Proceedings of the EMII Connected Learning Risk Research Symposium II: Food Contamination

7th September 2018
Food Contamination Risk: Expert and Public Perception

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DCU Business School

Join @ www.emii.ie
Expert: Risk Perception

NRA 2017
National Risk Matrix 2017

Risk Assessment Confidence Levels:

*** High Confidence
** Moderate Confidence
* Low Confidence
## Likelihood – Food Contamination

<table>
<thead>
<tr>
<th>Rating</th>
<th>Classification</th>
<th>Average Recurrence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Unlikely</td>
<td>10 - 100 years between occurrences</td>
</tr>
<tr>
<td>Food Contamination</td>
<td>5 Very High Impact</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------</td>
<td></td>
</tr>
<tr>
<td><strong>People</strong></td>
<td>Deaths greater than 1 in 20,000 people for population of interest OR Critical injuries/illness greater than 1 in 20,000</td>
<td></td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td>Very heavy contamination, widespread effects of extended duration</td>
<td></td>
</tr>
<tr>
<td><strong>Economic</strong></td>
<td>Greater than 8% of Annual Budget</td>
<td></td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td>Community unable to function without significant support</td>
<td></td>
</tr>
</tbody>
</table>

Consideration should be given to:
- Infrastructure;
- Community Services;
- Utilities;
- Evacuation/Quarantine;
- Property/Housing;
- Supplies: Food, Water, Medicines;
- Civil Unrest;
- Public dissatisfaction
### Confidence Level - Food Contamination

<table>
<thead>
<tr>
<th>Confidence Level</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>High ***</td>
<td>Assessment based on expert knowledge of the issue and/or reliable, relevant, current data. Consistent agreement among assessors.</td>
</tr>
</tbody>
</table>
Public Perception
(2018)
Data Collection

- Survey completed online using “Qualtrics”

- 6,497 responses* received

- Data collected over a two month period between 14th November 2017 & 17th January 2018

*Note – some respondents did not answer all questions
# Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Adults (age &gt;18) living at the address (4446n)</th>
<th>Children (age &lt;18) living at the address (4408n)</th>
<th>Highest Qualification (4435n)</th>
<th>Work (4427n)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mode</td>
<td>Mode</td>
<td>Leaving Cert.</td>
<td>Full-time</td>
</tr>
<tr>
<td></td>
<td>Range (min, max)</td>
<td>Mean</td>
<td>Bachelor’s degree or higher</td>
<td></td>
</tr>
<tr>
<td>Gender (4490n)</td>
<td>2</td>
<td>0</td>
<td>diploma</td>
<td>73.9% (3272n)</td>
</tr>
<tr>
<td>Female</td>
<td>70.6% (3171n)</td>
<td>Mean</td>
<td>Master degree or post-grad</td>
<td></td>
</tr>
<tr>
<td>Age (4383n)</td>
<td>Mean (SD)</td>
<td>0.85</td>
<td>diploma</td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>45.06 (11.89)</td>
<td>Mean</td>
<td>17.5% (777n)</td>
<td></td>
</tr>
<tr>
<td>Min, Max</td>
<td>18, 92</td>
<td>Mean</td>
<td>Bachelor’s degree or higher diploma</td>
<td></td>
</tr>
<tr>
<td>Lives in (4487n)</td>
<td>16.8% (755n)</td>
<td>Mean</td>
<td>Master degree or post-grad diploma</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>Suburbs or outskirts of a city</td>
<td>Mean</td>
<td>Master degree or post-grad diploma</td>
<td></td>
</tr>
<tr>
<td>Suburbs or outskirts of a city</td>
<td>21.9% (982n)</td>
<td>Mean</td>
<td>Master degree or post-grad diploma</td>
<td></td>
</tr>
<tr>
<td>Town</td>
<td>21.8% (979n)</td>
<td>Mean</td>
<td>Master degree or post-grad diploma</td>
<td></td>
</tr>
<tr>
<td>Village</td>
<td>9.6% (431n)</td>
<td>Mean</td>
<td>Master degree or post-grad diploma</td>
<td></td>
</tr>
<tr>
<td>Rural area</td>
<td>29.9% (1304n)</td>
<td>Mean</td>
<td>Master degree or post-grad diploma</td>
<td></td>
</tr>
<tr>
<td>Own vs Rent Home (4477n)</td>
<td>Own Home</td>
<td>Own</td>
<td>Own Home</td>
<td></td>
</tr>
<tr>
<td>Own Home</td>
<td>77.7% (3479n)</td>
<td>Home</td>
<td>77.7% (3479n)</td>
<td></td>
</tr>
<tr>
<td>Household Income</td>
<td>Income Below 30,000</td>
<td>Income Below 30,000</td>
<td>Income Below 30,000</td>
<td></td>
</tr>
<tr>
<td>Income Below 30,000</td>
<td>12.2% (532n)</td>
<td>Income Below 30,000</td>
<td>Income Below 30,000</td>
<td></td>
</tr>
<tr>
<td>Income 30,000-70,000</td>
<td>53.5% (2328n)</td>
<td>Income 30,000-70,000</td>
<td>Income 30,000-70,000</td>
<td></td>
</tr>
<tr>
<td>Income Over 70,000</td>
<td>34.3% (1491n)</td>
<td>Income Over 70,000</td>
<td>Income Over 70,000</td>
<td></td>
</tr>
</tbody>
</table>
## Food Contamination: Likelihood & Impact

