Multi-State Outbreak of *Salmonella* Senftenberg Associated with Green Grapes Western States, Fall 2001

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- Unusual number of *S.* Senftenberg cases in California and Colorado
- Matching PFGE patterns
- Cases in other western states

Salmonella Senftenberg

Commonly isolated from

- **Meat**
- **Poultry**
- **Imported seafood**

Foodborne outbreaks

- **Baby cereal**
- **Turkey**
- **Hospital kitchen, food unknown**

Objectives

- Describe the outbreak
- Identify source of infection

Case Definition

PFGE-matched isolate of *S.* Senftenberg in the United States during September–December 2001

Case Selection

- Case finding through routine reporting
- Inclusion/exclusion criteria
  - Available at time of study
  - Excluded patients with urinary tract infections

Control Selection

- 2 controls per case
- Random digit dialing
- Matched by
  - Telephone prefix
  - Age range (9-17; 18-40; 41-65; 66+)

Questionnaire

Meats

- Chicken
- Beef
- Turkey

Dairy

- Cheese
- Eggs

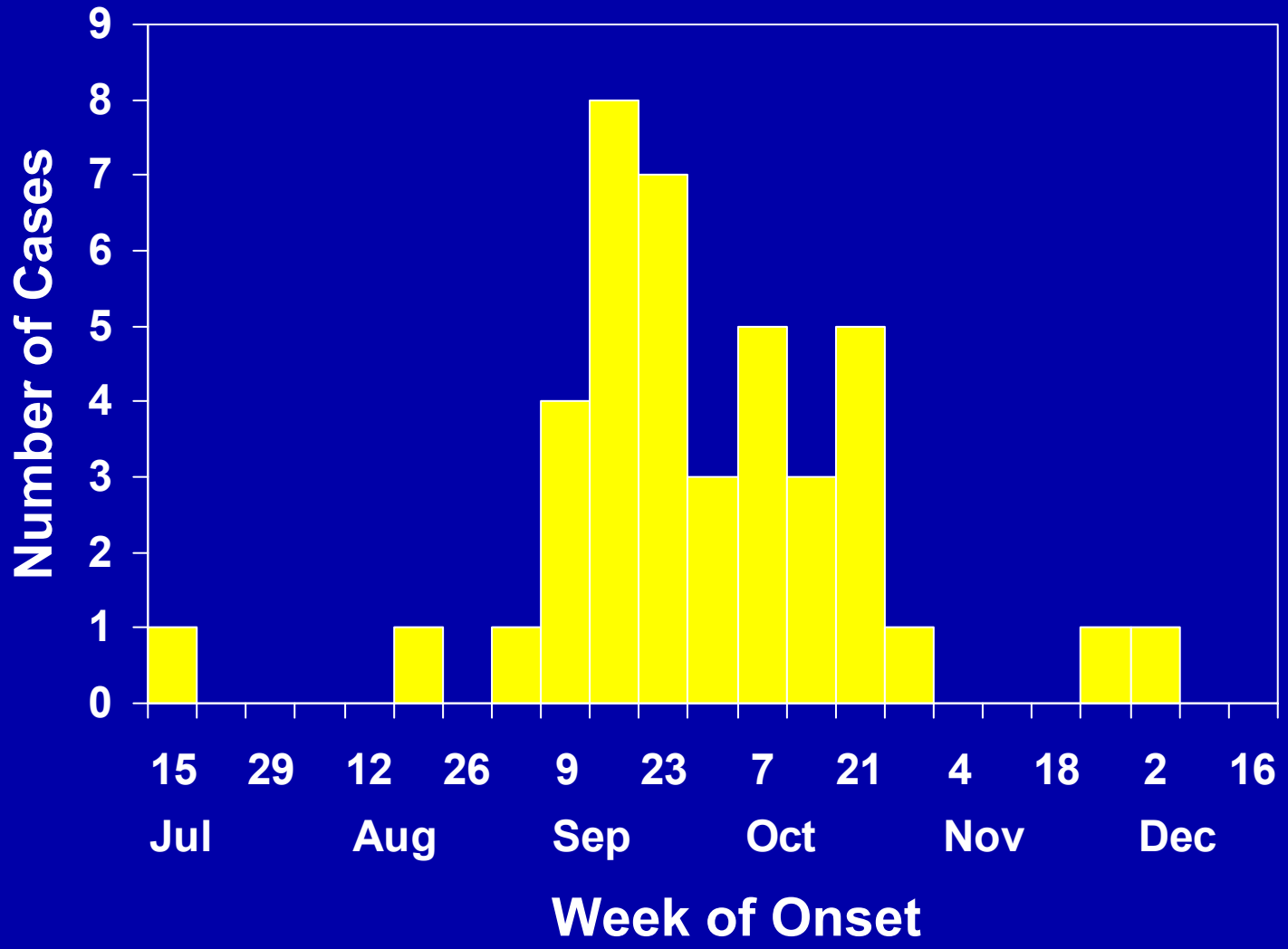
Vegetables

- Lettuce
- Tomatoes

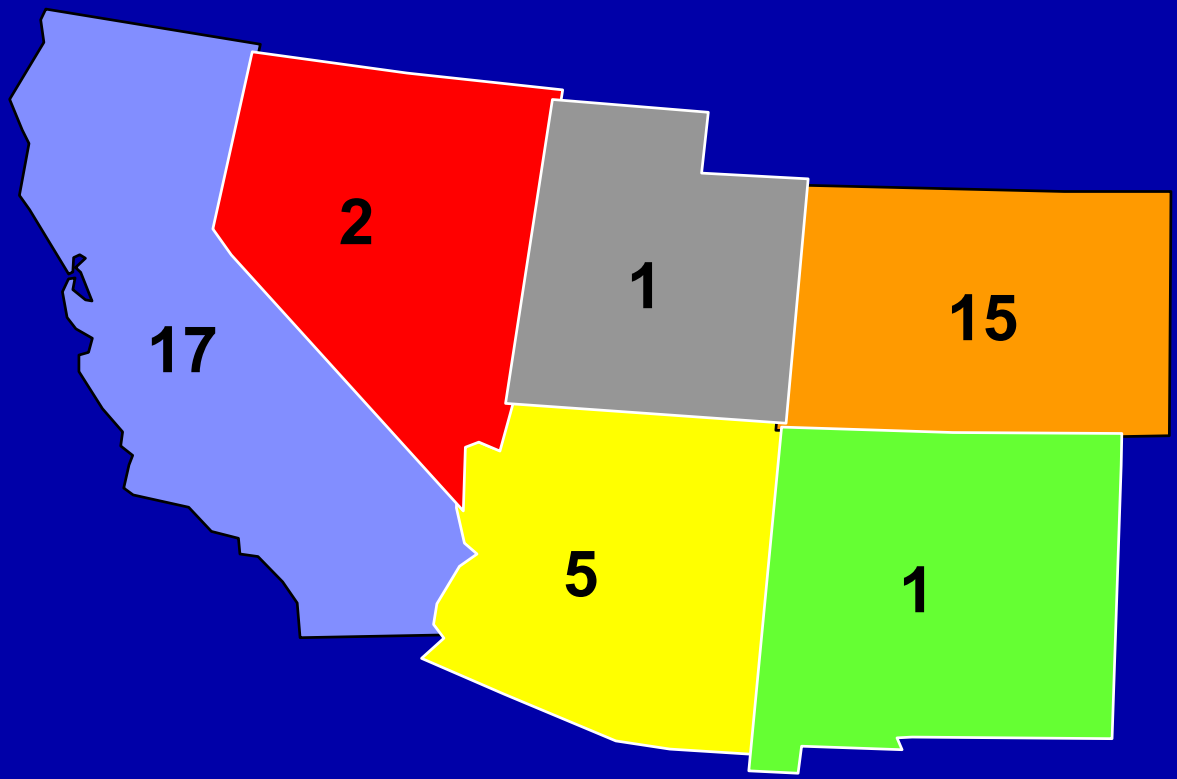
Seasonal fruits

- Grapes
- Apples

Cases of *Salmonella* Senftenberg Western States 2001 (N=41)



Distribution of *S.* Senftenberg Cases, Sep–Dec 2001 (N=41)



Patient Demographics (N=41)

Age, years	
Median	**28**
Range	**2-79**
Female, %	**54**

Characteristics of Illness Among Case-Patients (n=25)

Characteristic	n	%
Diarrhea	24	96
Abdominal pain	23	92
Fever	16	64
Vomiting	8	32
