

Three Outbreaks of *E. coli* O157 Infections Due to Retail Ground Beef in Minnesota, 2000: Detection, Investigation, and Characteristics



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***E. coli* O157 Surveillance in Minnesota**

- **Isolates must be submitted to the Minnesota Department of Health (MDH)**
- **Real-time pulsed-field gel electrophoresis (PFGE) subtyping of all isolates**
- **Routine interviews of all cases**

Daily Report from Lab to Epi

Name	Age	City	County	Pathogen
J. Doe	3	Blaine	Anoka	<i>E. coli O157</i>
H. Smith	26	St. Paul	Ramsey	<i>E. coli O157</i> <i>MN501</i>
R. Jones	21	Luverne	Rock	<i>C. jejuni</i>
C. Grant	62	Stockton	Winona	<i>S. Typhimurium</i>
B. Brown	55	Winona	Winona	<i>S. Typhimurium</i>

4. Where did you shop for groceries eaten during the week before your illness?

5. Where and when did you purchase any hamburger you ate the week before your illness? _____

6. What type of hamburger was it (extra lean, % fat, etc.)? _____

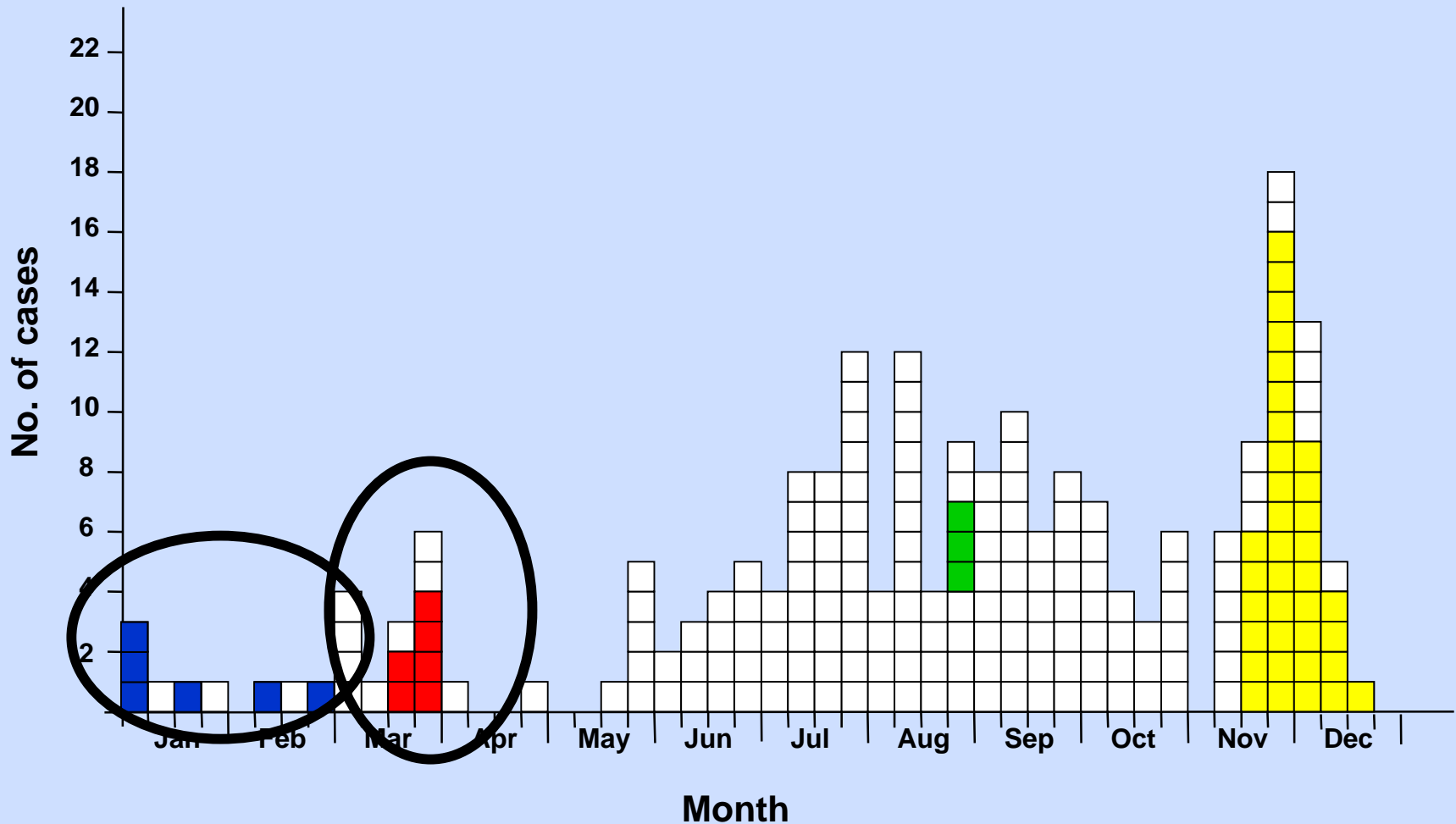
What size package?

