Listeria: 5000 cases and still counting

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Presentation adapted with permission from: Dr Jim McLauchlin

Food Water and Environmental Microbiology Services, PHE
Listeria outbreak: Health secretary orders NHS food review

15 June 2019

Spain issues international alert over biggest ever listeria outbreak

One dead and 150 confirmed cases as health ministry investigates over 500 more suspected infections

Harry Cockburn | Wednesday 21 August 2019 19:15 |

Listeria warning for pastrami sold in South Australia

7:19am Sep 5, 2019

Thousands of fresh apples recalled over listeria concerns by Michigan produce company

By KELLY MCCARTHY | Oct 29, 2019, 10:49 AM ET
Listeria and human disease

- Rare, especially compared to other foodborne illness
- 3 cases/ million E&W (compare Salmonella- 140/million)
- Statutory notification- almost all culture positive cases captured

Asymptomatic carriage (2-20%)

Mild self-limiting gastrointestinal symptoms (likely much under-reported)

Flu-like illness

Invasive disease:
meningitis/ encephalitis

Invasive disease in pregnancy- stillbirth and miscarriage
Listeria: people at risk

- aged over 60 years
- people with malignancies (especially of the blood)
- kidney disease
- liver disease
- diabetes
- alcoholism
- patients on immunocompromising treatment (ever-increasing pool)
- pregnant women and their unborn or newborn infants

- Mortality and morbidity high
- 30% mortality in non-pregnancy-related cases
- 25% invasive infections in pregnancy lead to foetal loss or neonatal death
- Compare *Salmonella*- mortality rate <1%

https://www.cdc.gov/listeria/faq.html
**Listeria: transmission**

Organism is widely distributed in the environment

Vast majority of cases foodborne

Listeria grows at temperatures down to -1.5C (and up to 40C)

Facultative anaerobe (happy with or without oxygen)- so will grow in modified atmosphere or vacuum packaging

Acid tolerant (pH 4.3)

Salt tolerant (12-16%)

**Effectively killed by cooking at normal temperatures and pasteurisation**

Biofilm formation on processing surfaces- difficult to eradicate

Contact with animals who are birthing/ just given birth also implicated

Healthcare transmission- contaminated equipment
L. monocytogenes in foods

- ready-to-eat processed foods
- capable of supporting the growth of *L. monocytogenes*
- refrigerated with extended shelf lives
- contaminated post-process

E.g. cooked meats, pâté, cooked chicken, soft cheese, pre-packed sandwiches, smoked fish, butter, crab meat, melon………

Some unusual food vehicles have been reported: e.g. dried alfalfa tablets, ice cream

Specific foods associated with transmission are not identified for the majority of cases
Investigation and control of human listeriosis

Characterisation of *Listeria monocytogenes*

Control of the food chain

Paté
Attributing disease to food: 1981-2015

- 5,252 cases of listeriosis in England and Wales
- All prior to routine whole genome sequencing (game changing….)

- **Clinical evidence**: compatible illness
- **epidemiological evidence**: descriptive or analytical
- **microbiological evidence**: identification of an indistinguishable *L. monocytogenes* isolate from a case or cases as well as from food, a food component, or its environment which is unlikely to have been contaminated either coincidentally or after the event.
### Foodborne listeriosisis in England and Wales 1981-2015 and attribution to specific foods

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</thead>
<tbody>
<tr>
<td><strong>Cases</strong></td>
<td>604</td>
<td>753</td>
<td>1353</td>
<td>957</td>
<td>1585</td>
</tr>
<tr>
<td><strong>L.mono typing methods used</strong></td>
<td>Sero, phage</td>
<td>Sero, phage</td>
<td>Sero, phage</td>
<td>Sero, phage, AFLP, PFGE</td>
<td>Molecular sero, fAFLP, selective WGS</td>
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<tr>
<td><strong>Food attributed cases</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Incidents in hospital</strong></td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td><strong>in the community</strong></td>
<td>1</td>
<td>381</td>
<td>0</td>
<td>19</td>
<td>52</td>
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<tr>
<td><strong>% attributed to a specific food</strong></td>
<td>0.2%</td>
<td>51%</td>
<td>0.3%</td>
<td>3%</td>
<td>5%</td>
</tr>
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*Graph showing foodborne listeriosis in England and Wales 1981-2015*
Products with a shelf life of less than 5 days are automatically considered to belong to this category (1.3).
Hospital outbreaks 2002-6

- 10 incidents
  - 1 incident single case only
  - Remainder 2-9 cases each
  - 9/10 immunocompromised pts >60y
  - 1/10: 5 pregnant women and their babies
  - All but 1 in a single region only

- Implicated food based on questionnaires and microbiology
- 9/10 had indistinguishable strain from food or food prep area
- 7/9 <100cfu/g

what’s the food?
57 cases (22 deaths)

Outbreak associated with consumption of cold meats and prepared sandwiches in institutional settings (hospitals and other health care) produced by Maple leaf Foods

Canada’s biggest food processor

Withdrawal of 220 products

Contamination from factory sites, possibly slicing machines


Community outbreaks 2002-6

- 18 incidents
  - 8 outbreaks of >= 2 cases; max 378
  - 1 month- 3 years long
  - 13/18- non pregnant adults
  - 2/18- mixture of pregnant and non-pregnant
  - 3/18 sporadic single cases, pregnant

Food links mostly initially identified by linking isolates to tests NOT carried out as part of incident/ outbreak, up to 2.5y before the 1st clinical case

Domestic, retail and commercial refrigerators

Manufacturing environment

>100cfu/g in 11/18
Improvements in typing techniques, will result in detection of more possible associations between isolates from clinical cases of listeriosis and food/the environment.

Application of WGS since December 2015, ~500 cases up to March 2019

13 sporadic cases 9 clusters (36 cases)

~10% attribution

Likely to increase as WGS becomes more widely applied in other countries

e.g. 2015-18 outbreak associated with frozen sweetcorn exported to 100 countries and cases recognised in Austria, Australia, Denmark, Finland, Hungary and Sweden sweet
Whole-genome sequencing

Rapid, readily shareable results

More accurate linking- within and beyond UK; increased source attribution to 10% cases (will increase as databases get bigger)

Rapid risk assessment: Multi-country outbreak of Listeria monocytogenes serogroup IVb, multi-locus sequence type 6, infections linked to frozen corn and possibly to other frozen vegetables – first update

• Listeriosis rare but potentially devastating
• Disease mainly confined to risk groups, but this pool is increasing
• 5,252 cases of listeriosis were reported in England and Wales between 1981 and 2015
• Controls improved following some large outbreaks
• Specific foods were identified as associated with <10%
• Prospective WGS should improve source attribution, particularly cross-border
• Ongoing need for food supply chain controls
Acknowledgements

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