Food Poisoning

Introduction to Food Poisoning

Definition of Food Poisoning (Foodborne Illness)

- Food poisoning is a toxicological condition caused by consuming contaminated food or water. It may involve biological toxins, microbial pathogens, or chemical agents.
- From a clinical toxicology perspective, food poisoning is studied based on the mechanism of toxicity, clinical manifestations, and management protocols.

Classification of Food Poisoning based on Causative Agents:

1. Biological Toxins (Natural toxins)

- These are non-infectious toxic agents produced by organisms (bacteria, plants, algae, animals) and can cause toxic syndromes without infection.
- **Examples:**
  - **Botulinum toxin** (from *Clostridium botulinum*)
  - **Ciguatoxin** (marine fish)
  - **Scombrotoxin** (improperly stored fish)
  - **Aflatoxins** (produced by *Aspergillus* species)
  - **Mushroom toxins** (e.g., amatoxins from *Amanita phalloides*)

2. Microbial (Infectious agents)

- Involve pathogens that multiply or produce toxins in the GI tract.
  - **Bacteria:** *Salmonella*, *E. coli*, *Shigella*, *Listeria*
  - **Viruses:** Norovirus, Hepatitis A
  - **Parasites:** *Giardia*, *Entamoeba histolytica*
  - **Note**: In clinical toxicology, microbial causes are more the domain of infectious disease, but their **toxins** (like *Shiga toxin*) are studied for their toxicodynamics.

3. Chemical Toxins

- These include pesticides, heavy metals, or other industrial/agricultural chemicals.
- **Examples:**
  - Organophosphates (insecticides)
  - Arsenic
  - Mercury
  - Polychlorinated biphenyls (PCBs)
  - Nitrites and nitrates

Mechanisms of Toxicity

Preformed Toxins

- Toxins are ingested already formed in the food. Clinical manifestations occur rapidly (within hours).
- **Example**: Botulinum toxin → blocks acetylcholine release → causes **flaccid paralysis**.

In Vivo Toxin Production

- Pathogen colonizes the GI tract and produces toxin after ingestion.
- **Example**: *Clostridium perfringens* releases enterotoxins in the gut.

Direct Infection with Secondary Toxin Effects

- Microorganisms infect tissue and release toxins causing systemic effects.
- **Example**: *E. coli O157:H7* → produces **Shiga toxin** → can lead to **hemolytic uremic syndrome (HUS)**.

Chemical Toxicity

- Chemicals in food act on organs such as the liver, kidneys, or nervous system.
- **Example**: Aflatoxins → hepatotoxic → risk of **hepatocellular carcinoma**.

Clinical Features (Toxicological Syndromes)

Toxin/Agent	Onset	Key Symptoms	Toxicologic Concern
Botulinum toxin	12–36 hrs	Diplopia, ptosis, dysphagia, flaccid paralysis	Neurotoxin – potentially fatal
Scombrotoxin	Minutes – hrs	Flushing, rash, headache, vomiting	Histamine-like reaction
Aflatoxins	Days – weeks	Liver injury, nausea, jaundice	Hepatotoxic; carcinogenic
Ciguatoxin	6–12 hrs	GI upset, paresthesia, temperature reversal	Neurotoxin
Shellfish toxins	< 1 hour	Paralysis, nausea, dizziness	Neurotoxic – saxitoxin (PSP), brevetoxin
Arsenic	Hours – days	GI distress, hypotension, QT prolongation	Multisystem toxicity
Organophosphates	Minutes – hrs	SLUDGE symptoms, respiratory distress	Cholinergic crisis

Diagnosis in Clinical Toxicology

Diagnosis of food poisoning from a toxicology standpoint involves:

History Taking

- Onset of symptoms after food intake
- Type and source of food (e.g., canned foods, seafood)
- Multiple cases (outbreak pattern)
- Time to onset is critical to narrow down toxin type

Laboratory Tests

- Blood tests: Electrolytes, liver enzymes, renal function
- Toxin assays: Botulinum toxin in serum/stool
- Microbiological cultures (limited in toxin-related cases)
- Urinary toxin analysis (e.g., arsenic, mycotoxins)

Specialized Testing

- EEG or EMG (in neurotoxic syndromes)
- Imaging for complications (e.g., cerebral edema in severe cases)
- Biopsy (rare, for chronic exposures)

Treatment and Management

General Management

- Supportive care (hydration, electrolyte balance)
- Antiemetics, antidiarrheals (use with caution)
- Hospitalization in severe cases

Specific Antidotes and Treatments

Toxin	Treatment
Botulinum toxin	Equine antitoxin (heptavalent)
Organophosphates	Atropine + Pralidoxime (2-PAM)
Aflatoxins	No specific antidote; supportive care
Arsenic/Mercury	Chelation with dimercaprol (BAL), DMSA
Scombrotoxin	Antihistamines
Ciguatoxin	Mannitol (investigational), supportive

Decontamination

- Activated charcoal (only in early ingestion, if applicable)
- Gastric lavage (rare; only if within 1 hour and life-threatening toxin)

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