<table>
<thead>
<tr>
<th>Food Contamination</th>
<th>Code</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Unlikely</td>
<td>1</td>
<td>19.5%</td>
</tr>
<tr>
<td>Very Unlikely</td>
<td>2</td>
<td>20.7%</td>
</tr>
<tr>
<td>Unlikely</td>
<td>3</td>
<td>41.6%</td>
</tr>
<tr>
<td>Likely</td>
<td>4</td>
<td>14.6%</td>
</tr>
<tr>
<td>Very Likely</td>
<td>5</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

n = 6007

<table>
<thead>
<tr>
<th>Food Contamination</th>
<th>Code</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low Impact</td>
<td>1</td>
<td>13.0%</td>
</tr>
<tr>
<td>Low Impact</td>
<td>2</td>
<td>18.4%</td>
</tr>
<tr>
<td>Moderate Impact</td>
<td>3</td>
<td>29.7%</td>
</tr>
<tr>
<td>High Impact</td>
<td>4</td>
<td>26.3%</td>
</tr>
<tr>
<td>Very High Impact</td>
<td>5</td>
<td>12.6%</td>
</tr>
</tbody>
</table>

n = 5466
## Food Contamination: Risk Rating

<table>
<thead>
<tr>
<th></th>
<th>Likelihood</th>
<th>Impact</th>
<th>Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>6007</td>
<td>5466</td>
<td>5466</td>
</tr>
<tr>
<td>Mean</td>
<td>2.62</td>
<td>3.07</td>
<td>8.04</td>
</tr>
<tr>
<td>Mode</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>
Public Perception: Experience, Worry & Preparedness
Experience of Food Contamination

- Yes: 85%
- Indirectly, someone close to me has experienced this emergency: 8%
- No: 7%

n=5357
Food Contamination: Worry

- 62%: A great deal
- 24%: A lot
- 11%: A moderate amount
- 2%: A little
- 1%: Not at all

n=5240
Food Contamination: Preparedness

- I am prepared for this emergency: 13.2%
- I do not need to prepare for this emergency: 27.9%
- I am not prepared to deal with this emergency, but I do see a benefit in preparing: 32.5%
- Nothing I do to prepare will help should this emergency occur: 26.4%

n=4697
Finally: Relative Risk
Citation

• If citing this presentation, please use the following format:

Food Emergencies: The Investigative Framework

Dr Patricia Garvey
Dr Lois O’Connor

Join @ www.emii.ie
Food Emergencies: The Investigative Framework

Dr Patricia Garvey
Dr Lois O’Connor
Health Protection Surveillance Centre
September 2018
Health Protection Surveillance Centre

To improve the health of the Irish population by provision of the best possible information on disease including infectious diseases through surveillance and independent advice, epidemiological investigation, research and training.
Health Protection Surveillance Centre

Six Functions

- Surveillance of communicable diseases
- Operational support
- Training
- Research
- Policy advice
- Public Information [www.hpsc.ie](http://www.hpsc.ie)
What is an outbreak?

- Occurrence of more cases of disease than expected
  - over a particular period of time (TIME)
  - in a given area (PLACE)
  - among a specific group of people (PERSON)
Why do we investigate an outbreak?

