NEED TO KNOW

Jellyfish stings, such as those from bluebottles, commonly cause minor effects, but stings from box jellyfish — *Chironex fleckeri* — may cause severe and life-threatening effects requiring early resuscitation.

Irukandji syndrome is characterised by severe generalised pain and autonomic effects — often requiring large amounts of parenteral analgesia.

First aid for jellyfish stings includes removal of tentacles, hot water immersion for bluebottles and vinegar for *Chironex fleckeri*.

Penetrating marine injuries with local pain and trauma can occur from spiny fish, stingrays and sea urchins. First aid includes hot water immersion, analgesia, thorough wound cleaning and close review for secondary infection.

Ciguatera poisoning results from the ingestion of some tropical reef fish, causing gastrointestinal and neurological effects — classically cold allodynia.

Tetrodotoxin poisoning is rare and results in flaccid paralysis — mainly after eating toadfish in Australia.

Scombroid poisoning is due to ingesting spoiled fish containing histamine and results in an allergic-like reaction.

Contact the Poisons Information Centre (131 126) for advice.

Marine stings and poisoning

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INTRODUCTION

MARINE creatures are responsible for a range of venomous and poisonous effects in Australia. Venomous animals have a specialised gland that produces venom, which is injected into or applied to another organism causing envenoming, such as a sting from a jellyfish. Marine poisoning occurs when a marine creature containing toxic substances is ingested. These marine creatures do not contain a specialised venom apparatus.

The major groups of venomous marine creatures are jellyfish, which cause stings when their tentacles contact skin, and spiny venomous fish causing penetrating injuries. Most marine stings are uncommon – except for bluebottle stings, which have been experienced by many Australians. Other marine stings include sea urchin spine injuries, contact reactions to sponges and, rarely, blue-ringed octopus and sea snake bites.

Ciguatera is the most common type of marine poisoning from eating particular reef fish and is a major issue in the Pacific. Other marine poisonings are uncommon and include tetrodotoxin poisoning, shellfish poisoning and scombroid.[1]

This How to Treat covers marine envenoming and poisoning. It aims to ensure GPs can treat common marine bites and stings and know when to refer more complex cases.

MARINE STINGS AND ENVENOMING

Epidemiology

MARINE stings generally occur in the warmer months when swimming is popular – except in the tropics, where they can occur throughout the year. They are a common presentation in coastal hospitals and medical practices, ranging from very minor jellyfish stings to severe box jellyfish envenoming and major trauma from stingray injuries.

Most jellyfish stings are minor, such as bluebottle stings; people often do not seek medical attention and are treated by surf lifesavers or first-aid stations. Severe injuries are rare and include major box jellyfish and stingray injuries. These require urgent medical treatment.

Jellyfish stings

Jellyfish belong to the phylum Cnidaria and include a large variety of marine creatures, with more than 100 medically important species. Most patients do not easily recognise jellyfish, with the exception of common species, such as the bluebottle (*Physalia physalis)*. Most stings cause similar effects, making it difficult to associate clinical effects with a particular jellyfish.

Important jellyfish in Australia include bluebottles (*Physalia* sp.); major box jellyfish (*Chironex fleckeri*); *Carukia barnesi*, which causes Irukandji syndrome; and a range of other minor jellyfish, such as hair jellyfish (*Cyanea* sp.), mauve stinger (*Pelagia* sp.), jimble and other box jellyfish (*Chiropsalmus bronzeii*).

The envenoming apparatus of jellyfish are called nematocysts or stinging cells. These occur in large numbers on the tentacles and cause most stings, such as in physalia stings. However, there are small numbers on the bell, and these are important in envenoming in some species, such as *C. barnesi*, which causes Irukandji syndrome. The nematocysts contain venom and a coiled hollow harpoon-like tube that will spring out when stimulated, penetrating the skin of the victim and injecting venom.

There are two major clinical syndromes that result from venom injection with jellyfish stings: linear tentacle-like stings and Irukandji-like stings, where contact with the bell is more likely (see box 1 and table 1). Most jellyfish stings are the former, with varying severity of pain and sometimes with non-specific systemic effects.

Bluebottle stings

Bluebottles (see figure 1) are the most common cause of jellyfish stings in Australia and account for thousands of stings annually – mostly in NSW and Queensland. Most cases are treated on the beach or at home; very few cases present for medical treatment.

CLINICAL EFFECTS

Bluebottle stings cause immediate intense local pain where the ▸

tentacles have made contact with the skin. The pain lasts for minutes to hours, depending on the degree and duration of contact. A linear erythematous mark develops at the sting site (see figure 2) and remains for one or two days. More widespread redness or flushing may also occur. Systemic effects are rare but can include nausea, vomiting, abdominal pain and myalgia. Delayed reactions are uncommon, but a localised bullous reaction may occur days after the sting. Scarring is rare.

