Problems caused by seafood toxins in Vietnam

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Harmful effects from seafood toxins

- Health impact
- Economic impact
1. Toxic by either symbiotic bacteria or encoded in gene,
   - Puffer
   - Blue ring octopus
   - Goby fish
   - Snail
   - Horseshoe crab, xanthid crab...

2. Toxic by taking toxic organisms such as microalgae through feeding activity,
   - Fish (Ciguatera)
   - Bivalve (ASP, DSP, PSP...)

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Horseshoe crab *Carcinoscorpius rotundicauda*

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Number of patient</th>
<th>Fatality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2004</td>
<td>Can Gio, HCMC</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Jun 2004</td>
<td>Can Gio, HCMC</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2006</td>
<td>Ca Mau</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Oct 2007</td>
<td>Ba Ria – Vung Tau</td>
<td>2</td>
<td>2</td>
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Main symptom: Paralysis

**Figure 1-1** *C. rotundicauda*
(a) live specimen; (b) Soft tissues of female specimen

**Figure 1-2** Vung Tau - Sampling location
- TTX is the main toxin component in *C. rotundicauda*.
- Frequency of highly toxic specimen is high (83%).
Blue-ringed octopus *Hapalochlaena lunulata*

- **Bitten cases:**
- **Poisoning cases:**
  - 2004, Binh Thuan: 85 patients including 42 children (3 deaths).
  - May 2006, Khanh Hoa: 3 patients (1 death).
- **Main symptom:** Paralysis.

- **TTXs:**
  - 75 specimens: toxic (max: 1169.0 MU/g); 21 specimens: non toxic.
  - Difference of TTX toxicity in tentacles, cephalothorax and abdomen is not clear.

- **STXs:** toxicity: <3.0 MU/g.
**Goby Yongeichthys nebulosus**

**Poisoning case:** 07 May, 2003, Thua Thien - Hue: Several deaths of pets after eating goby

- **Toxin in** *Y. nebulosus* **is** TTX.
- **Toxicity:** 147.5 ± 76.8 MU/specimen (n=36).
- **100%** specimens are toxic including 22% of them show toxicity higher than 10.0 MU/g.
Case 1: 17 October 2006, in Quang Ngai: 3 patients (2 deaths)

Nassarius (Alectrion) papillosus TTXs: 70.0 MU/g (n=1)

Case 2: 17th December 2007, in Ninh Hai: 5 patients

Natica (Natica) fasciata TTXs and STXs: < 10.0 MU/g (n=7)

Case 3: 27 December 2007, Phan Thiet: 4 patients (1 deaths)

Nassarius (Alectrion) glans glans TTXs and STXs: < 10.0 MU/g (n=1)

Nassarius (Zeuxis) compus TTXs and STXs: < 10.0 MU/g (n=2)

Main symptom: Paralysis
**Marine puffers**

✓ **Poisonings:**
  Puffer poisoning: 15.1% of all food poisonings; mortalities: 42.9% of total mortalities by food poisonings (Number of the patients in 1999-2003: 737 persons including 127 mortalities).

✓ **Problems:**
   Local people still eat puffers because not all of cases caused poisoning.
   They use puffers to make fish sauce/salty dried fleshes.

Puffer product in fish port in Cat Ba, Hai Phong  
Home-processed product of salty dried puffer causing the poisoning for 8 patients (3 deaths) in 1 October 2004, in Nha Trang city
Some common marine puffer fish in Vietnam (Species name upper from left; Takifugu oblongus, Lagocephalus inermis, L. lunaris; middle from left; frL. suezensis, Torquigener gloerfelti, T. brevipinnis; lower from left; Arothron hispidus, A. nigropunctatus, Canthigaster valentine)
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Shellfish poisonings and their causative species in Vietnam:

- ASP, DSP and PSP: No official report on by consumption of shellfish in Vietnam (Lucky?).

- Toxic *Pseudo-nitzschia, Alexandrium, Dinophysis...* are known to distribute widely in Vietnam.

- ASP, DSP, PSP are highly potential occurrence in Vietnam.
Domoic acid accumulation case in Vietnam

- *Spondylus* spp. have been eaten by local people, and sometimes they talk about poisoning after consumption of *Spondylus* spp.
ASP (Amnesic shellfish poisoning) toxin contamination have been reported from several areas in the world. But no report from SEA.

DA in *Spondylus versicolor* from Vietnam was 18.93 ± 11.24 µg /g tissue (n = 10) (Takata *et al.*, 2009).

Consumption of *S. versicolor* is not safe.