1/2 lb. _____ **1 lb.** _____ **2 lb.** _____ **Other** _____

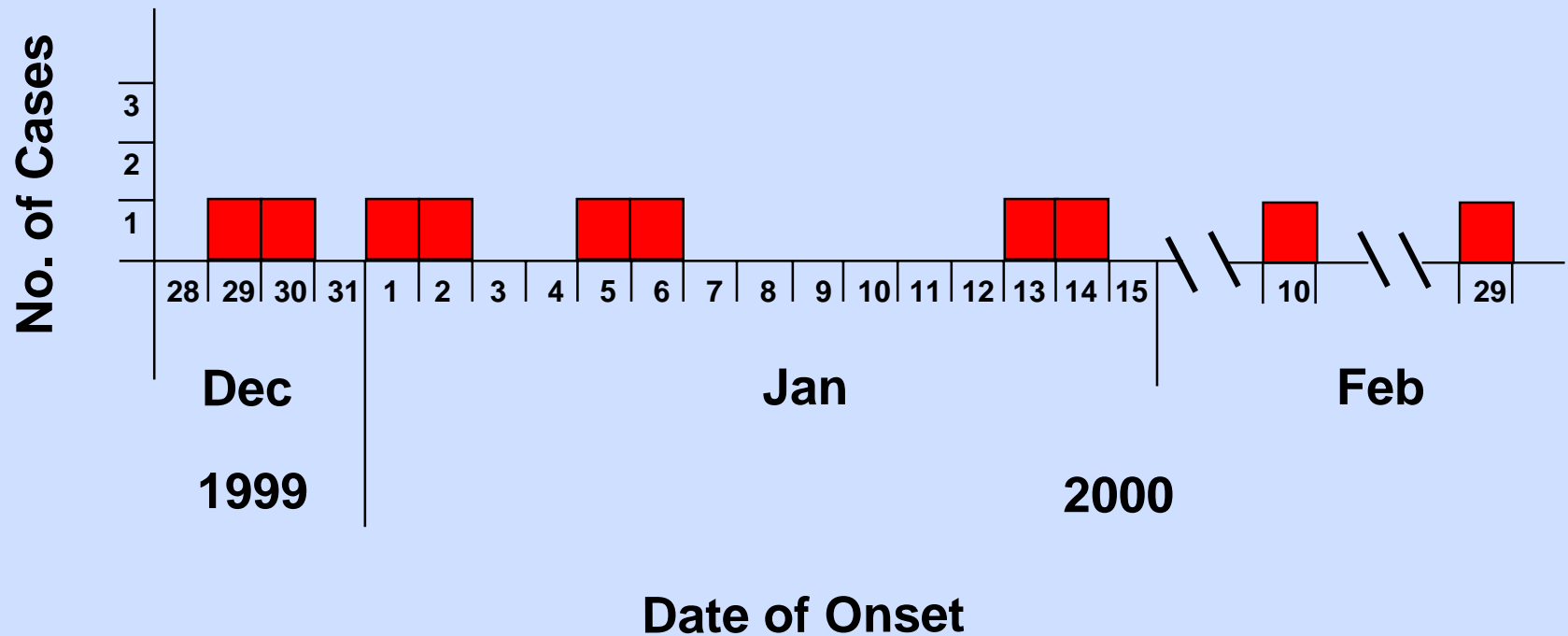
Meats & Poultry

<u>Food Item</u>	<u>Ate</u>	<u>Did not eat</u>	<u>May have eaten</u>	<u>How prepared</u>	<u>Variety or brand</u>	<u>Grocery store where purchased</u>	<u>Date purchased (mo/da/yr)</u>
Hamburger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____	__/__/__
Hamburger as an ingredient: type of dish: _____ a. Hamburger: <input type="checkbox"/>raw <input type="checkbox"/>rare (red in middle) <input type="checkbox"/>medium (pink in middle) <input type="checkbox"/>well done (no pink)							
Other beef:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____	__/__/__

