
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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PLANT TOXINS

Cucurbitacins

- Cucurbitacea family, including cucumber and squash, produce an intensely bitter group of compounds known as cucurbitacins
- They are potent toxins with natural insecticidal and / or fungicidal properties.
- Cucurbitacins are toxic at high levels, but they are so bitter that it is almost impossible for anyone to eat sufficient quantity of the toxins to cause significant harm.

CYANOGENIC GLYCOSIDES

- Cyanogenic glycosides are chemical compounds that occur naturally in many plants, including species of Prunus (wild cherry), Sambucus (elderberry), Manihot (cassava), Linum (flax), Bambusa (bamboo) and Sorghum (sorghum).
- Chemically, they are defined as glycosides of the α-hydroxynitriles.
- These compounds are potentially toxic as they are readily broken down by enzymic hydrolysis to liberate hydrogen cyanide when the plant suffers physical damage.

CYANOGENIC GLYCOSIDES

- Cyanogenic glycosides, can be found in the edible parts of some important food plants. These include amygdalin (almonds), dhurrin (sorghum), lotaustralin (cassava), linamarin (cassava, lima beans), prunasin (stone fruit) and taxiphyllin (bamboo shoots).
- The symptoms of acute cyanide poisoning include rapid breathing, drop in
- blood pressure, raised pulse rate, dizziness, headache, stomach pains, vomiting, diarrhoea, confusion, twitching and convulsions. In extreme cases, death may occur.

FUROCOUMARINS

- The furocoumarins are a group of naturally occurring chemicals that are found in a wide variety of plants, but which are present at their highest concentrations in members of the Umbelliferae family, particularly parsnips, celery and parsley.
- They are also present in lower concentrations in other foods such as citrus fruit, celeriac and figs.
- Furocoumarins are photoactivated carcinogens.

FUROCOUMARINS

- This means that they absorb long-wave ultraviolet radiation upon exposure of the skin to sunlight and are activated by the light to form carcinogens.
- Prolonged exposure can result in cell damage, by binding pyrimidine bases and nucleic acids and thus inhibiting DNAsynthesis.
- Furocoumarins are produced by many plants in response to stresses such as bruising or injury caused by predation.

GLYCOALKALOIDS

- Many plants in the Solanaceae family contain glycoalkaloids, and they are considered to be natural toxins.
- They are active as pesticides and fungicides and are produced by the plants as a natural defense against animals, insects and fungi that might attack them.
- Amongst the most widely cultivated food crops, aubergines, tomatoes and potatoes are in the Solanaceae family; however, the levels of glycoalkaloids in tomatoes and aubergines are generally quite low and are therefore not a concern.

GLYCOALKALOIDS

- Most cases of suspected potato poisoning involve only mild gastrointestinal effects, which generally begin within 8–12 h after ingestion and resolve within one or two days.
- However, reported symptoms have included nausea and vomiting, diarrhoea, stomach cramps and headache.
- More serious cases have experienced neurological problems, including hallucinations and paralysis, and fatalities have also been recorded.

GRAYANOTOXIN

- Grayanotoxins are natural plant toxins (diterpenes polyhydroxylated cyclic hydrocarbons that do not contain nitrogen) found in rhododendrons and other plants of the family Ericaceae.
- They can be found in honey made from the nectar produced by the flowers of these plants, and can cause a very rare poisonous reaction.

GRAYANOTOXIN

- Symptoms include dizziness, weakness, excessive perspiration, nausea, and vomiting shortly after the toxic honey is ingested.
- Other symptoms may include low blood pressure or shock, bradyarrhythmia (slowness of the heart beat associated with an irregularity in the heart rhythm) and other cardiac abnormalities.

