

## Marine Envenomations & Toxins

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## Mechanism of Injury

- Traumatic Injuries
- Venomous bites and stings
- Toxic Ingestions

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## Traumatic Injuries

Sharks	Barracudas
Moray Eels	Giant Grouper
Sea Lions	Needlefish
Killer Whales	Alligators & Crocs

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## Venomous Bites and Stings

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- Vertebrates
  - Stingrays, Catfish, Lionfish, Stonefish, Scorpionfish
- Invertebrates
  - Coral
  - Sea Urchins
  - Coelenterates
    - Hydrozoans – Portuguese Man-of-War
    - Scyphozoans – True Jellyfish
    - Anthozoans – “Hells Fire Sea Anemone”

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## Venomous Stingray Injuries

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- Rays do not attack man
- Injuries usually from stepping on the animal
- Fishermen are also often injured
- Injuries usually on the feet or lower leg

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## Venom Apparatus

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- Striking organ (spine)
  - Serrated appearance
  - Covered with glandular venom tissue
  - Covered by epidermis
  
- Venom is injected by tearing off the venom tissue which may remain in the wound
- Broken spines are regenerated

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### Clinical Signs of Envenomation

- Deep lacerations are common
- Penetrating puncture wounds occur frequently
- Pain not severe at time of incident
  - Intense pain develops over 30-90 minutes
- Profuse bleeding occurs from initial contact
- Edema may develop, but is not consistent
- **SEVERE DISTRESS** due to local pain is the most common problem in stingray injuries

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### Signs of severe envenomation

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- Nausea
- Vomiting
- Syncope
- Excessive salivation
- Muscle cramps
- Convulsions
- Circulatory collapse

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### First Aid

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- Wash wound with sea water to remove venom and gland tissue
- Bathe the part in hot water
  - Venom is heat labile
  - Do not scald, temp not > than 110 F
  - May continue up to 2 hours

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## Clinical Treatment

- Pain meds as necessary
- Wound explored and debrided
  - Leave open initially
- Tetanus prophylaxis
- Antibiotic prophylaxis

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## Fish stings

- Lionfish
- Scorpionfish
- Weeverfish
- Catfish
- Stonefish
  - Most toxic fish

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Scorpionfish

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Stonefish

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- Ornate lionfish produce mild poisoning.
  - Camouflaged scorpionfish cause moderate to severe poisoning.
  - The motionless stonefish causes severe to life-threatening poisoning.

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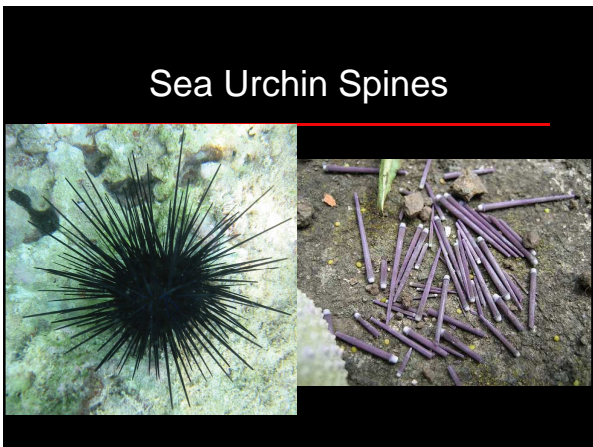
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## Signs and symptoms

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- Intense throbbing pain peaks in 1-2 hours and lasts 12 hours.
- Redness, bruising, swelling, numbness, tingling, and tissue sloughing at the wound site may also occur.
- Severe reactions include nausea, vomiting, abdominal cramps, tremors, abnormal heart rhythms, weakness, shortness of breath, seizures, decreased blood pressure, fainting, and paralysis.
- Death may occur.

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## Treatment

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- Immerse the wound in water as hot as the victim can tolerate for 30-90 minutes. Repeat as necessary to control pain.
- remove any spines or sheath remaining in the wound.
- Cleanse the wound and then flush the affected area with fresh water
- Antivenom is available for stonefish

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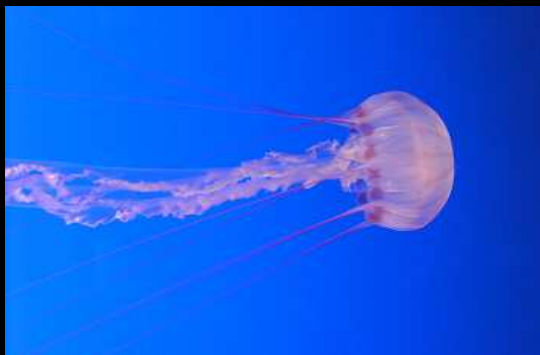
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## Jellyfish



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## Most Venomous Sea Creature on the Planet?

