

Human *Escherichia coli* O121 Infections Linked to Frozen Snack Foods — U.S., 2013

Stacey A. Bosch, DVM, MPH, DACVPM
Commander, United States Public Health Service
Epidemiologist, Outbreak Response and Prevention Branch

InForm Annual Meeting
San Antonio, TX
November 19, 2013

Shiga Toxin-producing *Escherichia coli* (STEC) Infections

- ❑ Cause ~175,000 illnesses, 2,400 hospitalizations, and 20 deaths annually in the U.S.
- ❑ Acquired from different sources—meat, produce, unpasteurized dairy products, animal contact
- ❑ Causes diarrheal illness in humans
 - Bloody diarrhea
 - Hemolytic uremic syndrome (HUS)



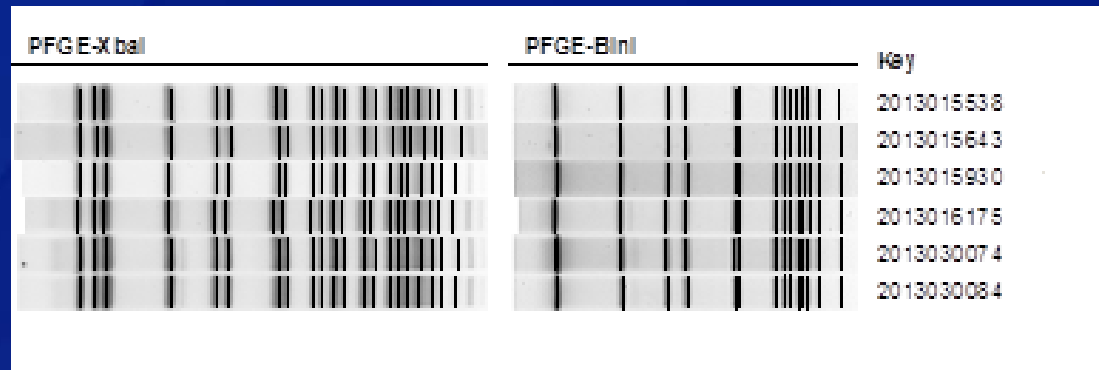
Outbreak Detection

- ❑ On February 7, 2013 PulseNet identified 5 STEC O121 isolates with indistinguishable PFGE patterns reported from 5 states
 - AL, MS, SD, WA, WI
- ❑ Novel PFGE pattern to PulseNet database
- ❑ CDC initiated multistate investigation



Outbreak Case Definition

- ❑ Illness in patient with STEC O121 infection
- ❑ Illness onset* on/after December 30, 2012
- ❑ PFGE pattern indistinguishable from outbreak strain



*Isolation date if onset date unavailable

• Data are preliminary and subject to change •

Identifying Source of Outbreak

- ❑ In early interviews, patients reported eating a variety of frozen foods
- ❑ Standardized hypothesis-generating questionnaire used to uniformly assess common exposures, including frozen food items initially reported by patients
- ❑ Interview results were compared to the 2006 FoodNet population survey
 - Survey of general population in 10 FoodNet sites across US
 - Foods consumed in 7 days prior to interview

Frozen Food Signal Strengthened

- ❑ Patients continued to report frozen food consumption

- ❑ 7/7 (100%) reported any frozen food
 - 5/7 (71%) reported frozen bites or rolls
 - 2/5 (40%) reported Brand A mozzarella bites/sticks

- ❑ 2006 FoodNet population survey
 - No similar comparison variable for frozen bites or rolls
 - 28% ate frozen dinners/entrees
 - 25% ate frozen pizza

Single Interviewer Iterative Approach

- ❑ CDC requested permission to interview newly identified cases or re-interview selected older cases
- ❑ New questionnaire focusing on frozen foods along with open-ended component to capture unidentified exposures
- ❑ Single interviewer strategy employed
 - Compare responses across interviews
 - Hone in on infrequently mentioned, unusual exposures
 - Drill down on identified commonalities

