Colorado Department of Public Health and Environment

Investigating an Outbreak of *E. coli* O157:H7 Infections Associated with Ground Bison

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Overview

- How *E. coli* O157 cases and outbreaks are detected and investigated at the state level
- How local, state, and federal public health agencies collaborate during an outbreak
- Example of real outbreak investigation

E. coli O157:H7

- Annual public health impact — United States
  - >63,000 illnesses
  - 2,100 hospitalizations
  - 20 deaths
- Colorado
  - ~ 75 cases reported per year
  - ~2000 illnesses per year in Colorado
- Diarrheal illness
- Hemolytic-uremic syndrome (HUS)
  - 5–10%

E. coli O157:H7

- **Epidemiology**
  - Fecal-oral transmission
  - Incubation 2–10 days
  - Foodborne
  - Animal contact, person-to-person, waterborne
- **Implicated foods include**
  - Beef and other meats
  - Fresh produce
  - Dairy products
  - Processed foods (cookie dough, frozen foods)

Tracking *E. coli* O157:H7 Infections

- ***E. coli* O157:H7 infections are 'reportable' in each state**
  - **Clinicians and/or laboratories must report infections to state or local health departments within a specific time frame (e.g. 7 days)**
- **Case investigation by local public health agency**
  - **Prevent further transmission**
  - **Determine if an outbreak is occurring**
  - **Determine source of infection**
- **Patient's specimen sent to state public health laboratory for further testing**
  - **DNA 'fingerprinting' using pulsed-field gel electrophoresis (PFGE)**
  - **Used to identify potential clusters of cases**

Colorado's *E. coli* O157 Case Investigation Form

Travel information

*Did patient travel outside the US in the 7 days prior to the onset of illness? Yes No Unk

If yes, Country Date left US Date returned to US

(1)_____

(2)_____

(3)_____

☐ Check box if case was adop
or immigrated to US (no "dat

Did patient travel within the US in the 7 days prior to the onset of illness? Yes No Unk

If yes, where/when:_____

Water

During the 7 days before illness, what was patient's primary source of drinking water?

☐ Municipal ☐ Well water ☐Bottled water ☐Other_____

Did patient drink any untreated water from a pond, stream, spring, or lake? Yes No Unk

Did the patient swim or wade in any of the following types of recreational water? If yes, location / dates:

Hot tub/spa, whirlpool, Jacuzzi	Y	N	U
*Lake, pond, river, or stream	Y	N	U
*Recreational water park or any type of fountain	Y	N	U
*Swimming or wading pool	Y	N	U
Drainage ditch/irrigation canal	Y	N	U

Other, specify:_____

Pet or animal exposure in 7 days prior to illness

*Did the patient live on a farm with animals?	Yes	No	Unk
*Visit any animal exhibits (petting zoo, county fair, farm, etc)	Yes	No	Unk
If yes to either, did the case have exposure to manure?	Yes	No	Unk
Work in a slaughterhouse or meat packing plant?	Yes	No	Unk
Have a pet or contact with other people's pets?	Yes	No	Unk

If yes to any of these, indicate the animals with which patient had contact:

Dog/puppy	Y	N	Sheep	Y	N	Frog
Cat/kitten	Y	N	Pig	Y	N	Reptile (e.g. snake, iguana, turtle)
Cow/calf	Y	N	Horse	Y	N	Rodent (e.g. mouse, hamster, guinea pig)
Chicken	Y	N	Elk	Y	N	Exotic bird (e.g. parakeet, parrot)
Chick/duckling	Y	N	Deer	Y	N	Other? specify:_____