• Responsible for much illness and death
• Identify the source and eliminate it
• Minimise human harm
• Prevent future outbreaks
• Evaluate existing prevention strategies
• Describe new diseases and learn more about known diseases
• Improve surveillance and outbreak detection
Are Foodborne Disease Outbreaks Common?

- In developed countries, 90% of all outbreaks are gastrointestinal
- Majority are viral
- Only a small minority are shown to be foodborne in nature

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Outbreaks</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland (IID)</td>
<td>2015</td>
<td>315</td>
<td>3086</td>
</tr>
<tr>
<td>Ireland (Foodborne)</td>
<td>2015</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>US (Foodborne)</td>
<td>2015</td>
<td>902</td>
<td>15,202</td>
</tr>
</tbody>
</table>
Outbreak Agents

- **Bacterial**
  - Salmonella, *E. coli*, Campylobacter, Listeria etc.

- **Viral**
  - Norovirus, Hepatitis A

- **Parasitic**
  - Cryptosporidium, Trichinella, Giardia, etc.

- **Toxins**
  - *C. botulinum*, *S. aureus*, *B. cereus*, *C. perfringens*, algae, shellfish poisoning

- **Chemical**
  - heavy metals, organic compounds etc.
Routes of Food Contamination

• Contamination of raw food or failure to eliminate contamination of raw food
  – Farming practice/abattoir practice/zoonotic problems
  – Pasteurisation failure
  – Undercooking, inadequate cooling

• Contamination during food preparation
  – Infected food handler
  – Environmental contamination
  – Cross contamination (from raw or processed ingredients)

• Contamination after food preparation
  – Infected food handler
  – Inadequate storage, cooling or reheating
  – Environmental contamination
  – Cross contamination from raw food
What are the Elements of a Foodborne Outbreak Investigation?

- Epidemiological investigation
  Cases, distribution - who, when, where relationships
- Laboratory investigation
  Pathogen identification
- Environmental investigation
  Premises, physical environment, food, water
Steps of an outbreak investigation

- Confirm outbreak and diagnosis
- Define a case
- Identify cases & obtain information
- Describe cases in time, place, person
- Develop hypothesis
- Test hypothesis - analytical epidemiology
- Conduct additional investigations
- Communicate results
- Implement control measures
Detection of an outbreak

- Systematic surveillance
  - Disease notifications (laboratory or clinical)
- Non-statutory laboratory/clinical surveillance
- Detection of additional cases during investigation of a sporadic case
- An alert clinician
- General public
- Media
Outbreak Notification

• Under S.I. No. 707, all outbreaks of disease are notifiable to the Medical Officer of Health regardless of whether the specific pathogen implicated is notifiable or not.

• Moreover, unusual clusters or changing patterns of illness are also notifiable. It is not necessary for a pathogen to have been identified before an outbreak is notified.
Confirm outbreak

Is this an outbreak?
- More cases than expected?
- Surveillance data
- Surveys: hospitals, labs, physicians

Caution!
- Seasonal variations
- Notification artefacts
- Diagnostic bias (new technique)
- Diagnostic errors (pseudo-outbreaks)
Outbreak Control Team

**Multidisciplinary**
- Public Health Physicians
- Environmental Health Officers
- Clinical Microbiologist
- Food Safety Authority
- Reference Laboratories

**Roles**
- Coordinate all activities
- Liaison
- Media
- Maintain a record of investigation
- Produce reports
Epidemiology

Clinicians

Co-ordination

Food safety

Laboratory

Media

Authorities

Vector Reservoir

Surveillance

Prediction

Supply channels

Trace back

Investigation

Media

Authorities

Diagnostic

Specimen transfer

Clinical

Decisions
Infrastructure
Regulations
Vaccinations etc

Dead

Sick

Exposed
Confirm diagnosis

• Laboratory confirmation
  – culture and/or PCR
  – serology
  – typing
  – detection of toxins
• Discuss/meet with attending physicians
• Contact the laboratories

Not always necessary to confirm all the cases but confirm a proportion throughout the outbreak
Case definition

- Standard set of criteria for deciding whether an individual should be classified as suffering from the disease (or health condition) under investigation

- Criteria
  - clinical and/or biological criteria
  - time
  - place
  - Person

- Case definition can be adjusted if new information becomes available
Identify cases and obtain information

• Case finding
  – Notifications
  – Hospitals, GPs, Laboratories
  – Schools
  – Workplaces, etc.

