

# Critter Attacks



David Hamer, MD

Department of Global Health

Boston University School of Public Health

Travel Clinic and Section of Infectious Diseases

Boston Medical Center



# Talk Outline

- **Global rabies epidemiology**
- **Epidemiology of common types of envenomation (injection of venom by a bite or sting): spiders and snakes, marine creatures**
- **Prevention of bite and sting exposures, including first aid**



# Bites & Stings

- Snakes
- Spiders
- Scorpions
- Mammals
- Jelly fish and sea urchins
- Fish (e.g. stonefish, weever fish, lionfish)
- Sharks



# Introduction

- > 30 million dog bites per year
  - ~55,000 rabies deaths
- > 421,000 – 1.2 million snake bites per year
  - 81,000 - 138,000 deaths
- Spider / scorpion?
- Jelly fish / sea urchin?
- Sharks
  - < 100 attacks
  - < 10 deaths / year

***International  
Health  
Hazard and  
Common  
Travel-  
Related  
Concern***



# Mammals



# Potential Mammalian Bites

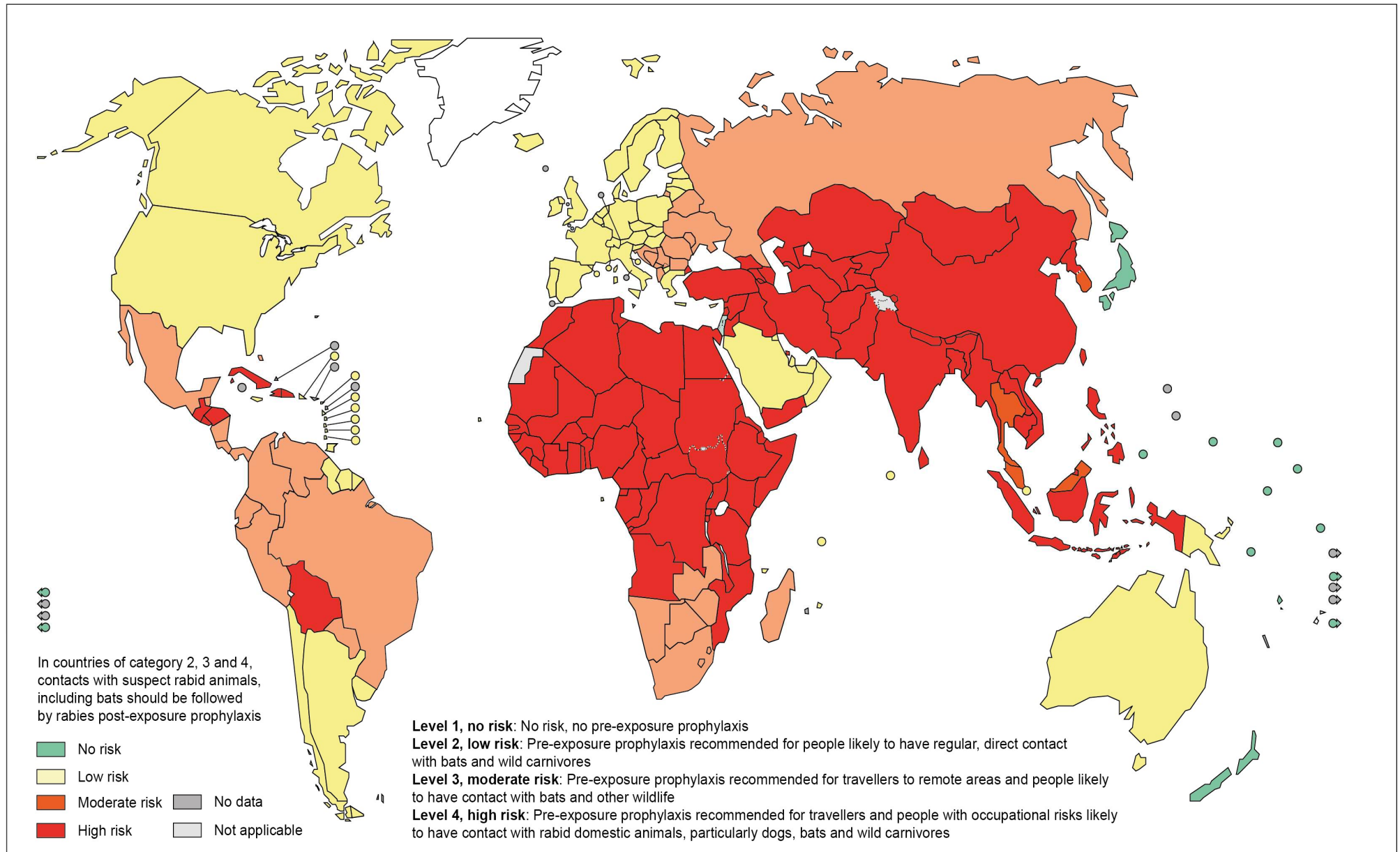


# Rabies

- Estimated 55,000 deaths/yr
- >3.7 million DALYs/year
- Feared and widespread but preventable!
- Dogs main source (99%)
- Estimated annual global cost of 8.6 billion dollars (USD)



