FOOD BORNE INFECTION AND INTOXICATION

Dr. B. Sunil and Dr. Vilas M. Vaidya
Division of Veterinary Public Health
Indian Veterinary Research Institute, Izatnagar, Bareilly, (U.P.)

Food safety has become an issue of special importance for the food industry. There are many opportunities for food to be contaminated between production and consumption. Food can be contaminated at the farm, ranch, orchard, or in the sea. Food also can be contaminated at food processing plants and during transport to food establishments. Finally, food can be contaminated during the last stages of production, at retail establishments, and by consumers in their homes. Even when food is purchased from inspected and approved sources, ingredients may be contaminated when they arrive at the food establishment. It is important to know how to handle these ingredients safely and how to prepare food in such manner that reduces the risk of contaminated food being served. Food safety in retail food establishments begins with managers who are knowledgeable about food hazards and who are committed to implementing proper food handling practices in their facility. It continues with properly trained food workers who understands the essentials of food safety and sanitation and who will not take shortcuts when it comes to food safety. In this context, knowledge regarding food borne illness assumes great significance.

Foodborne illness

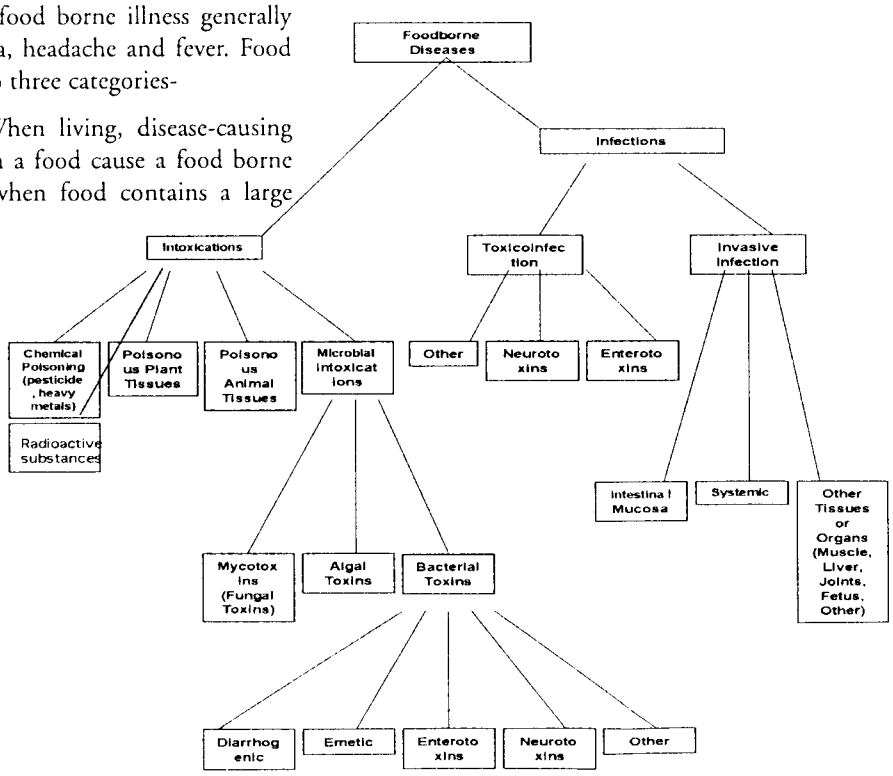
Foodborne illness is any illness caused by consumption of contaminated food. Symptoms of food borne illness generally include nausea, vomiting, diarrhoea, headache and fever. Food borne illness has been classified into three categories-

1. Food borne infection - When living, disease-causing microorganisms is eaten along with a food cause a food borne infection. Food infection occurs when food contains a large number of living harmful bacteria which grow in the human intestinal tract. Symptoms usually occur between 4 to 48 hours, lasting from 2 to 4 days (death has even occurred). Common symptoms are an upset stomach with violent diarrhea, cramps, fever, nausea and vomiting.