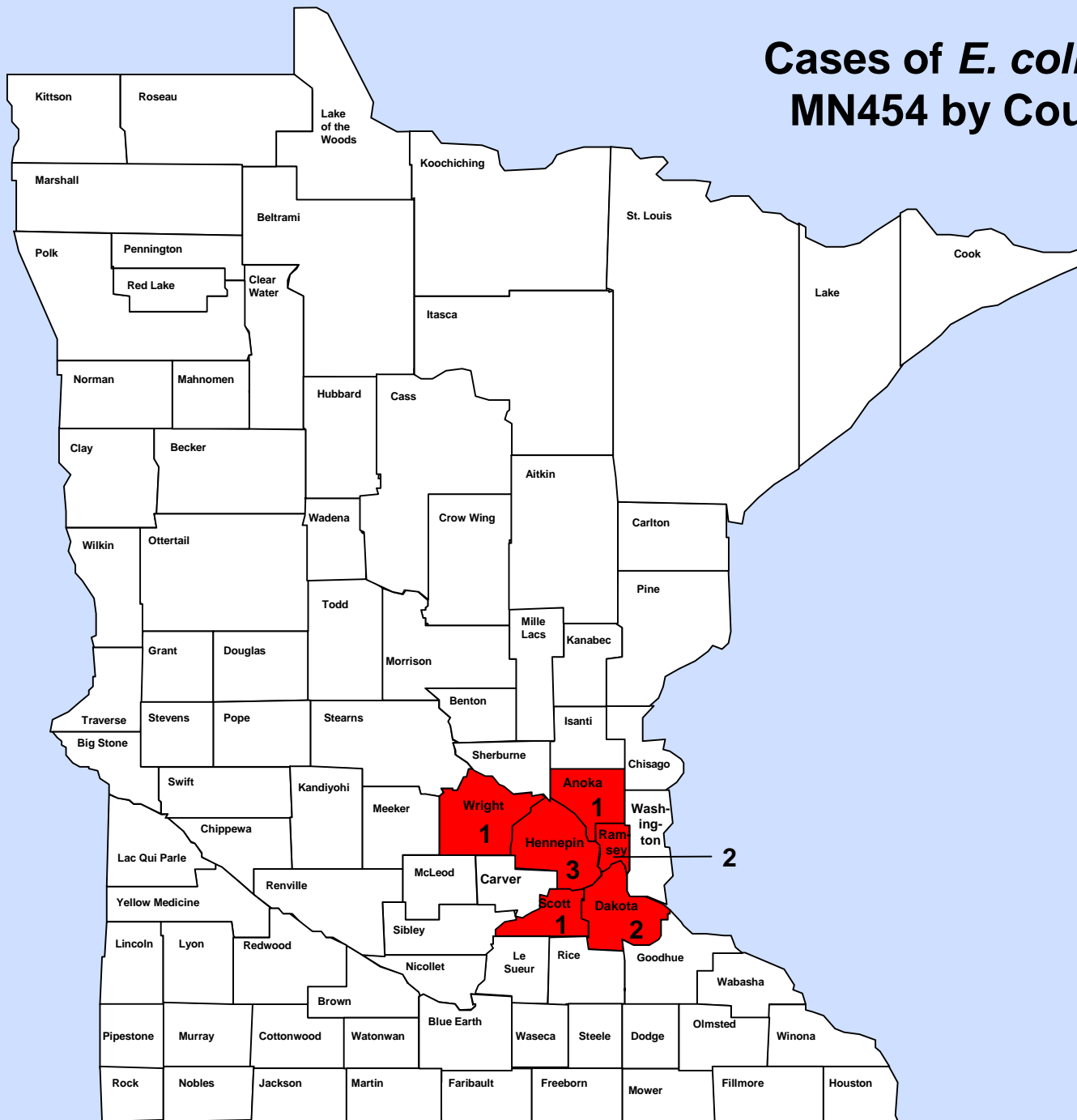
E. coli O157 Subtype Surveillance, Minnesota, 2000



E. coli O157:NM subtype MN454 Cases by Date of Onset, Minnesota, December 1999-February 2000



Cases of *E. coli* O157:NM subtype MN454 by County of Residence



Outbreak 1:

December 1999 – February 2000

- **Median age of cases: 18 years
(range, 4 to 62 years)**
- **Based on initial interviews, no
obvious common source identified**

Outbreak 1

- **Community case-control study done to determine risk factors for infection**
 - **two age-matched controls per case selected by sequentially dialing telephone numbers with the same prefix as the case's number**
 - **standardized interview about food consumption and other potential exposures in the 7 days prior to case's onset of illness**