• Data collection form
  – Identifying information
  – Patient demographics
  – Clinical information
  – Risk factor/exposure information
Descriptive Epidemiology

Describe cases by **time**, **place** and **person**

- **When** did they become ill?
- **Where** do they live?
- **Who** are the cases?

![Diagram showing different categories of cases](image-url)
Time - Epidemic curve

• Describe
  – start
  – peak(s) - number & duration
  – end
  – atypical cases (outliers)

• Helps to develop hypotheses
  – incubation period
  – etiological agent
  – type of source
  – type of transmission
  – time of exposure
Examples of Epidemic curves

**Common point source**

- Cases over hours:
  - Days 1-2: 1 case each
  - Days 3-4: 2 cases each
  - Days 5-7: 3 cases each
  - Days 8-9: 4 cases each

**Common persistent source**

- Cases over days:
  - Days 1-12: 1 case each

**Common intermittent source**

- Cases over days:
  - Days 1-2: 1 case each
  - Days 3-4: 2 cases each
  - Days 5-7: 3 cases each
  - Days 8-9: 4 cases each

**Person-to-person source**

- Cases over weeks:
  - Weeks 1-2: 2 cases each
  - Weeks 3-4: 3 cases each
  - Weeks 5-6: 4 cases each
  - Weeks 7-9: 5 cases each
  - Weeks 10-12: 6 cases each
Place

- Place of residence
- Place of possible exposure
  - work
  - meals
  - travel routes
  - day-care
  - leisure activities
- Maps
  - identify an area at risk
Person

- Distribution of cases (numerator)
  - age
  - sex
  - occupation, etc.

- Distribution of these variables in the population (denominator)

- Attack rates
Hypotheses generation

- Pathogen?
- Source?
- Transmission?
- At risk?
- Vehicle?
- Person
- Time
- Place

Develop hypotheses

- Pathogen?
- Source?
- Transmission?
- At risk?
- Vehicle?
Tools for Hypothesis Generation in Ireland Trawling Questionnaires

Salmonella

VTEC

Generic IID
Information collected on Trawling Questionnaires

- WATER
- TRAVEL – FOREIGN AND DOMESTIC
- ANIMAL EXPOSURES – FARM, PET, WILDLIFE
- OUTDOOR ACTIVITIES
- EATING OUT
- READY-TO-EAT - TAKE OUT, SANDWICH BARS, ETC
- FOOD EXPOSURES
  - PORK AND PORK PRODUCTS
  - POULTRY
  - BEEF, LAMB & OTHER MEAT
  - FISH/SEAFOOD
  - EGGS/DAIRY
  - SALAD VEGETABLES
  - OTHER FRESH PRODUCE
  - OTHER SALAD INGREDIENTS
  - HERBS AND SPICES
  - FRUIT
  - SNACKS
  - SAUCES, PICKLES or DIPS
- SHOPS
**Sample page from questionnaire**

### FRESH PRODUCE:

50. **In the 7 days before you became ill, did you eat any raw salad vegetables either at home or outside the home?**

   [Prompt: don’t forget salad items in sandwiches, in juices and smoothies, as crudites, burgers, kebabs, at home, in restaurants/cafés, etc]

<table>
<thead>
<tr>
<th>SALAD VEGETABLES</th>
<th>Yes</th>
<th>No</th>
<th>Unk</th>
<th>Describe, e.g. organic or not, variety, shape, colour, if relevant</th>
<th>Packaging/presentation, e.g. wrapped/tray/bag, whole/halved/sliced, 6-pack/3-pack, etc</th>
<th>Brand and where purchased/eaten, e.g. name restaurant/café, supermarket, local store, farmers market, home, etc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lettuce, e.g. ball-headed like iceberg, loose leaved, bagged lettuce leaves, etc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other salad leaves, (specify, e.g. rocket, baby beet leaves, spinach, lambs lettuce, watercress, etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomatoes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cucumber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peppers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onion/shallots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring onion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radish</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-made deli style salads, either from an open salad bar or pre-packed, (specify bean-based, pasta-based, carrot-based, potato-based, coleslaw, pasta-based etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hypotheses generation

• Apply trawling questionnaire
  - face-to-face or telephone interview (or online)
• Record and analyse information in spreadsheet/database
• Review data for common exposures
• Followed by analytical study and/or microbiological investigation

