Epidemiology of Food Poisoning

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Definition

Public Health Importance

Epidemiology of Food poisoning

Investigation of an Outbreak

Prevention & Control Measures
Food poisoning is an acute gastroenteritis caused by ingestion of food or drinks contaminated with either living bacteria (e.g. Salmonella) or their toxins (e.g. enterotoxins of Staphylococcus aureus) or chemicals (e.g. pesticides, metals) or toxins derived from plants (solanine from potatoes) or animals (e.g. shellfish)
Major features of Food Poisoning

1. Acute sudden onset
2. Involvement of number of individuals
3. Uniformity of symptoms and signs
4. History of consumption of common food item(s)
5. Single epidemic curve with cases occurring inside one incubation period
6. Lack
Public Health Importance

2 million deaths occur every year from contaminated food or drinking water

More than 200 diseases are spread through food

6-33 million episodes of food poisoning in US every year

The problem of food poisoning is on the rise-
Urbanization, Globalization, more outdoor eating, development of drug resistance, emerging infections
Epidemiology of Food Poisoning

Agent

Host

Environment

Time
Agents

**Bacteria:** Salmonella, Shigella, Staphylococcus aureus, Clostridium perfringens, Clostridium botulinum, *E. coli* O157:H, Campylobacter, Bacillus cereus

**Virus:** Norovirus, Rotavirus

**Parasite:** Giardia lamblia

**Chemicals:** Shellfish, Solanine, pesticides, Amanita phalloides, metals
Host Factors

High Risk Groups

Infants & children

Elderly

Pregnant

Individuals with chronic diseases: HIV, Diabetes, cancers
Foods Factors

Meat and meat products
Milk and milk products

Preparation of food too much in advance
Inadequate cooking
Storage at room temperature
Inadequate re-heating
Environment Factors

From Farm to Folk or From Farm to Plate

Production, storage, transport, storage, preparation, cooking, storage, distribution

Physical Factors: Non-availability of storage facilities, poor sanitation conditions in slaughter houses, rodent infestations

Cultural Factors: Consumption of raw food, festivals & ceremonies

Behavioral Factors: Poor hygienic practices of food handlers, lack of supervision of food handlers
## Time Factor

<table>
<thead>
<tr>
<th>Etiological agent</th>
<th>Median incubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticides/ Mushroom</td>
<td>minutes</td>
</tr>
<tr>
<td>Staph aureus &amp; B cereus type-1</td>
<td>2 hours (1-6)</td>
</tr>
<tr>
<td>C perfringens &amp; B cereus type 2</td>
<td>12 hours (10-18)</td>
</tr>
<tr>
<td>Salmonella</td>
<td>18 hours (12-24)</td>
</tr>
<tr>
<td>C botulinum</td>
<td>24 (18-36)</td>
</tr>
</tbody>
</table>
# Symptoms and Signs

<table>
<thead>
<tr>
<th>Etiological agent</th>
<th>Nausea Vomiting</th>
<th>Diarrhea</th>
<th>Abdominal cramps</th>
<th>Fever</th>
<th>Blood In stools</th>
<th>Neuro Muscular Symptoms/ signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticides/ Mushroom</td>
<td>++</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+++</td>
</tr>
<tr>
<td>Staph aureus B cereus</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C perfringens B cereus</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Salmonella</td>
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<td>+++</td>
<td>++</td>
<td>+</td>
<td>+++</td>
<td>-</td>
</tr>
<tr>
<td>C botulinum</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+++</td>
</tr>
</tbody>
</table>
Investigation of Food Poisoning
1: Verifying the diagnosis & deciding which meal to investigate

The diagnosis is often *clinico-epidemiological* based on history of common food, likely organism (from symptoms) and incubation period.
2: Line listing of epidemic

<table>
<thead>
<tr>
<th>Ser No</th>
<th>Name</th>
<th>Developed illness or not</th>
<th>History of taking particular food item served during the suspected meal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chicken curry</td>
</tr>
<tr>
<td>1</td>
<td>AAA</td>
<td>Yes</td>
<td>Y</td>
</tr>
<tr>
<td>2</td>
<td>AAB</td>
<td>No</td>
<td>N</td>
</tr>
<tr>
<td>134</td>
<td>ZZZ</td>
<td>Yes</td>
<td>Y</td>
</tr>
</tbody>
</table>
3: Calculation of Risks

<table>
<thead>
<tr>
<th>Food item</th>
<th>Those who ate the food item</th>
<th>Those who did not eat the food item</th>
<th>Relative risk</th>
<th>Attributable risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Became sick</td>
<td>Not sick</td>
<td>Incidence among those who ate the item</td>
</tr>
<tr>
<td>Chicken curry</td>
<td>40</td>
<td>31</td>
<td>9</td>
<td>78</td>
</tr>
<tr>
<td>Matar paneer</td>
<td>61</td>
<td>30</td>
<td>31</td>
<td>49</td>
</tr>
<tr>
<td>Rice</td>
<td>80</td>
<td>34</td>
<td>46</td>
<td>42.5</td>
</tr>
</tbody>
</table>


4: Investigations regarding circumstances of contamination

Source of procurement
Transport
Storage
Preparation
Utensils
Source of water
Sanitation of cookhouse
Cooking
Food handlers
Reheating
Prevention

1. Cook food thoroughly

2. Eat cooked food immediately

3. Store food $< 5 \text{ C}$ or $> 60 \text{ C}$
4. Avoid contact between raw and cooked food

5. Good personal hygiene

6. Food items to be eaten raw MUST be washed thoroughly
7. Use boiled or pasteurized milk

8. Reheat food to at least 60 C

9. Keep cooked food safe

10. Food handlers
Five keys to safer food

**Keep clean**
- Wash your hands before handling food and often during food preparation.
- Wash your hands after going to the toilet.
- Wash and sanitize all surfaces and equipment used for food preparation.
- Protect kitchen areas and food from insects, pests, and other animals.

**Why?**
- Microorganisms can cause foodborne illness when transferred to food by infected individuals.

**Separate raw and cooked**
- Separate raw meat, poultry, and seafood from other foods.
- Use separate equipment and utensils such as knives and cutting boards for handling raw foods.
- Store food in containers to avoid contact between raw and prepared foods.

**Why?**
- Cross contamination can occur when raw foods come into contact with cooked foods, leading to foodborne illness.

**Cook thoroughly**
- Cook food thoroughly, especially meat, poultry, eggs, and seafood.
- Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally use a food thermometer.

**Why?**
- Proper cooking kills most dangerous microorganisms, which can cause foodborne illnesses.

**Keep food at safe temperatures**
- Do not leave cooked food at room temperature for more than 2 hours.
- Refrigerate promptly all cooked and perishable food (preferably below 5°C).
- Keep cooked food piping hot (more than 60°C) prior to serving.
- Do not store food too long even in the refrigerator.
- Do not store frozen food at room temperature.

**Why?**
- Microorganisms can multiply very rapidly at certain temperatures by adding at very low rates and below 7°C or allowing for the growth of enzymes that do not require oxygen. Some bacteria and microorganisms still grow below 5°C.

**Use safe water and raw materials**
- Use safe water or treat it to make it safe.
- Select fresh and wholesome foods.
- Choose foods processed for safety such as pasteurized milk.
- Wash fruits and vegetables, especially if eaten raw.
- Do not use food beyond its expiry date.

**Knowledge = Prevention**

Food Safety
World Health Organization
FOODBORNE DISEASE OUTBREAKS

Guidelines for Investigation and Control
Thank You