# Distribution of risk levels for humans contacting rabies, worldwide, 2018



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2018. All rights reserved

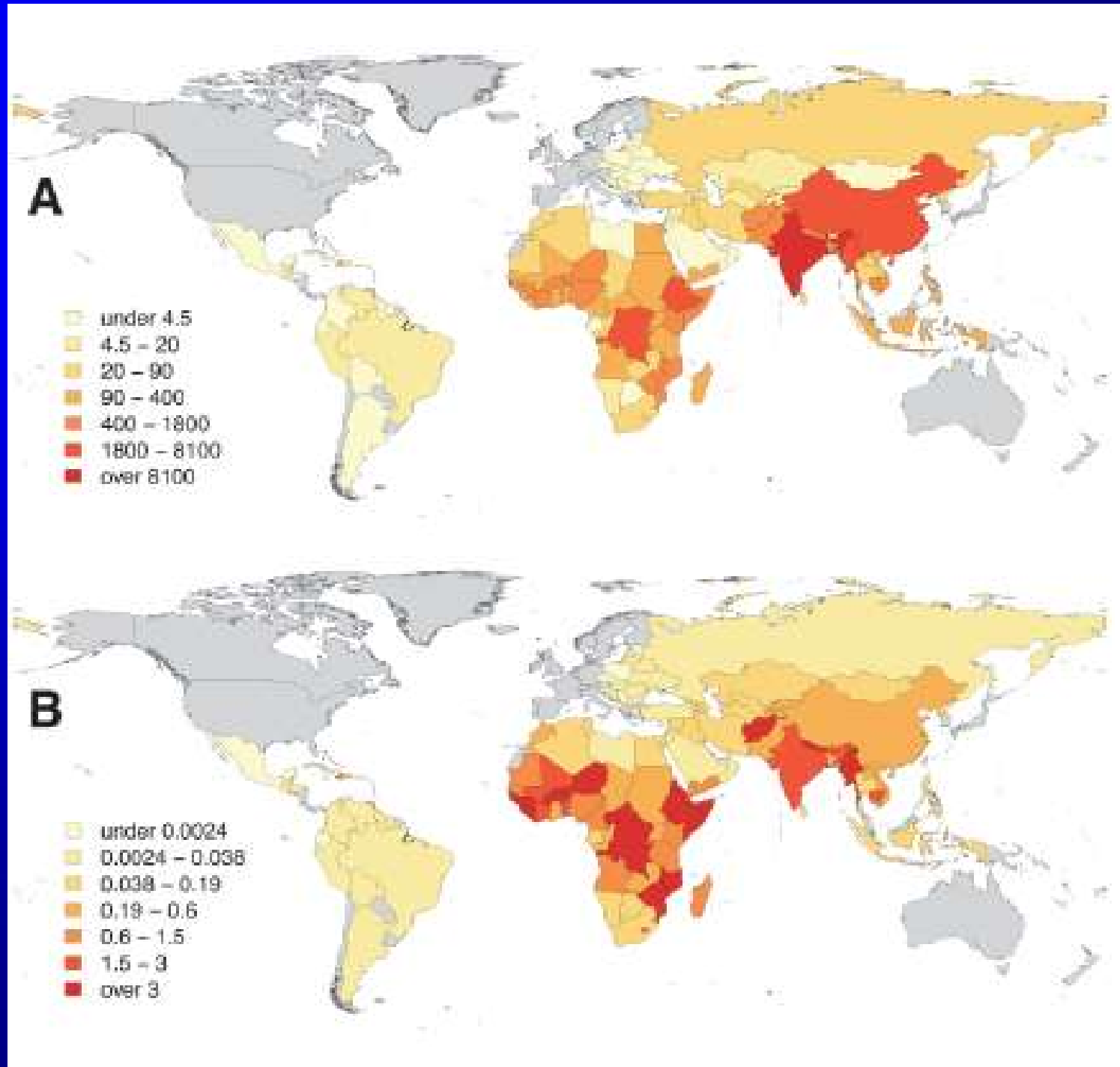
Data Source: World Health Organization  
 Map Production: Control of Neglected  
 Tropical Diseases (NTD)  
 World Health Organization