2. Food intoxication- When living organisms multiplies in or on a food and produces a chemical waste/toxin or, if the food containing toxin is eaten it leads to food borne intoxication. Symptoms are usually severe and occur quickly than food infection (1 to 8 hours after eating). Toxins can also cause tissue damage in the intestinal tract, while some affects the nervous system. Symptoms vary (violent nausea and vomiting, headache, dizziness and cramps). The illness could be one or a combination of these symptoms. The illness may last for several days and could be fatal.

3. Toxin-mediated infection- It is a combination of infection and intoxication, caused when a living organism is consumed with food. The organism inside the human body produces a toxin that causes the illness. It is different from intoxication in that the toxin is produced inside the human body.

Classification of food borne diseases



Summary of Agents that Cause Foodborne Illness

Causative Agent and type of illness	Symptoms Onset	Common Foods	Prevention
Campylobacter jejuni (Bacterial food borne Infection)	watery, bloody diarrhea, fever, abdominal pain, headache, no vomiting (2-5days)	raw chicken, raw milk, dairy products, raw meat	properly handle and cook foods, avoid cross contamination
Listeria monocytogenes (Bacterial Infection)	**Healthy adult:** flu-like symptoms **At risk population:** septicemia, meningitis, encephalitis, birth defects (1day-3weeks)	raw milk, dairy items, raw meats, refrigerated ready-to-eat foods, raw vegetables, and seafood 1 to 10% of human may be intestinal carrier of *L.monnocytogenes*	properly store and cook foods, avoid cross contamination; rotat processed refrigerated foods.
Salmonella enteritidis (Bacterial Infection)	nausea, fever, vomiting, abdominal cramps, diarrhea (6-48 hrs)	raw meats, raw poultry, eggs, milk, dairy products, food handlers	properly cook foods, avoid cross contamination
Shigella sonnei, S. flexneri, S.dysenteriae etc. (Bacterial Infection)	"bacillary dysentery", diarrhea, fever, abdominal cramps, dehydration (1-7 days)	foods that are prepared with human contact, faecal contamination of food and water, salads, raw vegetables, milk, dairy products, raw poultry, non-potable water, ready-to-eat meat	wash hands and practice good personal hygiene, properly cook foods
Vibrio parahemolyticus, V.cholerae (Bacterial Infection)	headache, fever, chills, diarrhea, vomiting, severe electrolyte loss, gastroenteritis (2-48hrs)	raw or improperly cooked fish and shellfish (seafoods)	practice good sanitation, properl cook foods, avoid serving raw seafood
Escherichia coli O157:H7 (Bacterial Infection or Toxin mediated infection)	hemolytic uremic syndrome (HUS), kidney failure bloody diarrhea, thrombotic thro-bocytopenic purpura (TTP)-older- adults (12 - 72 hrs)	undercooked hamburger, raw milk, unpasteurized apple cider and lettuce intestinal tract of some mammals	practice good food sanitation, hand washing, properly handle and cook foods
Yersinia enterocolitica (Bacterial infection)	diarrhoea, fever, acute appendicitis, no vomiting, abdominal cramps, leukocytosis, erythema nodosum	animal intestine, pork and other meats, raw milk or any contaminated raw or leftover foods	Cook food thoroughly, protects food from contamination, contr rodents
Staphylococcus aureus Strains - A, B, C1, C2, C3, D and E (Bacterial Intoxication)	nausea, vomiting, abdominal cramps, headaches, may be fever (2 - 6 hrs)	foods that are prepared with human contact (carrier), cooked or processed foods	wash hands and practice good personal hygiene. Cooking will not inactivate the toxin
Clostridium Perfringens (sporeforming) Bacterial Toxin-mediated infection	intense abdominal pain and severe diarrhea, no vomiting , no fever (8-22 days)	Soil contaminated foods, spices, gravy, improperly cooled foods (especially meats and gravy)	properly cook, cool, and reheat foods
Bacillus Cereus (sporeforming) Bacterial Intoxication or toxin-mediated infection	**Diarrhea type (infection)**-abdominal cramps (8-16 hrs), no vomting, no fever **Vomiting type (intoxication)**-vomiting, diarrhea, abdominal cramps (30 minutes - 6 hrs)	**Diarrhea type**-meats, milk, vegetables **Vomiting type**-rice, starchy foods; grains and cereals	properly heat, cool, reheat foods and wash vegetables
Clostridium Botulinum (sporeforming) strains- **A, B, C, D, E and F** Bacterial Intoxication	vertigo, double vision, difficulty in breathing and swallowing, headache (12-36 hrs), fatal if not treated	improperly canned foods, vacuum packed refrigerated foods; cooked foods in anaerobic mass, soil contaminated foods	properly heat process anaerobica packed foods, do not use home canned foods in food services