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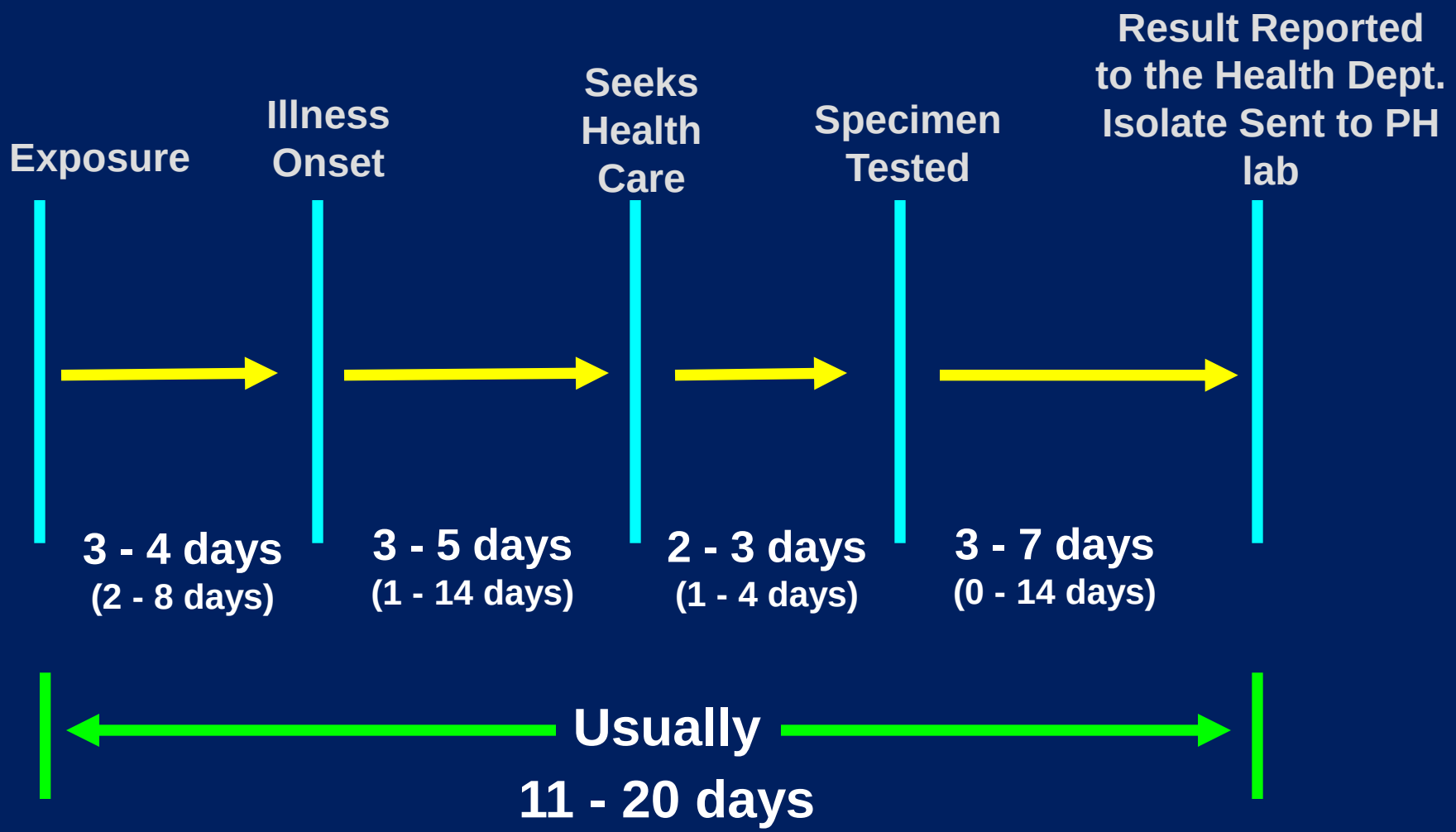
Typical reporting path: *E. coli* O157:H7



The Outbreak

- **June 18, 2010**
  - **CO state public health lab notified epidemiology of 4 *E. coli* O157:H7 isolates with same PFGE pattern**
- **Earlier that week…**
  - **Epidemiology had already started to investigate**
  - **4 *E. coli* O157:H7 cases**
  - **Reported June 8 – June 14**
  - **All males; between 6-24 years**
  - **2 reported consuming ground bison**
  - **A 5th case just reported also ate ground bison**

Questions to address

- Do we have an outbreak?
- Is it unusual to have 3/5 people eating bison? In Colorado?
- Did the cases eat the same bison product?
- Is there any bison we can test?
- Who regulates bison?