Bloody diarrhea	7	28
Hospitalized	3	12

Case-Control Results

n=25 cases, 50 controls

Food item	Matched OR	95% CI
Green grapes	6.7	(1.8, 24.2)
Chicken	3.0	(0.4, 23.7)
Cheese	3.0	(0.4, 24.9)
Red grapes	2.5	(0.6, 9.7)
Chicken at restaurant	2.4	(0.8, 7.6)
Green apples	1.9	(0.6, 5.5)
Red apples	1.3	(0.4, 3.9)

Trace-Back Investigation

- Seedless, non-organic grapes
- Most autumn grapes from California
- Limited by poor recall
- Supermarket club card information cannot distinguish produce varieties
- Inconclusive

Limitations

- Timing of food history questions for cases and controls
- 71% (25/35) of cases available for case-control
- Potential for
  - Recall bias
  - Interviewer bias

Conclusions

- Green grapes likely vehicle
- “Stealth vehicles”

Conclusions

- Changes in food production and distribution
  - Wider distribution of cases
  - Lower attack rates seen
- PFGE crucial in identifying outbreaks

Grapes in Other Outbreaks

Salmonella Sundsvall, California and Washington 1997

- 25 cases
- OR = 5.15
- No trace-back

E. coli O157:H7, California 2000

- 14 cases
- OR = 13.0
- Trace-back inconclusive

How can grapes become contaminated?

- Extensively “hand groomed”
- Drip irrigation
- Not washed, but gassed to retard mold
- Cold storage for up to 2 months

Recommendations

- Add season-specific produce (grapes) to food-history questionnaires
- Food safety messages stress all produce can become contaminated
- Review hygiene issues, education in grape/produce industry

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