Yersinia enterocolitica Surveillance in Minnesota

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Yersinia enterocolitica (YE)

- **Gram-negative facultative anaerobic coccobacillus**
- **Family *Enterobacteriaceae***
- **One of three pathogenic *Yersinia: Y. pestis, Y. pseudotuberculosis, Y. enterocolitica***

Reservoir and Transmission

- Broad environmental and zoonotic reservoir
- Swine are the major reservoir for disease in humans
- Major mode of transmission is foodborne from raw or undercooked pork and from milk or water
- Contact with animals or products
- Blood transfusions

Culturing *Yersinia*

- **CIN agar**
- **Any media for *Enterobacteriaceae***
- **Differential tests for *Yersinia* not included in many commercial ID systems**
- ***Yersinia* prefers 25-30°C**

Y. enterocolitica (cont.)

- **Human pathogenic strains have traditionally been associated with defined bioserogroups that carry the virulence plasmid:**
  - **biotypes 1B, 2, 3, 4, 5**
  - **serotypes O:3, O:5, O:8, O:9**
- **Biotype 1A traditionally considered non-pathogenic; no virulence plasmid**

Y. enterocolitica Biotypes

- **Classification as a pathogenic or non-pathogenic biotype is based on biochemical test result profiles**
  - **biochemical tests incubated at 25°C for 48 hrs: xylose, salicin, esculin, pyrazinamidase, trehalose, indole**

Y. enterocolitica Biotypes (cont.)

- **Pathogenic biotypes have been shown to have the virulence plasmid, and non-pathogenic strains do not, when verified by molecular methods**
- **However, there are important chromosomal virulence genes that contribute to the pathogenicity of *Y. enterocolitica***

Methods

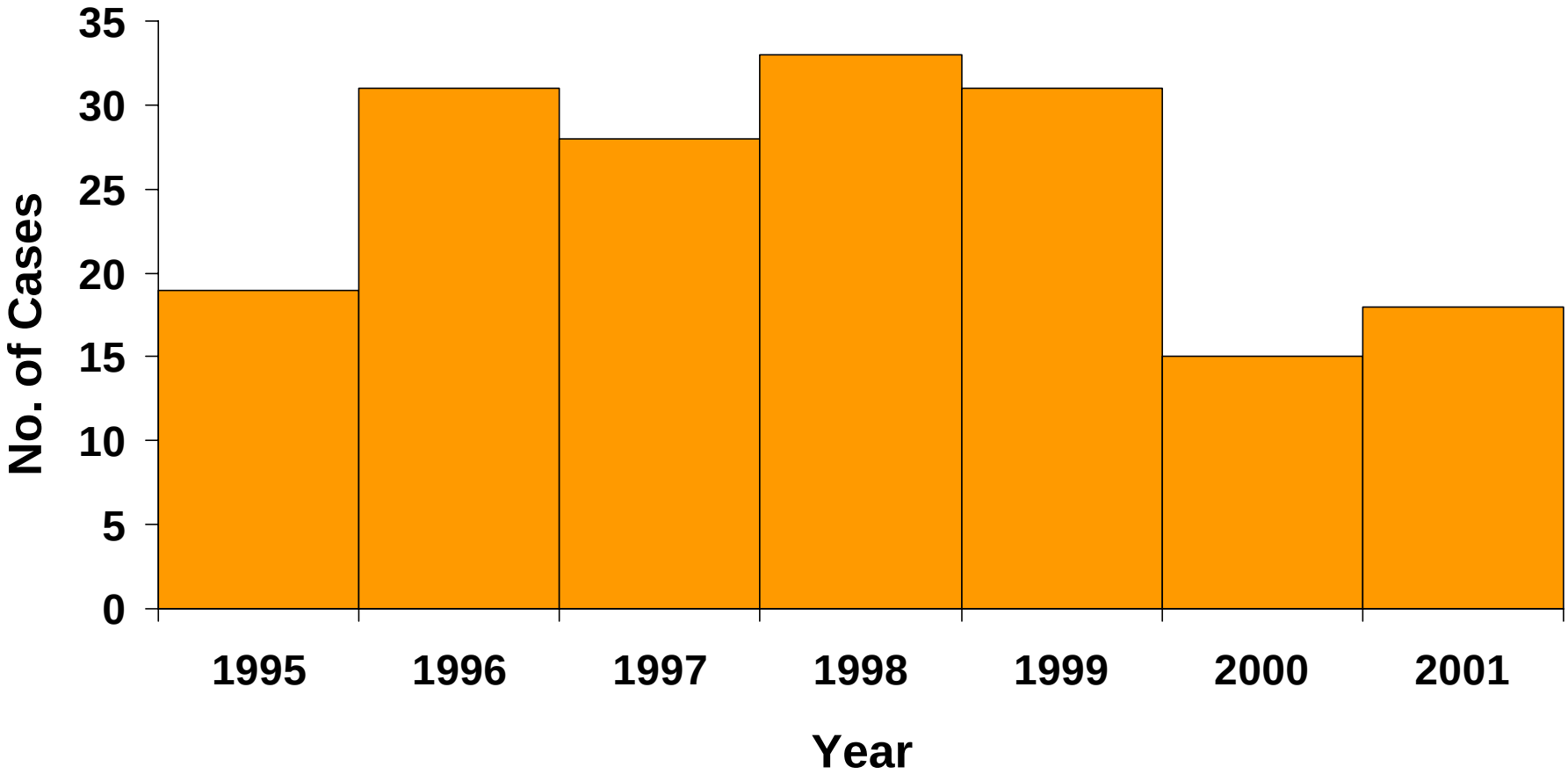
- Reviewed clinical histories of cases reported to the MDH from 1995-2001
- Characterized isolates by biotype, and pulsed-field gel electrophoresis (PFGE)
- Evaluated laboratory practices for enteric culture affecting surveillance for *Yersinia* in Minnesota