Investigation Methods

- Case finding – look for additional ill people
- Generate hypotheses about potential cause of outbreak
- Test hypotheses
  - Compare ill people to well people
  - Test foods or environment
  - Traceback
- Take action to prevent more illness
  - Recall a product
  - Public messaging
- Monitor to make sure outbreak is over

Finding Additional Ill People

- **Case definition**
  - **A person with laboratory-confirmed *E. coli* O157:H7 infection with the outbreak PFGE pattern since June 1, 2010 in the US**
- **Monitored Colorado database for new cases**
- **Notified local public health agencies, other state health departments, and CDC about the outbreak**
- **Used CDC's PulseNet database to search for *E. coli* O157 cases with the same 'DNA fingerprint' in other states**

Generating Hypotheses

- Each case re-interviewed with more specific questionnaire
  - Any foods > 2 cases reported eating on initial questionnaire
  - Detailed purchase and handling information
  - Asked about leftover bison
  - Obtained shopper card numbers
- 4/5 Colorado cases ate ground bison or had it in their home
  - All bison was Brand A in same size and style of package
- No other common exposures identified

Testing the Hypothesis: Case-Control Study

- Compare exposures of cases to exposures of well people
- All 5 cases
- 3 ‘controls’ per case, matched by age group and neighborhood
  - Located using on-line tools for finding residential phone numbers in a case’s neighborhood
  - Enrolled 14 controls

Case-Control Study Results

Consuming ground bison or having it in one's home was statistically associated with illness

Exposure	Cases Exposed N (%)	Controls Exposed N (%)	Odds Ratio	P-value
Consume bison meat	3 (60)	2 (14)	9.0	0.08
Bison meat in home	3 (60)	2 (14)	9.0	0.08
Consume bison meat or have in home	4 (80)	2 (14)	24.0	0.02
Consume ground beef	3 (60)	10 (71)	0.6	1.0
Consume lettuce	4 (80)	11 (85)	0.7	1.0
Consume organic milk*	3 (75)	2 (15)	16.5	0.05

*each case consumed milk from a different source

Testing the Hypothesis: Product Testing

- One case had a leftover cooked ground bison patty in freezer
- We purchased one package from local grocery store
- Both tested at state public health laboratory
- Both negative for *E. coli* O157

Testing the Hypothesis: Traceback

- Generally a collaboration between state health departments, CDC, and appropriate regulatory agency
- Review detailed purchase information
  - Lot numbers or best by dates
  - Purchase dates and locations
- Shopper card data can be valuable
- Who regulates ground bison?

Bison Regulation

- Bison considered a ‘game meat’
- Not included in Federal Meat Inspection Act
- Falls under US Food and Drug Administration (FDA) authority
- Inspection authority typically delegated to state agriculture departments
- CO Department of Agriculture has no resources to regulate bison producers and requires they enter into USDA’s voluntary inspection program

Traceback: Using Shopper Cards

- **Potentially a powerful tool**
  - **Stores collect data on shopper purchases including purchase date and product details**
- **Can be challenging to use**
  - **Cases do not always have shopper card numbers handy**
  - **Elderly people receive groceries from many sources (less of an issue in this outbreak)**
  - **Some retailers require signed consents**
  - **Authority to compel retailers to provide information varies by state**

Traceback Results

- Shopper card data collected for 4 Colorado cases
  - All purchased implicated Brand A ground bison product
- USDA FSIS determined product came from Plant A in Denver, Colorado
- USDA FSIS environmental investigation at Plant A
  - Plant A agreed to recall implicated product

Take Action to Prevent More Illness

Recall Date: July 2, 2010

Product: 66,000 pounds of ground and tenderized steak bison products

Distribution: Nationwide

Public messaging via press release to inform consumers

USDA Food Safety and Inspection Service

Recall Release

CLASS I RECALL
HEALTH RISK: HIGH

Congressional and Public Affairs
Atiya Khan (202) 720-9113
FSIS-RC-043-2010

COLORADO FIRM RECALLS BISON PRODUCTS DUE TO POSSIBLE *E. COLI* O157:H7 CONTAMINATION

WASHINGTON, July 2, 2010 – Rocky Mountain Natural Meats, a Henderson, Colo. establishment, is recalling approximately 66,000 pounds of ground and tenderized steak bison products that may be contaminated with *E. coli* O157:H7, the U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS) announced today.

