

International Outbreak of Multiple Salmonella Serotype Infections Linked to Sprouted Chia Powder, 2014 — The U.S. Perspective

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Outbreak Detection

- ❑ On May 6, 2014, PulseNet USA identified cluster of *Salmonella* Newport infections
 - 9 cases in 5 states
 - PFGE pattern (JJPX01.1645) novel in the United States

- ❑ On May 14, 2014, PulseNet Canada identified matching cluster of outbreak strain
 - 4 cases in 2 provinces

Hypothesis Generation

- State questionnaires
 - Healthy-eater signal
 - 4 persons with specialized diet
 - 1 dairy-free diet
 - 1 allergic to milk
 - 1 vegetarian/vegan diet
 - 1 patient with Crohn's disease
 - 5 persons shopped at higher-end chain health food stores
 - 'Chia flour' noted by local health department in Wisconsin during investigation of ill person
 - Captured by question about juice, smoothies/blended drinks, health drinks or supplements
 - Often used in gluten-free diets

Hypothesis Generation

- ❑ **Open-ended interviews conducted with ill persons or proxies**
 - Single interviewer approach
 - Iterative process
 - Typically last between 1.5-2 hours
- ❑ **Take a complete food history**
 - Typical meals
 - Absolute negatives and favorite foods
 - Elicit free-form responses
 - Use OR or MN long foodborne history forms as prompt if needed

Hypothesis Generation

- Common food items identified during interviews with 3 patients
 - Patient 1:
 - Shopped at health food store A
 - Smoothies (frozen blueberries/raspberries/strawberries, dried goji berries, pre-packaged chia seed powder, ground flax, greek yogurt, fresh spinach)
 - Kale chips
 - Patient 2:
 - Shopped at health food store A
 - Had G tube, juice diet (veggie juice: arugula, kale, spinach, bell peppers, leeks, beets, garlic, carrots, apples, orange; hemp protein, flax seeds, almond milk, hot house cucumbers, sunflower seeds, almond slivers, walnuts; fruit juice: pineapple, mango, banana, apple, mint, coconut water, frozen papaya, blueberries, raspberries, and blackberries; pre-packaged Brand X chia seed powder, goji berries)
 - Patient 3:
 - Did not shop at health food store A
 - No frozen berries, but ate strawberries
 - **Did not buy chia**
 - Ate smoothie prepared by roommate; on Instagram saw posting of chia pudding roommate made the week the patient became ill – would check and verify

Hypothesis Generation

Common food items identified during interviews with 3 patients

■ Patient 1



■ Patient 3



Hypothesis Testing

- ❑ Focused questionnaire developed
 - Flax seeds
 - Goji berries and powder
 - Chia seeds and powder
 - Sunflower seeds
 - Nuts (almonds, walnuts)
 - Fresh and frozen fruit (blueberries, blackberries, raspberries, strawberries, mangos)
 - Leafy greens (spinach, arugula, kale)
 - Smoothies
- ❑ Open-ended interviews continued

Results From First Focused Questionnaire (n=5)

Exposure	No. Exposed	Total	Percent Exposed	
Flax	4	5	80%	→ No brand overlap
Goji Berry	0	5	0%	
Goji Powder	0	5	0%	
Chia seeds	4	5	80%	→ No brands reported
Chia Powder	2	5	40%	→ 2/2 reported Brand X
Sunflower seeds	1	5	20%	
Almonds	3	5	60%	
Walnuts	1	5	20%	
Blueberries	3	5	60%	
Frozen Blueberries	1	5	20%	
Blackberries	0	5	0%	
Frozen Blackberries	1	5	20%	
Raspberries	0	4	0%	
Frozen raspberries	0	5	0%	
Strawberries	3	5	60%	
Frozen strawberries	1	5	20%	
Mangos	1	5	20%	
Frozen Mangos	1	5	20%	
Spinach	4	5	80%	→ No overlap in type of spinach
Arugula	1	5	20%	
Kale	3	5	60%	
Smoothie	4	5	80%	→ Many contained chia seeds/powder