# A) Human rabies deaths

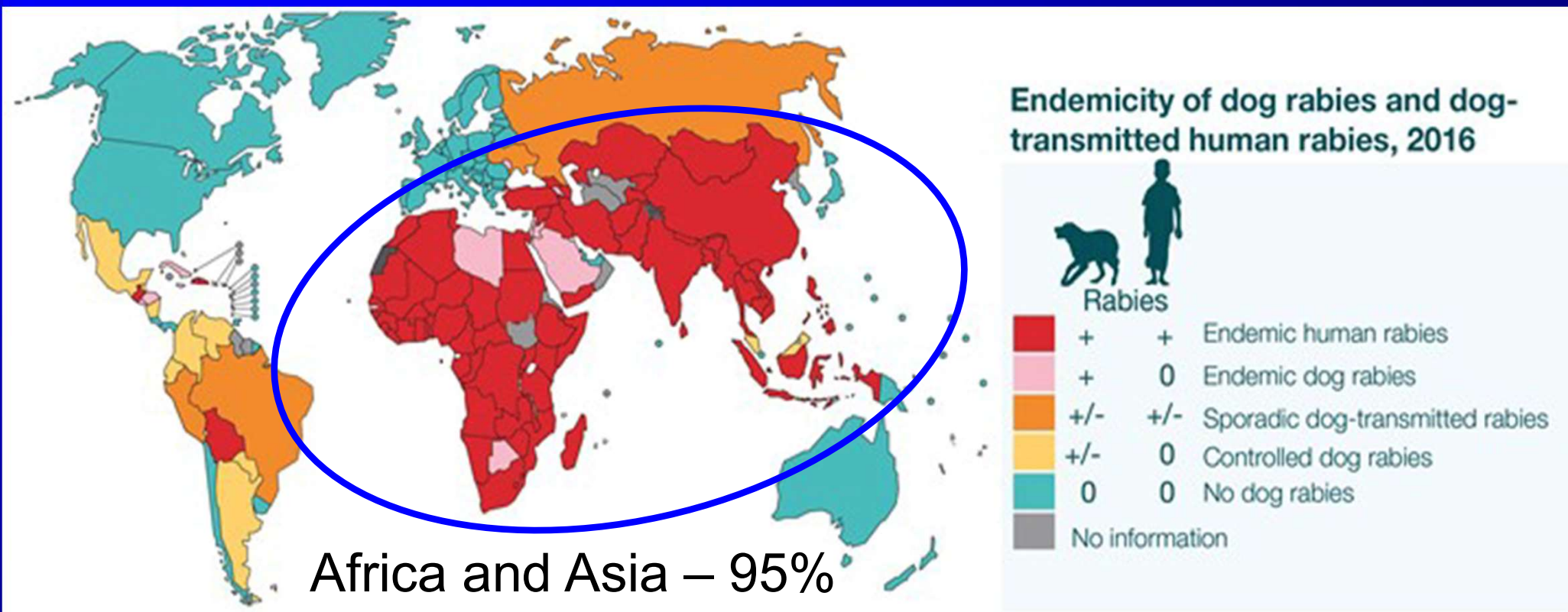
# B) Per capita rabies deaths



Hampson K et al.  
PLoS NTD. 2015



# Canine Rabies – Global Epidemiology



- >40% children under 15 years old
- Inadequate surveillance in Asia and Africa

- Taylor & Knopf. Zoonoses & Pub Health 2015



# Rabies

- Dogs & cats
- Raccoons
- Skunks
- Foxes
- Bats
- Cows & horses



*RARE* in hamsters, rabbits, rats, squirrels  
*NEVER* in birds, fish, insects, reptiles  
*DOGS* and *MONKEYS* issues for travelers

# GeoSentinel Animal Exposure Analysis

Muehlenbein M et al. J Travel Med 2020

- Data from Jan 2007 to Dec 2018
- 6470 animal exposures (bite and non-bite)
- Majority occurred in Asia (71%)
- Exposures reported from 167 different countries
- Majority involved dogs, monkeys, and cats (76%)
- 63% of 4,395 travelers without a pre-travel visit



**Table 1.** Demographic characteristics of travelers with an animal bite or exposure (non-bite) reported to GeoSentinel, 1 January 2007–31 December 2018 (*n* = 6470)

Characteristic	<i>n</i>	%
Median age in years (range)	30 (0–88)	
Gender		
Female	3208	49.7
Male	3250	50.3
Travel reason		
Tourism	4944	76.4
Visiting friends or relatives	694	10.7
Business	446	7.2
Missionary, humanitarian or volunteer	199	3.1
Education or student	113	1.8
Migration	14	0.2
Research	12	0.2
Planned medical care	11	0.2
Migrant worker	9	0.1
Military	8	0.1
Region of exposure <sup>a</sup>		
Southeast Asia	3021	46.7
South Central Asia	1219	18.8
North East Asia	379	5.9
North Africa	342	5.3
South America	334	5.2
Sub-Saharan Africa	284	4.4
Middle East	273	4.2
Western Europe	167	2.6
Eastern Europe	155	2.4
Central America	150	2.3
Caribbean	56	0.9

- **Dog bites most common in Thailand, Nepal, China, India, and Indonesia**

**Cat bites most common in Thailand, Turkey, Morocco, Algeria, and the Philippines**

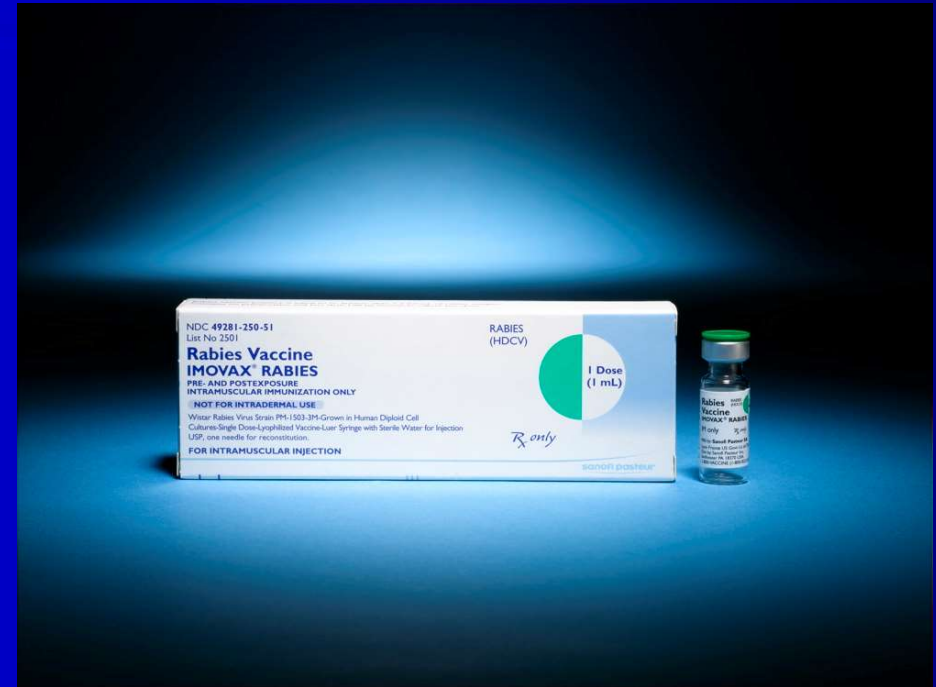
**Muehlenbein M et al.  
J Travel Med 2020**



