

Emerging Fluoroquinolone Resistance among Non-Typhoidal *Salmonella* in the United States: NARMS 1996-2000

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Salmonella

- An estimated 1.4 million cases annually in the United States
 - 15,000 persons are hospitalized
 - 600 persons die
- For the treatment of *Salmonella* infections, fluoroquinolones are the most commonly used antimicrobial in adults

Fluoroquinolone Use

- **In humans:**
 - Fluoroquinolones were approved for use in 1986
- **In animals:**
 - Fluoroquinolones were approved for use in chickens and turkeys in the United States in 1996; cattle in 1998
 - Chickens and turkeys: fluoroquinolones are added to the drinking water
 - Cattle: fluoroquinolones are available in an injectable form

Fluoroquinolone Resistance

- Among *Salmonella*, cross-resistance occurs for all fluoroquinolones
 - Accumulation of 2 mutations in the *gyrA* gene
 - MIC \geq 4 $\mu\text{g/ml}$
- A single mutation in the *gyrA* gene confers decreased susceptibility to fluoroquinolones
 - Has been associated with treatment failures
 - MIC \geq 0.25 $\mu\text{g/ml}$ AND MIC $<$ 4 $\mu\text{g/ml}$
 - Resistance to nalidixic acid

Objective

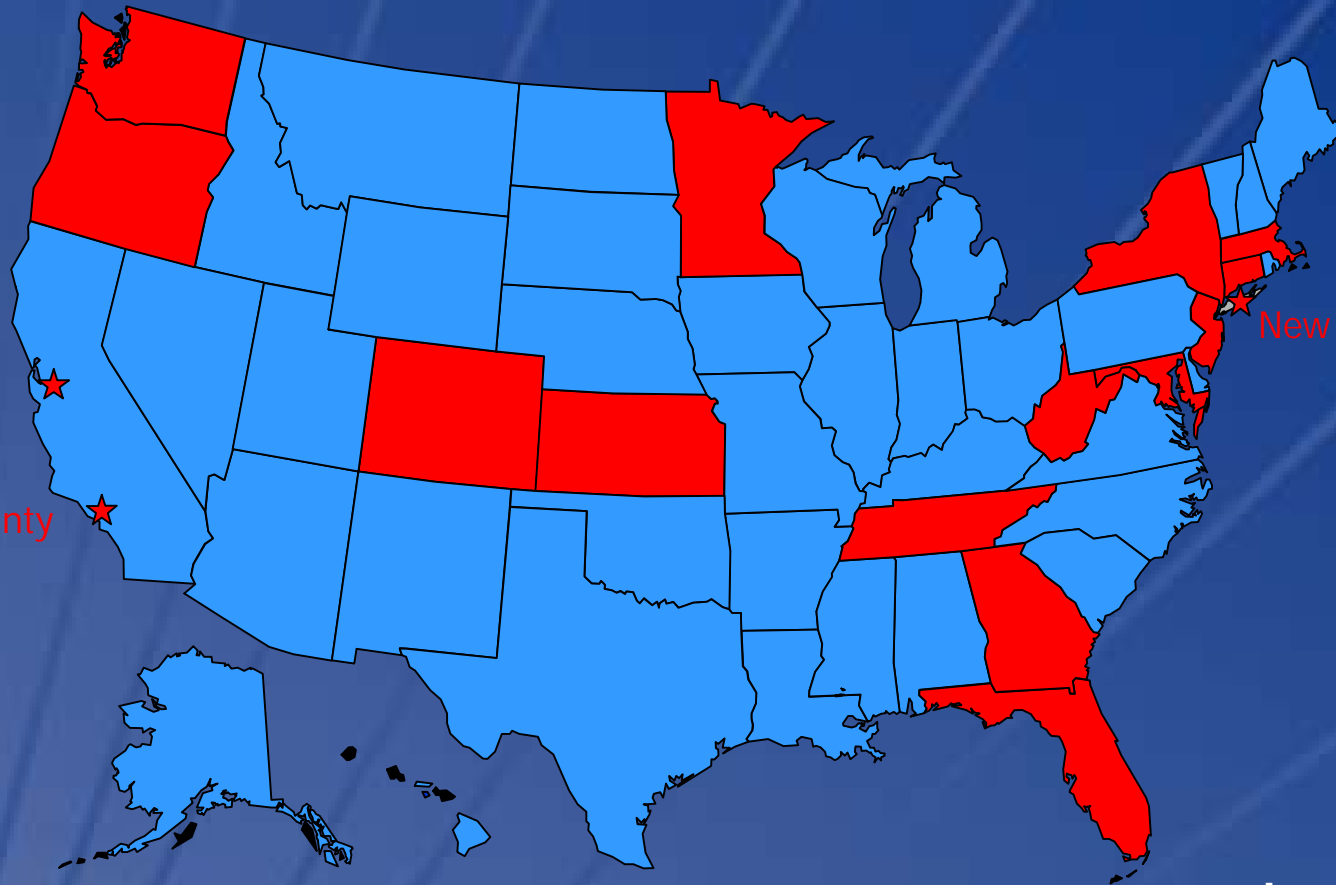
- To determine the prevalence of fluoroquinolone resistance and the prevalence of decreased susceptibility to fluoroquinolones among human non-typhoidal *Salmonella* isolates

