

FOOD POISONING

- Food borne illness (also food borne disease and colloquially referred to as food poisoning)
- Food poisoning is a common, usually mild, but sometimes deadly illness.
- Typical symptoms include nausea, vomiting, abdominal cramping, and diarrhea that occur suddenly (within 48 hours) after consuming a contaminated food or drink.
- Depending on the contaminant, fever and chills, bloody stools, dehydration, and nervous system damage may follow.
- These symptoms may affect one person or a group of people who ate the same thing (called an outbreak).
- The Centers for Disease Control and Prevention (CDC) estimates that in the United States, food poisoning causes about 48 million illnesses, 128,000 hospitalizations, and up to 3,000 deaths each year.
- Norovirus and salmonella are the most common infectious forms of food-borne illness.
- Worldwide, diarrheal illnesses are among the leading causes of death.
- Travelers to developing countries often encounter food poisoning in the form of traveler's diarrhea or "Montezuma's revenge."
- Additionally, there are possible new global threats to the world's food supply through terrorist actions using food toxins as weapons.

Food Poisoning Causes

- More than 250 known diseases can be transmitted through food.
- The undiscovered agents cause 68% of all food-borne illnesses and related hospitalizations.
- Many cases of food poisoning are not reported because people suffer mild symptoms and recover quickly.
- Also, doctors do not test for a cause in every suspected case because it does not change the treatment or the outcome.

- The known causes of food poisoning can be divided into two categories:
 - 1) infectious agents
 - 2) toxic agents.

Infectious agents include viruses, bacteria, and parasites.

Toxic agents include poisonous mushrooms, improperly prepared exotic foods or pesticides on fruits and vegetables.

- Food usually becomes contaminated from poor sanitation or preparation. Food handlers who do not wash their hands after using the bathroom or have infections themselves often cause contamination.
- Improperly packaged food stored at the wrong temperature also promotes contamination.

FOOD POISONING SYMPTOMS

- Symptoms of food poisoning depend on the type of contaminant and the amount eaten.
- The symptoms can develop rapidly, within 30 minutes, or slowly, worsening over days to weeks.
- Most of the common contaminant's cause:
 - nausea,
 - vomiting,
 - diarrhea, and
 - abdominal cramping.
- Usually food poisoning is not serious, and the illness runs its course in 24-48 hours.

Bacteria

- Bacteria can cause food poisoning in two different ways.
- Some bacteria infect the intestines, causing inflammation and difficulty absorbing nutrients and water, leading to diarrhea. Other bacteria produce

chemicals in foods (known as toxins) that are poisonous to the human digestive system. When eaten, these chemicals can lead to nausea and vomiting, kidney failure, and even death.

- **Salmonellae**: Salmonellae are bacteria that may cause food poisoning; the illness itself is often referred to as Salmonella or Salmonella infection. Salmonellae cause a moderate illness with nausea, vomiting, crampy diarrhea, and headache, which may come back a few weeks later as arthritis (joint pains). In people with impaired immune systems (such as people with kidney disease or HIV/AIDS or those receiving chemotherapy for cancer), Salmonellae can cause a life-threatening illness. The illness is transmitted by undercooked foods such as eggs, poultry, dairy products, and seafood.

Treatment: administer IV fluid therapy and occasionally antibiotic therapy such as ampicillin, ceftriaxone.

- **Campylobacter**:

is a genus of Gram-negative bacteria. **Campylobacter** typically appear comma- or s-shaped, and are motile. Some **Campylobacter** species can infect humans, sometimes causing **campylobacteriosis**, a diarrhoeal disease in humans. Causes mild illness with fever, watery diarrhea, headache, and muscle aches. Campylobacter is the most commonly identified food-borne bacterial infection encountered in the world. It is transmitted by raw poultry, raw milk, and water contaminated by animal feces.

- Treatment: supportive measures and in severe cases tetracycline or cotrimoxazole
- **Staphylococcus aureus**: Causes moderate to severe illness with rapid onset of nausea, severe vomiting, dizziness, and abdominal cramping. These bacteria produce a toxin in foods such as cream-filled cakes and pies, salads (most at risk are potato, macaroni, egg, and tuna salads, for example) and dairy products. Contaminated salads at picnics are common if the food is not chilled properly.
- Treatment: IV fluid therapy, antiemetic agent if nausea present.