# Rabies

- Low risk
- High impact
- EDUCATE
- Immunize
- Post exposure strategies

*Uniformly fatal, completely preventable  
Very rare, but TRIP INTERRUPTING!*



# Venomous Spiders

- Brown recluse
- Widow
- Funnel web
- Tarantula





# Widow Spider

- Name "black widow" comes from female's habit of eating the male after mating
- Live outside / temperate
- Bite usually painful
- "Lactrodectism"
  - Pain
  - Muscle spasm
  - "acute abdomen"



## Treatment:

- Morphine
- Diazepam
- Calcium gluconate
- Anti venom
- Tetanus booster



# Brown Recluse Spider



- Often inside / reclusive!
- Most bites benign
- Envenomation
  - Painless
  - Necrotizing
  - Rarely systemic

## TREATMENT:

- Ice / anti-inflammation
- Dapsone?
- Hyperbarics?
- Nitroglycerin?

Often mis-diagnosed as MRSA, pyoderma, etc.



# Funnel Web Spider

- Outdoor
- Active at night
- Males bite
- Australian version very dangerous
  - Rapid pain!
  - CNS effect
  - Can be fatal



## TREATMENT:

- Transport
- Anti-venom



# Tarantula

- No webs
- Non aggressive
- Urticarial hairs with barbs
- Will bite if threatened



## TREATMENT:

- Ice / anti-inflammation
- Urticarial rxn
- Ocular irritation





**Goliath Birdeater (*Theraphosa leblondi*)**



# Venomous Snakes

Elapids v. Vipers v. Colubrids v. Hydrophiidae

## Elapids versus Vipers



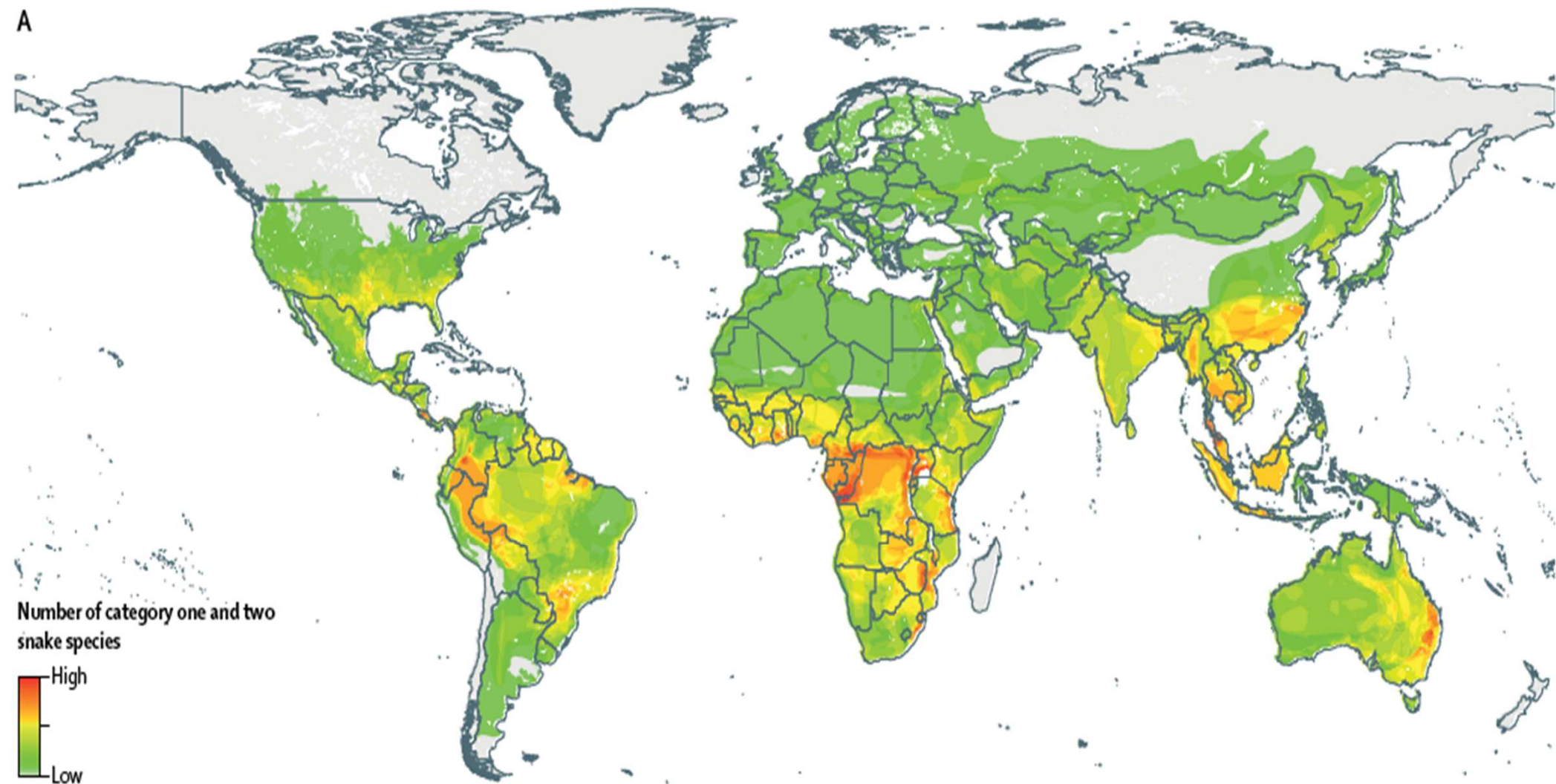
- Cobras (Africa & Asia)
- Coral Snakes (Americas)
- Mambas (Africa)
- Kraits (Asia)



