
Food Poisoning

Hussein H. Abulreesh *BSc, PhD*

Assistant professor of environmental and public health microbiology

Dept. of Biology, Umm Al-Qura University

hhabulreesh@uqu.edu.sa

Food poisoning

- Food poisoning occurs after:
 - 1- Ingestion of food contaminated with chemical toxin
 - 2- Ingestion of food contaminated with pesticide and heavy metals (mercury)
 - 3- Ingestion of food contaminated with bacterial pathogens and/or their toxins, enteric viruses (norwalk viruses) and protozoa (*Giardia* and *Cryptosporidium*)
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Food poisoning

- Microbial food poisoning
 - Facts & Figures
 - Comes second to respiratory diseases as a cause of adult deaths worldwide (9500 cases in the USA annually)
 - The leading cause of child mortality worldwide (5 million child dies annually in Asia, Africa and South America)
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Food poisoning

- Bacterial food poisoning
 - How does it happen?
 - Bacterial food poisoning occurs when individuals ingest food that is either:
 - 1- contaminated with bacteria and their toxins (intoxication)
 - 2- contaminated with bacteria that reaches the colonize the gut and either (food infection):
 - 2-A- Secret toxin after adhering to intestinal epithelium
 - Or
 - 2-B- Invade the intestinal mucosa
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Food poisoning

- Bacterial food poisoning
- Basic mechanisms
 - 1- production of toxins in food: induce vomiting & abdominal cramps within few hours
 - 2-A- Secretion of toxin in the gut: watery diarrhoea, no fever, no blood in stool
 - 2-B- Invasion of gut mucosa: causes either Dysentery (colon & ileum, fever, abdominal pain, blood & mucus in stool)
or
Enteric fever (diarrhoea with fever & bacterimia)

Intoxication:

Staphylococcus aureus
Bacillus cereus
Clostridium perfringens

Food infection

Watery diarrhoea

Vibrio cholerae
Salmonella spp. (non-typhoidal)
Enterotoxigenic *E. coli* (e.g. *E. coli*O15)
Enteropathogenic *E. coli* (e.g. *E. coli*O55)
Clostridium perfringens
Listeria monocytogenes
Bacillus cereus

Dysentery

Shigella spp.
Entero-invasive *E. coli* (e.g. *E. coli*O159)
Enterohaemorrhagic *E. coli* (e.g. *E. coli*O157)
Campylobacter
Yersinia enterocolitica
Aeromonas hydrophila

Enteric fever

Salmonella typhi
Salmonella paratyphi

Food poisoning = Diarrhoea diseases, enteritis or gastroenteritis

Food poisoning

Organism	Epidemiology	Pathogenesis
<i>Staphylococcus aureus</i>	Grow in meats, dairy & bakery	Enterotoxin acts on gut receptors
<i>Clostridium botulinum</i>	Grow in anaerobic food (canned foods)	Toxin blocks acetylcholine release at neuromuscular junction
<i>Vibrio cholerae</i>	Grow in gut / produce toxin	Toxin causes hypersecretion in small intestine
<i>Salmonella typhi</i>	Invade gut epithelium, reach lymph nodes, liver, spleen	Endo-toxin and tissue inflammation
<i>Salmonella</i> (non-typhoidal)	Grow in gut	Superficial infection, little invasion
<i>Campylobacter jejuni</i>	Grow in small intestine	Invasion of mucous membrane, uncertain toxigenic
<i>E. coli</i> (<i>E. coli</i> O157)	Grow in gut	Toxin causes hypersecretion in small intestine

Food poisoning

Campylobacter jejuni

- The leading cause of enteritis worldwide (50000 reported cases in England and Wales, estimated 500000).
 - Common commensals in the gut of diverse avian species (especially poultry).
 - Wide spread in the environment.
 - Enters 'Viable but non-culturable' stage.
 - Doesn't multiply in food, water and the environment (evidence for recent contamination).
 - Very low infective dose required to cause infection (estimated 500 cells).
 - Infection is self-limiting, 5-8 days, then individuals become carriers for up to 4 weeks (up to 1 million cells/gram faeces).
 - Post infection complexities could lead to Guillain-Barre' syndrome, a neuromuscular disorder
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Food poisoning

Salmonella spp (non-typhoidal)

- There is about 2500 serovar (serotype) all of which are human-potential pathogens
 - *S. enteritidis* and *S. typhimurium* DT104 & DT160
 - Second leading cause of enteritis worldwide (40000 cases annually in USA)
 - Common commensals in diverse avian (low prevalence) and reptilian species
 - Able to multiply outside the gut (food and the environment)
 - Enters 'Viable but non-culturable' stage
 - Infected personnel become carriers
 - Infection requires low does (estimated 200 cells)
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Food poisoning

- Bacterial food poisoning
 - Food poisoning in Saudi Arabia, facts & figures
 - There is annual increase in diarrhoea cases (186 cases in 1411 to 482 cases in 1422)
 - *Staphylococcus aureus* was the leading cause of infection (40% out of 6052 cases)
 - *Salmonella* spp. Came second as a common cause of infection
 - There is increase in diarrhoea cases during Hajj season in the last decade (44 to 132 cases each season)
 - Cholera outbreaks were last reported during Hajj in 1985
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Food poisoning

- How to minimize the risk of infection?
 - Education (personal hygiene) for individuals and catering sectors personnel
 - Avoid and prohibit food sold on streets
 - Environmental surveillance of enteric pathogens (typing of environmental and clinical isolates)
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Food poisoning

Further readings

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Thank you for your patient listening