TREATMENT

First-aid includes removing the tentacles — either by washing them off with sea water (not fresh water) or picking them off carefully. Hot water immersion (45°C) for 20 minutes is the recommended treatment for local pain. A randomised controlled trial showed that hot water was more effective than ice packs for bluebottle stings.[2]

It is important for someone else to test the temperature of the water first or for the patient to test it with the unaffected limb. If immersion in hot water is not possible, then alternatives include a hot shower or a constant flow of hot water onto the sting site. Do not apply vinegar to the sting as this may increase the pain.

Medical treatment is rarely required and, where indicated, includes symptomatic relief with analgesia and local dressing for more severe skin reactions.

Figure 1. Bluebottle.

Figure 2. Bluebottle sting around two hours after the sting.

Major box jellyfish

The major box jellyfish is the most dangerous jellyfish in Australia and is often referred to as the world's most venomous animal. In the past 30 years, there have been more than 70 deaths from *C. fleckeri* stings, and almost all of these have been children.[3] These jellyfish are distributed in the far north of Australia, and many stings occur in remote areas with little access to medical care.[3]

Most stings are minor, but severe and life-threatening stings occur with a large area of skin contact with the tentacles. *C. fleckeri* have multiple tentacles attached to each of the four corners of their box shape. This makes it possible for several metres of tentacle contact to occur, resulting in severe envenoming. Just over 1m of tentacle contact has resulted in death in a child.

CLINICAL EFFECTS

Most *C. fleckeri* stings are similar to those from other jellyfish tentacle stings, with intense local pain and linear raised erythematous reactions (see table 1). However, there are often multiple sting marks that characteristically appear as red or dark purple whip-like lesions (see figure 3A).

The severity and duration of the pain is generally much worse than with other jellyfish stings, such as a bluebottle. In addition, local necrosis can occur with *C. fleckeri* stings, but this rarely causes permanent injury or scarring. In more than half of cases, a delayed itchy papular urticarial rash develops in the same linear pattern of the sting marks after these have resolved (see figure 3B). Severe envenoming is rare and results in life-threatening effects that are characterised by rapid onset of cardiovascular collapse and death within 20-30 minutes.

Box 1. Major clinical syndromes with jellyfish stings

- **Linear tentacle-like stings:**
  - Stings result from contact with the tentacles.
  - This causes immediate local pain, lasting minutes to hours.
  - Linear erythematous or urticarial eruptions.
  - Non-specific systemic effects — including nausea, vomiting and malaise — are uncommon.
- **Irukandji-like stings:**
  - Minimal local pain and erythema.
  - Delayed (20-30 minutes) severe generalised pain, including abdominal, back, chest and muscular pain.
  - Usually associated with sympathomimetic effects, such as nausea, vomiting, headache, tachycardia, anxiety, agitation and hypertension.
  - Myocardial injury and pulmonary oedema may rarely occur as a result of the sympathomimetic effects.

TREATMENT

Patients with severe chironex envenoming rarely arrive at hospital before they develop cardiovascular collapse, so pre-hospital resuscitation is key. Early institution of CPR by family or bystanders appears to be associated with survival in most cases. In all patients with severe envenoming, basic life support should proceed simultaneously with removal of tentacles. Wash the tentacles off with sea water or carefully remove them by hand. Cover sting sites with vinegar after tentacle removal. The aim of the vinegar is to stop further nematocyst discharge and prevent severe envenoming occurring, not to treat the pain.

The major issue in less severe envenoming is local pain, and ice packs are the recommended initial treatment. In a randomised controlled trial, hot water immersion was shown not to be superior to ice packs in chironex stings but may provide symptomatic relief.[4] In cases of more severe pain, administer oral or parenteral opiate analgesia. Skin reactions usually resolve without any treatment; however, in more severe cases with necrosis, use local dressings — similar to burns dressings.

Systemic envenoming almost never develops in patients after they present to hospital. In patients

Figure 3. A. Multiple linear lesions from *C. fleckeri* sting. B. Delayed hypersensitivity reaction to a sting.

Table 1. Jellyfish types, clinical effects, first aid and treatment for the two major jellyfish clinical syndromes

Linear tentacle-like stings		Irukandji-like stings
Bluebottle and minor jellyfish (*Physalia* sp., pelagia, cyanea)	**Major box jellyfish** (*C. fleckeri*)	**Box jellyfish** (*C. barnesi*, some carybdea species)
Clinical effects		
• Immediate intense local pain for minutes to hours with linear erythematous eruptions where the tentacle made contact • Rarely, non-specific systemic effects	• Severe local pain with erythematous eruption • Multiple and large surface area tentacle contact can cause cardiovascular collapse and death	• Delayed generalised severe pain after 20-30 minutes • Systemic sympathomimetic effects: tachycardia, agitation, hypertension • Cardiac injury/pulmonary oedema uncommonly secondary to sympathomimetic effects
First aid		
• Wash sting site with sea water and remove tentacles • Hot water immersion at 45°C for 20 minutes* • Avoid vinegar, which may worsen the pain	• Wash sting site with sea water and remove tentacles • Apply vinegar • CPR for unconscious patients	• Wash sting site with sea water and remove tentacles
Medical management		
Further intervention is rarely required	Hospital transport for: • Analgesia (oral and IV) • Advanced life support for cardiovascular collapse • Consider box jellyfish antivenom if not responsive to supportive measures	Hospital transport for: • Analgesia (oral and IV) • Cardiac investigations (ECG, troponin, echocardiogram) • Cardiac monitoring and, rarely, treatment for pulmonary oedema