Case Definition

- **Minnesota resident with *Yersinia enterocolitica* isolated from any source**
- **1995-2001**
- **No other pathogen isolated**

Number of YE Cases in Minnesota by Year, 1995-2001

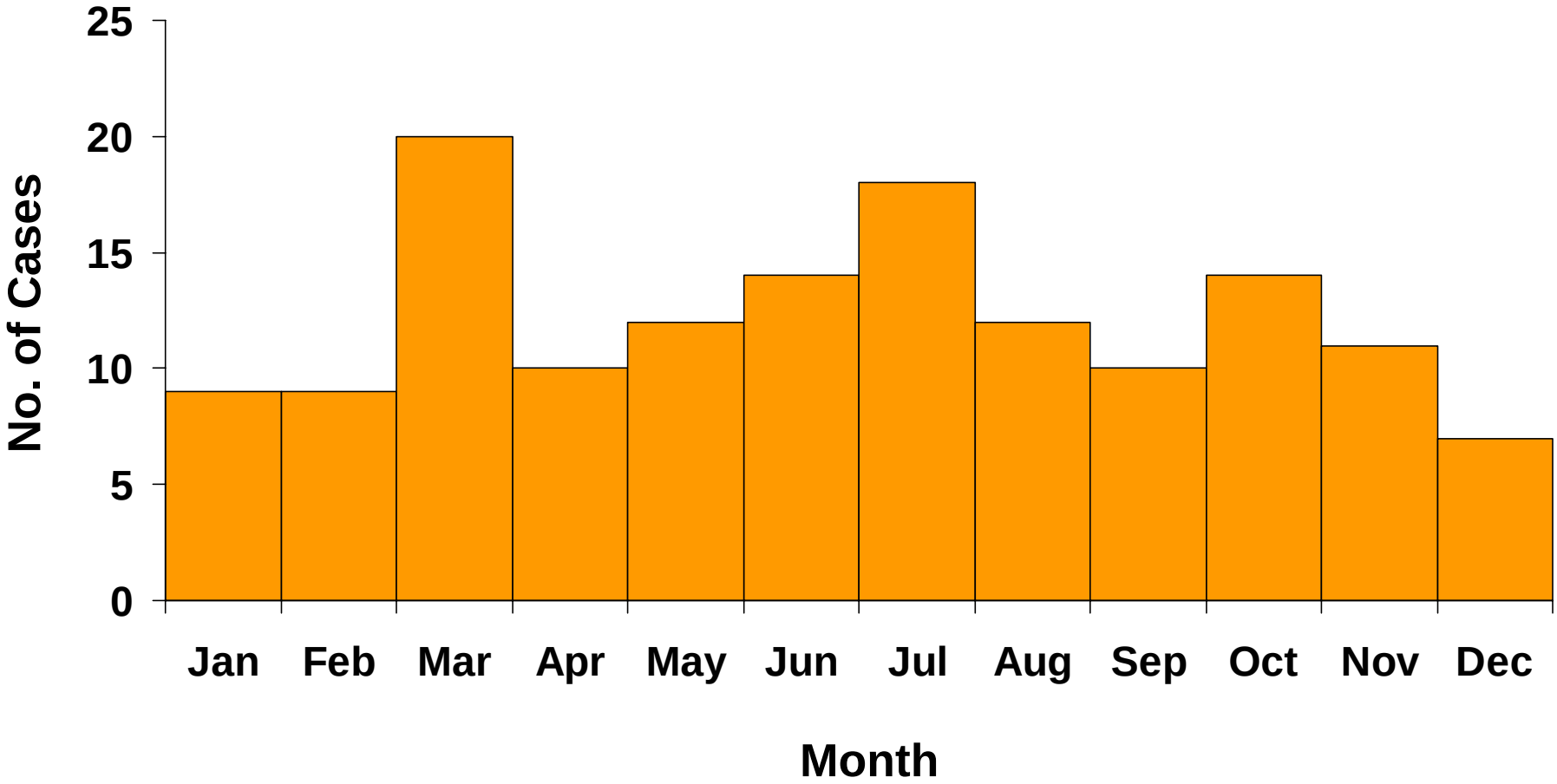
- 175 total cases reported to MDH
- Mean, 25 cases/year (range, 15-33)