- Found predominately in Australian and South Asian waters
- Can be found in the open ocean
- Mortality rates from exposure approach 20%
- Carry enough venom to kill several adult humans

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## The Box Jellyfish!

- Chironex fleckeri (a.k.a sea wasp or stinger)
  - Most venomous of all stinging marine life
  - Over 100 documented fatalities
    - Can cause death in 5 minutes from respiratory failure
  - Antivenom available in Australia

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### Stinging apparatus

- Nematocyst
  - Present by the thousands to millions on the tentacles
  - Each contains a microdose of venom
    - Combines the mechanical functions of a harpoon gun and an injection syringe
  - Discharges in response to mechanical or chemical stimulation (sticky feeling when touched)
  - Adult jellyfish may have 4 to 5 million nematocysts on its tentacles

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### Nematocyst

Labels in diagram: hinged operculum, barbs, spines, endochel operculum, nematocyst, cridoblast, rudents

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## Envenomation process

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- Simultaneous discharge of thousands of nematocysts
  - Rapidly absorbed, quickly rising blood levels of venom
- Massive envenomation may result from entanglement in the tentacles

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## Portuguese Man-of-War

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## Nematocyst Inhibition

### “How do I stop the stinging”?

- Do not wash off with tap water
  - Enhances discharge
- Many substances used in the past
  - Alcohol, vinegar, paw paw juice, human urine, meat tenderizer, ammonia, and other plant extracts
  - Vinegar (5% acetic acid) is the preferred method used today

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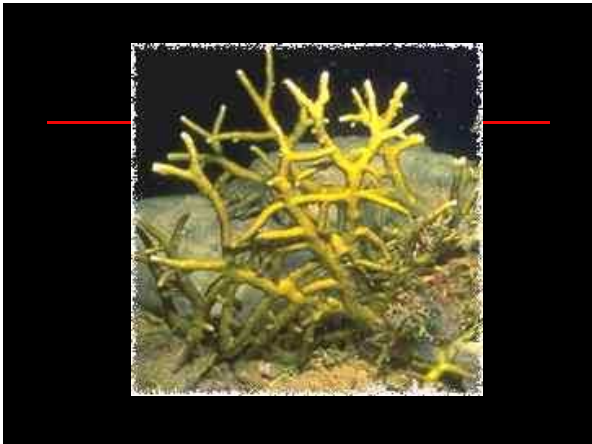
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Venom Apparatus

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- Octopus has a distinct venom delivery system
  - Two sets of salivary glands
  - Parrot like beak
- Venom is a form of tetrodotoxin, a potent neurotoxin

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## TOXINS

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- Ciguatera
- Scombroid
- Fugu

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## Ciguatera

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- Most commonly reported fish-borne illness worldwide
- Normally only found between 35 degree parallels North and South of Equator
- Over 500 species of fish may cause it
- Most common:
  - Barracuda, Grouper, Amberjack, Snapper and Sea Bass

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## Ciguatoxin

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- A heat-stable, lipid-soluble, acid-resistant compound produced by the dinoflagellate *Gambierdiscus toxicus*
- It lives in and around coral reefs and is eaten by small fish
- The toxin does not harm the fish but is concentrated up the food chain
- It is not altered by cooking, processing, smoking, drying or freezing

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Symptoms

- Toxin activates sodium channels
- Symptoms begin usually within 6 hours of ingestion (30 minutes to 30 hours)
- Nausea, vomiting, abdominal cramps and watery diarrhea for first 24-48 hrs.
- Bizarre neuro symptoms are "Classic"
  - Reversal of Hot & Cold sensation
  - Paresthesias of lips & extremities
  - Sensation of teeth being loose

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Ciguatera Symptoms (cont.)