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Mycotoxins (Aflatoxin, Patulin, Ochratoxin A, Luteoskyrin, Roquefortine etc.) Intoxication	**Acute onset**-hemorrhage, fluid buildup, possible death. **Chronic**-cancer from small doses over time	moldy grains-corn, corn products, peanuts, pecans, walnuts, and milk	purchase food from a reputable supplier; keep grains and nuts dry; and protect from humidity
Norwalk Virus (Viral Infection)	vomiting, diarrhea, abdominal pain, headache, and low grade fever (24-48 hrs)	sewage contaminated water; contaminated salad ingredients, raw clams, oysters	use potable water; cook all shellfish; handle food properly; meet time temperature limits.
Rotavirus (Viral Infection)	diarrhea (especially in infants and children), vomiting, low grade fever; (1-3 days onset; lasts 4-8 days)	sewage contaminated water; contaminated salad ingredients, raw seafood	good personal hygiene and handwashing; proper food handling practices
Hepatitis A (Viral Infection)	fever, nausea, vomiting, abdominal pain, fatigue, swelling of the liver, jaundice(15-50 days)	foods that are prepared with human contact; contaminated water	wash hands and practice good personal hygiene; avoid raw seafood
Hanta virus (Viral infection)	Hantavirus pulmonary syndrome (HPS), flu like illness, fever, sore muscles, headache, vomit, shortness of breath, Fatal (60%)	All foods subjected to rodent excretions, ground level berries and plants, Infected rodents shed virus in saliva, urine and faeces	Proper personal hygiene, wash food well, virus susceptible to household disinfectants
Polio virus types I, II, III (poliomyelitis) Viral infection	Fever, vomiting, headache, pain in muscle groups, paralysis I.P. (5-35 days)	Milk, possibly other beverages and prepared foods, contaminated water	Personal cleanliness, adequate heating of foods, disinfection of water, prevention of contact of flies with foods
Shellfish toxins: PSD DSP, DAP, NSP (Intoxication) feeding on toxic algae- Dinoflagellates- Gonyaulax catanella and G.tamarensis	numbness of lips, tongue, arms, legs, neck, lack of muscle coordination (10-60 min), death can occur within 2 to 12 hr. due to respiratory paralysis	contaminated mussels, clams, oysters, scallops	purchase from a reputable supplier
Scombrotoxin (Seafood Toxin originating from histamine producing bacteria)	dizziness, burning feeling in the mouth, facial rash or hives, peppery taste in mouth, headache, itching, teary eyes, runny nose (1-60 min)	tuna, mahi-mahi, bluefish, sardines, mackerel, anchovies, amberjack, abalone	purchase fish from a reputable supplier, store fish at low temps to prevent growth of bacteria, toxin is not inactivated by cooking
Ciguatoxin (Fish Toxin originating from toxic algae- Lyngbya majuscala of tropical waters	vertigo, hot/cold flashes, diarrhea, vomiting (30 min - days)	marine finfish: groupers, barracuda, snappers, jacks, mackerel, trigger and reef fish	purchase fish from a reputable supplier; cooking will not inactivate the toxin
Anisakis spp. Anisakiasis Parasitic Infection-nematode	Coughing, vomiting, irritation of throat and digestive tract, (I.P. several days)	raw or undercooked seafood especially bottom feeding fish	cook fish to the proper temperature throughout, freeze to meet Food Code specification
Cryptosporidium parvum (Parasitic Infection-protozoa)	severe watery diarrhea within 1 week of ingestion low grade fever, severe intestinal distress	contaminated water; food contaminated by infected food handlers	use potable water supply; practice good personal hygiene and handwashing