Leftover Product

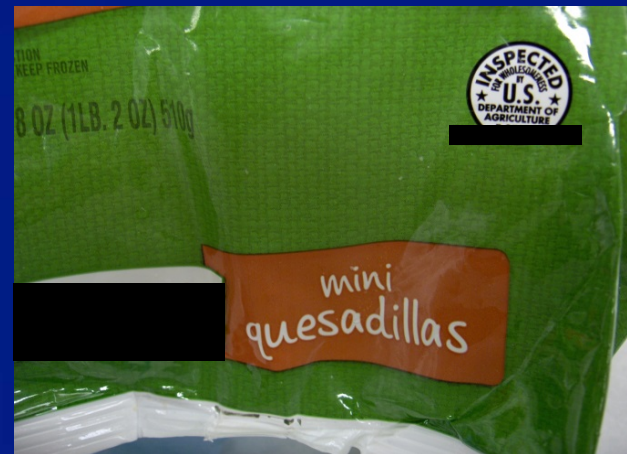
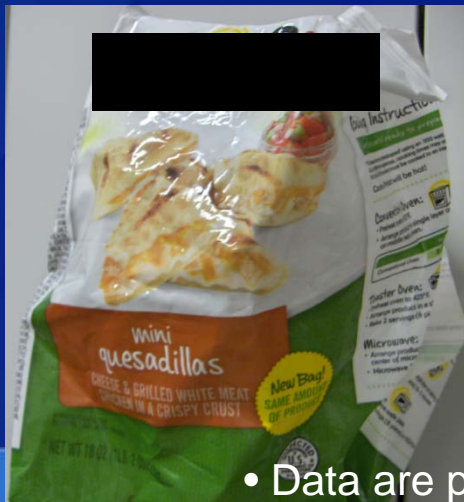
- ❑ **March 15th – CDC interviews mother of a New York patient with leftover frozen foods in freezer**
 - **Brand A mini chicken quesadillas**
 - **Brand B chicken patties**
- ❑ **Leftover food items sent to New York state laboratory for testing**

Brand A Signal Strengthens

- ❑ Investigators continue to interview cases**
- ❑ Brand A products identified with increasing frequency**
- ❑ 7/12 ate one of several Brand A frozen food products**
 - 3/7 mini quesadillas**
 - 2/7 mozzarella sticks**
 - 2/7 Philly cheese steaks**
 - 1/7 mozzarella bites**

Recall #1

- ❑ New York state lab isolates STEC O121 outbreak strain from leftover Brand A mini chicken quesadillas
 - Produced at Plant A in GA
- ❑ March 28th – company recalls ~196,222 pounds of Brand A partially baked frozen foods produced at Plant A



• Data are preliminary and subject to change •

Investigation Continues

- ❑ **CDC continues to interview cases**
- ❑ **FSIS and FDA inspect Plant A**
- ❑ **Leftover Brand A mini pizza slices identified in patients' homes in Texas and New York**
 - **Produced at Plant A, but at different times**
 - **Lot code on bag indicated mini pizza slices from New York were not covered by the recall**

Recall #2

- ❑ **April 3rd – FSIS laboratory isolates STEC O121 outbreak strain from leftover Brand A mini pizza slices from TX patient’s home**

- ❑ **April 4th – Recall expanded out of “abundance of caution”**
 - **Everything produced at Plant A from July 1, 2011 to March 29, 2013**
 - **Products manufactured under 3 different brand names (including Brand A)**
 - **>10.5 million pounds of recalled frozen food products**