*Spondylus* spp. are specific species to accumulate DA: appropriate for DA study.

DA producing organisms distributed widely in tropical areas.
Figure 6-3 Distribution of DA (%) (av. 0.99 ± 0.32 µg/g whole tissue; n=25) in different tissues of *S. versicolor* (n=25)
Toxic organisms in Vietnam:

- Causative toxin for poisoning cases: TTX.
- Toxicity varies in individuals and organs (puffers).
Other seafood poisonings in Vietnam

- Xanthid crabs (1998, Nhon Chau Isle, Quy Nhon): 2 patients (1 death): PSP toxins?

- Fresh water puffers poisoning (May 2004, Ben Tre): 5 patients (3 deaths): TTX?

- Snapper poisoning (May 2008, Binh Thuan): 85 patients including 42 children (3 deaths): CFP?
Other seafood poisonings and their causative species in Vietnam:

- DSP and PSP: No official report on by consumption of shellfish in Vietnam (Lucky?).
- Toxic *Alexandrium, Dinophysis*... are known to distribute widely in Vietnam.
How do seafood toxins influence human health?

- Self-processing by unknowledgeable local peoples
- Low living standards
- Uncontrolled local markets
- Lack of public awareness
- Not-well designed monitoring system
Puffer in post

Fish post in Cat Ba island, Haiphong province

*Lagocephalus lunaris, L inermis*
Estimated: 5 - 7 tons/day
Toxicity of some dangerous puffers

Ovary of *Torquigener gloerfelti* (Toxicity: av. 3710 MU/g)

*Lagocephalus inermis*: 4kg (Toxicity: 35 MU/g muscle)
Toxic food processed by patients and solve in market

Salty dried puffer
(Lagocephalus lunaris; av. 4760 MU/g)
(8 victims, 3 died on the fishing boat, Nha Trang, 2005)

Fresh-water puffer for fish gruel
(Carinotetraodon lorteri; av. 506 MU/g)
(5 victims, 3 died, Ben Tre, 2004)

Fish cake used puffer (Lagocephalus sp.)
(7 victims, Nha Trang 2005)
Uncontrolled market

Puffer???

Puffer fish cake???
Blue-ringed octopus???
(toxicity: 390 nM/g salivary gland)
Some toxic snails in Vietnam: From left, up to down: *Charonia tritonis, Nassasius conoidalis, Oliva cericea, Polinices didyma, Nassasius catus*, Tutufa bufo, Tubo chrysostomus, Tectus pyramis

*: Causative species for human poisonings in VN
<table>
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<th>Frequency of puffer catching:</th>
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| - Every day                  | 81.8%  
| - Sometimes                  | 18.2%  

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<th>Puffer catch/day/small boat:</th>
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| - < 25 kg                    | 61.4%  
| - 25 - 50 kg                 | 32.0%  
| - 51 - 100 kg                | 5.6%  
| - > 100 kg                   | 1.0%  

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<th>Knowledge about toxic puffer:</th>
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| - Yes                         | 97.2%  
| - No                          | 2.8%  

Interview result from fishermen (n=1918)
<table>
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<th>Selling ways:</th>
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<tbody>
<tr>
<td>- In local markets</td>
<td>95.7%</td>
</tr>
<tr>
<td>- For tourists</td>
<td>4.0%</td>
</tr>
<tr>
<td>- For export (to China, Korea and Campuchia)</td>
<td>0.3%</td>
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<th>Processing ways:</th>
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<tr>
<td>- Fresh</td>
<td>57.2%</td>
</tr>
<tr>
<td>- Dried (eating themselves &amp; selling)</td>
<td>13.9% (4.4% &amp; 9.5%)</td>
</tr>
<tr>
<td>- Cake (eating &amp; selling)</td>
<td>27.4% (17.6% &amp; 9.8%)</td>
</tr>
<tr>
<td>- Fish source</td>
<td>1.5%</td>
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<th>Why eat puffer?</th>
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<tr>
<td>- Longtime habit</td>
<td>62.9%</td>
</tr>
<tr>
<td>- Did not know it is puffer</td>
<td>3.8%</td>
</tr>
<tr>
<td>- Self believe on their processing</td>
<td>19.6%</td>
</tr>
<tr>
<td>- Difficult to say NO</td>
<td>13.7%</td>
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Effort to protect human life from toxic aquatic animals

Institute of Oceanography
Academic studies, new researches

Ministry of Fishery
Management, monitoring system

Ministry of Medicine
Public awareness, Protection, treatment
Materials for campaign in Vietnam
Thank you!