• Novel hypothesis generation tools, e.g. loyalty cards, etc.
Test hypotheses

Analytical studies

Key feature is a **comparison group**

- **Cohort study**
  - Attack rate in exposed group
  - Attack rate in unexposed group

- **Case-Control study**
  - Odds of exposure in cases
  - Odds of exposure in control
Sources of data for comparison

• General population – random selection
• Survey panelists
• Food consumption surveys
• Case-case approach
• Commercial sales data
Additional investigations

- Microbiological investigation
- Environmental investigation
- Veterinarian investigation
- Trace back investigations (origin of foods)
The Role of Primary and Reference Laboratories in Outbreak Investigations

• Detection of clusters and outbreaks
• Outrule links with unrelated cases
• Confirm link between suspected source and human cases

Examples of laboratory methods to type micro-organisms
• Serotyping
• Phage typing
• Molecular typing, e.g. PFGE, MLVA
• Sequencing (WGS, NGS, etc)
Implement control measures

• Commence immediately outbreak is identified
• At first - general measures
• According to findings – more specific measures

**Aim** - To protect persons at risk and prevent future outbreaks
  – Controlling the source of the pathogen
  – Interrupting /blocking the mode of transmission
  – Control of distant cases – inter/national alerts
  – Modifying the host response/defence
  – Risk group protection
Communication

- OCT
- Media
- Affected population
- Wider public health community
- General public
Outbreak Report

- Detailed report at the end
  - communicate public health messages
  - provide recommendations
  - influence public health policy
  - training tool
  - legal proceedings
The reality....

- Confirmation
- Site visit
- Case definition
- Organize Data
- Descriptive Epidemiology
- Line list
- Analytical Epidemiology
- Recommendations
- Report Publication
- Communication
- Control measures
- Communication

Outbreak suspected
Form Outbreak Control Team
Confirm Diagnosis
Investigation and management of an outbreak of *Salmonella* Typhimurium DT8 associated with duck eggs, Ireland 2009 to 2011

P Garvey (patricia.garvey@hse.ie), P McKeown, P Kelly, M Cormican, W Anderson, A Flack, S Barron, N De Lappe, J Buckley, C Cosgrove, D Molloy, J O’Connor, P O’Sullivan, J Matthews, M Ward, A Breslin, M B O’Sullivan, K Kelleher, A McNamara, C Foley-Notan, H Pelly, F Cloak, Outbreak control team

1. Health Protection Surveillance Centre, Dublin, Ireland
2. Irish Department of Agriculture, Food and the Marine, Dublin, Ireland
3. National Salmonella, Shigella and Listeria Reference Laboratory, Medical Microbiology Department, University Hospital Galway, Galway, Ireland
4. Food Safety Authority of Ireland, Dublin, Ireland
5. Veterinary Department, Cork County Council, Cork, Ireland
6. Health Service Executive, Communicable Disease Unit of the Environmental Health Service, Blanchardstown Dublin, Ireland
7. Department of Public Health, Health Service Executive Mid-West. Department of Public Health, HSE West, Limerick, Ireland
8. Department of Public Health, Health Service Executive East, Dr Steeven’s Hospital, Dublin, Ireland
9. Department of Public Health Medicine, Health Service Executive North West, Sligo, Ireland
10. Department of Public Health, Health Service Executive South, Wilton, Cork, Ireland
11. National Office for Health Protection, Health Service Executive Offices, Limerick, Ireland
13. Food Safety Promotion Board, Cork, Ireland
14. Department of Public Health, Health Service Executive West, Merlin Park Hospital, Galway, Ireland
15. The remaining members of the team are listed at the end of the article

Citation style for this article:
A **confirmed** case was defined as a person who had a laboratory-confirmed infection with *Salmonella* Typhimurium DT8 (MLVA pattern 2-10-NA-12-212 or a closed related pattern) and who had a date of onset after August 1st 2009.

Lab data source: NSSLRL, Galway

Distribution of DT8 outbreak cases by month of onset

Trawling questionnaires indicated higher than expected consumption of duck eggs

<table>
<thead>
<tr>
<th>Exposure to duck eggs</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumed duck eggs</td>
<td>18</td>
</tr>
<tr>
<td>Possible contact with duck eggs</td>
<td>4</td>
</tr>
<tr>
<td>Presumed secondary case</td>
<td>1</td>
</tr>
<tr>
<td>No duck egg exposure reported</td>
<td>9</td>
</tr>
<tr>
<td>Duck egg exposure unknown</td>
<td>3</td>
</tr>
</tbody>
</table>

Known duck egg exposure explained 23 of 32 (72%) cases.