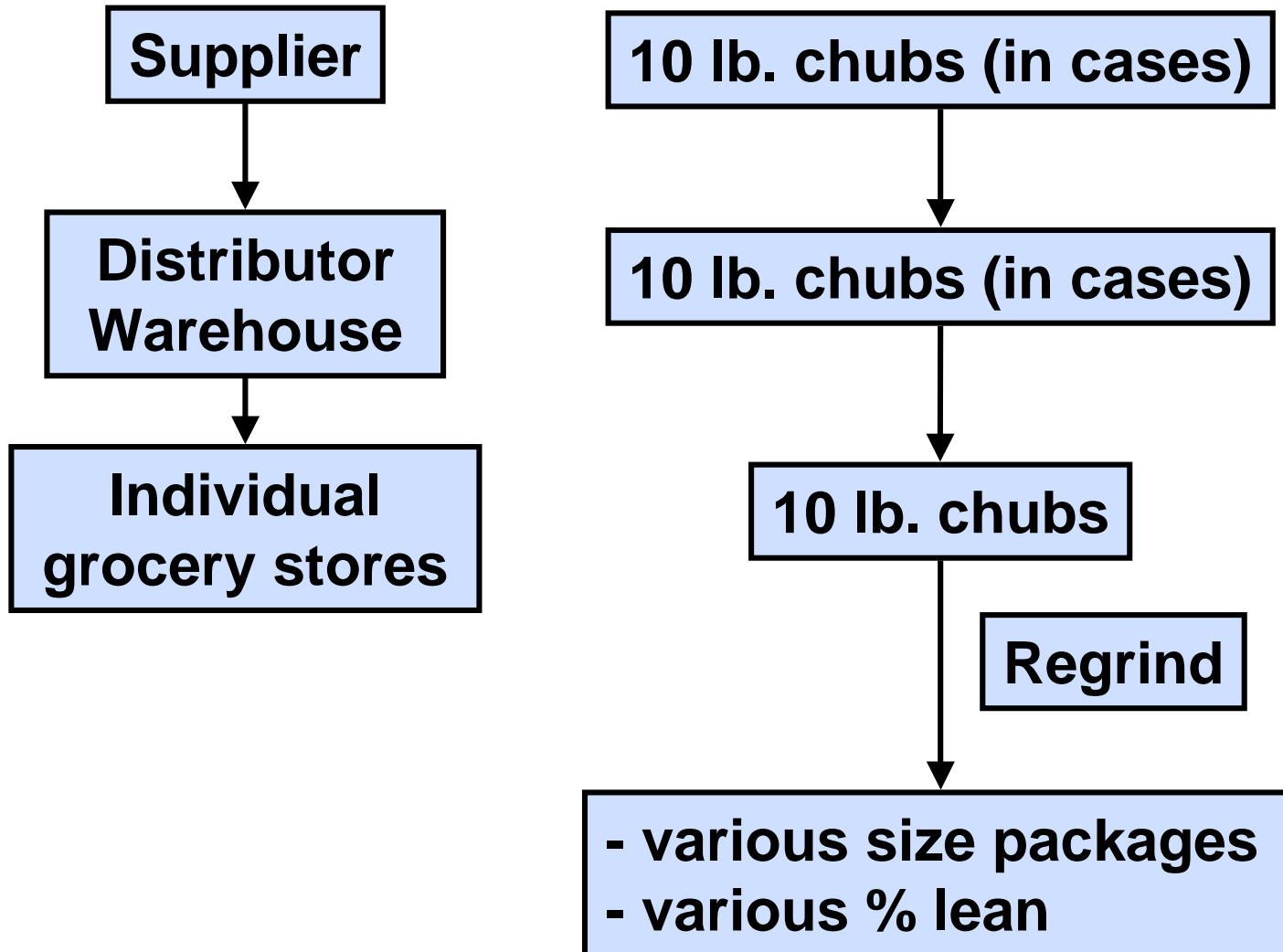
Outbreak 1

- **Nine of 10 cases ate ground beef from one major chain of grocery stores (Grocery Chain A) versus four of 20 controls**
 - **matched OR, 11.8; 95% CI, 1.5 – 92.9; p = 0.019**