Source of YE Case Isolates (n=157)

- **Stool: 148 (94%)**
- **Urine: 4 (3%)**
- **Wound exudate: 3 (2%)**
- **Blood: 1 (<1%)**
- **Bile: 1 (<1%)**

Distribution of YE Cases by Month of Illness Onset,1995-2001



Y. enterocolitica Case Demographics, Minnesota, 1995-2001

- **Gender: 54% female**
- **Race: White 90%, African American 5%, Asian 3%, Native American 1%**
- **Ethnicity: Hispanic 3.5%, Non-Hispanic 96.5%**

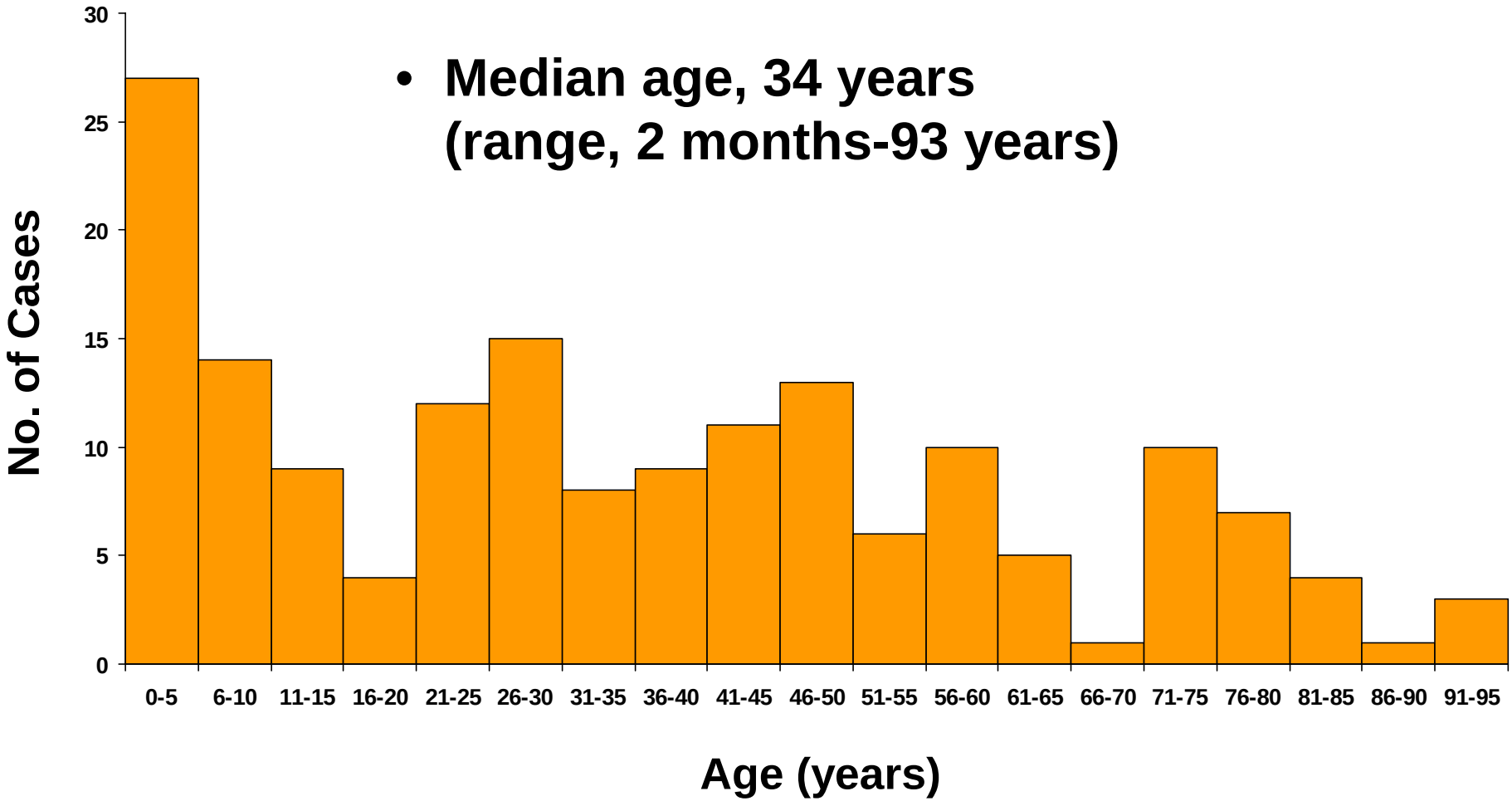
Y. enterocolitica Case Demographics, Minnesota, 1995-2001 (cont.)