- Inhalation exposure: Move the patient from toxic environment to fresh air
- Administer 100% humidified supplemental oxygen if required
- **Bacillus cereus**: Causes mild illness with rapid onset of vomiting, with or without diarrhea and abdominal cramping. It is associated with rice (mainly fried rice) and other starchy foods such as pasta or potatoes. It has been speculated that this bacteria may also be used as a potential terrorist weapon.
- Treatment: Chloramphenicol, tetracycline
- **Escherichia coli (E coli)**: Causes moderate to severe illness that begins as large amounts of watery diarrhea, which then turns into bloody diarrhea. There are many different types of this bacteria. The worst strain can cause kidney failure and death (about 3% to 5% of all cases). It is transmitted by eating raw or undercooked hamburger, unpasteurized milk or juices, or contaminated well water. Outbreaks of food poisoning due to *E. coli* have also occurred following ingestion of contaminated produce.
- Treatment: cotrimoxazole
- Haemorrhagic colitis condition require serious hospitalisation and aggressive treatment
- **Vibrio cholerae**: Causes mild to moderate illness with crampy diarrhea, headache, nausea, vomiting, and fever with chills. It strikes mostly in the warmer months of the year and is transmitted by infected, undercooked, or raw seafood.

Treatment: Antibiotic therapy- tetracycline

Antiemetic, antidiarrhoeals and antiplasmodics are contraindicated.

PROTOZOA

- **Entamoeba histolytica**
- Source: contaminated food and water, Raw vegetables which have not been washed. Human to human transmission is also quite common

- Symptoms: abdominal discomfort and diarrhoea. Extraintestinal amoebiasis may involve liver, lungs etc
- Treatment: metronidazole (30mg/kg/day for 8 -10 days)

Cryptosporidium parvum

- Sources: contaminated food and water.
- Symptoms: malnutrition, pulmonary manifestation, toxic megacolon
- Treatment: Albendazole (400mg twice daily)

PARASITES

- Source: Raw fish, RAW MEAT
- Aetiologic agents: Roundworm, Fish tapeworm
- Clinical features: Anisakiasis (**Anisakiasis** is a parasitic disease caused by anisakid nematodes (worms) that can invade the stomach wall or intestine of humans. The transmission of this disease occurs when infective larvae are ingested from fish or squid that humans eat raw or undercooked.), fish tapeworm disease
- Treatment: Niclosamide, praziquantel, or paromomycin

Food Poisoning Self-Care at Home

- Short episodes of vomiting and small amounts of diarrhea lasting less than 24 hours can usually be cared for at home. Do not eat solid food while nauseous or vomiting but drink plenty of fluids. Small, frequent sips of clear liquids (those you can see through) are the best way to stay hydrated. Avoid alcoholic, caffeinated, or sugary drinks. Over-the-counter rehydration products made for children such as Pedialyte and Rehydralyte are expensive but good to use if available. Home remedies for nausea or diarrhea such as tea with lemon and ginger can be used for relief from symptoms. There are no proven herbal food poisoning cures. Consult a health care practitioner before taking any natural food poisoning remedies.

Food Poisoning Prevention

- Safe steps in food handling, cooking, and storage are essential to avoiding food-borne illness.
- Bacteria cannot be seen, smelled, or tasted, which may be on any food.

Safe shopping

- Buy cold foods last during your shopping trip.
- Get them home fast.
- Never choose torn or leaking packages.
- Do not buy foods past their "sell-by" or expiration dates.
- Keep raw meat and poultry separate from other foods.

Safe storage of foods

- Keep it safe; refrigerate.
- Unload perishable foods first and immediately refrigerate them.
- Place raw meat, poultry, or fish in the coldest section of your refrigerator.
- Check the temperature of your appliances.
- To slow bacterial growth, the refrigerator should be at 40 F (4.44 C) , the freezer at 0 F (-17.7 C).
- Cook or freeze fresh poultry, fish, ground meats, and variety meats within two days.

Safe food preparation

- Keep everything clean!
- Wash hands before and after handling raw meat and poultry.
- Sanitize cutting boards often in a solution of one teaspoon chlorine bleach in one quart of water.
- Do not cross-contaminate.
- Keep raw meat, poultry, fish, and their juices away from other food.

- After cutting raw meats, wash hands, cutting board, knife, and counter tops with hot, soapy water.
- Marinate meat and poultry in a covered dish in the refrigerator. Discard any uncooked/unused marinade.

Safe cooking

- Use a meat thermometer
- Cook ground meats to 160 F (71 C)
- Cook ground poultry to 165 F (74 C)
- Cook beef, veal, and lamb steaks, roasts and chops to 145 F (63 C)
- Cook all cuts of fresh pork, 160 F (71 C).
- Whole poultry should reach 180 F (82 C) in the thigh; breasts 170 F (76.6 C).
- Keep hot foods hot and cold foods cold.
- Never leave food out more than two hours (or more than one hour in temperatures above 90 F [32 C]).
- Bacteria that cause food poisoning grow rapidly at room temperature.