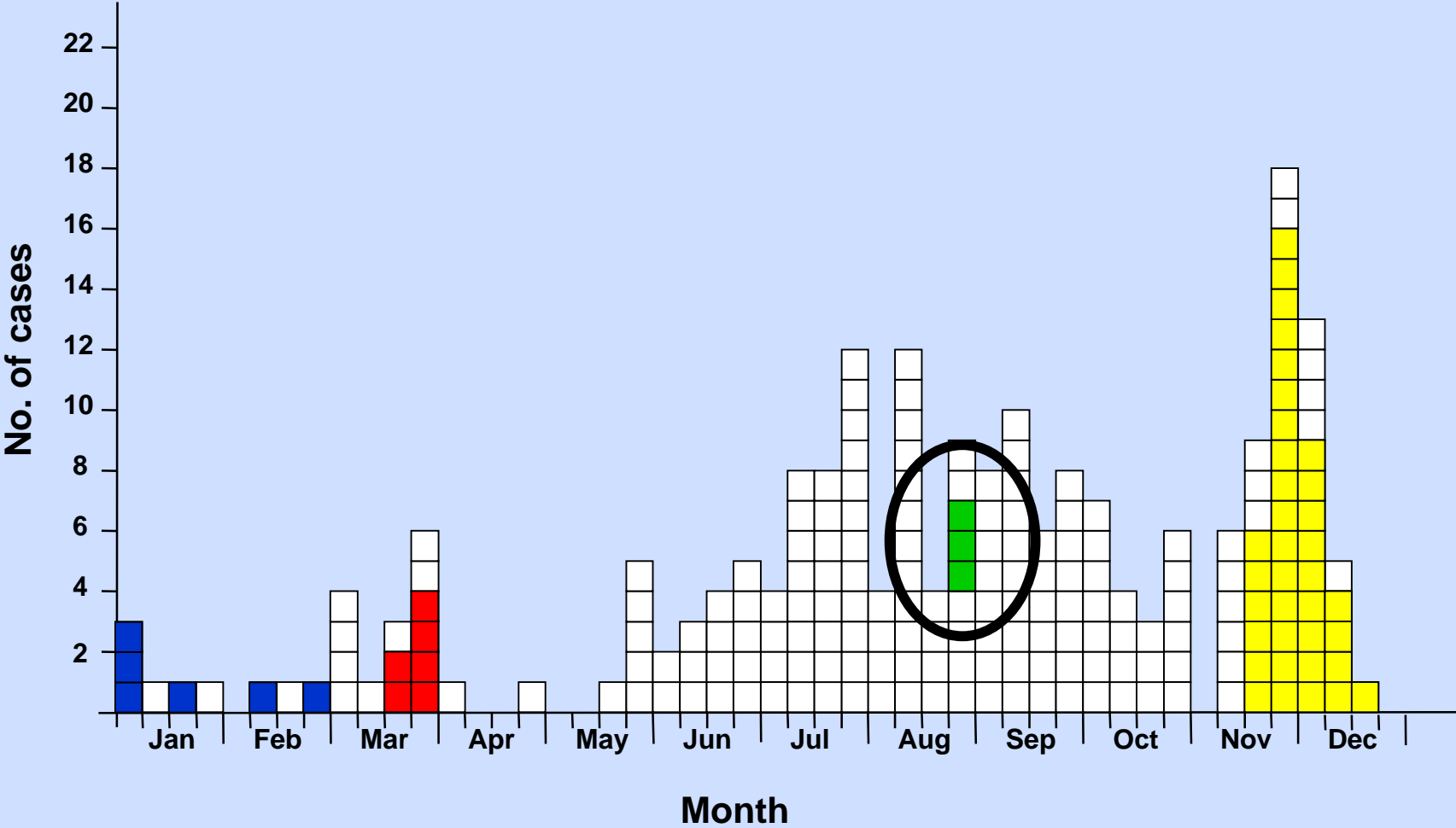
Outbreak 1

- **Ground beef was purchased from eight different Grocery Chain A stores**
 - **packages varied in weight and fat content**
- **Ground beef samples tested by Minnesota Department of Agriculture (MDA) were negative for O157**

Ground Beef Flow Through Retail System



E. coli O157 Subtype Surveillance, Minnesota, 2000



Outbreak 2

FRIDAY, SEPTEMBER 1

- MDH lab reported 3 *E. coli* O157:H7 isolates with indistinguishable PFGE pattern (MN501)
 - specimens collected in previous week
- 2 cases attended same barbecue, ate undercooked hamburgers
 - brand A frozen hamburger patties
- 3rd case not linked to barbecue, but had consumed Brand A patties in the week before onset
 - box with leftover patties submitted to MDA