- Rattlesnake (Americas)
- Copperhead (Americas)
- Night adder (Africa)
- Bushmaster (So. America)

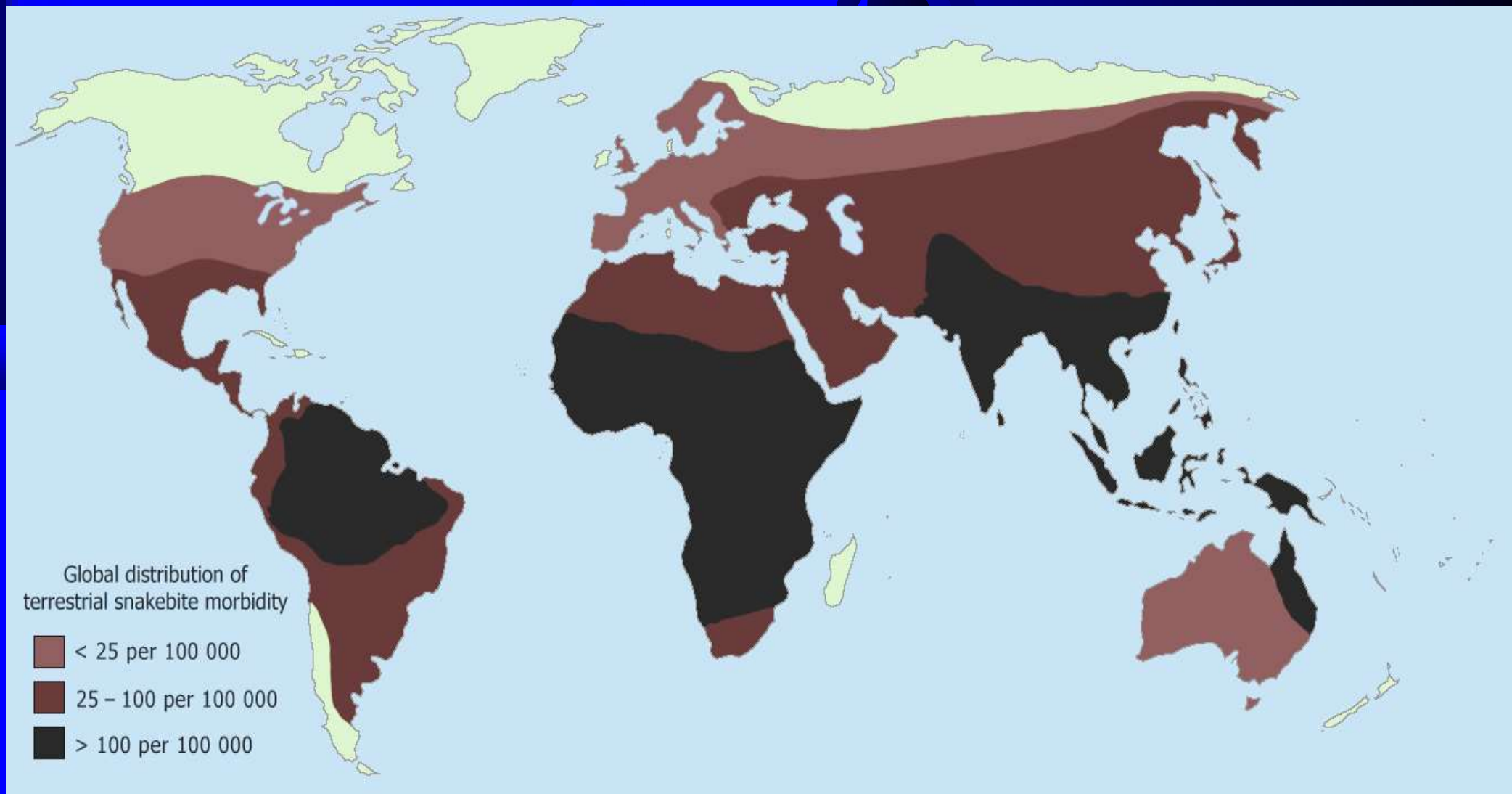


# Global Distribution of Venomous Snakes



Longbottom J et al. Lancet 2018

# Snake Bite Mortality



Estimated 80,000 to 130,000 deaths annually

- Siefert SA et al. Snake envenomation NEJM 2021





# Snake Bite Risk Factors

- Unprovoked bites more likely in women and on lower extremity
- Provoked bites more likely in men and upper extremities
- Handling snakes when inexperienced, careless, overconfident, or intoxicated



# Venom Effects

Local (destruction) versus systemic (neurotoxic)

## VIPERS

- Rapid onset
- Local pain
- Necrosis
- Hemolysis
- Rhabdo

## ELAPIDS

- Delayed onset
- Ptosis
- Diplopia
- Dysphagia
- Respiratory arrest



# Snake Bite First Aid

## Do:

- ❑ Protect from further bite
- ❑ Safely try to identify snake
- ❑ Cleanse (unless using venom detection kit)
- ❑ Remove constricting items
- ❑ Compressive bandage to reduce lymphatic flow
- ❑ Immobilize extremity

## Do not:

- ❑ Apply tourniquet
- ❑ Incise / use suction
- ❑ Apply electric shock
- ❑ Add drugs / EtOH
- ❑ Get bitten!



