
بسم الله الرحمن الرحيم
In The Name Of Allah, The Most Beneficent, The Most Merciful

رَبِّ زِدْنِي عِلْمًا

MY LORD! INCREASE ME IN KNOWLEDGE.

FOOD SAFETY AND QUALITY MANAGEMENT

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L # 5. BIOLOGICAL HAZARDS & FOOD

BIOLOGICAL HAZARDS

- **Bacteria**
- **Viruses**
- **Parasites**
- **Other Biological Hazards - Prions**
- Biological hazards occur when hazardous or pathogenic organisms are introduced to food and thus pose a food safety concern to consumers
- Biological hazards include bacteria, viruses and parasites of public health significance

BIOLOGICAL HAZARDS

Biological hazards can be introduced to food

- from the environment (e.g. soil bacteria, agricultural run-off)
- from inadequate sanitation practices
- From cross contamination during transportation, handling, processing, and storage (e.g. poor food hygiene practices)
- The type and magnitude of microbial growth is determined in part by
  - the nature of the food
  - package conditions
  - storage environment

BACTERIA

- Bacteria are single-celled microorganisms that exist in a range of habitats and can be
  - free-living (e.g. in soil, air, water)
  - symbiotic (e.g. in intestinal tract or mucous membranes of animals and humans)
  - have a broad range of enzymatic, biochemical and / or pathogenic properties
- The principal bacteria associated with food borne illnesses include.

BACTERIA – FOOD BORNE

- *Bacillus cereus*
- *Campylobacter jejuni*
- *Clostridium botulinum*
- *Clostridium perfringens*
- *Escherichia coli* **0157:H7**
- *Escherichia coli* **0104:H4**
- *Listeria monocytogenes*
- *Salmonella* **spp.**
- *Shigella* **spp.**
- *Staphylococcus aureus*
- *Vibrio cholerae*
- *Vibrio parahaemolyticus*
- *Vibrio vulnificus*
- *Yersinia enterocolitica*
- *Cronobacter sakazakii*

BACTERIA

- Ingesting food contaminated with pathogenic microorganisms and/or their toxic by-products can lead to food-borne illness
- These illnesses can take the form of Infection or Intoxication, or both
- Infectious microorganisms are detrimental to their host through mechanisms which crowd out beneficial microorganisms, use up host resources, and destroy host tissue

BACTERIA

- A Food Borne Illness caused by an infection can take days or weeks to manifest which often makes it difficult to identify the causative agent
- On the other hand, illness caused by intoxication often occurs within hours of consuming the suspect food
- Intoxications are caused by toxins that are produced by the microorganism, either in the food itself or after ingestion

VIRUSES

- In contrast to other microorganisms, active viruses consist of unique sections of DNA or RNA enclosed in a thin coat of protein, and cannot exist independently of their living hosts
- Depending on the combination of DNA/RNA and the protein coating, viruses can be very infectious and often pathogenic
- They reproduce by inserting themselves into a host cell and altering the function of that cell to replicate the component pieces that make up the virus
- Viruses commonly associated with **Food Safety Issues** include

VIRUSES

- ***Bacteriophage***
- ***Enteric virus (other than Hepatitis A and Noroviruses)***
- ***Hepatitis A virus***
- ***Norovirus***
- ***Norwalk virus***
- ***Rota virus***
- Viruses are typically introduced into food either through **poor handling** practices by people infected with the virus (i.e. **poor personal hygiene practices) or via contaminated food ingredients** (i.e. water)

FOOD BORNE VIRUSES

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PARASITES

- A parasite is any organism which obtains nourishment from its host organism in order to grow and reproduce
- Unlike symbiotic organisms, which reciprocate by supplying their hosts with other resources the host would not otherwise be able to find, parasites do not supply the host with any resources, usually to the **detriment** of the host
- Parasites commonly associated with **Food Borne Illnesses** include

PARASITES

- ***Cryptosporidium parvum***
- ***Giardia duodenalis or intestinalis***
- ***Taenia spp.***
- ***Toxoplasma gondii***
- ***Trichinella spiralis***
- ***Entamoeba histolytica***
- ***Entamoeba coli***
- Parasites enter food through similar means as viruses (i.e., poor personal hygiene practices and contaminated ingredients)

OTHER BIOLOGICAL HAZARDS - PRIONS

- Other biological food safety hazards not belonging to the above mentioned categories include **prions**, also known as **proteinaceous infectious particles**, which are infectious agents made of protein
- They are known to cause a number of diseases that affect both **humans** and animals
- **BSE** (Bovine Spongiform Encephalopathy) "**Mad Cow Disease**" is a progressive, fatal disease of the nervous system of cattle

OTHER BIOLOGICAL HAZARDS - PRIONS

- It is also known as a **Transmissible Spongiform Encephalopathy (TSE)**
- Other TSEs include Scrapie in **Sheep**
- Scrapie is a disease of sheep involving the central nervous system, characterized by a lack of coordination causing affected animals to rub against trees and other objects for support, and thought to be caused by a virus-like agent such as a prion
- **Creutzfeldt-Jakob** disease in **humans** is thought to be caused by consuming cattle infected with BSE, although the exact cause of BSE is unknown, it is associated with the presence of **PRIONS**
- There is no treatment or vaccine currently available for the disease

PRION DISEASES

- A prion is a type of protein that can trigger normal proteins in the brain to fold abnormally
- Prion diseases or Transmissible Spongiform Encephalopathy (TSE) are a family of rare progressive neurodegenerative disorders that affect both humans and animals

CREUTZFELDT-JAKOB DISEASE (CJD)

- It is a universally fatal brain disorder
- Early symptoms include memory problems, behavioral changes, poor coordination, and visual disturbances
- Later dementia, involuntary movements, blindness, weakness, and coma occur
- About 90 % (more than 85 %) of people die within a year of diagnosis
- The disease was first described by German neurologist Hans Gerhard Creutzfeldt in 1920 and shortly afterward by Alfons Maria Jakob, giving it the name Creutzfeldt–Jakob
- Prevalence 1/1000000 per year

ANIMAL PRION DISEASES

- ***Bovine Spongiform Encephalopathy (BSE)***
- ***Chronic Wasting Disease (CWD)***
- ***Scrapie***
- ***Transmissible mink encephalopathy***
- ***Feline spongiform encephalopathy***
- ***Ungulate spongiform encephalopathy***

CLASS ACTIVTY - HUMAN PRION DISEASES

- ***Creutzfeldt-Jakob Disease (CJD)***
- ***Variant Creutzfeldt-Jakob Disease (vCJD)***
- ***Gerstmann-Straussler-Scheinker Syndrome***
- ***Fatal Familial Insomnia***
- ***Kuru***
- FOOD BORNE VIRUSES