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Toxic marine poisoning

Marine poisoning occurs following ingestion of fish or shellfish containing toxins that are produced by algae or bacteria. Ingestion of these toxins can cause gastrointestinal, neurologic or cardiovascular symptoms, and in some instances can be fatal.

Scromboid is the most common seafood related poisoning [1] and is caused by the consumption of fish containing high levels of histamine. Other causes of marine poisoning include ciguatera, pufferfish poisoning and paralytic shellfish poisoning.

Scromboid

Scromboid follows ingestion of fish that have been inadequately refrigerated allowing the build-up of high levels of histamine in their flesh; histamine accounts for the symptoms of scromboid. Fish associated with scromboid generally belong to the *Scrombridae* family: bluefin and yellowfin tuna, mackerel, skipjack and bonito. These fish contain high levels of the amino acid histidine in their flesh. If the fish are not adequately refrigerated, histidine is converted to histamine and other scrombotoxins by bacteria at temperatures from 20 to 30°C. Other fish implicated include mahi-mahi, bluefish, sardine, anchovy, herring, and amberjack.

Symptoms of scromboid closely resemble a moderate to severe allergic reaction beginning 10 to 60 minutes following ingestion. Skin flushing, pruritus, a throbbing headache, dizziness, and nausea, vomiting, abdominal cramps and diarrhoea are characteristic.

Management of scromboid involves symptomatic relief using anti-histamines, and most cases resolve within four hours.

Ciguatera

Ciguatera poisoning usually follows ingestion of coral reef fish containing ciguatoxin and other toxins. Ciguatoxin originates in algae known as dinoflagellates that are found in association with other algae usually attached to coral reefs. Toxin is ingested by herbivorous fish and becomes concentrated as it progresses up the food chain to large carnivorous coral reef fish, and finally to humans. Fish at risk include grouper, snapper, barracuda, jacks, sea bass, and moray eels. Ciguatera is widespread in tropical and subtropical waters, and is most common in the Pacific and Indian oceans and the Caribbean Sea. Ciguatoxin is found in high concentrations in the liver, gastrointestinal tract, roe, and fish heads, and is resistant to heat.

Symptoms of ciguatera usually occur within one to four hours of eating contaminated fish, but have been reported within 15 to 30 minutes. Gastrointestinal symptoms of nausea, vomiting and diarrhoea occur early and may be followed by neurologic and, less commonly, cardiac symptoms. Neurologic symptoms include a sensation of hot-cold temperature reversal, paresthesiae affecting the arms, legs, perioral area, tongue and throat, and discomfort in the teeth. Cardiac symptoms can include arrhythmias and hypotension. Death rarely results from cardiac or respiratory failure.

Most symptoms will resolve within one to four weeks with supportive care. However, chronic symptoms of dyesthesias and fatigue may be persistent and need careful evaluation and support.

Pufferfish poisoning

Pufferfish poisoning occurs following ingestion of fish containing tetrodotoxin, a potent neurotoxin. Tetrodotoxin is typically in pufferfish, porcupine fish and ocean sunfish. These fish are found throughout the Pacific, Atlantic and Indian Oceans. The toxin is concentrated in the ovaries, liver, intestine and skin of these fish and is not inactivated by heating.

In Japan pufferfish, or fugu, is an expensive delicacy which is eaten for the fugu experience which is characterised by tingling of the lips and tongue, a sensation of general warmth and a feeling of euphoria and exhilaration. Although improved legislation and licensing of restaurants serving fugu has reduced the incidence of poisoning, there were 449 cases and 49 deaths from pufferfish poisoning in Japan between 1983 and 1992 [2].

Initial symptoms include perioral paresthesia, nausea and dizziness within minutes of ingestion. Generalised paresthesiae then develop together with numbness, ataxia, ascending paralysis, headache, vomiting and diarrhoea. In severe cases there is respiratory failure, bradycardia and hypotension. Most deaths occur within six to 24 hours of onset of symptoms and are due to respiratory failure.

There is no antidote for tetrodotoxin; treatment is aimed at limiting the absorption of tetrodotoxin by gastric lavage within the first three hours after ingestion, and intensive support of affected persons.

Paralytic shellfish poisoning

Paralytic shellfish poisoning (PSP) occurs as a result of eating contaminated bi-valve mollusks (clams, oysters, cockles, mussels, scallops) containing saxitoxin and other potent neurotoxins produced by dinoflagellates. Outbreaks may occur in mollusks harvested from both temperate and tropical waters.

Initial symptoms of PSP usually occur within 30 to 60 minutes of eating contaminated shellfish and include paresthesiae of the face, lips and tongue. Other symptoms include headache, nausea, vomiting and diarrhoea. In severe cases ataxia and decreased mental status occur, progressing to flaccid paralysis with respiratory failure over 12 hours. The case fatality rate of PSP varies from 1% to 12%, but persons who survive beyond 12 hours have an improved prognosis.

There is no antidote for PSP and treatment is supportive.

Less common types of shellfish poisoning include neurotoxic, diarrhetic and amnesic and are summarised in the table.

Summary of the causes toxic marine poisoning

Syndrome	Toxin	Seafood	Distribution	Symptoms
Scromboid	Histamine	Mahi-mahi, tuna, mackerel, bonito, herring, sardine, anchovy.	Worldwide	Flushing, headache, nausea, vomiting, urticaria
Pufferfish	Tetrodotoxin	Pufferfish	Worldwide, but commonest in East Asia	Perioral paresthesia, nausea, dizziness, respiratory failure
Ciguatera	Ciguatoxin	Barracuda, snapper, grouper, sea bass, moray eel	Commonest in Caribbean and South Pacific	Gastroenteritis, neurologic symptoms
Paralytic shellfish poisoning	Saxitoxin	Bivalve shellfish	Worldwide, commonest in temperate waters	Facial and perioral paresthesia, headache, nausea, vomiting, ataxia
Neurotoxic shellfish poisoning	Brevetoxins	Bivalve shellfish	Gulf of Mexico, New Zealand	Gastroenteritis, paresthesia, temperature reversal, vertigo, ataxia
Diarrhetic shellfish poisoning	Okadaic acid	Bivalve shellfish	Japan, Europe, Canada, New Zealand, South America	Gastroenteritis
Amnesic shellfish poisoning	Domoic acid	Mussels	Eastern Canada	Gastroenteritis, amnesia, headache, seizures

Advice for travellers

Toxins responsible for causing poisoning are able to survive normal cooking procedures. In many cases they are also resistant to preservation methods including freezing, canning and smoking.

Many high income areas of the world will adhere to guidelines regarding the harvesting and preparation of fish and shellfish. Warnings may also be posted when conditions are conducive to fish poisonings, such as the presence of excessive amounts of dinoflagellates in breeding areas, known as ‘red tides’. However, low income countries may not have such guidelines.

Travellers can reduce their risk of toxic poisoning by avoiding potentially contaminated fish and shellfish. Pufferfish should be avoided in all cases, and not eating moray eels and barracuda, as well as avoiding reef fish that weigh three kilograms or more will decrease the risk of ciguatera intoxication. The head, viscera and roe of reef fish should also be avoided. Adequate refrigeration of fresh fish should be maintained until it is prepared for consumption, and will help to prevent scromboid.

Travellers should also be aware that there is a risk of other food and water borne illnesses associated with the consumption of contaminated shellfish, including hepatitis A.

References

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Further reading

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