# Snake Bite Management



*Calm Transport to Medical Care*



# Snake Bite Treatment

*The Only Effective Bite Treatment is Anti-Venom*



**Imagine there was no glass...**



**PLEASE DON'T TEASE THE SNAKES!**

 **KALIMBA**  **REPTILE PARK**

# Snake Bite Prevention

- LEAVE THE SNAKE ALONE!
- Protective clothing
- Good foot wear
- Walking stick
- Flashlight
- Check your shoes

*Watch where you step  
Watch where you reach!*





# Scorpions

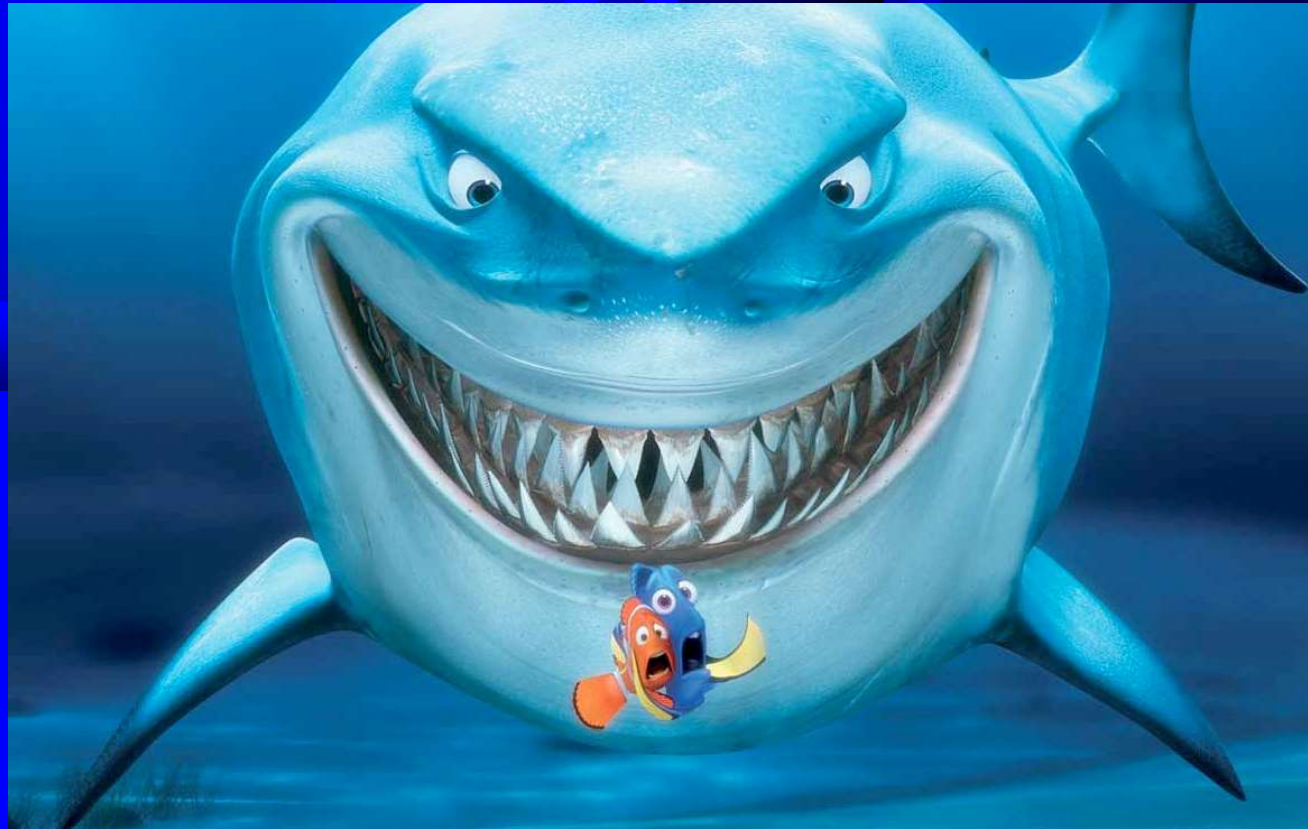
- Not aggressive
- Wait for prey
- Nocturnal
- Pinch & sting!
- NEURO toxic
- CYTO toxic



