Ciguatera Shellfish Poisoning: a new ecotoxicological phenomenon related to marine Oscillatoriales (cyanobacteria) blooms?

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The well-known Ciguatera Fish Poisoning food chain

Carnivorous Humans

Coral reef

Gambierdiscus spp.

Herbivorous

Ciguatoxin

Yasumoto 2001

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Two eco-toxicological surveys

Location

Lifou

Slip construction

Toxic

Non-Toxic

Raivavae

Wharf

Toxic

Non-Toxic

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Two eco-toxicological surveys

1. Epidemiologic data => Symptoms of giant clam consumers

**LIFOU**
- Dizziness, cold sensation
- Diarrhoea, nausea, vomiting
- Muscular pain, headaches
- Weakness in the legs
- Inability to walk
- Itching, reversal of sensations

**RAIVAVAE**
- Severe itching
- Neuropathy of the lower limbs
- Blurred vision, dizziness
- Diarrhoea
- Myalgia, Inability to walk
- Tingling in the extremities
- Reversal of sensations

**Symptoms of Ciguatera intoxication**

- Strong alteration to taste
- Burning sensation of the tongue and the throat

**Symptoms of Paralytic shellfish intoxication**

- Feeling of paralysis
- Labored breathing
- Strong alteration to taste
- Burning sensation of the tongue and the throat

**Strong and atypical ciguatera intoxication**

Anne-Sophie KERBRAT

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Two eco-toxicological surveys

2. Environmental survey

Lifou
Hydrocoleum spp.

Raivavae
Oscillatoria spp.
Toxicity of marine filamentous cyanobacteria is still poorly explored.

June 2008, *Hydrocoleum lyngbyaceum*
3. Toxicological data

- **Benthic cyanobacteria**
  - Giant Clams
  - Herbivorous

**Two eco-toxicological surveys**

- Water-soluble
- Lipid-soluble

**Two types of activity**

- P-CTX-1B
- CTX-like activity

Two eco-toxicological surveys: some results

1. Lipid-fraction / RBA

<table>
<thead>
<tr>
<th>Location</th>
<th>Cyanobacteria Identification</th>
<th>Affinity values of Cyanobacteria extract</th>
<th>Affinity values of Giant clams collected in the same area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifou</td>
<td>Hydrocoleum lyngbyaceum April 2005</td>
<td>2.41 ± 0.11 µg eqv CTX-3C g⁻¹ of extract</td>
<td>7.95 ± 1.06 µg eqv CTX-3C g⁻¹ of extract</td>
</tr>
<tr>
<td>Raivavae</td>
<td>Oscillatoria bonnemaisonii. April 2007</td>
<td>2.32 ± 0.62 µg eqv CTX-3C g⁻¹ of extract</td>
<td>10.8 µg eqv CTX-3C g⁻¹ of extract</td>
</tr>
<tr>
<td>Raivavae</td>
<td>Oscillatoria bonnemaisonii. September 2007</td>
<td>9.4 ± 4.56 µg eqv CTX-3C g⁻¹ of extract</td>
<td>12.1 µg eqv CTX-3C g⁻¹ of extract</td>
</tr>
</tbody>
</table>

2. Water-soluble / GC-MS

CTX-like Toxins

Paralysing toxin: Anatoxin + Homoanatoxin
For the first time in marine Cyanobacteria
Ciguatera Shellfish Poisoning: A new intoxication?

Survey in *Bora Bora, Pr. Bagnis in 1967*

- An outbreak of “unknown” nature
- 33 inhabitants and animals were seriously intoxicated
- Fish area where giant clams were toxic

*Siguatera* (Cuba, 1787)
Proposition of a new food chain
« Ciguatera Shellfish Poisoning »

Carnivorous Humans

Coral reef

Cyanobacteria

Giant clam

G. t.

Herbivorous

Ciguatera Shellfish Poisoning

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Propositions for Ciguatera Assessment

• Toxic cyanobacteria
  (CTx-like toxins + Paralysing toxins)

• Toxic giant clams

• Toxic fishes

These new findings suggest that ciguatera risk assessment programs should now include the monitoring of both cyanobacteria of Oscillatoria genus in addition to the well-established ciguatera-causing Dinoflagellates.
Thank you for your attention.