Marine Poisoning
Toxicology

1 Introduction

Marine poisoning can occur when seafood containing toxic substances is ingested. These toxins accumulate within the animal rather than being venom which they use to envenom prey. Most marine poisoning syndromes are characterised by neurotoxicity.

This module addresses 4 marine poisoning syndromes:
- Ciguatera Poisoning
- Tetrodotoxin Poisoning
- Shellfish Poisoning
- Scombroid Poisoning

Ciguatera Poisoning
Ciguatera toxins accumulate in tropical reef fish including, tuna, mackerel, red bass, snapper, emperors, cod, coral trout, jacks, scads and barracuda. It is endemic to the Indo-Pacific region as well as the Caribbean.

Toxicokinetics
Ciguatoxins are heat stable sodium channel toxins which cause channels to open at resting membrane potentials. Ciguatoxins bioaccumulate in the food chain. Pacific ciguatoxin is 10 times more potent than Caribbean ciguatoxin and neurological features are more prominent.

Risk Assessment
Onset of symptoms is typically short, with gastrointestinal symptoms commencing hours after ingestion and typically resolving within 24 hours. Neurological symptoms develop later within 24 hours and can persist for days:
- Moderately severe GI symptoms
- Myalgia
- Paraesthesia
- Cold allodynia
- Ataxia
- Cardiac manifestations are rare

Management
Management is supportive with rehydration for gastrointestinal symptoms. There is no evidence for mannitol\(^1\). Ciguatera is a notifiable public health condition in Australia.

**Tetrodotoxin Poisoning**
Tetrodotoxin poisoning is rare but potentially lethal marine poisoning. It can be caused by ingesting toad fish or puffer fish as well as being bitten by a blue ringed octopus which contains tetrodotoxin in its saliva.

**Toxicokinetics**
Tetrodotoxin is a water soluble guanidine which binds to the outer pore of the sodium channel occluding it.

**Risk Assessment**
The severity of the poisoning is directly proportional to the dose ingested. An earlier manifestation of symptoms, particularly if they develop within an hour following ingestion, is also associated with severe poisonings.

Major symptoms are
- Mild gastrointestinal symptoms
- Descending paralysis
- Bradycardia, hypotension and arrhythmia
- Diabetes insipidus
- Can mimic brain death

Clinical grading system\(^2\) (Fukada & Tani):
- **I** Perioral paraesthesiae & numbness ± mild GI symptoms
- **II** Facial, tongue numbness, more distal numbness
  - Early motor paralysis: ataxia, slurred speech but normal reflexes
- **III** Flaccid paralysis (including bulbar, ocular, distal & respiratory muscles)
  - Normal level of consciousness
- **IV** Respiratory failure
  - Hypotension, Bradycardia, Arrhythmia
  - Unconsciousness

Tetrodotoxin can be measured in uneaten fish, or from urine and serum samples if necessary.

**Management**
Management is entirely supportive, mechanical ventilation and intensive care treatment is required in severe cases. Most of these resolve within 7 days. Given tetrodotoxin poisoning can mimic brain death, treatment should not be withdrawn within the first week based solely on poor neurological function.

**Shellfish Poisoning**
Shellfish poisoning is rare, but can be paralytic, neuroexcitatory, encephalopathic or diarrhoeal. Onset is typically rapid within 30 minutes to 3 hours. Paralytic shellfish poisoning is secondary to saxitoxins or gonyautoxins and resembles tetrodotoxin poisoning. Neuroexcitatory shellfish poisoning is secondary to brevetoxins and resembles ciguatera poisoning. Encephalopathic shellfish toxicity is due to domoic acid and is
characterised by memory loss and confusion and Diarrhoeal shellfish poisoning is similar to infected gastroenteritis. All syndromes require supportive management.

**Scombroid Poisoning**
Scombroid poisoning is an allergy-like form of food poisoning, although the exact role of histamine in its pathophysiology isn’t known. It results from the ingestion of poorly handled fish which have accumulated histamine and other decomposition products from bacterial production.

The onset is typically within 10 minutes to 1 hour following consumption.

Symptoms include
- Oral numbness
- Headache
- Dizziness
- Urticarial
- Facial swelling
- Anxiety
- Gastrointestinal symptoms
- Bronchospasm
- Anaphylactic shock (rare)

Management is along the same lines as per allergy and anaphylaxis. Recovery is expected within 24 hours.

2 **Further reading**

3 **References**
4. WikiTox Marine Poisoning
   [http://wikitoxin.toxicology.wikispaces.net/Marine+Poisoning](http://wikitoxin.toxicology.wikispaces.net/Marine+Poisoning)