- TREATMENT:
- Ice / pain rx
- Supportive care
- *Anti-venom*



# Marine Stings



*and a bit about bites...*

# Hazardous Marine Life (broadly, 3 categories)

## 1. Sting

*Coral, Anemone, Jellyfish*

## 2. Puncture

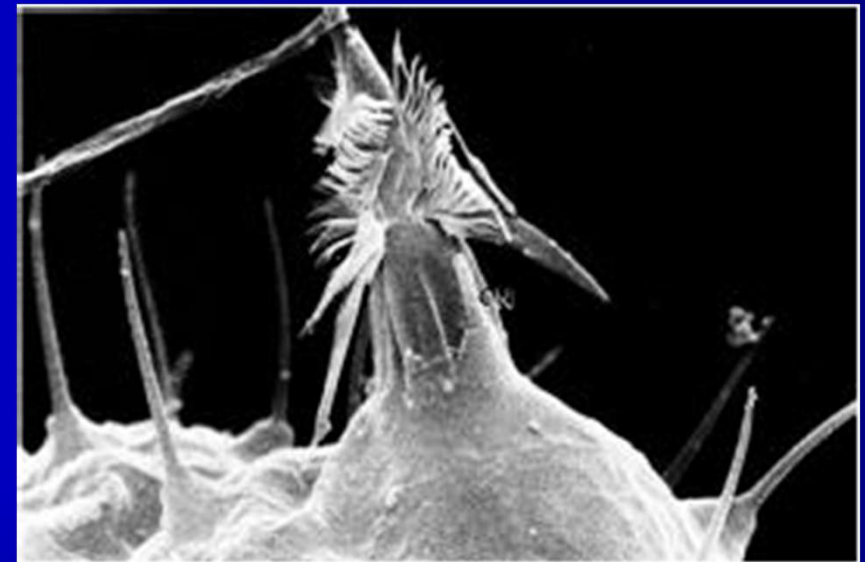
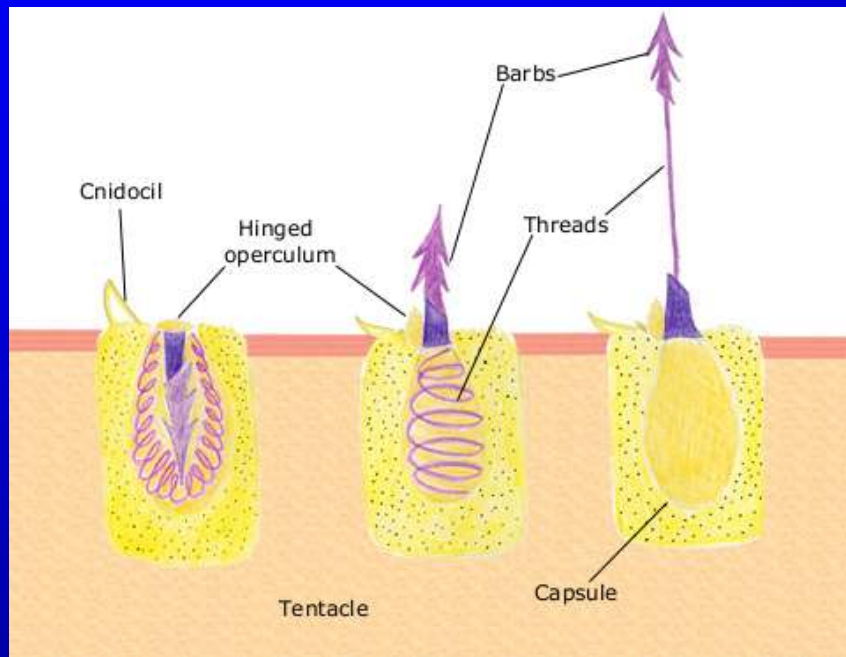
*Stingray, Spiny Fish, Urchin*

## 3. Bite / Envenom

*Octopus, Shark, Barracuda*

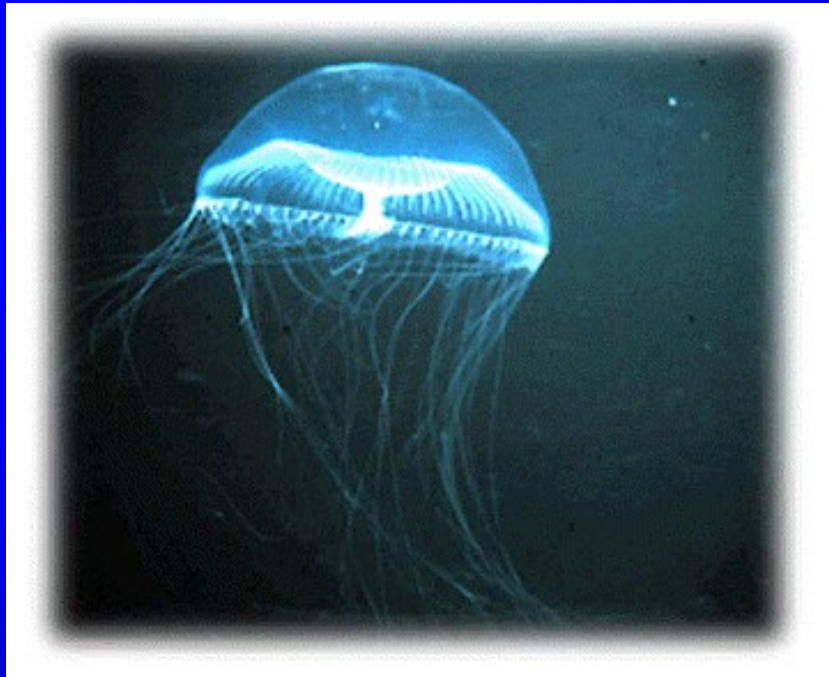


# Stinging Mechanism = Nematocyst



- Internal hydrostatic pressure = 200 atm
- Fired at 40,000 g !
- Typically neurotoxic





## *Hazardous Marine Life*

### **Coelenterates: “Jellyfish”**

- ❑ **Rinse with seawater (NOT freshwater)**
- ❑ **Immerse in HOT WATER**
- ❑ **Acetic acid 5% (vinegar)**
- ❑ **Shave to remove nematocyst**



# **+ VINEGAR**

**FOR USE ON MARINE STINGS  
POUR ON - DO NOT RUB !  
SEEK MEDICAL ATTENTION**



# Jellyfish Management Controversies

## Hot water vs. ice?

- Hot water immersion superior to ice packs for achieving clinically symptomatic pain relief at 10 and 20 minutes vs ice packs (1 trial)
  - Cochrane review 2013

## □ Vinegar or no vinegar?

- Vinegar recommended for box jelly fish and their smaller cousins, Irukandji
- Vinegar or Adolph's meat tenderizer may make skin appear worse or can stimulate the discharge and make pain worse