Additional Serotypes and Outbreak Strains Associated with Outbreak in United States

- ❑ Testing of leftover foods from case-patient homes yielded multiple strains of *Salmonella*
 - *Salmonella* Newport
 - *Salmonella* Oranienburg
 - *Salmonella* Hartford
 - Ill person in Canada co-infected with *Salmonella* Newport
 - Novel PFGE pattern
- ❑ PulseNet USA query identified additional infections
- ❑ Included in case definition after gathering epidemiologic data

Summary of U.S. Laboratory Results

Serotype (outbreak strain/PFGE pattern)	Human (n=31)	Leftover product (n=14)	Intact product (n=25)
Newport (JJPX01.1645)	19	11	15
Newport (JJPX01.4815)	1	0	1
Hartford (JHAX01.0291)	7	1	0
Oranienburg (JJXX01.0027)	4	2	0
Additional serotypes and PFGE patterns*	-	0	9

*Included *Salmonella* Saintpaul, Sandiego, Hartford, and Oranienburg

A Second Focused Questionnaire

- ❑ **Narrowed to chia products only**
 - ❑ Powder
 - ❑ Seeds
 - ❑ Drinks
 - ❑ Desserts
 - ❑ Other chia-containing items (i.e., granola bars, cereals, etc)
- ❑ **Questions on specific brand names**
 - ❑ **Example: Did you eat any Brand X chia powder in the 7 days before you became ill?**

Chia Exposure from Open-ended Interviews and Supplemental Questionnaires

<u>Chia exposure</u>	<u>n = 21</u>
Chia seeds or powder	19 (90%)
Chia seed powder	15 (71%)
Chia seeds only	4 (19%)



Chia Seed Powder Brand

Consumed chia seed powder	n=15
Brand X*	9 (47)
Brand B*	2 (11)
Brand C*	1 (5)
Brand D*	1 (5)
Brand E*	1 (5)
Unknown Brand	1 (5)

