



# Unsafe Food and Foodborne Enteric Diseases

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June 6, 2023

# Overview

- Enteric pathogens commonly transmitted by consumption of unsafe food
- It is an important public health issue in industrialized and LMICs
- Disproportionally affect children, pregnant women, elder, immunocompromised,
- The pathogens cause acute gastroenteritis and diarrhoea, and other serious long term outcomes, such as Guillain-Barré syndrome, Reactive arthritis, stunting
- Ensuring food safety is a public health priority and an essential step to achieving food security
- Effective food safety is not only relevant to ensure the health and well-being of people, but also to fostering economic development

# Causes of unsafe food



## • Food production process

- Natural reservoir in animals,
- Contaminated environment, soil
- Unsafe water use for irrigation,

## Food practices (in the food chain)

- Unsafe food handling practices from farm to fork
- Unhygienic conditions,
- Unsafe food additives
- Lack of awareness among food handlers, in the community

## Applications of food safety system

- Inadequate food mg't system
- Weak monitoring system, poorly enforced regulatory standards
- Lack of resources, capacity

## Other contributing factors

- Poor infrastructure of the storage, distribution channels
- Domestic local market , open markets, street foods,

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## Burden of enteric disease estimates

- In 2010, WHO estimated 22 enteric foodborne diseases
  - 2.0 billion (95% UI 1.5–3.0 billion) illnesses, 39% in children < 5 years
- Among the 1.9 billion (95% UI 1.4–2.8 billion) cases of diarrheal diseases,
  - Norovirus was responsible for 684 million (95% UI 491–1,112 million) illnesses; the largest number of cases for any pathogen
- ETEC, Shigella spp., G. lamblia, Campylobacter spp. and NTS– next largest cases
- 29% (95% UI 23–36%) of all 22 diseases were estimated to be transmitted by contaminated food
  - 582 million (95% UI 400–922 million) foodborne cases, 38% (95% UI 24–53%) in children <5 years of age
- The pathogens resulting in the most foodborne cases were norovirus, Campylobacter spp., ETEC, NTS, and Shigella spp.
- EPEC, Cryptosporidium spp., and Campylobacter spp. occurred in high proportion among children <5 years of age

## Deaths due to foodborne enteric diseases

- 1.09 million (95% UI 0.89–1.37 million) deaths, 34% (95% UI 29–38%) in children <5 years
- Among the diarrheal diseases, norovirus was responsible for the most deaths
- EPEC, *V. cholerae*, and *Shigella* spp. -- large numbers of deaths
- 351,000 (95% UI 240,000–524,000) deaths due to contaminated food, 33% (95% UI 27–40%) in children <5 years of age
- *Salmonella* Typhi, EPEC, norovirus, iNTS, NTS, and hepatitis A. --- responsible for most foodborne deaths
- The mortality rates highest in the African region and South Eastern Asian region

# The Long-Term Health Outcomes

- Most foodborne illnesses result in acute symptoms including diarrhea, vomiting, abdominal pain, cramps, and sometimes fever and jaundice, and are self-limiting
- However, for some pathogens can result in sequelae, which can be severe, require multiple hospitalizations, and be costly to society
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# The Long-Term Health Outcomes