**There is evidence only for bluebottle stings, but it is likely to work with other minor jellyfish stings[2]*

Adapted from Berling I et al 2015[7]

presenting with severe envenoming following pre-hospital cardiac arrest, treatment should be continued as per advanced life support but may include the addition of IV antivenom.

There is very limited evidence for the effectiveness of box jellyfish antivenom. An animal study demonstrated that administration of antivenom even before envenoming did not prevent cardiovascular collapse, supporting the rapid effects of the venom.[5] There have also been at least four fatalities despite the administration of antivenom.[3] Do not administer IM antivenom because it will not reach the systemic circulation rapidly. Although IV antivenom should be considered in patients with severe envenoming, early and ongoing CPR is far more important.

Irukandji syndrome

Irukandji syndrome occurs mainly in the north of Australia, but there are occasional reports from further south. 'Irukandji' refers to the clinical syndrome and not the type of jellyfish that causes the effects. Although a number of different jellyfish have been reported to cause Irukandji syndrome, it is classically associated with stings from *C. barnesi*. Most stings are due to contact with the bell rather than the tentacles, like most other jellyfish stings. Only one death has been associated with Irukandji syndrome, but the severity of the generalised pain and systemic effects mean that most cases require medical treatment.[6] Studies of *C. barnesi* demonstrate that the venom causes secondary release of catecholamines, which are likely the cause of the major clinical effects.

CLINICAL EFFECTS

Irukandji syndrome is the second major clinical syndrome associated with jellyfish stings (see table 1). It is characterised by delayed onset (20-30 minutes later) of severe generalised pain (muscle, abdominal, chest and back) associated with autonomic and cardiac systemic toxicity in a proportion of cases (see box 2). There are minimal local effects and often only mild pain at the sting site; in some cases, the site of the sting may be difficult to determine.

Box 2. Associated features in Irukandji syndrome

- Non-specific systemic symptoms of nausea and vomiting.
- **Sympathomimetic effects:**
  a. Tachycardia.
  b. Hypertension.
  c. Diaphoresis.
  d. Agitation and anxiety.
- **Cardiac toxicity secondary to catecholaminergic excess:**
  a. ECG changes (ST depression and T-wave inversion).
  b. Elevated troponin indicating myocardial injury/strain.
  c. Rarely, cardiogenic pulmonary oedema and/or cardiogenic shock from catecholamine-induced cardiomyopathy.

TREATMENT

Most stings require treatment in hospital because of the severity of the pain and systemic effects. The pain almost always requires IV opioid analgesia – either morphine (2.5-5mg every 5-10 minutes) or fentanyl (25-50μg every 5-10 minutes). Large amounts of opioids are often required for the pain. The nausea and vomiting can be treated with antiemetics, and benzodiazepines may be useful for agitation and anxiety. Perform an ECG and troponin in all patients.

The patient can be discharged after six hours if the pain settles and they have a normal ECG and troponin. If there is any evidence of cardiac effects on ECG or troponin, they require admission and may require an echocardiogram. In severe cases, admission to a critical care unit may be required for acute pulmonary oedema or cardiogenic shock. These patients should be managed with oxygen and positive-pressure ventilation, with or without inotropes.

Discussion with the National Poisons Centre Network (131 126) or a clinical toxicologist is advised in severe envenoming.

Other jellyfish stings

Many other jellyfish species cause stings, but in most cases, the jellyfish is not identified, and the patient is treated based on the history of a marine sting and the clinical effects. The better-known ones in Australian waters include the mauve stinger, the hair jellyfish, the jimble and other box jellyfish.

Most stings result in local pain with linear erythematous eruptions, similar to bluebottle stings (see table 1). Systemic effects are rare, and Irukandji-like stings are uncommon. Hair jellyfish can cause injuries to the eye or cornea, and these should be treated like any other eye injury – with copious irrigation.

Treatment is symptomatic, supportive and similar to treatment for bluebottle stings. First aid includes washing off or removing the tentacles, and hot water immersion ▸

◂ can be considered for pain relief. Cases rarely present to hospital except if there is severe pain, ongoing systemic effects or delayed bullous or keloid skin reactions.