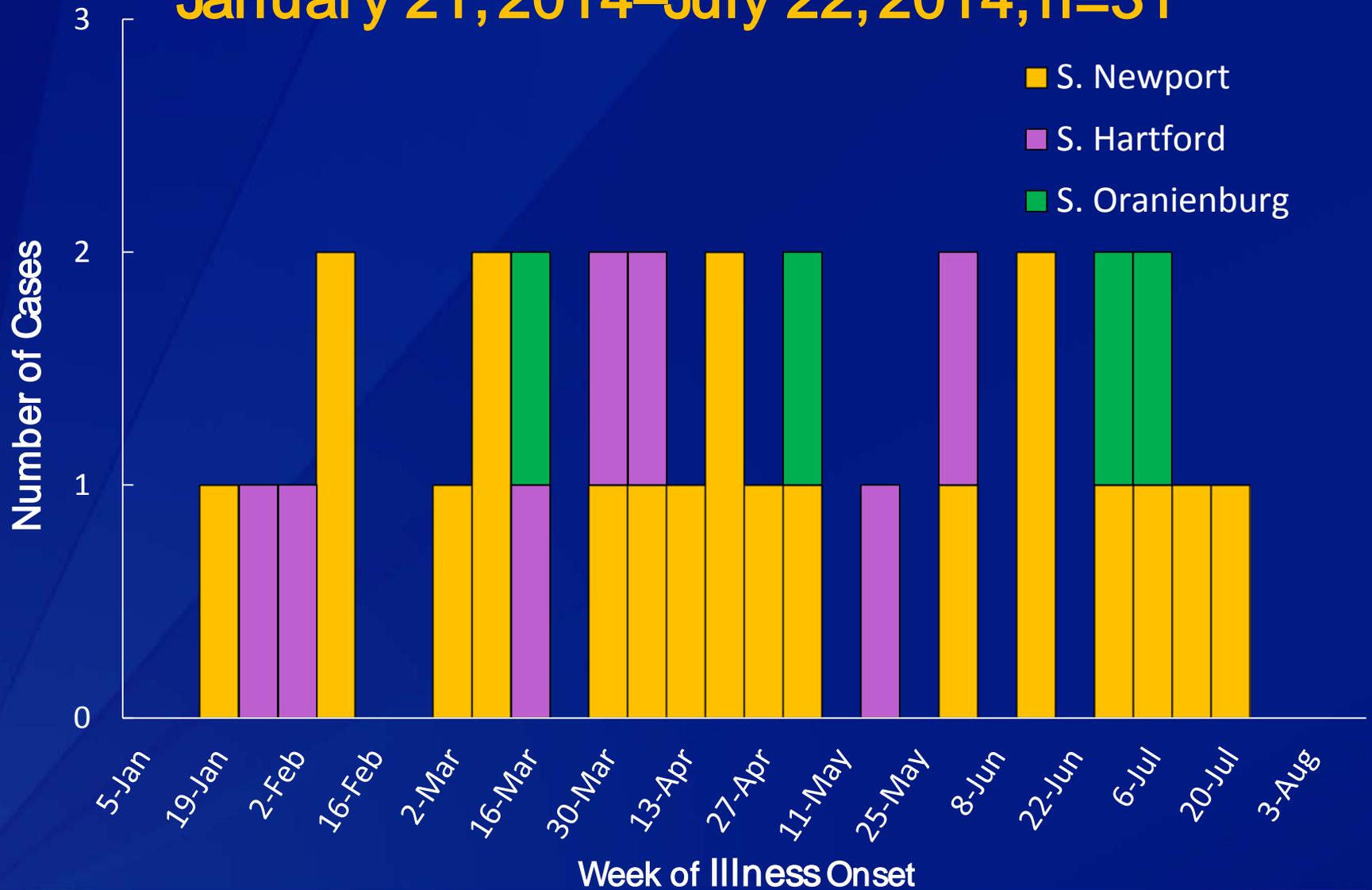
*Recalled

U.S. Case Definition

- ❑ Person infected with outbreak strains of *Salmonella* Newport, Hartford, or Oranienburg
 - JJPX01.1645 (Newport)
 - JJPX01.4815 (Newport)
 - JHAX01.0291 (Hartford)
 - JJXX01.0027 (Oranienburg)

- ❑ Isolated January 1–August 8, 2014

Cases by Week of Illness Onset and Serotype, January 21, 2014–July 22, 2014, n=31



Patient Characteristics

Demographics n = 31

Age (years) , median (range) 48 (1–81)