- **County of Residence: 60% live outside the seven county Minneapolis-St. Paul metropolitan area**
  - **47% of Minnesota residents live outside the metropolitan area**

    ($z = 3.37$, $p < 0.001$)

Age Distribution of YE Cases

- **Median age, 34 years (range, 2 months-93 years)**



Clinical Signs and Symptoms

- Diarrhea - 89%
- Abdominal pain - 75%
- Fatigue - 69%
- Fever - 45%
- Vomiting - 26%
- Blood in stools - 25%
- 36/141 (25%) patients hospitalized; Median, 4.5 days (range, 1-33 days)

Potential Sources of Exposure to YE Reported by Cases

- **Drinking raw or untreated water: 32/121 (26%)**
- **Eating pork: 66/94 (70%)**
- **Eating chitterlings: 2/104 (2%)**
- **Living on or visiting a farm: 17/119 (14%)**
- **Travel outside Minnesota: 31/125 (25%)**
- **Ill household members: 24/121 (20%)**

Y. enterocolitica Isolates Biotyped at MDH, 1995-2001 (n=145)

- **Pathogenic biotypes (2, 3, 4, 1B)**
  - **61 (42%)**
- **Non-pathogenic biotype (1A)**
  - **84 (58%)**

Symptoms in Cases With Isolates Classified as Pathogenic vs. Non-Pathogenic based on Biotype

Of 40 cases with YE reporting diarrhea and fever:

Biotype	No.	(%)
Pathogenic	20	50%
Non-pathogenic	20	50%
Total	40	100%

Symptoms in Cases With Isolates Classified as Pathogenic vs. Non-Pathogenic based on Biotype (cont.)

Of 13 cases with YE reporting bloody diarrhea and fever:

Biotype	No.	(%)
Pathogenic	8	62%
Non-pathogenic	5	38%
Total	13	100%

Symptoms in Cases With Isolates Classified as Pathogenic vs. Non-Pathogenic based on Biotype (cont.)