Investigation Findings at Plant A

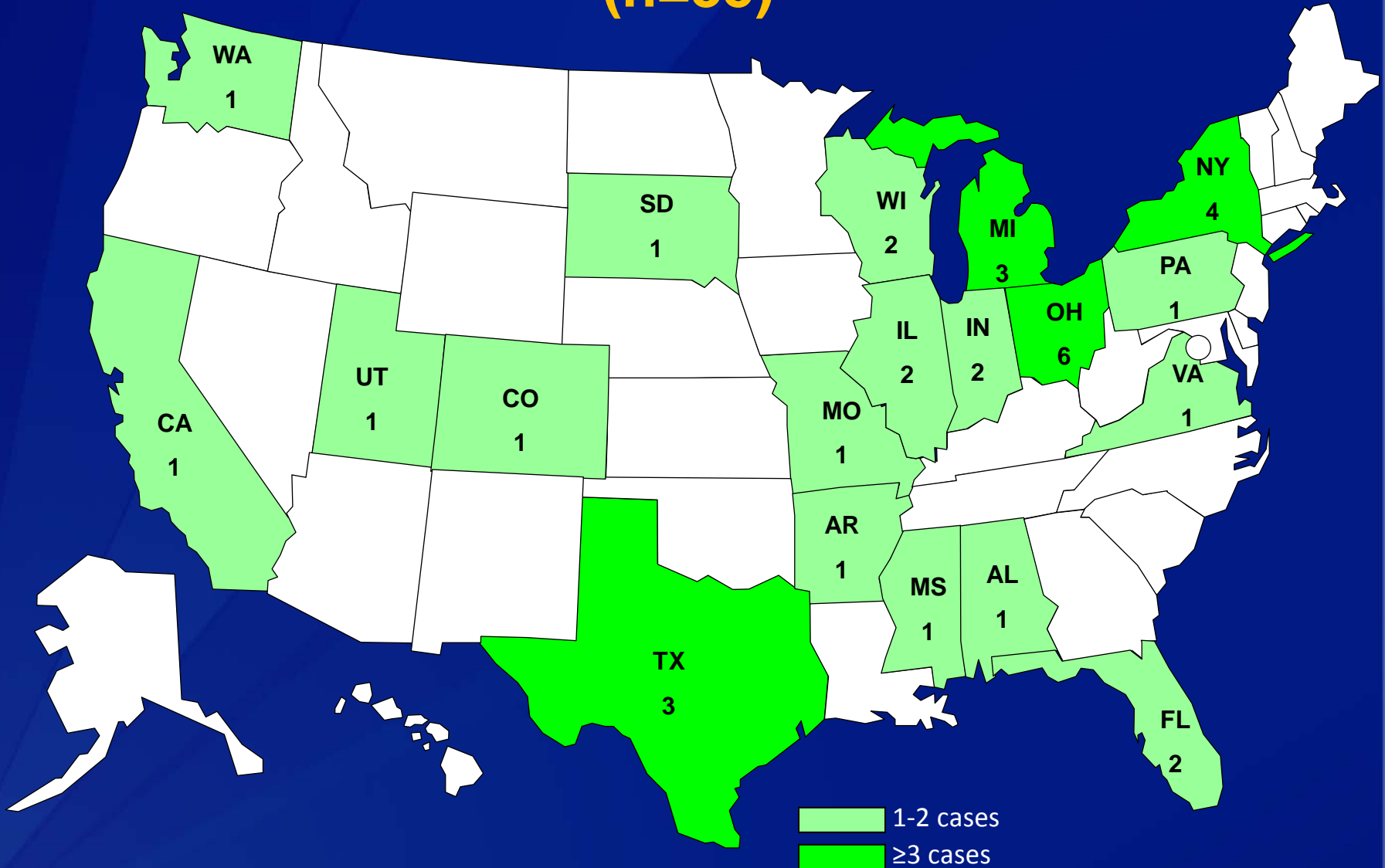
- ❑ Flour identified as most likely contaminated ingredient**
 - Common ingredient among all the food items reported by ill persons**
 - Hazard Assessment and Critical Control Points Plans (HACCP) did not account for potential STEC contamination of dry ingredients (including flour)**
- ❑ Flour and other ingredient sampling negative for STEC**
- ❑ Company voluntarily suspended production at Plant A until improvements made**

Patient Characteristics (n=35)

	n/N	%
Female	21/35	60
Hospitalized	9/29	31
HUS	2/29	7
Death	0	0
Median age (range)		17 years (1–75 years)