Viral Diseases

Hepatitis A Virus (HAV)

- Transmission: Fecal–oral, direct person–person > food (shellfish–oysters) > water.
- Vehicle: Human sewage-contaminated water and food, especially berries
- Clinical Manifestations: Anorexia, fever, nausea and vomiting, malaise, lethargy.

Hepatitis: Right upper quadrant (RUQ) pain, hepatomegaly, dark urine, pale feces, jaundice for up to 6 weeks.

prevention

- Primary prevention: Two formalin-inactivated vaccines, two (2) doses, 90% efficacy.
- Secondary prevention: IgM RIA or ELISA, IEM, PCR for RNA amplification.
- Tertiary prevention: Supportive therapy

Hepatitis E Virus (HEV)

Transmission: Fecal–oral, water > food (especially shellfish).

- Vehicle: Human waste-contaminated drinking water.
- Incubation: 2–8 weeks.

Clinical Manifestations

Hepatitis: Occurs predominantly in developing areas in 15- to 40-year-olds, especially pregnant women; high bilirubin levels, deeper jaundice than HAV, otherwise same as HAV; no chronic carriers.

PREVENTION

- Primary prevention: No vaccine; use boiled or bottled drinking water in developing countries.
- Secondary prevention: Immunofluorescent electron microscope (IFEM), viral RNA amplification by PCR; ELISA and Western blot for antibodies not widely available.
- Tertiary prevention: Supportive therapy only.

Norwalk-like Viruses

- Transmission: Fecal–oral, shellfish > salad > person to person > water.
- Vehicle: Human sewage-contaminated shellfish.
- Clinical Manifestations
- Acute gastroenteritis: 12–60 hours of watery diarrhea (with no mucus, blood, or pus), abdominal cramps, nausea and vomiting, fever, headache.

PREVENTION

- Primary prevention: No vaccine; well-cooked shellfish; proper human waste disposal on shellfish, Rehydration, supportive therapy

Rotaviruses

- Transmission: Fecal–oral.

Vehicle: Contaminated water > food > person-to-person.

Clinical Manifestations

Acute gastroenteritis: Nausea and vomiting precede 4–5 days of watery diarrhea without mucus, blood, or pus; low K⁺/Cl[–]—metabolic alkalosis mixed with hypoperfusion; metabolic acidosis possible; most common in infants 6–24 months old.

- Primary prevention: RotaShieldR live vaccine, 80% efficacy, withdrawn due to infant small bowel intussusception; breast-feeding confers IgA protection. Oral rehydration, supportive treatment, no anti-motility agents

FUNGI

Aflatoxins

- Aflatoxins are naturally occurring bisfuranocoumarin compounds produced by the fungus *Aspergillus flavus*. They occur as contaminants of several nuts, grains, & seeds, such as peanuts, rye, barley, corn etc. They are composed of highly substituted coumarin compounds that contain a fused dihydrofurofuran configuration.
- A dozen or more of these compounds have been identified: Aflatoxin, Aflatoxin B1, Aflatoxin B2, Aflatoxin 2a, Aflatoxin B3, Aflatoxin G1, aflatoxin G2, Aflatoxin G2a, Aflatoxin M1, Aflatoxin M2, Aflatoxin P, Aflatoxin T2.
- The aflatoxin is highly fluorescent.
- B-blue, G-green fluorescence, M-fungal metabolites present in milk, T-found in tobacco.
- Most of them associated with various types of liver damage. aflatoxin B1 is a potent hepatotoxin & carcinogen. It cause: hepatitis, fatty

liver, cirrhosis, hepatocellular carcinoma, hepatic failure, reye's syndrome, kwashiorkor.

- Clinical features: initial rye like syndrome with vomiting, fever, diarrhoea, abdominal pain, convulsion, & coma.
- Deaths were due to hepatic & renal failure. 2 to 6 mg/kg/day of aflatoxin for over a month produced an epidemic of hepatitis in India.
- Diagnosis: RIA, ELISA, HPLC, elevation of serum alkaline phosphatase.
- Treatment: supportive care, Antioxidants such as vitamin A.

PLANTS

• **CYANOGENIC PLANTS**

Cyanogenic plants may contain amygdalin or other glycosides, which on hydrolysis can release traces of cyanide. The following contain mostly glycosides other than amygdalin: Eg) apple, cassava, clover, pear, linseed etc

• **CASSAVA**

- Uses: cassava root- carbohydrate source
- Toxic part & MOA: The edible part of cassava is root. If this is properly processed before consumption, it causes no harm. However, insufficiently processed cassava liberates cyanide in the gut from the ingested cyanogenic glycoside linamarin.

Cyanide _ thiocyanate

- The substrate for this reaction is sulfur originating from proteins in the diet. When dietary protein intake is low, signs of toxicity begin to manifest.