- May also see :
  - Vertigo, Blurred vision, Ataxia
  - Coma, Hypotension, Arrhythmias
  - AV Block, Shock, Respiratory Failure
- Duration: one week but may persist for months
- Symptoms aggravated by ETOH, Fish Oils and nuts

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## Ciguatera Diagnosis & Treatment

- Diagnosis is purely clinical at present
- Treatment is mainly supportive
  - IV Mannitol appears to be effective in some cases
  - Amitriptyline and Gabapentin have shown some success for chronic paresthesias
  - Avoiding reef fish, ETOH and nuts for 3-6 months is normally advised

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## Fugu

- Tetrodotoxin
  - Most venom found in the liver, gonads, and skin of the Pufferfish
  - Toxicity from as little as 1.4 ounces
  - Heat stable protein
  - Mortality approaches 50%
  - Served Oct. – March in Japan
- Chefs must be licensed to serve
- Illegal to prepare in U.S.

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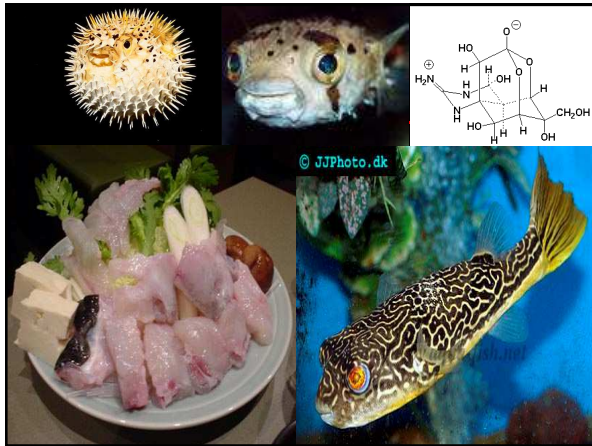
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### Signs and symptoms

- Onset from 15 minutes to a few hours
- Initially, lip and tongue paresthesias
  - facial and extremity paresthesias and numbness
- Salivation, N,V,D, abd pain (severe)
- Motor dysfunction with speech difficulties

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### Death by FUGU

- Rapidly ascending paralysis over 2-4 hours
  - extremity progresses to respiratory
- Finally, cardiac dysfunction, CNS dysfunction, and seizures
- Death usually in 4-6 hours

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## Treatment

- Dietary history is key to diagnosis
- AC if early
- Aggressive supportive care
  - Airway management
  - Antiarrhythmics, pressors
- NO ANTIDOTE!

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## Scombroid

- Food borne illness associated with consumption of improperly handled (i.e. refrigerated) dark-meat, histadine-rich fish
- Most commonly: Tuna, Albacore, Mackerel, Bonito, Mahi-Mahi, Bluefish
- Scombrototoxin is formed when surface bacteria proliferate and degrade free Histadine to Histamine

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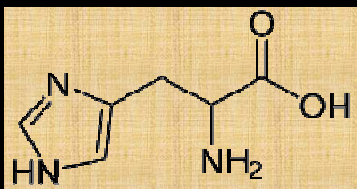
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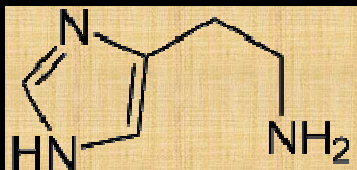
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Histadine



Histamine




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## Scombrotoxin

- Not destroyed by cooking or heating
- Causes fish to have a “peppery” or “metallic” taste
- Symptoms begin within minutes and usually only lasts about 4 hours
- Causes a classic “Histamine” reaction

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## Scombroid Symptoms

- Symptoms Include:
  - Facial flushing, Sweating, Burning sensation in mouth & throat
  - Diarrhea, Nausea, Dizziness, Palpitations
  - Headache and sunburn-like rash
- Often misdiagnosed as “Fish-Allergy”

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## Scombroid Treatment

- Supportive care: Fluids, anti-emetics
  - Consider Activated Charcoal for recent ingestion
  - Benadryl 25-50 mg IV
  - Cimetidine or Pepcid IV
  - Epinephrine and steroids in severe cases
- Course usually benign
- Public Health Concern-Notify OPH

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## One Final Warning!

- Small Amazonian catfish the "Candiru"
- Known for swimming up and lodging itself in the human urethra during river micturition



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## Take Home Points

- Know which envenomations respond to warm water treatment vs acetic acid
- Know how to recognize the toxins by their toxidromes
- Know what types of fish or conditions to avoid when contemplating eating seafood

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