Outbreak 2

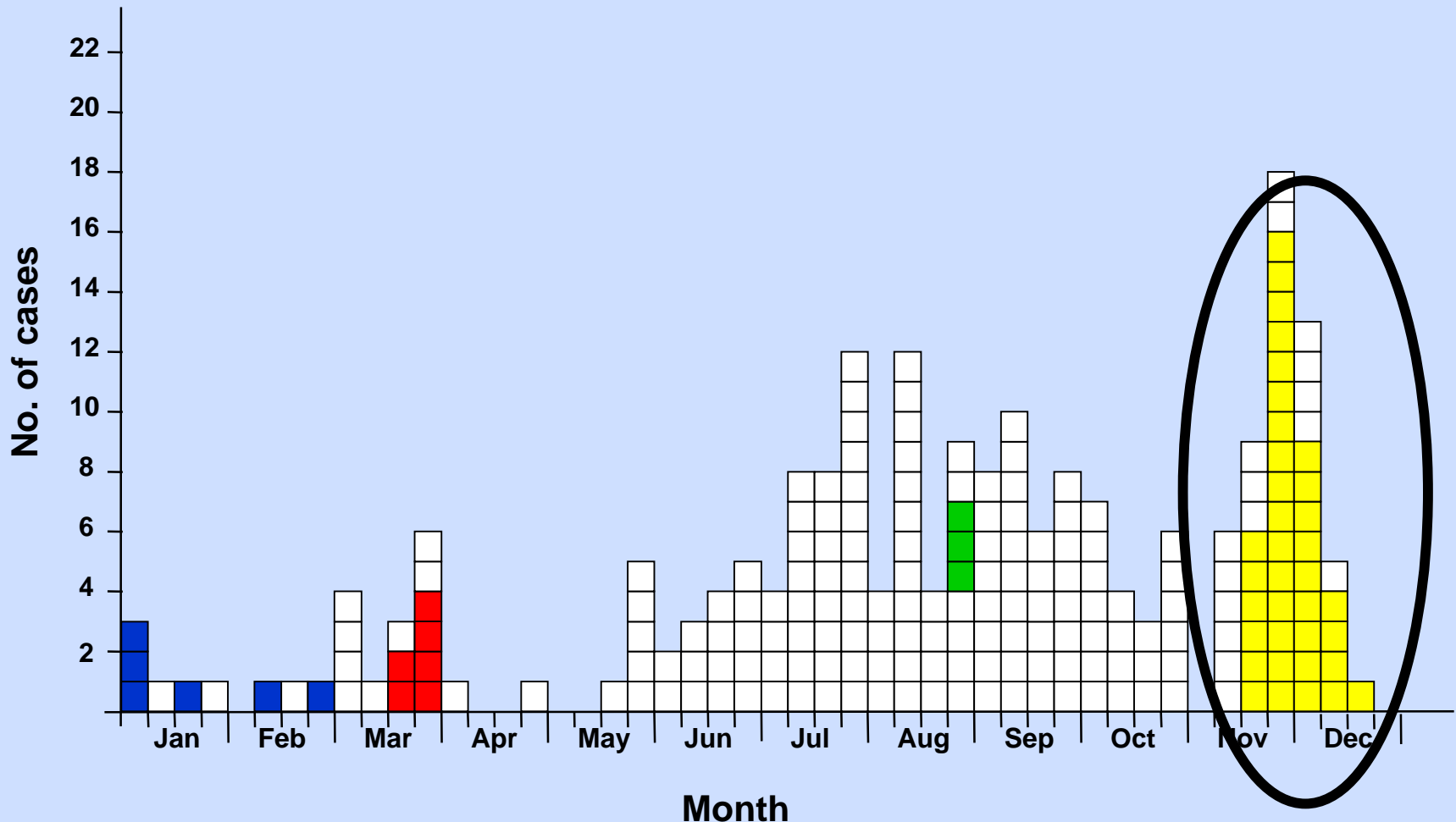
TUESDAY, SEPTEMBER 5

- *E. coli* O157 isolated from patties

WEDNESDAY, SEPTEMBER 6

- Hamburger isolates confirmed as MN501 by PFGE (matched case isolates)
- Recall of 30,000 lbs. of product from implicated production date
- MDA later isolated MN501 from intact packages

E. coli O157 Subtype Surveillance, Minnesota, 2000



Outbreak 3:

November 2000 – February 2001

MONDAY - TUESDAY, NOVEMBER 27-28

- MDH lab reported 5 *E. coli* O157:H7 isolates with indistinguishable PFGE pattern (MN9)
- Community case-control study initiated

WEDNESDAY, NOVEMBER 29

- MDH lab reported 5 additional isolates of MN9

Outbreak 3

FRIDAY, DECEMBER 1

- Consumption of ground beef purchased at Grocery Chain A associated with illness
 - 8 of 9 cases vs. 5 of 16 controls; matched OR, 10.0; 95% CI, 1.04-434; $p=0.04$

Outbreak 3

- **Majority of ground beef exposures not hamburgers, but rather casseroles, spaghetti sauce, tacos, etc.**
- **Most exposures occurred 3 to 4 days before illness onset**
- **Multiple Grocery Chain A stores identified as sources of ground beef for cases**
- **Ground beef varied in weight and fat content**

Outbreak 3

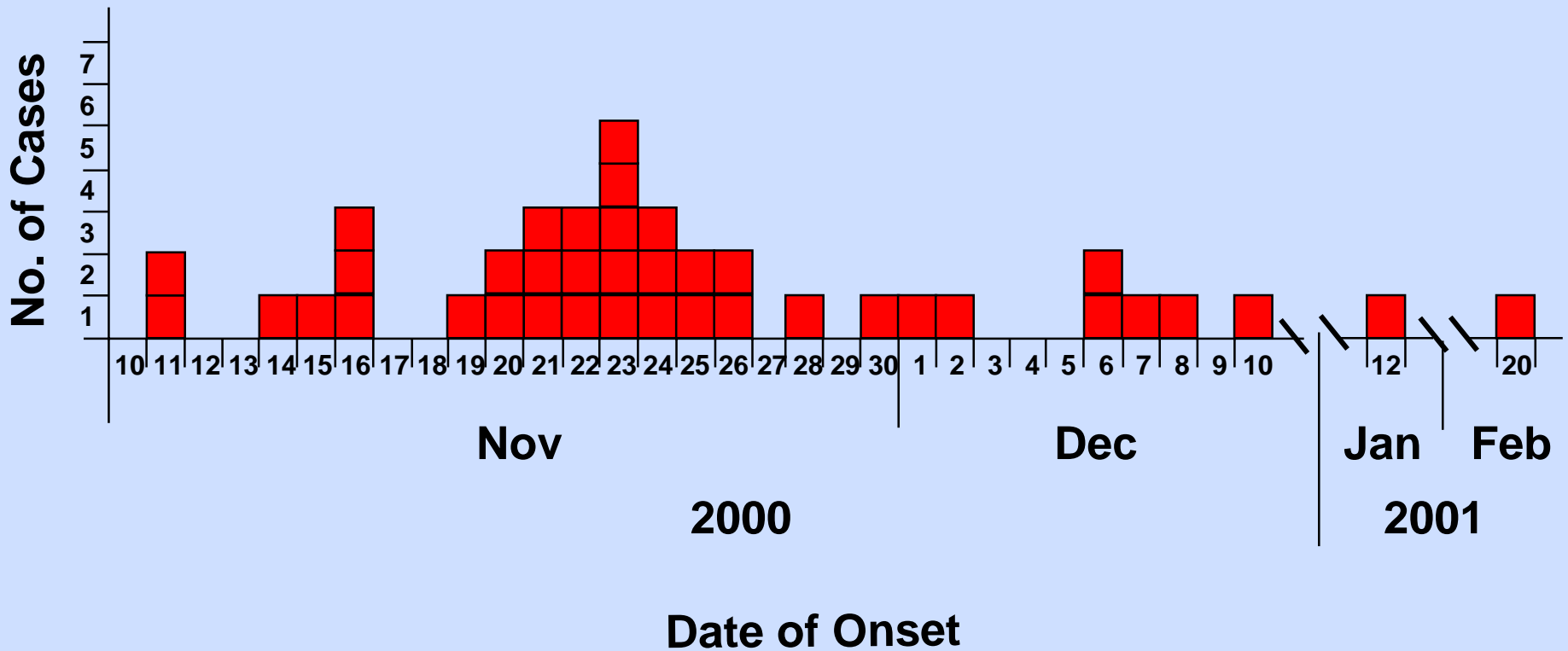
FRIDAY, DECEMBER 1

- **Grocery Store A/Distributor A voluntarily recalled all ground beef from grocery stores that received product from Supplier A since November 1**
- **Case-control study discontinued**

