a **jointly-trained core group of FDA and CA DHS/FDB** staff were available to rapidly respond to emergencies involving products we regulate, which to date have been predominately produce-related illness outbreaks.
- There are **27 members** currently on CaIFERT (19 from FDA and 8 from CA DHS).
- With management's support the team meets several times per year in order to **train in outbreak investigations and new technologies**.
- We believe this is a good example of **leveraging resources between federal and state agencies** to assure the right people with the right skills are available to react swiftly to food borne outbreaks.

# 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.



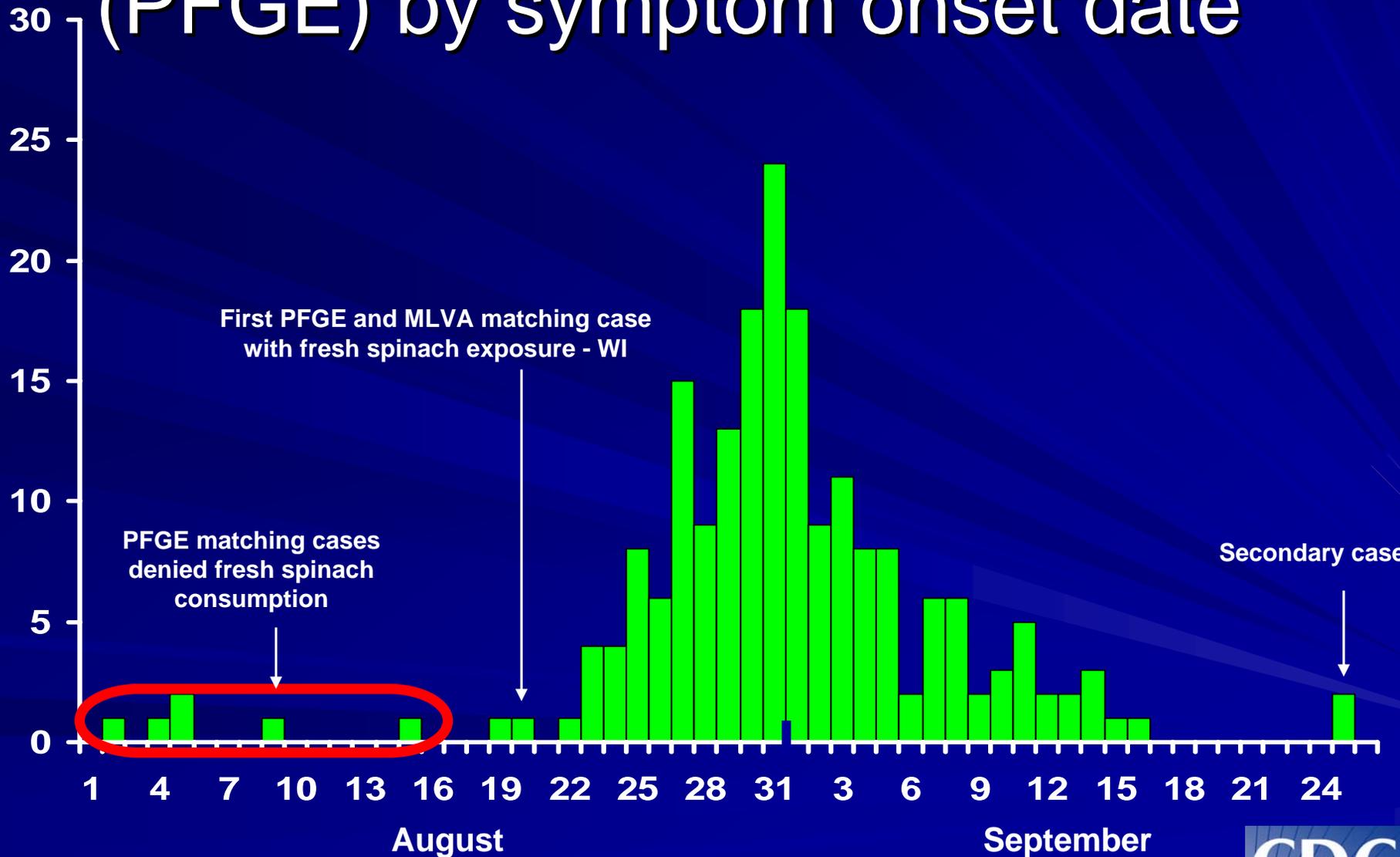
# Patient outcomes

<b>Outcome</b>	<b>n, (%)</b>
<b>Hospitalized</b>	<b>104 (51)</b>
<b>HUS</b>	<b>31 (15)</b>
<b>Died</b>	<b>3 (1)</b>

# Case Characteristics

Characteristics	(%)
Female	144 (71)
Hospitalized	103 (51)
HUS	31 (15)
Died	3 (1)

# Number of confirmed cases (PFGE) by symptom onset date



# Confirmed Case Exposure to Spinach Products\*

Exposure	Cases (n / N)	%
Any spinach	162 / 179	91%
Bagged fresh spinach	151 / 155	97%

# 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.

■ 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).

- 21 isolates from one ranch matched the outbreak strain

–2 stream water/sediment

–1 dust/dirt from pasture

–7 wild pig/wild pig feces

–11 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

- 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.
- CalFERT joint federal-state report to be issued shortly.
- This was the 22nd outbreak of O157:H7 linked to leafy greens in the last 12 years.

# Acknowledgements

- California Department of Health Services-Food Safety Section
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- Centers for Disease Control
  - National Center for Environmental Health
  - National Center for Zoonotic, Vectorborne, and Enteric Diseases