FOOD POISONING

Welcome to the lecture series on Food technology

Today the topic Food poisoning shall be discussed under the following sub headings

1. **Introduction**
2. **Food poisoning causes**
3. **Food poisoning agents**
4. **Prevention of food poisoning**
5. **Treatment for food poisoning**

1. Introduction

Food poisoning, also called food-borne illness, caused by eating contaminated food. Infectious organisms including various bacteria, viruses and parasites and their toxins are the most common causes of food poisoning. Infectious organisms or their toxins can contaminate food at any point during its processing or production. Contamination can also occur at home if food is incorrectly handled or cooked. Food poisoning symptoms often include nausea, vomiting or diarrhea, which can start just hours after eating contaminated food. Most often, food poisoning is mild and resolves without treatment. But some cases are severe, requiring hospitalization.

Current food trends reveal that more and more frequently today we buy pre-prepared ready-to eat convenience foods, dine out in restaurants and cafés, prefer frozen over fresh products and
have a growing demand for foods of animal origin. While this gives us many new choices in the food we eat, a greater risk of food poisoning.

Food Poisoning is a general term used to describe illness caused by all types of food-borne microorganisms. Food poisoning and food infection are different, although the symptoms are
similar.

Food Infection is caused by eating foods containing certain types of live bacteria. Once the contaminated food is consumed, the bacteria themselves continue to grow, usually in the intestine and illness can result.

Food Poisoning is of two types

- **Food Intoxication** is caused by eating food that contains a toxin or poison due to bacterial growth in the food. The bacteria that produced and excreted the toxic waste products into the food may be killed, but the toxin they produced remains on the food causing the illness or digestive upset to occur.
- **Toxin-mediated Infection** is caused by consuming food contaminated by organisms that produce toxins only after they have been ingested into the body.

More than 250 known diseases can be transmitted through food. The estimates unknown or 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.

They are high risk foods which are more vulnerable for food poisoning includes:

a) Meat, especially undercooked mince and rolled, formed or tenderised meats
b) Raw or undercooked poultry such as chicken, duck and turkey
c) Raw or lightly cooked eggs including foods made from raw egg such as unpasteurisedmayonnaise
d) Seafood
e) Cooked rice not kept at correct temperatures
f) Cooked pasta not kept at correct temperatures
g) Prepared salads such as coleslaw, pasta salads and rice salads
h) Prepared fruit salads
i) Unpasteurised dairy products and etc

2. Food poisoning causes

Food poisoning microbes are often present naturally in food but usually only in small numbers.However, given the right conditions their numbers can increase extremely quickly, so that 1 single bacterium could multiply to over 16 million in only 6 hours. This is where the food poisoning problem begins, so it is vitally important that we don't give these bacteria the right living environment where they can grow and multiply quickly.

The known causes of food poisoning can be divided into two categories: Infectious agents and 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. Food poisoning can affect one person or a group of people who all ate the same contaminated food.

The germs may get into the food you eat (called contamination) in different ways:

- Meat or poultry can come into contact with bacteria from the intestines of an animal that is being processed
- Water that is used during growing or shipping can contain animal or human waste
- Food improper handling or preparation in grocery stores, restaurants, or homes
- Any food prepared using cooking utensils, cutting boards, and other tools that are not fully cleaned
- Dairy products or food containing mayonnaise (such as potato salad) that have been out of the refrigerator too long

- Frozen or refrigerated foods that are not stored at the proper temperature or are not reheated properly
- Contaminated raw fish or oysters
- Raw fruits or vegetables that have not been washed well
- Packed raw vegetables or fruit juices and dairy products (look for the word "pasteurized," which means the food has been treated to prevent contamination)
- Undercooked meats or eggs
- Contaminated water from a well or stream, or city or town water that has not been treated

Infants and elderly people are at the greatest risk for food poisoning. You are also at higher risk if:

- Having a serious medical condition, such as kidney disease or diabetes
- Having a weakened immune system
- Travelling outside areas where you are exposed to germs that cause food poisoning
- Pregnant and breastfeeding women have to be especially careful to avoid food poisoning.

3. Food poisoning agents

Viruses: Viruses account for most food poisoning cases where a specific contaminant is found. Noroviruses (=Norwalk-like viruses, caliciviruses) are a group of viruses that cause a mild illness (often termed "stomach flu") with nausea, vomiting, diarrhea, abdominal pain, headache, and low-grade fever. These symptoms usually resolve in two to three days. It is the most common viral cause of adult food poisoning and is transmitted from water, shellfish, and vegetables contaminated by feces, as well as from person to person. Outbreaks are more common in densely populated areas such as nursing homes, schools, and cruise ships (hence the viral infection is also known as the "Cruise Ship Illness").