PENETRATING VENOMOUS MARINE INJURIES

PENETRATING marine injuries are the second major group of marine stings and envenomings. They include a range of penetrating injuries from venomous fish spines and some invertebrates – for example, sea urchins. Although they result from a variety of creatures, the clinical effects and treatment are similar in most cases, including hot water immersion for first aid and follow-up for the risk of marine infections.

Marine infections are an important complication of penetrating marine injuries and, although rare, can result in significant morbidity and mortality. In addition to normal skin flora, marine infections can be caused by *Vibrio* sp. (marine environment) and *Aeromonas* sp. (fresh water), so it is important to follow up all penetrating marine injuries. Ensure tetanus vaccination is updated if required. The routine use of prophylactic antibiotics is not recommended. If a marine infection is suspected, collect swabs in the correct media for marine bacteria. Consultation with an infectious diseases specialist is recommended if antibiotic therapy is initiated, and inpatient care is usually required.

Venomous fish stings

There are many different types of spiny fish in Australian coastal and fresh waters. A few of these commonly cause significant injuries because of their spines, including stonefish, bullrout, catfish and scorpion fish. The spines range from non-venomous in many types of catfish to the venomous stings of stonefish, which are covered by a sheath that pushes back as the venom-covered spine penetrates the skin.

The anatomical location of the injury also differs for each species depending on the fish habitat – for example, a bottom dweller – and whether they are caught on fishing lines.

Stonefish and bullrout both cause injuries to the bottom of the foot when they are trodden on. Stonefish camouflage themselves on the sea floor, and bullrout are present in eastern Australia on the bottom of tidal estuaries and slow-moving streams.

Catfish probably cause more injuries than stonefish and bullrout; these occur on the upper limbs when they are picked up or removed from fishing lines (see figure 4). The most severe catfish injuries occur from the striped marine catfish (*Plotosus lineatus*). There are numerous other venomous or spiny fish, such as red rock cod in NSW, soldier fish and cobblers in southern Australia and scats from the Indo-Pacific Ocean.[8] Again, most injuries occur when fish are removed from fishing lines or handled for other reasons.

Box 3 outlines the first aid and treatment for penetrating marine injuries.

CLINICAL EFFECTS

The extent of the clinical effects from fish spine injuries varies and depends on the size of the spines and the amount and potency of the venom injected. The pain is often out of proportion with the physical trauma and is severe and persistent in stonefish, bullrout and marine catfish stings. In more severe cases, there will be erythema and oedema surrounding the wound site, which may spread proximally up the limb. In some cases, the spine may break off in the wound.

Infection from marine and aquatic micro-organisms is the most important, although rare, complication of penetrating marine injuries. Systemic effects are reported but are usually related to the severe pain that occurs in some cases.

TREATMENT

The first-aid treatment for fish spine injuries consists of cleaning the wound site and hot water immersion. Hot water immersion (45°C) may provide pain relief but should only be applied for up to 90 minutes. If the pain does not settle, then oral and/or parenteral pain relief is required. Local anaesthesia can also be used and is particularly effective when irrigating and exploring the wound site.

Prophylactic antibiotics are not indicated in most spine injuries, but regular review of the wound over subsequent days for infection is important.

Stonefish antivenom is available, but there is limited evidence for its effectiveness. Consider antivenom if there is severe pain; this is given as a slow IV infusion (one vial in 200mL of normal saline). IM antivenom will not reach the systemic circulation and should not be used.

Figure 4. Penetrating catfish spine to the fourth finger.

Box 3. First aid and treatment for penetrating marine injuries

- **First aid:**
  - Wash the wound site.
  - Immerse in hot water, about 45°C, for a maximum duration of 90 minutes.
  - Local pressure for bleeding.
- **Medical treatment:**
  - Local irrigation of the wound and removal of foreign bodies.
  - Radiography or ultrasound to identify retained spines.
  - Oral or titrated parenteral analgesia; occasionally local or regional anaesthesia for severe pain.
  - Stonefish antivenom is available for stonefish stings with severe pain or systemic effects.
  - Surgical consultation for deep injuries, involvement of joints or bones, or retained material.
  - Resuscitation and surgical intervention for major trauma from thoracic or abdominal stingray injuries.
  - Consider prophylactic antibiotics for large wounds with foreign material or delayed presentation.
  - Review all penetrating marine injuries every 24-48 hours for the first week.

Stingrays

There are both freshwater and marine stingrays in Australia; they vary in size and therefore the potential for major injury. Most stingray injuries are to the ankles when they are trodden on in shallow water. Thoracoabdominal injuries can occur when divers swim past stingrays; this may cause major trauma, which is rare.

Stingray injuries cause more severe trauma than fish spine injuries. This is because of the size of the spines and the fact that the tail containing the spine whips upward to cause the injury rather than being static. The bony stingray spine will also leave venom in the wound, adding to the pain.