Traceback by EHS and DAFM and microbiological investigations provided evidence implicating several duck flocks
Control Measures

1. Advice for consumers
   I. Press releases (n=3) advising thorough cooking
   II. Point-of sale notices (FSAI)
   III. Public information campaign with postcards by Safefood

2. For positive flocks (DAFM)
   I. Movement of birds restricted
   II. Voluntary cull initially
   III. Duck house cleansing and disinfection
   IV. New birds to be sourced from salmonella negative flocks

3. DAFM Code of practice introduced in summer 2010
   I. Traceability
   II. Disease control
   III. Biosecurity
   IV. Testing

4. DAFM Guidelines for backyard producers in October 2010

5. Legislation **SI 565 of 2010**
   I. Legal basis for salmonella controls in all duck flocks which trade for profit
Outbreak of hepatitis A infection associated with the consumption of frozen berries, Ireland, 2013 - linked to an international outbreak

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5. Department of Public Health, HSE East, Dublin, Ireland
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7. Department of Public Health, HSE South, Cork, Ireland
8. Department of Public Health, HSE South-East, Kilkenny, Ireland
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10. Department of Public Health, HSE North-East, Meath, Ireland
11. The members of the Outbreak Control Team are listed at the end of the article

Citation style for this article:
Distribution of hepatitis A outbreak cases by week of onset of symptoms, Ireland, 2013 (n=21)

# Analytical epidemiology – Case Control Study Findings

## Food exposures among hepatitis A subgenotype IA cases (n = 11) and controls (n = 42), Ireland, 2013

<table>
<thead>
<tr>
<th>Exposure Total</th>
<th>Cases</th>
<th>Controls</th>
<th>Crude mOR</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total*</td>
<td>Exposed</td>
<td>%</td>
<td>Total</td>
<td>Exposed</td>
</tr>
<tr>
<td><strong>Individual products</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheesecakeb</td>
<td>10</td>
<td>4</td>
<td>40</td>
<td>42</td>
<td>4</td>
</tr>
<tr>
<td>Celery</td>
<td>11</td>
<td>6</td>
<td>55</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>Whole frozen berries</td>
<td>10</td>
<td>4</td>
<td>40</td>
<td>42</td>
<td>4</td>
</tr>
<tr>
<td>Yoghurt Ab</td>
<td>10</td>
<td>4</td>
<td>40</td>
<td>42</td>
<td>3</td>
</tr>
<tr>
<td>Fresh blueberries</td>
<td>11</td>
<td>9</td>
<td>82</td>
<td>42</td>
<td>22</td>
</tr>
<tr>
<td>Ice creamb</td>
<td>11</td>
<td>2</td>
<td>18</td>
<td>42</td>
<td>1</td>
</tr>
<tr>
<td>Yoghurtsbc</td>
<td>10</td>
<td>5</td>
<td>50</td>
<td>42</td>
<td>9</td>
</tr>
<tr>
<td>Smoothiesb</td>
<td>9</td>
<td>4</td>
<td>44</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>Fresh berries</td>
<td>11</td>
<td>10</td>
<td>91</td>
<td>42</td>
<td>33</td>
</tr>
<tr>
<td><strong>Grouped products</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheesecake or yoghurt A</td>
<td>10</td>
<td>6</td>
<td>60</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>Whole frozen berries or yoghurt A</td>
<td>10</td>
<td>6</td>
<td>60</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>Cheesecake or whole frozen berries</td>
<td>10</td>
<td>7</td>
<td>70</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>Cheesecake or whole frozen berries or yoghurt A</td>
<td>10</td>
<td>8</td>
<td>80</td>
<td>42</td>
<td>10</td>
</tr>
<tr>
<td>Cheesecake or whole frozen berries or yoghurt A or smoothiesb</td>
<td>11</td>
<td>10</td>
<td>91</td>
<td>42</td>
<td>16</td>
</tr>
</tbody>
</table>

CI: confidence interval; mOR: matched odds ratio.