Rotavirus: Causes moderate to severe illness with vomiting followed by watery diarrhea and fever. It is the most common cause of food poisoning in infants and children and is transmitted from person to person by fecal contamination of food and shared play areas.

Hepatitis A: Causes moderate illness with sudden onset of fever, loss of appetite, abdominal pain, and feeling of tiredness followed by jaundice, which is a yellowing of the eyes and skin. Symptoms usually last less than two months, but can be prolonged or relapse for up to six months. It is transmitted from person to person by fecal contamination of food.

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. TheCenter for Disease Control estimates that each year 1 million people are infected with *Salmonella*, amounting to $365 million in direct medical costs annually. Salmonellaecause a moderate illness with nausea, vomiting, crampy diarrhea, andheadache, which may come back a few weeks later as arthritis (joint pains). In people with impaired immune systems (such as people with kidney disease,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.

***Campylobacter*:** 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.

***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.

***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.

***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.

***Shigella* (traveler's diarrhea):** Causes moderate to severe illness with fever,diarrhea containing blood or mucus or both, and the constant urge to have bowel movements. It is transmitted in water polluted with human wastes.
Listeria monocytogenes: Listeriosis is a moderate to severe illness with nausea and vomiting. Some affected individuals can progress to developmeningitis from *Listeria*. It is transmitted on many tips of uncooked foods such as meats, fruits, vegetables, soft cheeses, unpasteurized milk, and cold cut meats. Pregnant woman and newborns are at increased risk for serious infections. In United States of America 2011, in an outbreak caused by tainted cantaloupe, 25 people died and 123 people were infected.

***Clostridium botulinum* (botulism):** Causes severe illness affecting the nervous system. Symptoms start as blurred vision. The person then develops problems talking and overall weakness. Symptoms then progress to breathing difficulty and the inability to move arms or legs. Infants and young children are particularly at risk. It is

transmitted in foods such as home-packed canned goods, honey, sausages, and seafood. Because botulism can be released in the air, it is considered a potential biological weapon for terrorists.

***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.

***Vibrio parahaemolyticus*:** Causes moderate to severe abdominal cramping, nausea, vomiting, and fever. In immunocompromised individuals, it can cause severe or deadly disease. It is transmitted by eating raw or undercooked fish, particularly oysters.

Parasites rarely cause food poisoning. When they do, they are usually swallowed in contaminated or untreated water and cause long-lasting but mild symptoms.

***Giardia* (beaver fever):** Causes mild illness with watery diarrhea often lasting one to two weeks. It is transmitted by drinking contaminated water, often from lakes or streams in cooler mountainous climates. The infection can also be spread from person to person by food or other items contaminated with feces from an infected person.

***Cryptosporidium*:** Causes moderate illness with large amounts of watery diarrhea lasting two to four days. May become a long-lasting problem in people with poor immune systems. It is transmitted by contaminated drinking water.

***Toxoplasma*:** The Center for Disease Control estimates that more than 60 million people in the U.S. carry the *Toxoplasma* parasite, but few have symptoms because the immune system keeps the parasite from causing illness. When it does cause disease, symptoms include headache, blurred vision, and eye pain. It is transmitted by eating undercooked or raw meat, contaminated water, or contact with contaminated cat feces. Pregnant women and those with compromised immune systems infected with *Toxoplasma* can have severe health complications.

Toxic agents are the least common cause of food poisoning. Illness is often an isolated episode caused by poor food preparation or selection (such as picking wild mushrooms).

Mushroom toxins: Illness can range from mild to deadly depending on the type of mushroom eaten. Often there is nausea, vomiting, and diarrhea. Some types of mushrooms produce a nerve toxin, which causes sweating, shaking, hallucinations, and coma.

Mycotoxins: Mycotoxins causing food poisoning brought the attention of the scientists in the early 1960s. *Aspergillus* was first described almost 300 years ago and is an important genus in foods. Most *Aspergillus* species occur in foods as spoilage or in biodeterioration. They are extremely common in stored commodities such as grains, nuts and spices. Almost 50 species of *Aspergillus* have been identified as capable of producing toxic metabolites. Chief toxins produced by *Aspergillus* sp., are the aflatoxins, (*A. flavus, A. parasiticus, A. nomius*), Ochratoxin A

(*A. ochraceus*), Sterigmatocystin (*A. versicolor*), Cyclopiazonic acid (*A. flavus, A. tamari*), Citrinin, Patulin and Penicillic acids. Other mycotoxins involved are the toxins produced by the fungus *Fusarium, Eurotium, Penicillium* etc.