The major clinical effects of stingray injuries are severe localised pain, local trauma, bleeding and inflammation (see figure 5). Like spiny fish injuries, systemic effects are rare, and the major complication is secondary infection. The risk of infection is higher because of the extent of the trauma and the chance of contamination.

TREATMENT

First aid includes cleaning the wound, local pressure if there is significant bleeding or trauma and hot water immersion for pain relief. As with fish spines, only apply hot water for up to 90 minutes.

With potentially larger traumatic injuries, parenteral analgesia and local anaesthesia will be required. Most wounds require irrigation and exploration under local anaesthetic, and larger wounds will require formal debridement under general anaesthetic. Thoracoabdominal injuries need to be managed as major trauma, with resuscitation and appropriate surgical intervention.

Prophylactic antibiotics are indicated for large wounds, those with considerable amounts of foreign material and any penetrating injury to a joint cavity, bone or body cavity. Follow-up of all cases is essential.

Sea urchins

Sea urchin injuries are similar to spiny fish injuries; however, almost all sea urchin spines are non-venomous. The other major difference is that almost all sea urchin spines break off in the wound, meaning that removal of broken spines is a major problem. Almost all injuries occur when people tread on sea urchins in the water (see figure 6). Injuries to the hand when urchins are handled are rare.

Sea urchin spines vary in their strength and composition, ranging from chalk-like material that is easily broken to more typical hard spines. Crown-of-thorns sea star injuries are similar and occur in the Indo-Pacific region, including the Great Barrier Reef.

Although pain occurs, this is often less severe except for the rare injuries with venomous sea urchin spines. Other symptoms relate to retained foreign bodies, with persistent pain from pressure on the injury site – for example, walking on retained spines in the foot. Infection appears to be much less common.

TREATMENT

Wash the wound and immerse in hot water for pain relief. However, the focus of treatment is to locate and remove broken and retained spines. Radiographical examination and ultrasound are required to locate spines. Superficial spines tend to be easily removed, but deeper spines require formal non-urgent surgical removal. A reasonable approach is to remove superficial spines first and then follow up with the patient to determine if further intervention is required.

OTHER MARINE STINGS AND ENVENOMINGS

Sea snakes

SEA snakes are venomous snakes that are closely related to Australasian elapids. They differ in that they have scales and no fins or gills. They occur in the tropical parts of the Indian and Pacific oceans. Most bites occur when the snakes are picked up out of fishing nets or off the beach. The most common species to cause confirmed bites in Australia is the beaked sea snake (*Hydrophis zweifeli*).[9]

Bites cause minor pain, and systemic effects will develop over minutes to hours. Systemic envenomation is usually myotoxicity, with neurotoxicity uncommon. Myotoxic envenomation results in myalgia, painful muscle rigidity, trismus and muscle weakness. Creatine kinase is PAGE 20 ▸

◂PAGE 18 elevated because of muscle injury, and in severe cases, rhabdomyolysis is complicated by hyperkalaemia, hypocalcaemia and acute kidney injury, with associated myoglobinuria.

Treatment is similar to that for Australian terrestrial snakes. First aid consists of a pressure bandage with immobilisation of the extremity and whole body. Antivenom is the mainstay of treatment for systemic envenomation, and a small case series supports its effectiveness.[9] Use only sea snake antivenom and not any other snake antivenom. In severe cases, supportive treatment is important for electrolyte abnormalities and acute kidney injury.

Blue-ringed octopus

Blue-ringed octopuses occur in tidal areas and rock pools around the coast of Australia. They are often well camouflaged until they are disturbed – when their rings change colour dramatically. Their saliva contains tetrodotoxin that is injected when the octopus bites. Bites almost always occur when the creature is picked up and irritated.

Most bites are painless and only recognised because there is local bleeding. Most cases result in only minor effects, with localised or regional numbness and paraesthesia. Systemic envenomation is characterised by flaccid paralysis, which is identical to tetrodotoxin poisoning and described later. Treatment is early basic life support for respiratory paralysis and immediate transport to hospital. Pressure immobilisation is recommended but should not prevent basic life support or transport. There is no antidote for tetrodotoxin, so treatment is supportive, with mechanical ventilation.

Sponges

Sponge injuries differ from other marine injuries because they are contact skin reactions rather than penetrating injuries. Injuries are uncommon, with only some species, such as fire sponges, having toxic secretions that cause more severe effects.[10] The clinical effects of most sponge injuries tend to be minor, with local paraesthesia, numbness, itchiness and mild stinging pain. The effects usually last hours but, in some cases, may persist for 2-3 days. Most cases only result in erythema, with occasional development of vesicles and blistering.

Fire sponges, however, differ because they cause moderate to severe delayed effects that can present up to 2-3 weeks after contact, with painful swelling and erythema, followed by desquamation (see figure 7). Wash the contact area as soon as possible, and treat symptomatically with analgesia and antihistamines. The effects resolve over days to weeks.

Figure 5. Stingray injury to the dorsum of the foot.