Health outcomes		Bacterial pathogens
Guillain-Barré syndrome	<ul style="list-style-type: none"> <li>• a rare but serious autoimmune illness, affects the nervous system and causes acute flaccid paralysis.</li> <li>• 10 days–3 weeks after gastrointestinal illness</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Campylobacter</i> spp. infection</li> </ul>
Hemolytic uremic syndrome	<ul style="list-style-type: none"> <li>• can affect all body organs, resulting in: kidney failure; hypertension; neurological problems; diabetes; digestive problems; gallstones; irritable bowel syndrome,</li> <li>• 4–10 days after onset of gastroenterit</li> </ul>	<ul style="list-style-type: none"> <li>• infection with Shiga toxin–producing <i>Escherichia coli</i> (STEC)</li> </ul>
Irritable bowel syndrome	<ul style="list-style-type: none"> <li>• is a gastrointestinal disorder that causes abdominal pain and bowel dysfunction.</li> <li>• It is not life threatening, but it can cause substantial health effects</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Campylobacter</i> spp.,</li> <li>• Non typhoidal <i>Salmonella enterica</i> serotypes or <i>Shigella</i> spp.</li> </ul>
Reactive arthritis	<ul style="list-style-type: none"> <li>• a type of spondyloarthritis that can developed upto 4 weeks after the infection</li> <li>• Case reports and outbreak investigations have demonstrated an association between reactive with a frequency of reactive arthritis ranging from 1% to 21%</li> </ul>	<ul style="list-style-type: none"> <li>• enteric infection from <i>Campylobacter</i> spp., non typhoidal <i>Salmonella</i> spp., <i>Shigella</i> spp., or <i>Yersinia enterocolitica</i></li> </ul>

# The Long-Term Health Outcomes ...

Health outcomes		Bacterial pathogens
Neurological dysfunctions	<ul style="list-style-type: none"> <li>• Long-term neurological damage</li> <li>• Infants who survive a <i>Listeria</i> infection may experience long-term neurological damage and delayed development.</li> <li>• Adults aged over 60 years can also be seriously affected by listeriosis</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Listeria monocytogenes</i></li> </ul>
Cholangitis –	<ul style="list-style-type: none"> <li>• Infection/inflammation of common bile duct</li> </ul>	<i>Yersinia</i>
Epididymo-orchitis –	<ul style="list-style-type: none"> <li>• Inflammation of one or both of the testicles</li> </ul>	<i>Brucella</i>
Malnutrition, stunting	<ul style="list-style-type: none"> <li>• Is a major contributor to mortality and is increasingly recognized as a cause of, potentially lifelong, functional disability</li> <li>• Enteric infections and malnutrition: a vicious cycle</li> <li>• Higher proportion of death of &lt; 5 children are associated with malnutrition</li> </ul>	<ul style="list-style-type: none"> <li>• due to multiple repeated enteric infections, diarrhea</li> </ul>

# Antimicrobial resistance (AMR)

- Currently, foodborne illness caused by bacterial contamination is one of the foremost threats of public health
- These bacterial pathogens are recognized as concern due to the emergence and rapid transmission of AMR in humans, animals, and the environment
- Antibiotic resistance has led to adverse consequences such as prolonged hospitalization, increased medical expenses, overburdened public health system, and even increased mortality rates
- WHO lists AMR as one of the top ten public health threats in the world

# Antimicrobial resistance ...

- A global AMR meta analysis, the prevalence of AMR foodborne pathogens in human clinical specimens was greater than 19% (Tao Q. etal., 2022)
- AMR in Ethiopia, the pooled prevalence of AMR in bacteria from food producing live animals was 20% (Gemedas et al., 2021)
  - The overall pooled multi-drug resistance (MDR) prevalence was 74% among AMR positive samples
  - Higher MDR patterns were reported from
    - *Staphylococcus spp.* (96%),
    - *Salmonella spp.* (81%) and
    - *Escherichia coli* (77%)

## Efforts made to improve food safety

- Globally considerable efforts were made to improve food safety and prevention of enteric diseases
  - Sustainable Development Goals (SDGs)- food safety
  - WHO global strategy for food safety 2022-2030
- Despite these advances, food safety remains a challenge due to multifaceted reasons
- Thus, national and global efforts should be continued to ensure food safety at local and global levels

## Conclusion

- Food safety remains as a challenge globally, particularly in LMICs
- Unsafe food has severe health, social and economic consequences
- There are multifaceted challenges to ensure food safety at local, national and global levels
- Enteric foodborne disease disproportionately affect disadvantages segment of the populations
- Continuous estimation of enteric foodborne disease is very crucial to prioritize the problems and to adequately inform policy-makers
- Effective and sustainable interventions are necessary for long-term improvement of food safety
- Collaboration and communication is needed among stakeholders and partners to alleviate the problem

Thank you

