Listeriosis in the United States

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Listeria monocytogenes and Risk Analysis
ASEPT, March 17, 2004

Unpublished data in this presentation is preliminary
Listeria monocytogenes Topics

- Clinical information
- Timeline of events in control of listeriosis
- Incidence
- Outbreaks
- Conclusions and Recommendations
Estimated annual burden of selected foodborne diseases, United States* (1997 estimates)

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Illnesses</th>
<th>Deaths</th>
<th>Case-fatality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campylobacter</td>
<td>2,453,926</td>
<td>124</td>
<td>0.1%</td>
</tr>
<tr>
<td>Salmonella</td>
<td>1,412,498</td>
<td>582</td>
<td>0.8%</td>
</tr>
<tr>
<td>E. coli O157:H7</td>
<td>73,480</td>
<td>61</td>
<td>0.8%</td>
</tr>
<tr>
<td>Listeria</td>
<td>2,518</td>
<td>504</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

* Due to foodborne and other transmission routes

Mead, EID Journal, 1999
High risk populations for *Listeria* infection

- Pregnant women, their fetuses, and newborns
- Immunocompromised
  - Malignancy
  - Organ transplant
  - Immunosuppressive medications
  - HIV/AIDS
- Elderly

~20% of Listeria patients do not fit into any of these high risk categories.
Clinical manifestations

• Pregnancy-associated
  - Miscarriage and stillbirth
  - Congenital infection

• Anyone
  - Sepsis (*Listeria* in the blood)
  - Meningitis
  - Encephalitis
  - Diarrhea with fever

*Invasive Listeria infection = listeriosis*
Serotypes of *L. monocytogenes* isolated from humans, United States

N=249

- 4b (40%)
- 1/2a (25%)
- 1/2b (30%)
- Other (5%)

*CDC. Active surveillance, 1994-98*
Incidence of listeriosis by age group, United States*

*Data from 1994-1998
Listeriosis control timeline, U.S., 1985-2002

1985

Jalisco cheese outbreak, 142 cases and 40 fatalities

1985  Jalisco Outbreak
1986  CDC begins active surveillance
Listeriosis control timeline, U.S., 1985-2002

1985: Jalisco Outbreak

1986: CDC begins active surveillance

1988: 1st sporadic case-control study
risks = un-reheated hot dogs, undercooked chicken
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1989 - Turkey franks case, "Zero tolerance"
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- 1st sporadic case-control study
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1992
- 2nd sporadic study
  risks = foods from deli, cheese
Listeriosis control timeline, U.S., 1985-2002

1985: Jalisco Outbreak

1986: CDC begins active surveillance

1988: Turkey franks case, "Zero tolerance"

1989: 1st sporadic case-control study
- risks = un-reheated hot dogs, undercooked chicken

1992: 2nd sporadic study
- risks = foods from deli, cheese

1998: Hot dog outbreak, 101 cases, 21 fatalities
Listeriosis control timeline, U.S., 1985-2002

1985
Jalisco Outbreak

1986
CDC begins active surveillance

1988
1st sporadic case-control study
risks = un-reheated hot dogs,
undercooked chicken

1989
Turkey franks case, "Zero tolerance"

1989
2nd sporadic study
risks = foods from deli, cheese

1992
Hot dog outbreak

1998
Turkey deli meat outbreak

2000
Listeriosis control timeline, U.S., 1985-2002

- **1985**: Jalisco Outbreak
- **1986**: CDC begins active surveillance
- **1988**: 1st sporadic case-control study, risks = un-reheated hot dogs, undercooked chicken
- **1989**: Turkey franks case, "Zero tolerance"
- **1992**: 2nd sporadic study, risks = foods from deli, cheese
- **1998**: Hot dog outbreak
- **2000**: Turkey deli meat outbreak
- **2002**: Turkey deli meat outbreak
Incidence of Listeriosis in the United States, 1986-2001*

*Data from various surveillance systems, Some data are preliminary
Incidence of Listeriosis in the United States, 1986-2001*

- 1st CDC case-control study
- 2nd CDC case-control study
- "Zero tolerance" policy
- Hot dog outbreak; PulseNet began subtyping

*Data from various surveillance systems, Some data are preliminary
Fishing outbreaks from a sea of “sporadic” illness