Methods

- After serotyping, participating sites forwarded every 10th non-typhoidal *Salmonella* isolate to CDC
 - Susceptibility testing to a fluoroquinolone and 16 other antimicrobial agents
 - Results were interpreted using NCCLS guidelines
 - Resistance to a fluoroquinolone is defined as ciprofloxacin MIC ≥ 4.0 $\mu\text{g/ml}$
 - Decreased susceptibility to a fluoroquinolone is defined as ciprofloxacin MIC ≥ 0.25 $\mu\text{g/ml}$ and ciprofloxacin MIC < 4.0 $\mu\text{g/ml}$

National Antimicrobial Resistance Monitoring System (NARMS)

[Population 108 million or 40% of the US population]



San Francisco,
Contra Costa, and
Alameda Counties

Los Angeles County

New York City

January 1, 2001



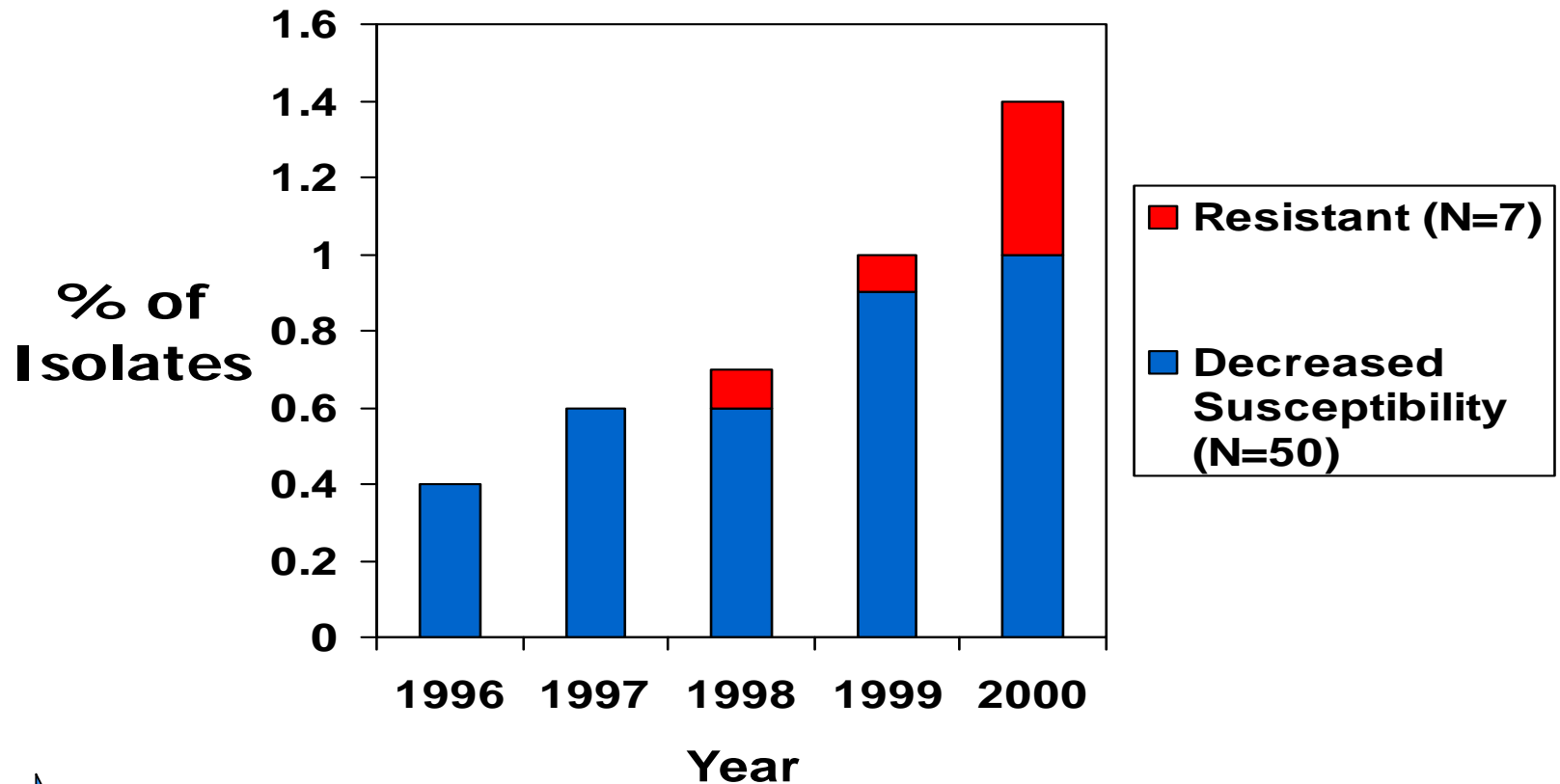
<http://www.CDC.gov/NARMS>

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Non-typhoidal *Salmonella* 1996-2000, N= 6970

- 57 (0.8%) isolates demonstrated either decreased susceptibility or resistance to a fluoroquinolone
 - 7 isolates were fully resistant
 - 50 isolates had decreased susceptibility

Non-typhoidal *Salmonella* 1996-2000 N= 6970



Nalidixic Acid MICs

- All 57 isolates were also tested for susceptibility to nalidixic acid:
 - 47 (94%) of the isolates with decreased susceptibility to a fluoroquinolone were also resistant to nalidixic acid
 - 7 (100%) of the isolates resistant to a fluoroquinolone were resistant to nalidixic acid

How Much Do We Know?

- Resistance to fluoroquinolones among *Salmonella* isolates is very rare in the US
 - Emerged from 1996-2000
 - Prevalence of fluoroquinolone resistance may be greater internationally
- Surveillance data leads to more questions