LECTINS

- Lectins are proteins that are widely distributed in nature and occur in many plants commonly consumed in the diets of humans and animals.
- Most lectins are actually glycoproteins containing 2 or 4 subunits, each of which has a sugar-binding site. Lectins are generally identified by the plant species that they are derived from.
- Leguminous vegetables are the most frequently encountered food sources of lectins,

LECTINS

- The common foods include Peanut, Kidney bean, Fava bean (*Vicia faba*), Soya bean, Lentil Lens, Winged bean (*Psophocarpus tetragonolobus*), Garden pea, Horse gram, Lima bean (*Phaseolus lunatus*)and Navy bean (*Phaseolus vulgaris*).
- Symptoms include acute gastroenteritis, sickness and abdominal pain, which may be severe enough to require hospitalization.
- The symptoms generally clear within 3–4 h and recovery is usually rapid and complete.

L # 13. FOOD HAZARDS FROM NATURAL ORIGIN

FISH TOXINS

FISH TOXINS

1. Amnesic Shellfish Poisoning (ASP)
2. Azaspiracid Shellfish Poisoning (AZP)
3. Ciguatera Fish Poisoning
4. Diarrhoeic Shellfish Poisoning (DSP)
5. Neurologic Shellfish Poisoning (NSP)
6. Paralytic Shellfish Poisoning (PSP)
7. Tetrodotoxin

BIOGENIC AMINES

1. Biogenic Amines (Excluding Histamine)

2. Scombrotoxin (Histamine)

FISH TOXINS

Amnesic Shellfish Poisoning (ASP)

- ASP is a foodborne intoxication associated with the consumption of contaminated shellfish harvested from waters affected by growth of certain types of toxic algae
- ASP is an acute form of human poisoning, which causes a wide range of symptoms and can sometimes be fatal.
- ASP is caused by domoic acid (DA), a water-soluble acidic amino acid that has been isolated from a number of marine macro- and micro-algae species. DA is a powerful neurotoxin and belongs to the kainoid class of compounds.

FISH TOXINS

Amnesic Shellfish Poisoning (ASP)

- Most human cases of ASP are related to bivalve molluscs, especially mussels, but DA has also been isolated from scallops, oysters and razor clams.
- DA is a potent neurotoxin, which can affect both central and peripheral nervous systems in humans and is also an emetic. It acts as an excitatory neurotransmitter that binds to receptor proteins on nerve cells.

FISH TOXINS

Azaspiracid Shellfish Poisoning (AZP)

- Azaspiracid shellfish poisoning (AZP) is a foodborne intoxication associated with the consumption of contaminated shellfish harvested from waters affected by growth of certain types of toxic algae.
- Recorded cases of AZP have been associated with consumption of mussels, but AZAs have also been found in crabs, oysters, clams, scallops, razor clams and cockles.

FISH TOXINS

Ciguatera Fish Poisoning

- Ciguatera fish poisoning (CFP) is a foodborne intoxication associated with consumption of coral reef fish from tropical and subtropical waters in the Pacific and Indian Oceans and the Caribbean sea.
- Ciguatoxins are found in a broad range of fish that live in or around coral reefs in comparatively shallow tropical waters.
- Ciguatoxins cause a wide variety of neurological, gastrointestinal and cardiovascular symptoms.
- They are extremely powerful toxins and an oral dose of 0.1 mg may be enough to cause illness.

FISH TOXINS

Diarrheic Shellfish Poisoning (DSP)

- Diarrheic shellfish poisoning (DSP) is a foodborne intoxication associated with the consumption of contaminated shellfish harvested from waters affected by growth of certain types of toxic algae.
- DSP is a non-lethal form of food poisoning with symptoms typical of gastroenteritis, especially diarrhea.
- Most cases of DSP are related to mollusks, especially mussels, but also scallops, oysters and clams. These species are filter feeders and accumulate toxins when the water contains sufficient levels of toxin-producing algae.
- DSP toxins are powerful phosphatase inhibitors and this property is associated with inflammation of the gut in humans. This leads to fluid loss from intestinal cells resulting in diarrhea.

FISH TOXINS

Neurologic Shellfish Poisoning (NSP)

- Neurologic shellfish poisoning (NSP) is a foodborne intoxication associated with the consumption of contaminated shellfish harvested from waters affected by growth of certain types of toxic algae. It is also sometimes referred to as neurotoxic shellfish poisoning.
- Most human cases of NSP are related to mollusks, including oysters, clams and mussels, all of which can accumulate brevetoxins during feeding when the water contains sufficient levels of toxin-producing algae.
- Brevetoxins are neurotoxins that act by affecting the sodium channels in the membranes of nerve cells.
- This causes the cells to fire repeatedly, giving rise to various neurological symptoms.