• Data are preliminary and subject to change •

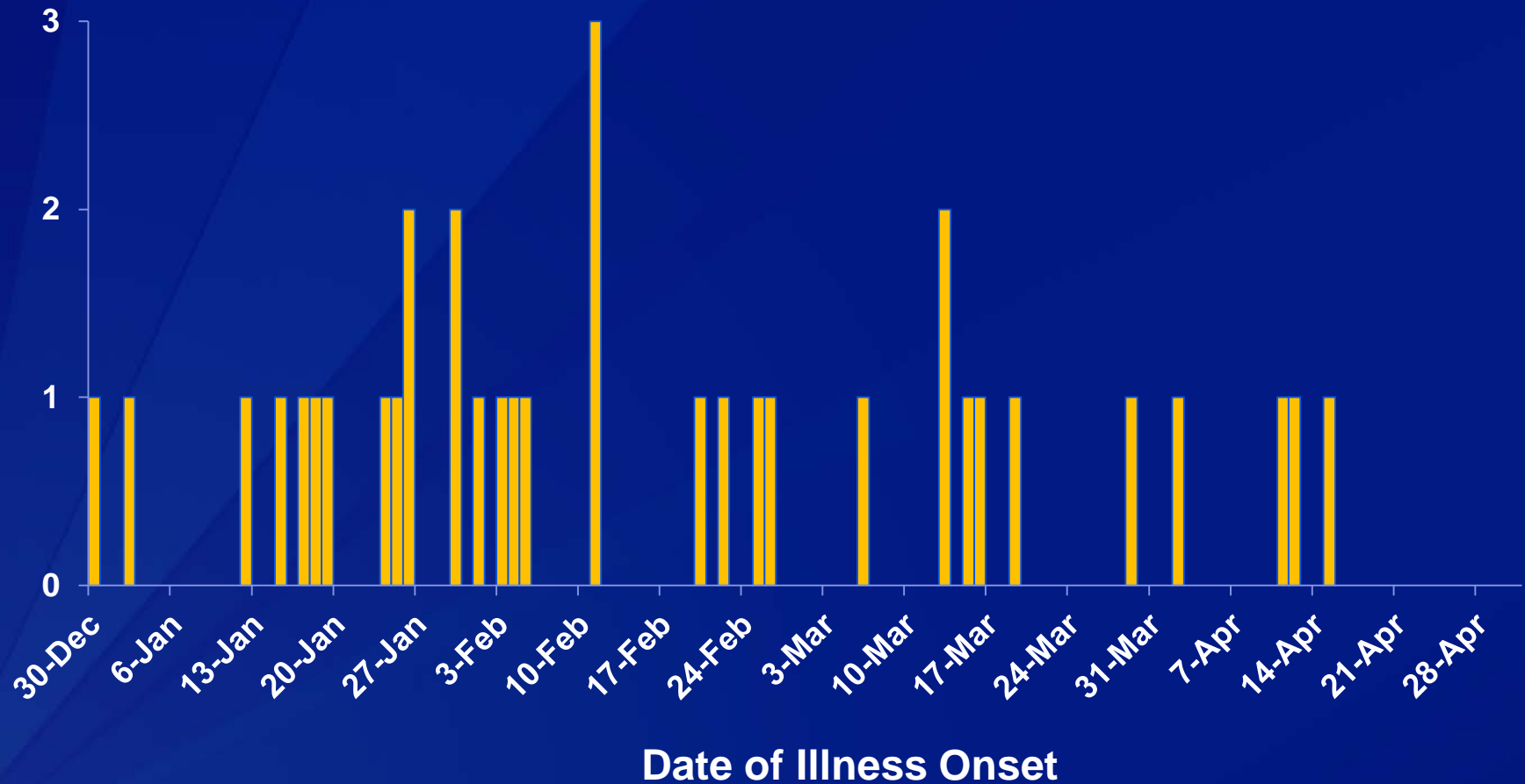
Persons infected with STEC O121 by state (n=35)



• Data are preliminary and subject to change •

Epidemic curve for STEC O121 (n=35)

Number of persons



• Data are preliminary and subject to change •

Brand A Products Reported by Patients

- ❑ Mini pizza slices
- ❑ Mini chicken quesadillas
- ❑ Philly cheese steaks
- ❑ Mozzarella sticks
- ❑ Mozzarella bites