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Giardia lamblia (Parasitic Infection-protozoa)	diarrhea within 1 week of contact ,abdominal cramps, fatty stool Beaver fever or Back packer's disease	Drinking contaminated water, cyst formed	potable water supply; good personal hygiene and handwashi filtration to remove cyst
Toxoplasma gondi (Parasitic infection-protozoa)	Fever, headache, rash, can be transmitted to mother to unborn during pregnancy, stillbirth, blindness	Ingestion of raw or insufficiently cooked meats containing tissue cysts	Cooking of meat at recommend temperatures, keep out of the danger zone, wash hands and foods
Trichinella spiralis (Parasitic infection from a Nematode worm)	nausea, vomiting, diarrhea, sweating, muscle soreness (2-28 days)	primarily undercooked pork products and wild game meats (bear, walrus)	cook foods to the proper temperature throughout
Entamoeba histolytica (Amoebiasis) Parasitic infection	Diarrhoea of varying severity, amoebic dysentery several days to 4 weeks, fatalities not uncommon	Water contaminated with sewage, moist food contaminated with human faeces	Protect water supplies, cleanlin in food preparation, ensure pro disposal of human excreta
Taenia saginata (parasitic infection-beef tapeworm)	Abdominal pain, hungry feeling, vague, discomfort (several weeks incubation period)	Raw or insufficiently cooked beef containing live larvae	Use meat processed under veterinary inspection, cook bee and fish thoroughly, avoid eati raw smoked fish
Taenia solium (parasitic infection-pork tapeworm)	Varies from a mild, chronic digestive disorder to severe malaise with encephalitis, may be fatal	Raw or insufficiently pork containing live larvae	Use meat processed under veterinary inspection, cook po thoroughly
Diphyllobothrium latum (Parasitic infection-fish tapeworm)	Usually none, anaemia in heavy infection (I.P. 3-6 weeks)	Raw or insufficiently cooked fish containing live larvae	Cook fish thoroughly, avoid e raw or smoked fish

Food borne illness - The future

1. Changing demography

   Population sensitive to food borne disease

- Elderly (over 65)
- Pregnant women
- Neonates
- Cancer and AIDS patients
- Organ transplant patients

2. Changing human behaviour- shift to a convenient ready to eat foods
3. Changing technology- opening of new avenues and changing technology of production and processing
4. Global market- the world is one big market and foods produced in different countries are easily available elsewhere. Hence chances of spread of food borne diseases are equally greater. This calls for putting in place a food borne disease surveillance system.

Objectives of food borne disease surveillance

- Prevention and control
- Identification of contaminated products
- Knowledge of disease causation
- Observe the track record of various illness causing agents
- Administrative guidance
- Assessment of trends to justify regu decisions/actions

Ways to improve food safety

1. The World Health Organization's Golden Rules f Food Preparation:
   - Choose foods processed for safety
   - Cooked food thoroughly.
   - Eat cooked foods immediately.
   - Store cooked foods carefully.
   - Reheat cooked foods thoroughly.
   - Avoid contact between raw and cooked foods.
   - Wash hands repeatedly.
   - Keep all kitchen surfaces meticulously clean.
   - Protect foods from insects, rodents, and other a
   - Use pure water.
2. Trained food handlers
3. Hazard analysis in food preparation
4. Improved data on spread of pathogenic organisms
5. Better surveillance and reporting system
6. Create quality consciousness among food industry managers and consumers
7. Involvement of veterinarian in quality control o animal origin