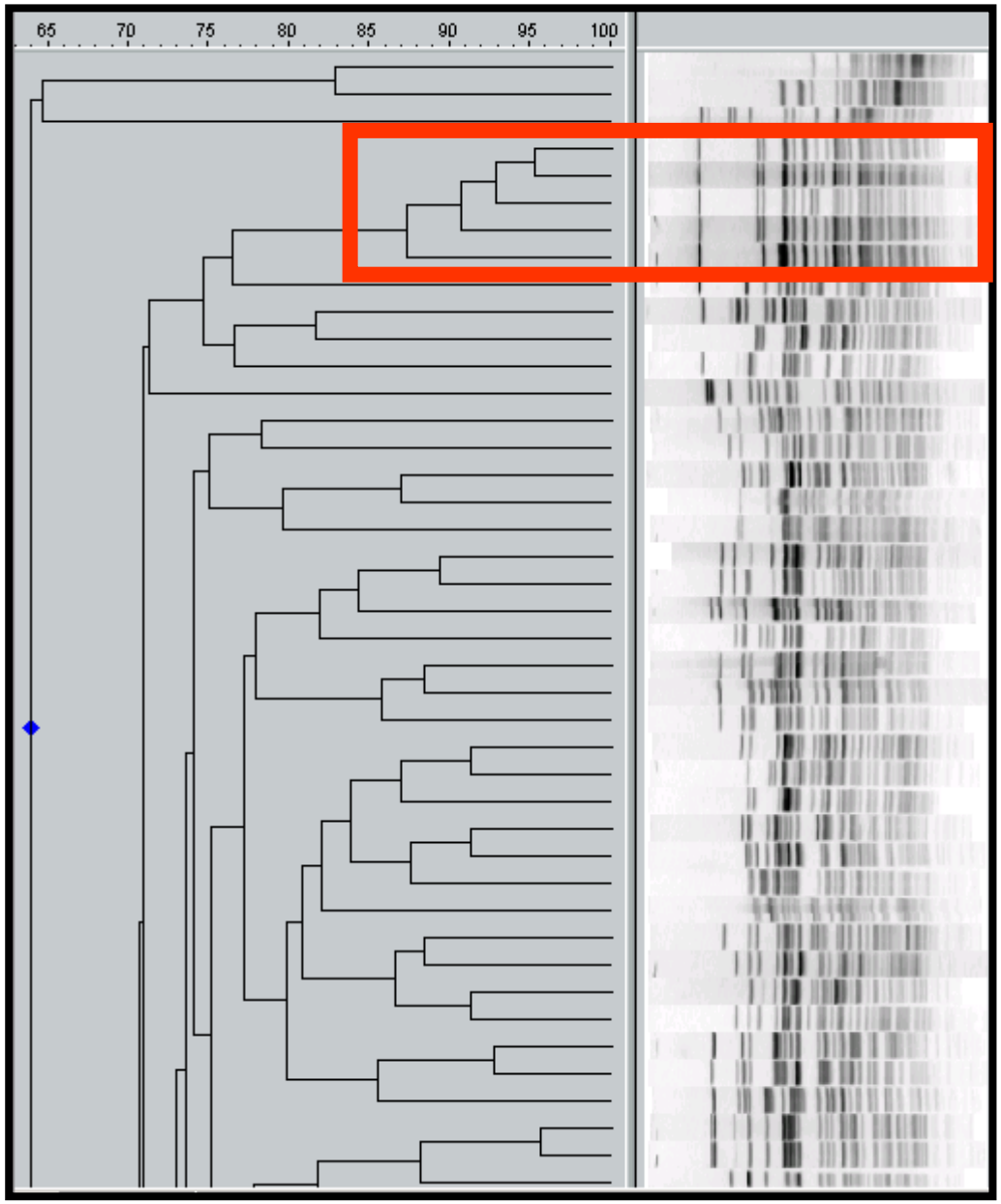
Of 23 hospitalized patients:

Biotype	No.	Median (days)
Pathogenic	11	3
Non-pathogenic	12	4.5
Total	23	3.5

PFGE Subtypes

- 122 isolates subtyped by PFGE
- 37/51 (73%) of the pathogenic biotype isolates were one of four closely related PFGE patterns (87% pattern similarity)
- 71 non-pathogenic biotype 1A isolates were represented by 53 heterogeneous PFGE patterns

Dendrogram of YE Isolates based on PFGE



Laboratory Practices Affecting *Y. enterocolitica* Surveillance in Minnesota

- From the FoodNet Survey of Clinical Laboratory Practices 2000
- 120/133 (90%) response rate
- 60 MN labs do enteric cultures on site

Laboratory Practices Affecting *Y. enterocolitica* Surveillance in Minnesota (cont.)

- **33/61 (54%) of laboratories routinely include *Yersinia* as part of their enteric screen, whether onsite or offsite**
- **30/33 labs that include *Yersinia* are located outside the Minneapolis-St.Paul metropolitan area, mainly in small, city or county hospitals**

Laboratory Practices Affecting *Y. enterocolitica* Surveillance in Minnesota (cont.)

- **15,229 (21%) of 71,735 stool samples submitted for culture were screened for *Yersinia***

Summary and Conclusions

- 58% of isolates were classified as non-pathogenic based on biotype
- Reported symptoms and length of hospitalization were similar for cases whose isolates were classified as pathogenic or non-pathogenic
- The clinical significance of putative non-pathogenic strains warrants further investigation

Summary and Conclusions (cont.)

- Greater surveillance by rural labs may contribute to the uneven distribution of YE cases in Minnesota
- A minority of stool samples submitted for enteric culture in Minnesota are tested for *Yersinia*
- Yersiniosis may be substantially under-diagnosed in Minnesota

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YE Isolates by Biotype and Serotype

Biotype	Serotype 03	05	08	Total
1A	1	14	1	16
1B	1	0	0	1
2	0	1	0	1
3	1	2	0	3
4	35	2	0	37
Total	38	19	1	58