* Cases with available information.

b These products contained frozen berries.

c Includes yoghurt A and other yoghurts containing frozen berries.

d No change when ice-cream was added to this combination.
Hepatitis A outbreak summary

- 21 outbreak cases
- Concurrent outbreaks in other European countries
- In analytical epidemiological study, cases were more likely than controls to have eaten berry cheesecake, whole frozen berries, yoghurt containing frozen berries or raw celery.
- Among cases, 91% had consumed at least one of four products containing frozen berries.
- Sixteen food samples tested were all negative for HAV, and source of berries not identified (see also European Food Safety Authority, 2014. Tracing of food items in connection to the multinational hepatitis A virus outbreak in Europe. EFSA Journal 2014;12(9):3821, 186 pp. doi:10.2903/j.efsa.2014.3821)
- As products containing frozen berries were implicated in the outbreak, the public were advised to heat-treat frozen berries before consumption.

International Health Regulations

• To prevent, protect against, control and provide a public health response to the international spread of disease
• Member States must notify the WHO of public health emergencies of international concern (PHEICs),
• Extraordinary events that pose a public health risk through the international spread of disease to the rest of the world
• Public Health Emergencies
  – Health impact (seriousness)
  – Unexpected nature
• International concern
  – Risk of international spread
  – International response (restrictions to travel or trade)
International Perspectives

• **ECDC:**
  – Surveillance of ID in Europe
  – Through surveillance networks
  – Provision of technical and scientific expertise
  – Support the networking activities of competent bodies

• **EFSA:**
  – Assess risks associated with the food chain in Europe
  – Communicate risks openly based on independent scientific advice of scientific expert panels
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

3 July 2018
Confirmed outbreak case

A laboratory-confirmed listeriosis patient with symptom onset on or after 1 January 2015 (date of sampling or date of receipt by the reference laboratory if date of onset is not available)

AND

- Fulfilling the additional laboratory criterion: with *L. monocytogenes* having ≤7 core-genome Multi-locus Sequence Typing (cgMLST) allelic differences from the outbreak isolate FI 122265 based on cgMLST analysis (assembly uploaded to EPIS UI-444 as IVb_MLST6_122265_S3_L001_R_q30w20.fasta). The cgMLST scheme is either that of Moura or Ruppitsch, or a respective scheme [11,14].

OR

- Fulfilling the additional laboratory criterion: with *L. monocytogenes* within a five SNP cluster from the outbreak isolate FI 122265 based on SNP analysis (assembly uploaded to EPIS UI-444 as IVb_MLST6_122265_S3_L001_R_q30w20.fasta).

Probable outbreak case

A laboratory-confirmed listeriosis patient with symptom onset on or after 1 January 2015 (date of sampling or date of receipt by the reference laboratory if date of onset is not available)

AND

- Fulfilling the additional laboratory criteria: with an isolate of *L. monocytogenes* serogroup IVb and with PFGE indistinguishable from the profile Ascl.0003-Apal.0070 (TESSy) (uploaded to EPIS as UI-444: BioNumerics.PFGE.Ascl.0003-Apal.0070.zip).

A second PFGE profile was described from non-human isolates matching the outbreak genomic profile. The analysis of the profile in on-going to determine the reference type.

Exclusion criteria

Cases with travel history outside of the EU/EEA in the 30 days before disease onset.
Table 1. *Listeria monocytogenes* IVb, ST6 confirmed outbreak cases by country and year, EU 2015–2018 (as of 15 June 2018)

<table>
<thead>
<tr>
<th>Country</th>
<th>Confirmed cases (No. of deaths)</th>
<th>Total number of cases</th>
<th>Total number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2015</td>
<td>2016</td>
<td>2017</td>
</tr>
<tr>
<td>Austria</td>
<td>0</td>
<td>2 (1)</td>
<td>0</td>
</tr>
<tr>
<td>Denmark</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Finland</td>
<td>0</td>
<td>4</td>
<td>10 (2)</td>
</tr>
<tr>
<td>Sweden</td>
<td>0</td>
<td>3 (1)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1</td>
<td>2</td>
<td>2 (2)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1 (0)</td>
<td><strong>11 (2)</strong></td>
<td><strong>17 (5)</strong></td>
</tr>
</tbody>
</table>
Figure 3. Graphical representation of traceability and testing information available in RASFF or provided to EFSA by Member States, as of 29 June 2018.

FSAI, 2016. Available at https://www.fsa.ie/resources_publications.html
Questions?

• Contact online: http://emii.ie/contact-us/

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