 - What were the sources of these 57 isolates?
 - Was international travel a risk factor?

Next Steps

- **With the assistance of state and local epidemiologists, we attempted to interview 57 patients whose isolates demonstrated decreased susceptibility or resistance to fluoroquinolones**
 - **A telephone questionnaire was designed to obtain information about:**
 - **Demographics**
 - **International travel**

Fluoroquinolone-Resistant Isolates

- 7 isolates were resistant
 - Each of these isolates was associated with international travel:

<u>Serotype</u>	<u>#</u>	<u>Site</u>	<u>Country</u>
Schwarzengrund	3	OR	Phillipines
Senftenberg	2	FL	India
Senftenberg	1	GA	India
Indiana	1	MA	Dom. Republic

- 3 of these infections apparently acquired in international hospitals

Isolates with Decreased Susceptibility to Fluoroquinolones

- 50 isolates had decreased susceptibility
- The most common serotypes were:
 - Enteritidis, Berta, Typhimurium, and Virchow
- 28 (56%) of these 50 patients were interviewed
 - 20 (71%) patients did not travel internationally in the week before illness onset

Conclusion

- Emerging fluoroquinolone resistance in non-typhoidal *Salmonella* is evident
 - Resistant isolates associated with international travel
 - Other isolates with decreased susceptibility were from infections acquired domestically

Mitigation Efforts

- **Reduce the misuse and overuse of fluoroquinolones in the United States**
 - **Promote the appropriate use of fluoroquinolones by physicians and veterinarians**
 - **Support mitigating actions such as the current FDA proposal to withdraw the use of fluoroquinolones in poultry**

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