Lecture Series
Unique Infectious Diseases, Poisonings and Envenomations of the Southwest

- 14 Lectures; 1 hour
- CME provided
- Lectures are all archived on ATP
- Target audience: Emergency Room Physicians; Family Physicians, Internal Medicine physicians, EMT, nurses, medical students
Topics

**Human diseases due to:**

- Inhalation/Ingestion
  - Hantavirus
  - Coccidioidomycosis
  - Basidiobolomycosis
- Plant poisonings
  - *Datura*
  - Mescal
  - Brevetoxins
- Animal poisonings
  - Colorado river toad
  - Sting ray barbs
  - Ciguatera
  - Sea Urchin spines
- Bites
  - Tick bites: *Rickettsia rickettsia, Rickettsia parkeri, Rickettsia philipi*, TBRF, *B. burgdorferi*
• Animal bites: rabies
  Rattlesnake bite
  Gila monster bite
  Black widow
  Arizona brown recluse
  Kissing bug bites: Chagas disease
• Mosquito bites: WNF, WEE, *Dirofilaria immitis*
• Fly bites: tularemia (*Chrysops discalis*)
• Flea bites: plague
• Sandfly bites: Leishmaniasis
• Black fly bites: *Onchocerca lupi*
  *Paragonomus kellcotti*
• Stings
  Massive Bee attacks
  *Centruroides sculpturatus*
  Other scorpions, ant stings
Each Lecture

- Start with a description of an actual case familiar to the lecturer
- Discuss the pathogenesis of disease
- Discuss the pathogen or poison
- Discuss treatment
Acutely confused Medical Professor after a Trip to New Orleans enters the ER. History is always the key to the problem...

Stephen A. Klotz
Division of Infectious Diseases
Arizona Telemedicine Program
Professor (78-year-old) gives paper in a New Orleans, Louisiana conference on kissing bugs.

Returns to Tucson and the next day has watery stool and vomiting X 1; no other problems

A day later he is confused, unkept, undressed and staggering when walking; brought to ER by wife

At ER: afebrile; **Sodium 124; pulse 38; RR of 12**; complains of hot and cold intolerance; begging for blankets and then tossing them off; rude and cursing at employees
Case Study

Because of sodium level and bradycardia, placed in ICU.

Ate redfish and oysters at Felix’s 48 hours before. While leaving New Orleans ate grilled oysters at New Orleans airport before leaving.

Patient awoke that evening in ICU, was lucid and coherent and made diagnosis

Clue to diagnosis: the city where conference was held, food choices, mental confusion and heat and cold intolerance
**DIAGNOSIS**

Neurotoxic Shellfish Poisoning NSP

Toxin elaborated by *Karenia brevis* associated with “red tide”
NSP Clinical Syndromes: Ingestion

Latent time to symptoms .25-24 hours
Signs & Symptoms: torso neck & face erythema

- **Gastrointestinal:**
  1. nausea,
  2. vomiting,
  3. diarrhea,
  4. abdominal pain

- **Neurologic; more prominent**
  1. paresthesias (circumoral, hot& cold feeling and reversal),
  2. vertigo,
  3. incoordination,
  4. dilated pupils,
  5. convulsion
  6. bradycardia
  7. rare respiratory paralysis and death
  8. Personality changes, profound—patients have ended up in mental hospitals
Treatment

- Supportive, only
- Reports of long term, neurologic sequelae
- Water restriction for hyponatremia
- Observation of bradycardia
The Brevetoxin (PbTxs): Neurotoxic Shellfish Poisoning

- Ten BTxs are known; all are from red tide algal bloom of K. brevis.
- Very lipid soluble, **heat stable (grilled oysters)**.
- BTxs concentrate in bivalves.
- Route of exposure to BTxs is Ingestion or inhalation.
- Clinically important & most potent ones are BTx-1, 2, 3
- Ladder like structures of polyethers
What elaborates the Brevetoxins?

Typical Dinoflagellate: *Karenia brevis*
Karenia brevis life cycle:

Stage I: Initiation, germination of the cyst

Stage II: Growth in numbers

Stage III: Maintenance

Stage IV: Termination & dispersal
Routes of Exposure:

- **Ingestion**---Shellfish concentrate the toxins
- **Inhalation**
1. PbTxs in nerve, muscle, cardiac tissue binds, at site 5 of alpha subunit, enhancing opening & inhibits channel sodium channel closer. This causes continuous activation leading to paralysis and fatigue.

1. PbTxs in lower airway’s smooth muscle causes activation of cholinergic nerve fiber’s sodium channel leading to acetylcholine release, causing bronchialeea & bronchospasm.

2. PbTxs: additionally, is known to cause histamine release from the mast cells.
Red Tide in Florida

**Statewide Karenia brevis concentrations 10/26/2023 - 11/02/2023**

**Key for Results**

- **Red Tide in Florida**
- **Description**
- **K. brevis abundance**
- **Possible effects (K. brevis only)**

<table>
<thead>
<tr>
<th>Description</th>
<th>K. brevis abundance</th>
<th>Possible effects (K. brevis only)</th>
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<tbody>
<tr>
<td>NOT PRESENT - BACKGROUND</td>
<td>background levels of 1,000 cells or less</td>
<td>no effects anticipated</td>
</tr>
<tr>
<td>VERY LOW</td>
<td>&gt; 1,000 - 10,000 cells/L</td>
<td>possible respiratory irritation; shellfish harvesting closures when cell abundance equals or exceeds 5,000 cells/L</td>
</tr>
<tr>
<td>LOW</td>
<td>&gt; 10,000 - 100,000 cells/L</td>
<td>respiratory irritation; shellfish harvesting closures; possible fish kills; probable detection of chlorophyll by satellites at upper range of cell abundance</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>&gt; 100,000 - 1,000,000 cells/L</td>
<td>respiratory irritation; shellfish harvesting closures; probable fish kills; detection of surface chlorophyll by satellites</td>
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<tr>
<td>HIGH</td>
<td>&gt; 1,000,000 cells/L</td>
<td>as above, plus water discoloration</td>
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Longest documented red tide blooms*

- 12 months (1959–1960)
- 17 months (2004–2006)
- 18 months (1953–1955)
- 30 months (1994–1997)

*Based on observations of >100,000 *Karenia brevis* cells/L and periods of suspected continuance of red tide.