**Box jellyfish**



**Bluebottle jellyfish**

# *Hazardous Marine Life*

## Echinodermata: “Sea Urchins”

- Immerse in HOT WATER
- Remove embedded spines *carefully*
- Shave to remove pedicellariae
- “spine dye” may be misleading





# Bad Boys of the Deep ?

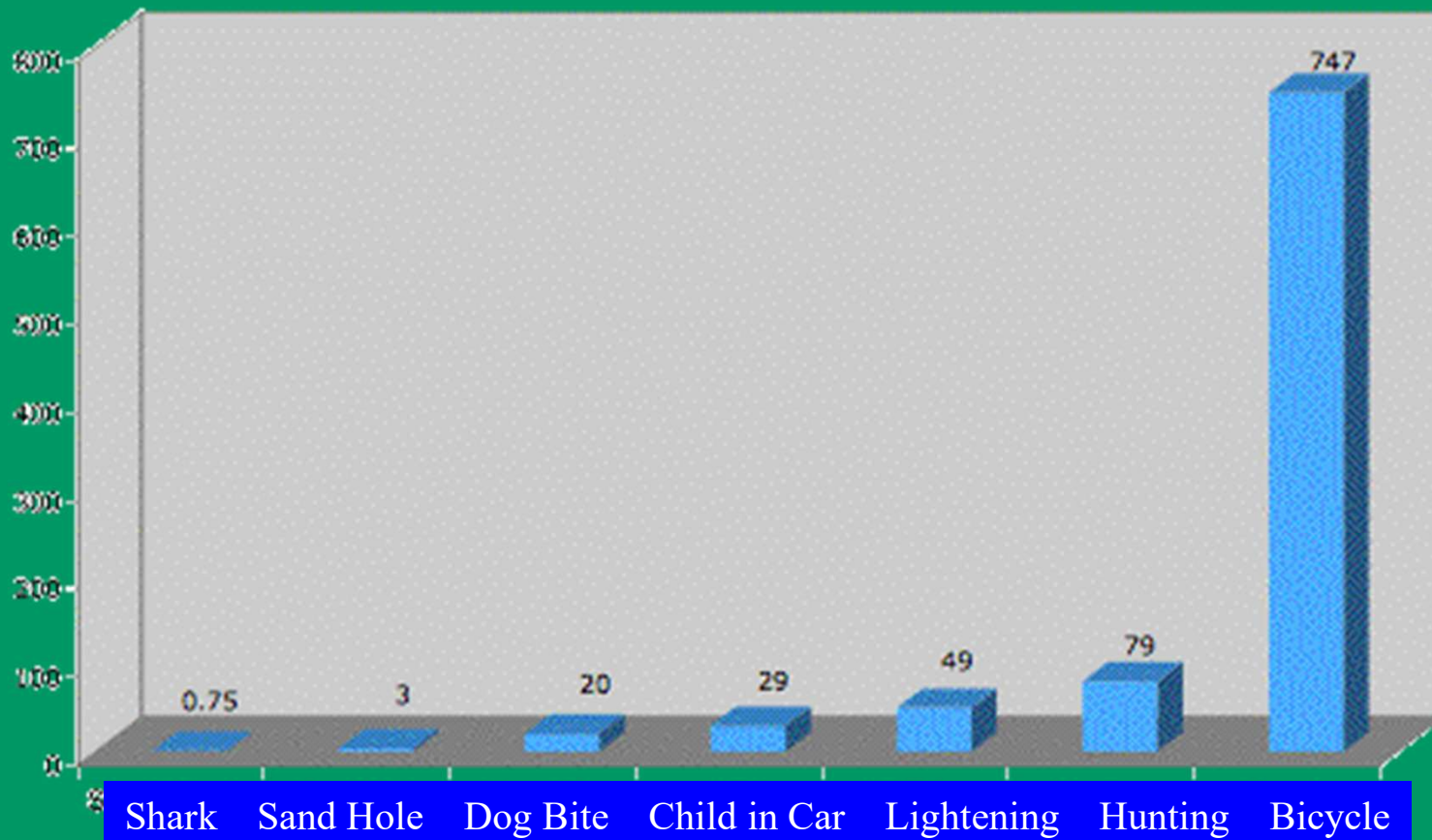


Mostly just bad reputation...



# Shark Bite Risk

Shark Attack Comparison  
Average Annual Fatalities, US, '94 - '05



1997 - 2006

1997 - 2006

# ***Hazardous Marine Life***



## **Marine “Bites”**

- **Standard “trauma” care**
- **Infection and foreign body risk**
- **Consider *Vibrio* & *Aeromonas* species**
- **Quinolones (e.g. ciprofloxacin), doxycycline, TMP-SMX**



# Summary – Critter Attacks

- Educate
- Look
- Look again
- Leave it alone
- Stay calm
- Transport
- Anti-venom

“I’ve yet to meet a traveler who has been bitten twice” - DAVID SHLIM



**Thank you!**



# Useful Resources

- Longbottom J et al. Global mapping venomous snakes Lancet 2018
- Williams DJ et al. Snakebite global response priorities PLOS NTD 2019
- Siefert SA et al. Snake envenomation NEJM 2022
- Santos MSV et al. Clinical and epidemiological aspects of scorpionism in the world: a systematic review. Wilderness Environ Med 2016
- Cegolon L et al. Jellyfish stings - review. Marine Drugs 2013
- Forrester JA et al. Human fatalities animals and insects USA WEM 2018
- Bhaumik S et al. Interventions for the management of snakebite envenoming. PLOS NTD 2020