• Data are preliminary and subject to change •

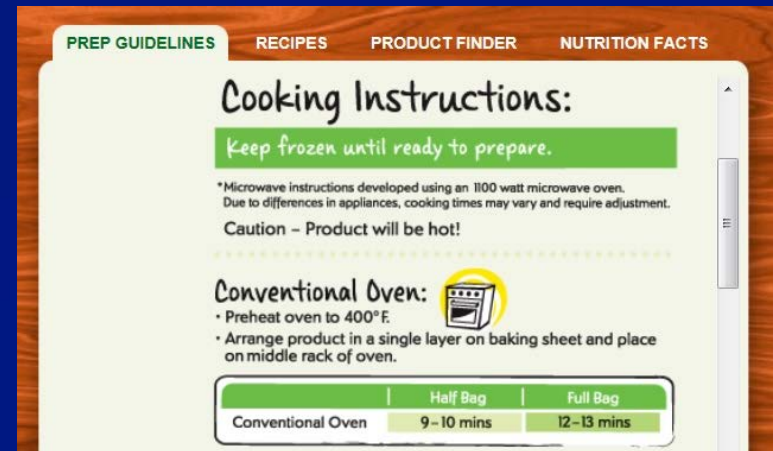
Product Preparation

❑ Cooking instruction varied by product

- Conventional oven, toaster oven, microwave, home fryer
- Microwave instructions based on 1100 watt
- “Half bag” and “full bag”

❑ Practices among patients

- 2/9 conventional oven
- 7/9 microwave
 - 4/7 didn't know oven wattage
 - Some placed “a few” pieces in microwave to cook
- None let food thaw before cooking



• Data are preliminary and subject to change •

Conclusions

- ❑ **Epidemiologic and laboratory investigations linked outbreak to Brand A frozen food products**
- ❑ **Iterative, open-ended interviewing critical to identifying outbreak vehicle**
- ❑ **Isolation of outbreak strain from leftover product greatly increased speed of solving outbreak**
- ❑ **Contaminated flour suspected source of outbreak, but no smoking gun**

Discussion

- ❑ **Contaminated flour source of other outbreaks**
 - 2008 – *Salmonella* Typhimurium linked to uncooked baking mixture in New Zealand
 - 2009 – STEC O157:H7 linked to ready-to-bake cookie dough
- ❑ **Firm's HACCP plans didn't account for potential STEC contamination of flour**
- ❑ **Implicated frozen food products not ready-to-eat and required further cooking by consumer**
 - Unclear if recommended cooking methods sufficient to kill outbreak strain
 - Not all patients adequately followed package instructions

Recommendations

- ❑ **Public health/regulatory agencies – increase awareness among food producers that raw flour could be a potential source of STEC**

- ❑ **Food manufacturers – label packaging appropriately**
 - **Place prominent labeling on products that must be cooked thoroughly**
 - **Include recommended wattage in microwave cooking instructions**

- ❑ **Consumers – cook foods thoroughly according to package directions**

Acknowledgments

State and Local Health Departments

Alabama	New York
Arkansas	Ohio
California	Pennsylvania
Colorado	South Dakota
Florida	Texas
Illinois	Utah
Indiana	Virginia
Michigan	Washington
Mississippi	Wisconsin
Missouri	

CDC Investigation Team

ORPB

Tara Anderson
Jeshua Pringle
Stacey Bosch
Matthew Wise
Laura Burnworth

EDLB

Maurice Curtis
Sung Im
Devon Stripling

USDA-FSIS

Bonnie Kissler	Alice Green
Kristin Holt	Lisa Volk
Regina Tan	
Stephanie Defibaugh-Chávez	
Office of Public Health Service	
Compliance and Investigations Division, OPEER	
Office of Public and Consumer Affairs	

FDA

Stelios Viazis	Kari Irvin
Jennifer Beal	Susan Lance
Alyssa Clendenin	Angela Hardin
Tami Cloyd	Allison Wellman
Katherine Vierk	Alisha Elliott
Haryean Lambert	Mickey Parish
FDA District Offices – ATL, DEN, NOL, CHI, CIN, MIN	
Center for Food Safety and Applied Nutrition	

Thank You

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333

Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov Web: www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