Symptoms

- Tropical ataxic neuropathy (TAN)
- Optic neuropathy
- Epidemic spastic paraparesis (ESP)

- Acute toxicity is rare. Cyanide levels in the blood averaged 1.12mg/L; urinary levels averaged 0.54mg/L.

TREATMENT:

- Symptomatic & supportive measures.

Amygdalin- containing plants

- CHICKLING PEA (Indian pea,grass pea)
- Toxic principle: Beta-N-oxalyl-L-alanine (BOAA) or beta-N-oxalyl-alpha-beta-diaminopropionic acid (beta-odap).

Clinical features:

- Chronic intake may lead to lathyrism (a tropical disease marked by tremors, muscular weakness, and paraplegia, especially prevalent in South Asia. It is commonly attributed to continued consumption of the seeds of the grass pea.), characterised by gradually progressing bilateral spastic paraparesis (**Paraparesis** occurs when partially unable to move legs. The condition can also refer to weakness in hips and legs. **Paraparesis** is different from paraplegia, which refers to a complete inability to move legs). There may be prodromal manifestations such as cramps,prickling sensation, & nocturnal calf pain. Total spastic paraplegia may result in course of time.

FISH

- Poisoning resulting from fish and other marine creatures is referred to as ichthyism.
- Poisonous fish are subdivided into
 1. Ichthyosarcotoxic fish, which contains a toxin within their flesh.
 2. Ichthyohaemotoxic fish, which have poisonous blood, and
 3. Ichthyootoxic fish, which contain a toxin mainly in their gonads.

Scombroid poisoning (Histamine fish poisoning)

- Source: Tuna, bonito,needle fish,amberjack,blue fish etc.
- Toxin: scombroid poisoning is a form of ichthyosarcotoxicosis.

- Poisoning occurs from consumption of improperly preserved fish in the endogenous histidine has been broken down by bacteria into high levels of histamine and saurine. Even if such contaminated fish is subsequently cooked well or smoked, the toxins are not destroyed.
- Scombrototoxin formation can also occur if the fish is improperly refrigerated.

Incubation period

- Few min to few hours: Symptoms may develop as early as 5 to 10 min after eating the fish, or be delayed as early as 1 to 2 hrs.
- Clinical features: manifestations are mostly histamine-mediated, & comprise erythema of face, urticaria, dermal flushing, diaphoresis, burning sensation of mouth, dizziness, throbbing head ache, vomiting, diarrhoea & abdominal cramps. Onset of symptoms occurred within 30 min of ingestion. Severe cases there may be bronchospasm and respiratory distress.

DIAGNOSIS

- Histamine levels of serum and urine will be greatly elevated.

TREATMENT

Degree of severity	Treatment	Clinical features
mild	Rash, flushing, tachycardia	
	Antihistamines	
Moderate	Rash, persistent flushing, tachycardia, Parenteral antihistamines	Basic life support
	headache	Activated charcoal
	GI symptoms.	
Severe support	Any of the above, &/or	Basic life

bronchospasm	Oxygen
hypotension	IV fluids
airway compromise	Adrenaline
angiodema.	Parentral
antihistamines	Gastric lavage, nebulised bronchodialators.

Prevention

1. Buy seafood only from a source which maintains high standards, & keeps fish cold.
2. Fish that have been caught should be packed in ice before being transported home. At home, the fish should be refrigerated immediately.
3. As far as possible, only smaller fish (weighing less than 5 pounds) should be ingested. The larger the fish, the more concentrated the toxin. (eg:ciguatera toxin)
4. Avoid eating raw seafood.
5. Donot eat visera of fish esp. liver and gonads.

Outbreaks of marine food poisoning must be promptly notified to local public health authorities

CHEMICALS

- Chemical contaminants of food include heavy metals,pesticides, & food additives.
- FOOD ADDITIVES
- It may be antioxidants,flavouring agents,colouring agents,sweetening agents,thickening agents or preservatives.

Monosodium glutamate (MSG)

Uses:

1. flavouring agent
2. Treat patients with hyper ammoniaemia in conditions such as hepatic encephalopathy

Clinical features:

- Ingestion of large quantities of (MSG) is said to cause chinese restaurant syndrome (CRS)
- Features include burning or tingling sensation and numbness of face, trunk, upperlimbs, weakness, dizziness, syncope, flushing, lacrimation, sweating, chest pain, headache, nausea, gastric distress and rarely broncho spasm & angio edema. In young children convulsive attack may occur (shudder attack)

Treatment

- Symptomatic & supportive.
- GI decontamination is not indicated after an acute ingestion.
- PREVENTION
- Avoid catered food.
- Avoid alcohol.