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LETTER TO THE EDITOR

Respiratory impairment in four patients associated with exposure to palytoxin containing coral

To the Editor:

Palytoxin is a highly toxic neurotoxin and can lead to severe human illness, causing gastrointestinal symptoms, myalgia, muscle cramps, respiratory and cardiac problems, and even death.^{1,2} We describe four cases of suspected palytoxin exposure due to inhalation after pouring hot water over a piece of coral with zoanthids (*Palythoa heliodiscus*) of ~75 cm² taken out of an aquarium in a room of ~100 m³.

After Patient 1 poured hot water over the coral, all patients developed a cough in 1–2 min and after 5–10 min also developed dyspnoea. There was no visible fume or unusual smell in the room. The patients entered the hospital with dyspnoea, cough, chest pain, tachycardia, and nausea approximately 45 min after the cleaning of the coral had begun. The estimated exposure time of Patients 1–4 was 20, 15, 5, and 10 min, respectively and all were in that timeframe within 6 metres of the coral. Patient characteristics and laboratory tests are shown in Table 1. None of the patients had significant pre-existing medical problems or a history of smoking. Chest radiograph and ECG showed no abnormalities. Arterial blood test revealed hypoxia with similar levels in Patients 1 and 2. Leucocytosis was seen in all patients. Further, routine blood parameters were within the normal range, except elevated creatine-kinase (Patient 1), neutrophils (Patients 3 and 4) and C-reactive protein (CRP) (Patients 2–4). Treatment was supportive, because a specific antidote is lacking, with oxygen therapy and standard dosages acetaminophen and diclofenac. Within 36 h the laboratory tests normalised and also physical signs, except for dyspnoea in Patients 1 and 2. Patients 1–3 were discharged out of the hospital after 36 h and Patients 1 after 72 h. After 3 months, Patients 1 and 2 still experienced dyspnoea and fatigue and therefore could not work for 3 and 1 month, respectively.

For confirmation of the presence of palytoxin a sample of zoanthid was taken out of the home aquarium for analysis by Cimminiello et al.³ The zoanthid contained high levels palytoxin and 42-hydroxy palytoxin (509 µg and 23 µg per 0.5 g wet zoanthid, respectively).

Palytoxin causes an impairment of the Na/K-ATPase pump, resulting in its conversion into a non-selective open channel leading to Na-efflux and Ca-influx and the release of neurotransmitters and myocyte contraction.² Also, palytoxin has an irritative and inflammatory potential, explaining the febrile syndrome, leucocytosis, and elevated CRP.² Palytoxin is heat-stable, but so far not detected in aerosols for definitive prove of palytoxin per inhalation.⁴

The near immediate onset of symptoms in all four patients exposed makes an infectious aetiology very unlikely. Although

Table 1. Patient characteristics and laboratory tests of the four patients at hospital admission.

Patient	1	2	3	4
Gender	M	F	M	F
Age (years)	40	44	17	14
Body temperature (°C)	39.1	38.1	39.6	38.1
Heart rate (beats per minute)	111	97	145	130
pH [¶]	7.40	7.40	NA	NA
pCO ₂ (kPa) ^λ	4.9	4.7	NA	NA
HCO ₃ (mmol/L) ^μ	22.4	21.2	NA	NA
pO ₂ (kPa) ^σ	9.2	41.3	NA	NA
Leucocytes (× 10 ⁹ /L) [#]	15.0	19.3	33.5	18.4
Neutrophils (× 10 ⁹ /L)*	NA [□]	NA [□]	31	15
CRP (mg/L) ^δ	< 1	28	228	162
CK (U/L) [°]	215	< 170	< 170	< 170

[¶]normal range: 7.35–7.45; ^λnormal range: 4.7–6.4 kPa; ^μnormal range: 22–28 mmol/L; ^σnormal range: 10.0–13.3 kPa; [#]normal range: 4–10 × 10⁹/L; ^{*}normal range: 2.00–7.20 × 10⁹/L; ^δCRP, C-reactive protein: normal range < 5 mg/L; [°]CK, Creatine-kinase: normal range < 200 U/L; [□]NA: not analysed.

all criteria for a palytoxin intoxication per inhalation are present,² other unidentified toxins cannot be excluded similar to other described cases.^{1,5,6} A case with positive confirmation of palytoxin in zoanthids has been described by Deeds and Schwartz.¹ Leucocytosis and raised CRP have been reported in other cases.^{5,6}

When taking into account the time of exposure and the short distance to the coral Patients 1 and 2 had the highest palytoxin exposure and experienced a much longer recovery period compared with the other two patients, suggesting a dose-dependent toxicity. Other possible factors influencing the recovery period can be age-related differences between the parents and their children in the toxicokinetic and -dynamic characteristics of palytoxin.

Prolonged respiratory complications have not been described before to our knowledge.

Aquarists working with zoanthids need to be alert about the potential severe consequences of palytoxin exposure.

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Declaration of interest

The authors report no declarations of interest. The authors alone are responsible for the content and writing of the paper.

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