Ciguatera poisoning: Caused by eating fish that contains toxins produced by a marine algae called *Gambierdiscus toxicus*. It can cause moderate to severe illness with numbness of the area around the mouth and lips that can spread to the arms and legs, nausea, vomiting, muscle pain and weakness, headache, dizziness, and rapid heartbeat. The toxin may cause sensory problems in which hot things feel cold and cold things feel hot. It is transmitted by eating certain large game fish from tropical waters-most specifically barracuda, grouper, snapper, and jacks. According to the CDC, ciguatera has no cure. Symptoms may disappear in days or weeks, but may persist for years.

Pesticides: Cause mild to severe illness with weakness, blurred vision, headache, cramps, diarrhea, increased production of saliva, and shaking of the arms and legs. Toxins are transmitted by eating unwashed fruits or vegetables contaminated with pesticides.

4. Prevention of food poisoning

Food poisoning can be avoided by

- Preventing food from being contaminated with pathogenicbacteria
- Preventing any bacteria present in the food from multiplying.
- Destroying those bacteria that are present in the food.
- Inspecting all food, and washing fruit and vegetables with water of drinking quality beforepreparation.
- Separating raw and high-risk, cooked and ready-to-eat foods at all stages of preparation,storage, display and distribution.
- Not using the same equipment, utensils and working surfaces to handle and prepare rawand high-risk, cooked and ready-to-eat foods.
- Keeping food covered as much as possible.
- Preventing insects, animals and birds from entering food rooms.
- Not using unsuitable, defective, or dirty equipment.
- Using good personal hygiene practices - always, including hand washing, not coughingor sneezing over or around food and wearing suitable protective clothing.
- Using the correct cleaning procedures, especially the washing and sanitizing of allequipment used to prepare raw food, including benches and chopping boards.
- Promptly removing unfit or waste food and refuse from food areas.
- Keeping high-risk foods at temperatures that inhibit the growth of bacteria (i.e. out of thetemperature danger zone).
- Food should be kept below 4°C in a refrigerated unit or above 70°C in a suitable warmingunit.
- Ensuring that during preparation, food is not in the danger zone for even a short a time.
- High-risk foods must not be left sitting out at room temperature.

- Using appropriate packing methods (like gas flushing or vacuum packing) for foodproducts.
- Preventing dried foods from absorbing moisture.
- Serving food as soon as possible after preparation.
- Adequately cooking food, ensuring that a minimum internal cooking temperature of 80°Cis reached.
- Using suitable processing methods such as pasteurisation, canning or sterilisation.

5. Treatment for food poisoning

Food poisoning persons usually recover from the most common types of food poisoning within a couple of days. The goal is to make feel better and make sure patients body maintains the proper amount of fluids.

- Should not eat solid foods until the diarrhea has passed, and avoid dairy products, which can worsen diarrhea (may be due to a temporary state of lactose intolerance).
- Drink any fluid (except milk or caffeinated beverages) to replace fluids lost by diarrhea and vomiting.
- Give children an electrolyte solution sold in drugstores.

If patients have diarrhea and are unable to drink fluids (for example, due to nausea or vomiting) need medical attention and fluids may be given through a vein by doctors. This is especially true for young children.

If patients take diuretics, need to manage diarrhea carefully. It should be done with consulting health care provider otherwise patient may need to stop taking the diuretic while having the diarrhea. Never stop or change medications without talking to your health care provider and getting specific instructions.

For the most common causes of food poisoning, doctor would NOT prescribe antibiotics.

Do not use these medicines without talking to health care provider if patients have bloody diarrhea or a fever. Do not give these medicines to children.

If patients have eaten toxins from mushrooms or shellfish, need medical attention right away, the emergency room doctor may take steps to empty stomach and remove the toxin.

Possible Complications: Dehydration is the most common complication. This can occur from any of the causes of food poisoning. Less common but much more serious complications depend on the bacteria that are causing the food poisoning. These may include arthritis, bleeding problems, kidney problems, damage to the nervous system, and swelling or irritation in the tissue around the heart.

Conclusion: Food poisoning is a common problem that affects millions of people in the world including India in each year. Most cases of food poisoning resolve on their

own. Prevention is key and depends upon keeping food preparation areas clean, good hand washing, and cooking foods thoroughly. Food poisoning is the name for the range of illnesses caused by eating or drinking contaminated food or drink. It is also sometimes called food borne illness. When dealing with food we must remember and practice the old age saying “when in doubt throw it out”.