A. Day one.

B. Day three.

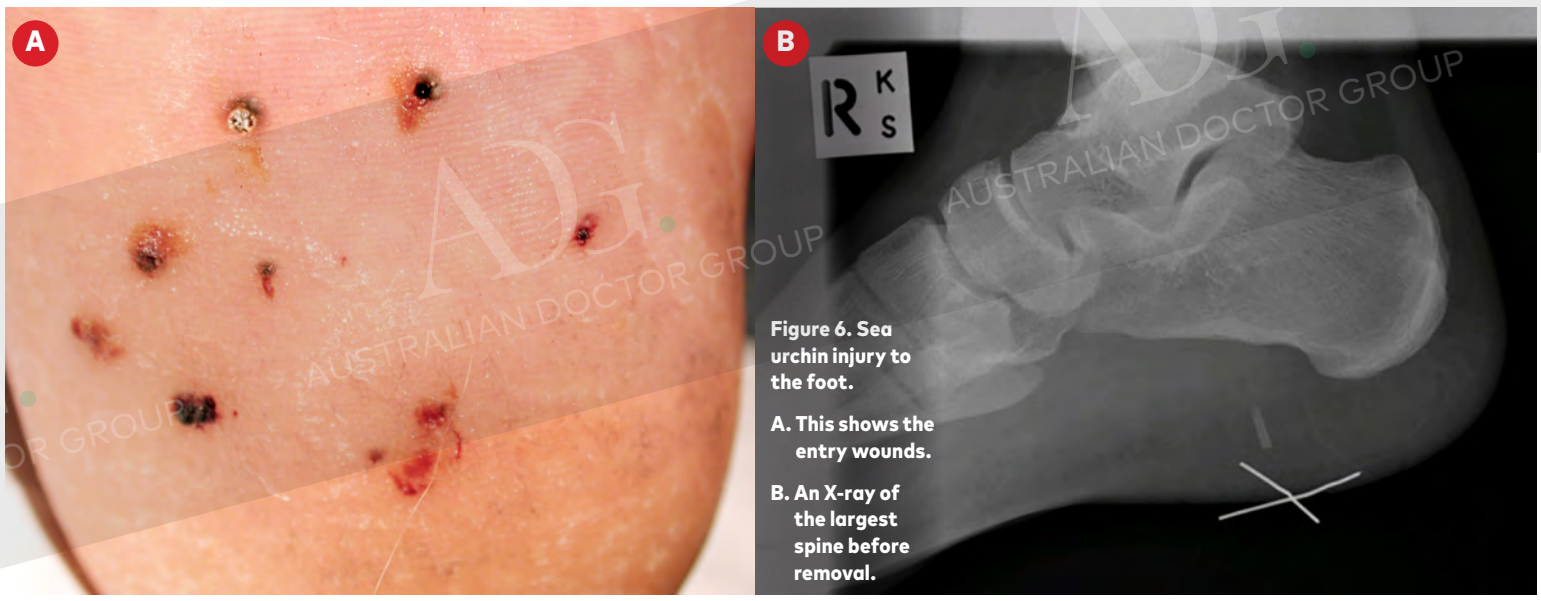

Figure 6. Sea urchin injury to the foot.

A. This shows the entry wounds.

B. An X-ray of the largest spine before removal.

MARINE POISONING

MARINE poisoning occurs following the ingestion of marine invertebrates (for example, shellfish) or vertebrates (large fish) where these animals have accumulated toxins from the environment via the food chain. Gastrointestinal and neurotoxic effects are the most common clinical manifestations.[1] Marine poisonings, like other causes of food poisoning, are notifiable diseases in Australia.

Ciguatera

Ciguatera is by far the most common marine poisoning: it is an important health condition in the Indo-Pacific and Caribbean regions, where seafood is the major dietary source of protein. It is endemic in parts of northern Australia, but with modern freezer transport and international travel, it can occur in any part of Australia.

Ciguatera results from the ingestion of ciguatoxins, which are produced by small marine creatures (dinoflagellates: *Gambierdiscus toxicus*) and then accumulate in larger tropical reef fish as they travel up the food chain. Fish typically implicated are Spanish mackerel, mackerel, bass, coral trout, moray eels and species of cod and emperors. Unfortunately, there is no way to identify if a fish contains ciguatoxins, including by the taste of the fish. Fish in different regions may or may not be affected.

CLINICAL EFFECTS

The clinical effects differ between the Indo-Pacific and the Caribbean. In the Indo-Pacific, including Australia, ciguatera causes both gastrointestinal and neurological effects. The gastrointestinal effects precede the neurological effects and may initially be like any food poisoning illness, with vomiting, crampy abdominal pain and diarrhoea. These symptoms may resolve after about 12 hours.