FSIS became aware of the problem during the course of an on-going investigation into a cluster of *E. coli* O157:H7 illnesses in Colorado with illness onset dates between June 4, 2010 and June 9, 2010. Working in conjunction with the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration, the Colorado Department of Public Health and Environment and the New York Department of Health, 5 case-patients have been identified in Colorado as well as 1 case-patient in New York with an indistinguishable PFGE pattern. FSIS determined that there is an association between the ground bison products and the cluster of illnesses in the state of Colorado. FSIS is continuing to work with the CDC, affected state public health partners, and the company on the investigation. Anyone with signs or symptoms of foodborne illness should contact a health care provider.

The following products are subject to recall:

- 16-ounce packages of "GREAT RANGE BRAND ALL NATURAL GROUND BISON." These products have a "sell or freeze by" date of June 21, June 22 or June 24, 2010.
- 16-ounce packages of "NATURE'S RANCHER GROUND BUFFALO." These products have a "sell or freeze by" date of June 22, 2010.
- 16-ounce packages of "THE BUFFALO GUYS ALL NATURAL GROUND BUFFALO 90% LEAN." These products have a lot number of 0147.
- 12-ounce packages of "GREAT RANGE BRAND ALL NATURAL BISON STEAK MEDALLIONS." These products have a "sell or freeze by" date of June 23 and June 24, 2010
- 12-ounce packages of "GREAT RANGE BRAND ALL NATURAL BISON SIRLOIN STEAKS." These products have a "sell or freeze by" date of June 20, June 23 and June 24, 2010
- 15-pound boxes of "ROCKY MOUNTAIN NATURAL MEATS, INC. BISON 10 OZ SIRLOIN STEAK." These products went to restaurants and bear a Julian Code of 0141.