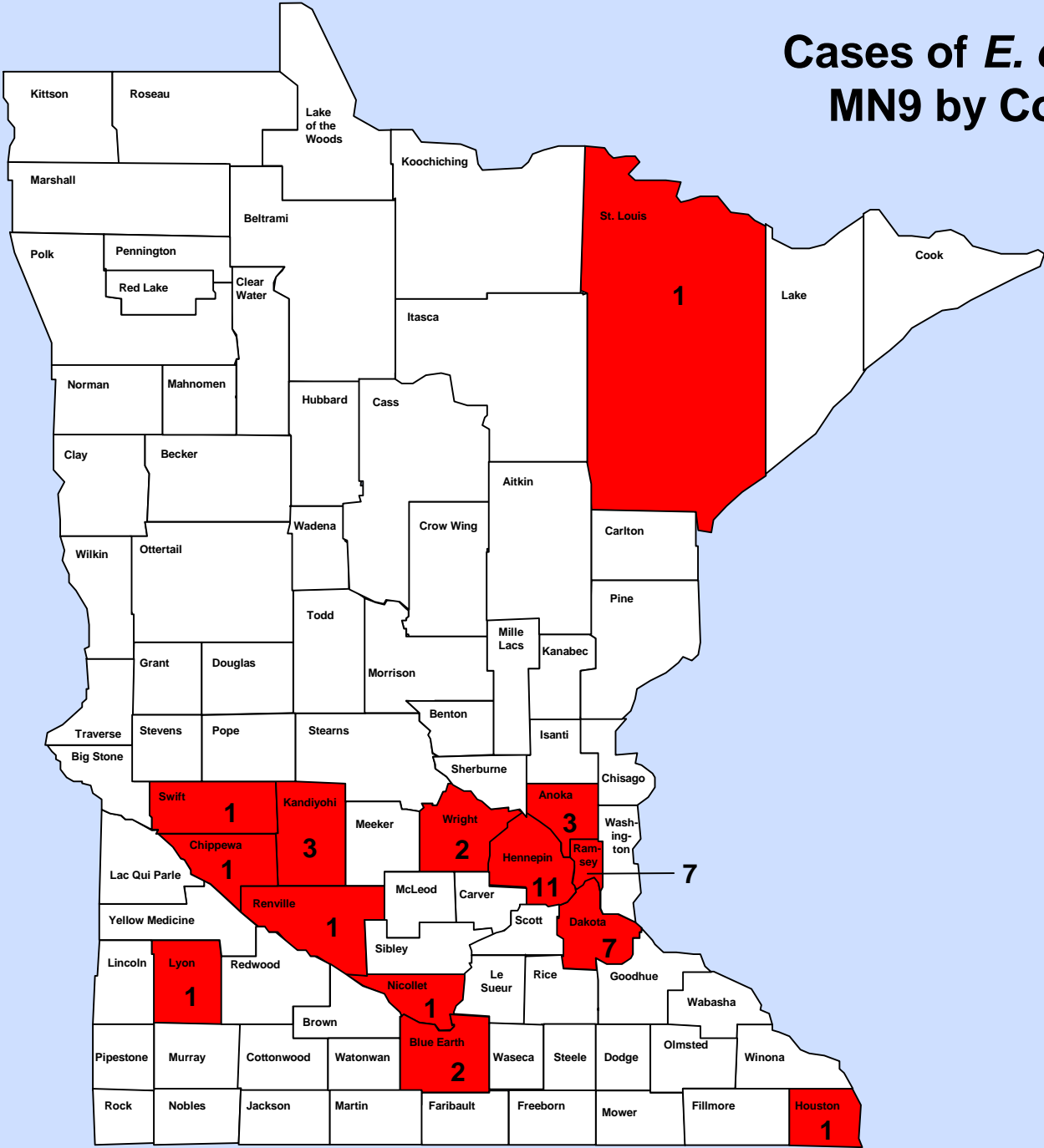
MONDAY, DECEMBER 4

- **Supplier A issued a voluntary nationwide recall of 1.1 million lbs. of ground beef with November 2–3 production dates**

E. coli O157:H7 subtype MN9 Cases by Date of Onset, Minnesota, November 2000 - February 2001



Cases of *E. coli* O157:H7 subtype MN9 by County of Residence



Outbreak 3

- **Median age was 20 years (range, 1 to 87 years)**
 - **24 cases hospitalized**
 - **3 cases of hemolytic uremic syndrome**
 - **2 colectomies**
 - **no deaths**
- **20 grocery stores identified as sources of ground beef for cases**

Outbreak 3

- **MDA isolated *E. coli* O157:H7 from 23 ground beef samples**
 - **4 samples from 3 case households (opened and intact packages; meatballs) were positive**
 - **19/43 samples from intact packages returned to 3 different stores were positive**
 - **19 positive samples yielded the MN9 subtype; 5 samples yielded isolates with other PFGE subtypes (not associated with human cases)**