Neurological effects are generally delayed and develop over a period of up to 24 hours. The combination of the early gastrointestinal effects and delayed neurological effects is the hallmark of the poisoning. The characteristic neurological effects are a sensory polyneuropathy with cold allodynia, distal and perioral paraesthesia, and numbness. Cold allodynia is often incorrectly referred to as heat reversal but is instead the abnormal and unpleasant sensation when touching cold objects, such as water.

Figure 7. Delayed skin reaction to a fire sponge contact.

More general systemic effects include myalgia, arthralgia and pruritus. Sub-acute and chronic forms are described, but these are poorly defined and present with less specific systemic effects, such as fatigue, loss of energy and depression, as well as gastrointestinal and neurological effects.

The diagnosis of ciguatera is clinical, based on the characteristic combination of the gastrointestinal and neurological effects after eating fish known to be implicated in ciguatera. The diagnosis of the sub-acute and chronic forms is more difficult. Although ciguatoxins can PAGE 22▸

◂PAGE 20 be detected in fish, it is not possible to detect the small amounts that cause ciguatera in humans.

TREATMENT

The treatment for ciguatera is supportive and symptomatic because there is no specific antidote for the toxin. Rehydration with standard IV fluids is the most important treatment, like with most gastrointestinal poisonings. Mannitol has not been shown to be effective. NSAIDs can be used for analgesia. Although numerous medications have been tried for the chronic form, there is little evidence to support their use.

Tetrodotoxin poisoning

Tetrodotoxin (TTX) occurs in numerous types of fish, including puffer fish, and occurs more commonly in South-East Asia. TTX poisoning is rare in Australia but occurs with ingestion of toadfish (see figure 8) and related types of fish.[11] Most cases occur when the fish is caught and eaten by a group of people who do not realise it is poisonous. In Japan, TTX poisoning occurs when puffer fish is incorrectly prepared and then eaten; this referred to as fugu poisoning.

TTX is a sodium-channel blocker and, if sufficient enough amounts are present, will cause failure of nerve conduction and a sensorimotor neuropathy.

CLINICAL EFFECTS

TTX poisoning develops within minutes to hours of ingestion and develops more rapidly in severe cases with larger ingestions. Sensory effects include paraesthesia and numbness, followed by motor effects with ataxia and then progressive distal to proximal muscle weakness. Initially, there may also be mild gastrointestinal symptoms, with nausea and vomiting. Severe poisoning causes respiratory muscle paralysis. In rare cases, there will be cardiovascular toxicity with bradycardia, arrhythmias and hypotension. TTX does not cross the blood-brain barrier, so there is no effect on the CNS, and importantly, patients will remain aware despite having severe paralysis. This is why sedation is essential and staff need to be aware that patients are conscious.


Figure 8. Toadfish.

TREATMENT

There is no specific antidote for TTX toxicity, and treatment is supportive. Pre-hospital treatment in severe cases requires early basic life support and then intubation and ventilation. Most patients will need ventilation for 2-5 days. Symptomatic bradycardia is treated with atropine, and fluid resuscitation may be required.

Shellfish poisoning

Shellfish poisoning is rare in Australia because of the increased controls of fisheries around the country. It is far more common to get viral and bacterial infections from shellfish ingestion than poisoning. Three of the four types of shellfish poisoning are neurotoxic in nature, including paralytic shellfish poisoning from toxins similar to TTX; neurotoxic shellfish poisoning, causing neuroexcitatory effects; and the very rare encephalopathic shellfish poisoning.[1]

Amnesic shellfish poisoning is the fourth type and is extremely rare.

Scombroid

Scombroid differs from other marine poisonings and is clinically similar to an allergic reaction. It is due to the ingestion of fish containing high concentrations of histamine because of spoilage from poor storage. Fish from the *Scombridae* family are most commonly implicated, including kingfish, tuna, mackerel and wahoo.

CLINICAL EFFECTS

Although similar to a hypersensitivity reaction, the effects are only caused by histamine. Patients will have a combination of gastrointestinal effects (nausea, vomiting, abdominal pain and diarrhoea), skin effects (urticaria, diffuse erythema, flushing and pruritus) and headache. In more severe poisoning, there will be hypotension and, rarely, respiratory effects. The effects develop over 30-60 minutes and generally resolve within 4-6 hours. The diagnosis is clinical and can be confirmed with the detection of high concentrations of histamine in the fish.

TREATMENT

Treatment is with antihistamines, both H_1 and H_2 antagonists — promethazine 50mg and either famotidine or nizatidine, unlike the primary use of adrenaline for acute anaphylaxis. Administer salbutamol for bronchospasm and IV fluids for hypotension.

How to Treat Quiz.

MARINE STINGS AND POISONING

GO ONLINE TO COMPLETE THE QUIZ **ausdoc.com.au/how-to-treat**

1. **Which THREE statements are correct?**
   - **a** Marine poisoning occurs when a marine creature containing toxic substances is ingested.
   - **b** Jellyfish cause stings when their tentacles contact skin.
   - **c** Major box jellyfish and stingray injuries are common in Australia in the summer.
   - **d** Most jellyfish stings are minor.