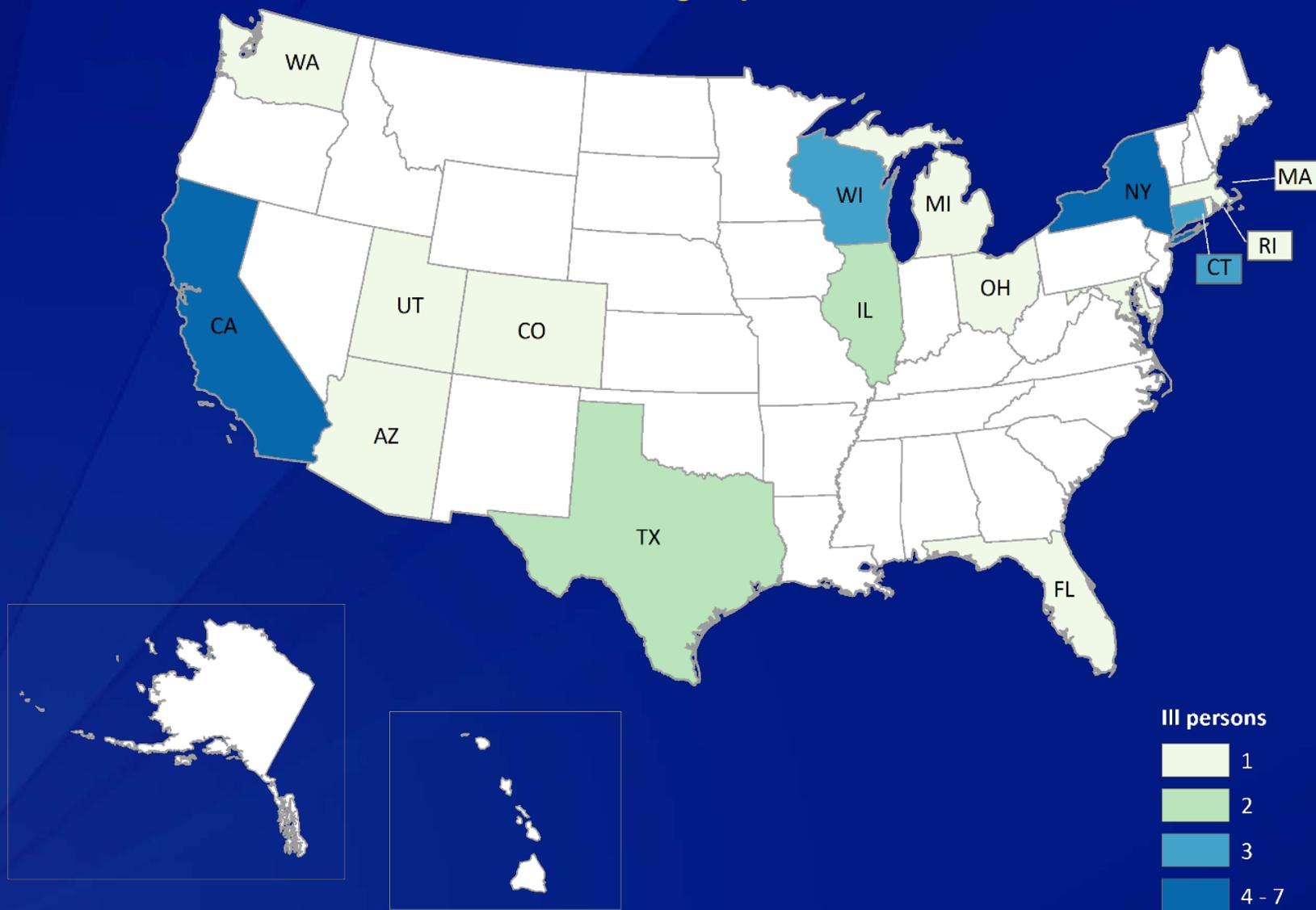
Female 19 (61%)

Outcomes n = 22

Hospitalizations 5 (22%)

Deaths 0

Persons Infected with the Outbreak Strains of *Salmonella* Newport, Hartford, or Oranienburg, by State, 2014, n=31



Conclusions

- ❑ First multistate outbreak of multiple *Salmonella* serotypes linked to consumption of sprouted chia seed powder...but an old problem!
- ❑ An early signal from state questionnaires along with open-ended interviewing helped identify a stealthy ingredient as the outbreak source
- ❑ Complex investigation enhanced through international collaboration of state or province and federal public health and regulatory agencies

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Thank You



The screenshot shows the Urban Dictionary website interface. At the top, the logo "urban DICTIONARY" is displayed in white on a dark background. To the right of the logo are navigation links: "Browse" with a dropdown arrow, "Vote", "Favorites", and "Store". Below the navigation is a search bar with the placeholder text "Type any word here...". The main content area is light gray. A white box contains the definition for "chiarrhea". The word "chiarrhea" is written in a large, bold, blue font. Below it, the definition is given in a smaller black font: "aggressive diarrhea due to excessive consumption of chia seeds." A user-submitted example is provided in italics: "(via text from a restaurant bathroom) - Dude, stuck on the [redacted] with chiarrhea from those seeds you gave me." The author is listed as "by pinkers" and the date as "March 16, 2011".

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TOP DEFINITION

chiarrhea

aggressive diarrhea due to excessive consumption of chia seeds.

(via text from a restaurant bathroom) - Dude, stuck on the [redacted] with chiarrhea from those seeds you gave me.

by **pinkers** March 16, 2011