Supplier A

**Distributor A
WI Warehouse**

**Distributor A
MN Warehouse**

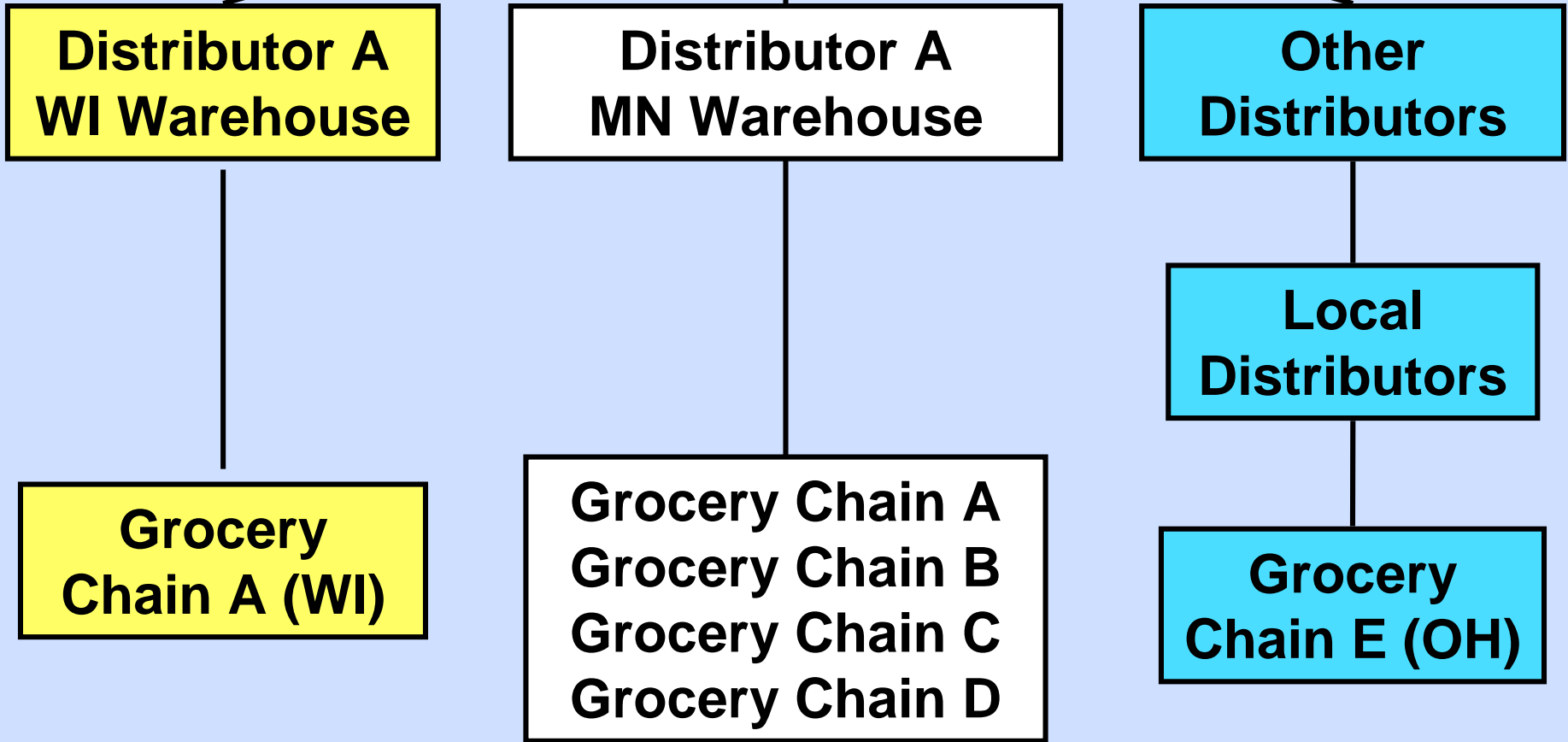
**Other
Distributors**

**Grocery
Chain A (WI)**

**Grocery Chain A
Grocery Chain B
Grocery Chain C
Grocery Chain D**

**Local
Distributors**

**Grocery
Chain E (OH)**



Discussion

- **Outbreaks due to retail ground beef can be difficult to identify**
 - cases may not be tightly clustered in time and space
- **Strategies exist to enhance outbreak detection and investigation**

Discussion (cont.)

- **Real-time PFGE subtyping of all *E. coli* O157 isolates**
- **Rapid interviewing of cases about potential exposures, including detailed questions about ground beef**
- **Community case-control studies**
 - **consider when there is a temporal cluster of at least 5 cases with no obvious common source**

Discussion (cont.)

- **Aggressive culturing of ground beef**
 - from case households
 - from retail sources
- **Ground beef sold in numerous grocery stores, in packages of varying weight and fat content, may be from a common source**
 - store grind records

Co-Investigators, Minnesota Department of Health

- **Kirk Smith**
- **Liz Wagstrom**
- **Fe Leano**
- **David Boxrud**
- **Jennifer Adams**
- **John Besser**
- **Richard Danila**
- **Harry Hull**