2. **Which ONE is not a common feature of linear tentacle-like jellyfish stings?**
   - **a** Stings result from contact with the tentacles.
   - **b** Immediate local pain lasting minutes to hours.
   - **c** Non-specific systemic effects, including nausea, vomiting and malaise.
   - **d** Linear erythematous or urticarial eruptions.

3. **Which TWO are appropriate first-aid treatment for a bluebottle sting?**
   - **a** Remove the tentacles — either by washing them off with fresh water or picking them off carefully.
   - **b** Hot water immersion (45°C) for 20 minutes is the recommended treatment for local pain.
   - **c** Do not apply vinegar to the sting as this may increase the pain.
   - **d** Applying an ice pack for 20 minutes is the recommended treatment for local pain.

4. **Which THREE statements regarding the major box jellyfish are correct?**
   - **a** IV antivenom is the most important aspect of resuscitation.
   - **b** Most stings are minor, but severe and life-threatening stings occur with greater skin contact with the tentacles.
   - **c** Pre-hospital resuscitation is key.
   - **d** Severe envenoming is characterised by rapid onset of cardiovascular collapse and death within 20-30 minutes.

5. **Which TWO statements regarding Irukandji syndrome are correct?**
   - **a** Most cases do not require medical treatment.
   - **b** It is classically associated with stings from *C. barnesi*.
   - **c** The pain almost always requires IV opioid analgesia.
   - **d** Most stings are due to contact with the tentacles.

6. **Which THREE are appropriate treatments for penetrating marine injuries?**
   - **a** Immerse in hot water, about 45°C, for a maximum duration of 90 minutes.
   - **b** Antibiotics for all penetrating marine injuries.
   - **c** Review all penetrating marine injuries every 24-48 hours for the first week.
   - **d** Oral or titrated parenteral analgesia and occasionally local or regional anaesthesia for severe pain.

7. **Which TWO statements are correct?**
   - **a** Antivenom is the mainstay of treatment for systemic sea snake envenomation.
   - **b** Systemic envenomation from sea snakes usually causes neurotoxicity.
   - **c** The saliva of the blue-ringed octopus contains tetrodotoxin that is injected when the octopus bites.
   - **d** Sponge injuries, although uncommon, usually result in severe local and systemic effects.

8. **Which THREE statements regarding ciguatera are correct?**
   - **a** Ciguatoxins impart a metallic taste to the fish, an indication not to eat it.
   - **b** The combination of the early gastrointestinal effects and delayed neurological effects is the hallmark of the poisoning.
   - **c** The characteristic neurological effects are a sensory polyneuropathy with cold allodynia, distal and perioral paraesthesia, and numbness.
   - **d** The treatment for ciguatera is supportive and symptomatic because there is no specific antidote for the toxin.

9. **Which THREE are features of tetrodotoxin poisoning?**
   - **a** Paraesthesia and numbness.
   - **b** Delirium.
   - **c** Initial mild gastrointestinal symptoms.
   - **d** Progressive distal to proximal muscle weakness.

10. **Which THREE statements regarding shellfish poisoning are correct?**
    - **a** Scombroid develops over 4-6 hours.
    - **b** Shellfish poisoning is rare in Australia.
    - **c** Scombroid is clinically similar to an allergic reaction.
    - **d** Treat scombroid with antihistamines and salbutamol IV fluids as indicated.

EARN CPD OR PDP POINTS

- Read this article and take the quiz via **ausdoc.com.au/how-to-treat**
- Each article has been allocated one hour by the RACGP and ACRRM.
- RACGP points are uploaded every six weeks and ACRRM points quarterly.

CASE STUDIES

Case study one

ANGIE, a five-year-old girl, runs out of the water at the beach screaming and holding on to her left wrist. The wrist has a narrow red line across it.

This is most likely a bluebottle sting. First aid is immersion of the wrist in hot water for 20 minutes. The pain will usually resolve after this, and Angie will not require further medical attention or transport to hospital.

Case study two

Erik, a 25-year-old male, presents to his GP with "something in the sole of his foot" after standing on something in the ocean. He only has moderate pain except when he weight-bears, and there is no obvious swelling.

The most likely diagnosis is sea urchin spines in his foot. An ultrasound and X-ray are appropriate.

Superficial spines can usually be easily removed. However, deeper ones require follow-up and possibly surgical removal if they continue to cause symptoms.

CONCLUSION

MARINE bites and stings are uncommon conditions, but this varies by geographical location and season. GPs working in coastal areas will need to treat these conditions mainly in the warmer months.

Most require simple supportive measures, including first aid, analgesia and cleaning of wounds. More unusual cases and major injuries can be managed in conjunction with the Poisons Information Centre (131 126) or appropriate specialist care: surgical or infectious diseases.

References

Available on request from howtotreat@adg.com.au