FISH TOXINS

Paralytic Shellfish Poisoning (PSP

- Paralytic shellfish poisoning (PSP) is a foodborne intoxication associated with the consumption of contaminated marine shellfish harvested from waters affected by a sudden and rapid growth of certain types of toxic algae.
- Mόst cases of PSP are related to bivalve mollusks, especially mussels and clams, but also oysters and scallops
- PSP toxins are potent neurotoxins.

FISH TOXINS

Tetrodotoxin

- Tetrodotoxin (TTX), also known as anhydrotetrodotoxin 4-epitetrodotoxin, or tetrodonic acid, is a marine biotoxin associated with certain fish species, notably pufferfish.
- Consumption of these fish can cause very severe foodborne intoxication, often referred to as pufferfish poisoning, or fugu poisoning.
- TTX is mainly associated with fish of the order Tetraodontidae (pufferfish, balloon fish, fugu, globe fish, blowfish, toad fish) from the Pacific and Indian Oceans.
- These fish are a traditional food in Japan, where they are sold as "fugu"

FISH TOXINS

Tetrodotoxin

- In specialized restaurants employing specially trained and licensed chefs who are able to remove the most toxic parts of the fish to reduce the poisoning risk.
- The highest levels of TTX are found in the viscera, particularly the liver and ovaries, and skin of the fish, but the muscle tissue does not usually contain dangerous levels of toxin.
- TTX is a very potent neurotoxin, and operates in a similar way to the PSP toxin (saxitoxin) by selectively blocking the voltage-gated sodium channel – a large protein that extends across the plasma membrane of nerve and muscle cells.

L # 14. FOOD HAZARDS FROM NATURAL ORIGIN

BIOGENIC AMINES

BIOGENIC AMINES

Biogenic Amines (Excluding Histamine)

- Biogenic amines are produced in a variety of foods by the decarboxylation of specific free amino acids.
- This may occur naturally as a result of the action of endogenous decarboxylase enzymes in the food, or more importantly as a byproduct of bacterial growth and the production of exogenous decarboxylases.
- The presence of significant amounts of biogenic amines, especially in meat and fish products, is often an indicator of bacterial spoilage.

BIOGENIC AMINES

Biogenic Amines (Excluding Histamine)

- Biogenic amines are known to occur in a wide variety of food products, but they are of particular significance in foods that contain a high level of free amino acids and high numbers of decarboxylase - producing bacteria.
- These include fish products, cheese, meat products (especially fermented meats), wine, beer and fermented vegetable products
- Certain biogenic amines are also found naturally in a range of fruit juices and fresh fruit and vegetables, including cocoa beans, mushrooms and lettuce.

BIOGENIC AMINES

Scombrotoxin (Histamine)

- Scombrotoxin is a foodborne toxin most often associated with the consumption of fish, particularly species belonging to the Scombridae and Scomberesocidae families (scombroid fish), such as mackerel and tuna.
- It can cause a mild, though sometimes distressing, form of foodborne intoxication (scombroid or scombrotoxic food poisoning) when ingested in sufficient quantities.
- Scombrotoxic poisoning is also known as histamine poisoning, since histamine is considered to be the toxic component of Scombrotoxin, although other compounds may be involved.
- Histamine is a biogenic amine and can be produced during processing and/or storage in fish and certain other foods, usually by the action of spoilage bacteria..

BIOGENIC AMINES

Scombrotoxin (Histamine)

- Scombrotoxin (histamine) poisoning is a chemical intoxication, in which symptoms typically develop rapidly (from 10 min to 2 h) after ingestion of food containing toxic histamine levels.
- The range of symptoms experienced is quite wide, but may include an oral burning or tingling sensation, skin rash and localized inflammation, hypotension, headaches and flushing.
- In some cases vomiting and diarrhea may develop and elderly or sick individuals may require hospital treatment.
- The symptoms usually resolve themselves within 24 h