The National Molecular Subtyping Network for Foodborne Disease Surveillance

August 2000

SAFER • HEALTHIER • PEOPLE
Outbreaks of Listeriosis, United States, 1978-2002*

* Data for later years is preliminary

Year

Number of outbreaks

0 1 2 3 4 5 6

'78 '80 '82 '84 '86 '88 '90 '92 '94 '96 '98 '00 '02

PulseNet begins subtyping *Listeria*
Outbreaks of Listeriosis, United States, 1978-2002*

* Data for 2001 and 2002 is preliminary

PulseNet begins subtyping *Listeria*
Confirmed and suspected vehicles in listeriosis outbreaks, 1998-2002 (n = 12 outbreaks)

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>No. outbreaks</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deli meat</td>
<td>5</td>
<td>Turkey meat confirmed vehicle in some, an ingredient in all</td>
</tr>
<tr>
<td>Hot dogs</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Paté</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Preliminary data
# Listeriosis Outbreaks in the United States 1979-2003*

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>Serotype</th>
<th>Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>TX</td>
<td>4b</td>
<td>Raw Milk Cheese</td>
</tr>
<tr>
<td>2002</td>
<td>(9)</td>
<td>4b</td>
<td>Turkey Deli meat</td>
</tr>
<tr>
<td>2001</td>
<td>CA</td>
<td>1/2a</td>
<td>Turkey Deli meat</td>
</tr>
<tr>
<td>2000</td>
<td>(10)</td>
<td>4b</td>
<td>Deli Meat</td>
</tr>
<tr>
<td>2000</td>
<td>NC</td>
<td>4b</td>
<td>Raw Milk Cheese</td>
</tr>
<tr>
<td>1999</td>
<td>(3)</td>
<td>1/2a</td>
<td>Pate</td>
</tr>
<tr>
<td>1999</td>
<td>(4)</td>
<td>4b</td>
<td>Imported Cheese</td>
</tr>
<tr>
<td>1998</td>
<td>(22)</td>
<td>4b</td>
<td>Hot Dogs</td>
</tr>
<tr>
<td>1994</td>
<td>IL</td>
<td>1/2b</td>
<td>Milk</td>
</tr>
<tr>
<td>1989</td>
<td>CT</td>
<td>4b</td>
<td>Shrimp</td>
</tr>
<tr>
<td>1985</td>
<td>CA</td>
<td>4b</td>
<td>Cheese</td>
</tr>
<tr>
<td>1983</td>
<td>MA</td>
<td>4b</td>
<td>Milk</td>
</tr>
<tr>
<td>1979</td>
<td>MA</td>
<td>4b</td>
<td>Produce?</td>
</tr>
</tbody>
</table>

*Preliminary data 2002, 2003
As the death toll mounted, federal regulators traced the food poisoning back to its source. They just didn’t tell the public. By Peter Perl

Plus: Bill Donahue on Letters
Written in Love and War
Listeriosis outbreaks probably common but difficult to detect...

- High potential for chronic, intermittent contamination of mass produced foods

- General population at low risk, select high risk individuals

- Limited ability to differentiate between potentially related and unrelated cases based on lab testing (e.g., serotype)
General conclusions from the epidemiological data

- *Listeria* is an important cause of death due to foodborne illness in the United States
- Major sources of human infection include
  - Processed ready-to-eat meats, especially turkey and hot dogs
  - Cheese
- Large outbreaks can occur even when measured level of contamination in food is very low
- Outbreak findings indicate that measures can be developed to make ready-to-eat products safer
Recommendations for Industry

• Implement measures to make ready-to-eat meats safer
  ➢ e.g., new USDA-FSIS directive

• Encourage research on the effectiveness and safety of measures to make ready-to-eat meats safer, e.g.,
  ➢ rigorous microbial sampling program
  ➢ additives
  ➢ post-packaging pathogen reduction treatments, e.g., irradiation

• Consider anonymous systematic prevalence survey of Listeria monocytogenes subtypes in processing plants
Acknowledgments

- Foodborne and Diarrheal Diseases Branch, CDC
  - EIS officers and staff epidemiologists
  - Microbiologists and PulseNet investigators
- State Health Dept epidemiologists and microbiologists
- USDA-FSIS
- FDA
- Industry personnel
- Hospital microbiologists
CDC information on *Listeria*

www.cdc.gov/ncidod/dbmd/diseaseinfo/listeriosis_g.htm