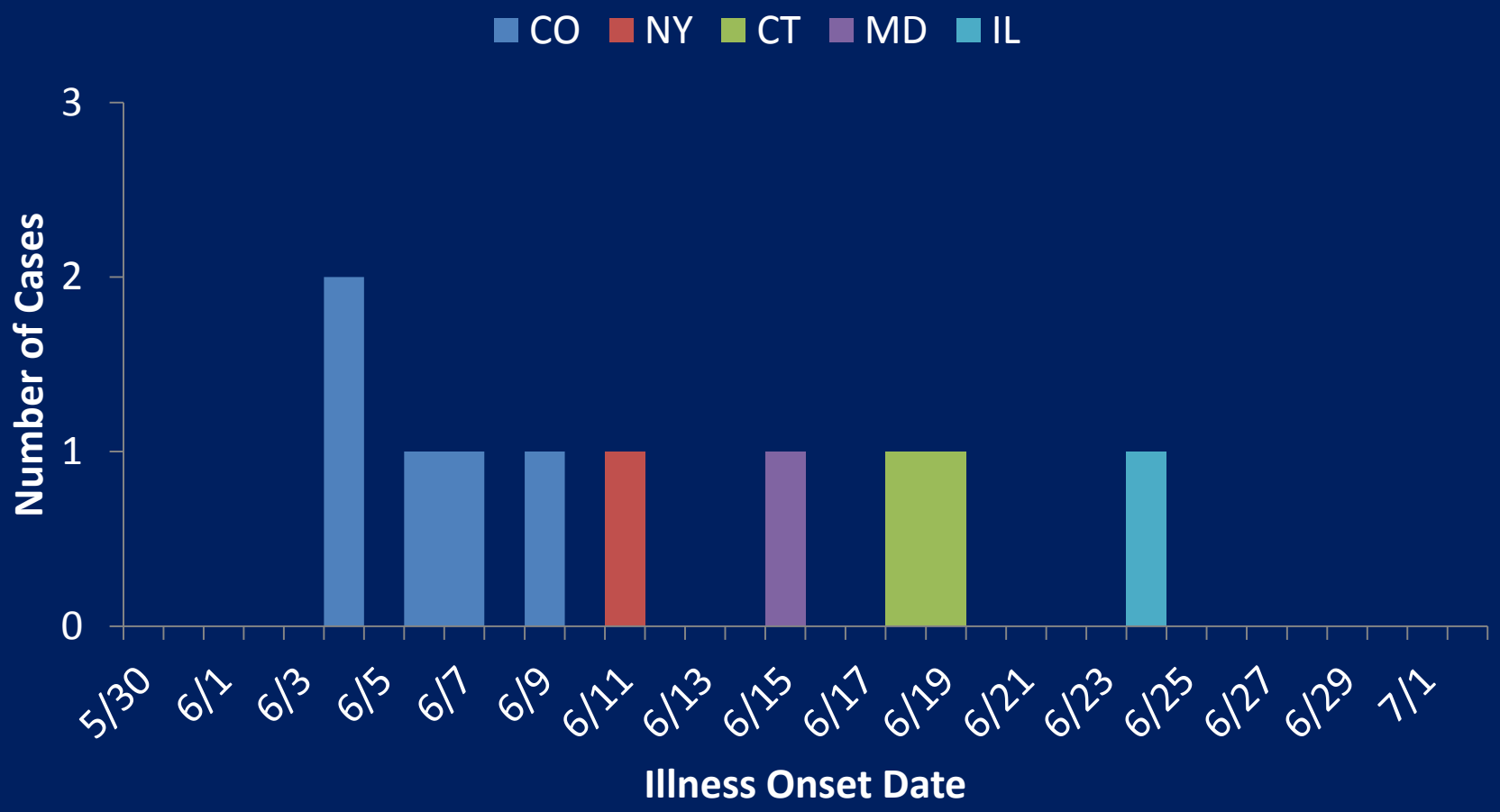
The products subject to recall bear the establishment number "EST. 20247" inside the USDA mark of inspection. These products were produced between the dates of May 21, 2010 through May 27, 2010, and were distributed to retail establishments nationwide and food service distributors in Utah and Arizona. While the sell-by dates for these products have passed, FSIS and the establishment are aware that consumers may also freeze the product before use and there is concern that some product may still be frozen and in consumers' freezers. When available, the retail distribution list(s) will be posted on FSIS' Website at http://www.fsis.usda.gov/FSIS_Recalls/ Open_Federal_Cases/index.asp.

Results of Case Finding

- 5 additional cases of *E. coli* O157:H7 with indistinguishable PFGE patterns detected in other states after Brand A ground bison product was implicated
  - Connecticut (2), Illinois (1), Maryland (1), New York (1)

- All 5 reported consuming Brand A ground bison

Multistate *E. coli* O157:H7 Outbreak Associated with Ground Bison, June 2010 (N=10)



Outbreak Summary

- 10 PFGE-matched cases in 5 states
- Onset dates: June 4 – June 24, 2010
- Median age = 26 years (range: 6 – 86 years)
- 70% male
- All cases survived
- 29% (2/7) were hospitalized
- No HUS

Conclusions

- *E. coli* O157:H7 outbreak caused by ground bison
- Regulatory authority for bison not as straightforward as for some other foods
  - Coordination and collaboration is key
- Traceback concurrently with epidemiologic investigation can result in earlier public health action
- Standardized protocols for using shopper card helpful

Acknowledgements

Colorado Local Public Health Agencies

- Eagle County Health and Human Services
- El Paso County Public Health
- Jefferson County Public Health

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Illinois Department of Health – Lori Saathoff-Huber

New York State Department of Health – David Nicholas

Maryland Department of Health and Mental Hygiene – Amanda Palmer

Thank you

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