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Palytoxin Poisoning via Inhalation in Pediatric Siblings

Martha M. Rumore
Touro College of Pharmacy, martha.rumore@touro.edu

Blaine M. Houst

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CASE REPORT OPEN ACCESS

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Introduction: Several cases of palytoxin poisoning have occurred during cleaning of aquariums. **Case Report:** We report a case of palytoxin inhalational toxicity in pediatric siblings following secondary exposure to vapors from cleaning of an aquarium containing Zoanthids. Symptoms included fever, tachycardia, leukocytosis and elevated lactic dehydrogenase. Both patients received supportive treatment in the pediatric intensive care unit and were discharged after 48 hours. Symptoms also occurred in children's parents including cleaning attendant.
Conclusion: Herein, we present a rare case of inhalational toxicity from palytoxin.

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Keywords: Palytoxin, Pediatric, Inhalation, Aquarium, Zoanthids

Martha M Rumore[1], Blaine M Houst[2]
Affiliations: [1]Pharm. D., J. D., F. A. Ph. A, Assistant Director of Pharmacy, Clinical & Educational Services, Pharmacy Dept., Cohen Children's Medical Center, North Shore LIJ, New Hyde Park, NY and Professor, Pharmacy & Health Outcomes, Touro College of Pharmacy, New York, NY, USA; [2]Pharm.D, Drug, Information Specialist, Pediatric Medication Resource Center, Pharmacy Dept., Cohen Children's Medical Center, North Shore LIJ, New Hyde Park, NY, USA.
Corresponding Author: Martha M. Rumore, Pharm.D.,J.D.,F.A.Ph.A, Assistant Director of Pharmacy, Clinical & Educational Services, Pharmacy Dept., Cohen Children's Medical Center, North Shore LIJ, New Hyde Park, NY and Professor, Pharmacy & Health Outcomes, Touro College of Pharmacy, New York, NY, USA; 01 718 470-8643, Fax: 470-3985; Email: merumore@nshs.edu

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INTRODUCTION

Zoanthid corals are often found in sea water aquaria. Touching the zoanthid corals results in palytoxin poisoning in patients with skin injuries and also through intact skin [1, 2]. Several cases of palytoxin poisoning have occurred during cleaning of aquarium by inhaling a water aerosol where toxin is dissolved [3, 4]. Herein, we report a case of inhalational toxicity affecting pediatric patients, as well as involving multiple individuals following cleaning of an aquarium. To our knowledge, this represents the first case of elevated lactic dehydrogenase (LDH) following inhalational exposure and the third case of leukocytosis.

CASE REPORT

A three-year-old boy and his two-month-old sister presented to the emergency department, both febrile after vomiting at home. The three-year-old also presented with tachycardia (heart rate 120 beats per minutes), cough and sleepiness whereas the two-month-old did not have cough, the cough reflex is unreliable at this age. Both patients had no known allergies. Since the children's parents were also ill with vomiting and a feeling of being hungover, an initial diagnosis of unspecified food poisoning was made.

The symptoms occurred after their aquarium attendant washed the coral in the tank with hot water. A short while after, the parents were both vomiting

and felt hungover while the children both vomited and spiked temperatures. The family received a call by the tank company three hours after the attendant left, were informed that the attendant was in emergency department with similar symptoms, and advised to seek medical treatment. At that point, palytoxin poisoning was suspected; both children were ultimately admitted to the pediatric intensive care unit (PICU).

On admission, chest X-rays and electrocardiograms of both the children were normal and oxygen saturation was 97% for both. Upon examination, both children showed leukocytosis and elevated LDH on blood analysis including elevated white blood cells. White blood cells of three-year-old was 34,000/μL and LDH levels was 331 U/L whereas white blood cells of two-month-old was 34,400/μL and LDH levels was 507 U/L (normal range 135–225 U/L). Laboratory examination of the three-year-old boy also revealed the following: elevated serum phosphorus 4.9 mg/dL, creatine kinase 78 U/L (normal 30–200 U/L), proteinuria 10 mg/dL. Alkaline phosphatase and all other laboratory values were normal.

The two-month-old female developed symptoms earlier than her brother and was considered more sick. Her laboratory values were more elevated than her brother. Her laboratory examination revealed the following: serum phosphorus 5.8 mg/dL, potassium 5.5 mmol/L, creatine kinase 169 U/L, aspartate aminotransferase/alanine aminotransferase (AST/ALT) (57/50 U/L) (normal 0–31 U/L), proteinuria 20 mg/dL. Mild metabolic acidosis was present— urine pH 6.5, blood pH 7.36, bicarbonate 17 mmol/L. The urine was hazy with trace blood. The patient was tachycardic (heart rate 156 beats per minutes) and hypotensive (blood pressure 102/65 mmHg). An echocardiogram on the two-month-old girl showed no findings. For both patients, serial extended monitoring of electrolyte levels was conducted.

Supportive therapy was given during the hospital stay, and the complete blood count and metabolic panels began to normalize. Both children received hydration (D5 ½ NS at 50 mL/hr); a one-time dose of acetaminophen suspension was administered to the three-year-old boy for a fever (100.4°F). The boy also received calamine lotion every 8 hours and diphenhydramine cream 1% for mosquito bites.

Within the next 24–48 hours, some of the laboratory values normalized while others remained elevated. The three-year-old was discharged 48 hours after admission with white blood cell 24,800/μL, creatine kinase 39 U/L, and LDH 253 U/L whereas the two-month-old was discharged at the same time with white blood cell 8,700/μL, creatine kinase 115 U/L and mildly elevated LDH 285 U/L.

Both children were discharged from the hospital within 48 hours.

DISCUSSION

Currently, there are no restrictions on the importation of toxic marine organisms into the United States if they are not ingested. Records regarding Zoanthidea are also not required. In some cases, Zoanthidea are not purchased at all, but are merely contaminants growing on rock or coral (e.g. frags). Recently, specimens of Zoanthids collected from home aquarium stores were analyzed and found to be highly toxic with palytoxin [5]. Palytoxin ($C_{129}H_{223}N_3O_{54}$), first isolated in 1971, is one of the largest and most complex natural products and is the second deadliest toxin known to man with an LD_{50} of 300 ng/kg in mice, 2 mg of toxin could kill 300,000 mice [5–7]. A toxic dose in humans may be about 4 μg. However, there are no reliable quantitative data on acute toxicity in humans. In our case, both identification of the toxin and quantification of levels were not performed, and palytoxin was implicated based on the exposure to Zoanthids and clinical symptomology. Palytoxin is one of the only marine toxins that are toxic to humans via ingestion, inhalation or dermal exposure. The toxin is heat stable and boiling or hot water used in cleaning aquaria does not inactivate the toxin.

Palytoxin binds to Na, K-ATPase, resulting in transformation of the sodium pump into a non-specific ion channel for monovalent cations causing a wide spectrum of secondary pharmacological actions [8]. More specifically, an increase in sodium may stimulate calcium-independent superoxide anions and oxidative stress, leading to cellular death [9]. The toxicity can be severe affecting multiple organ systems and takes place after a short-time of exposure at very low concentration. Clinically, patients can develop paresthesia, hypertension, dysgeusia, nausea, vomiting, diarrhea, rhabdomyolysis, cardiac dysrhythmias, respiratory depression, coma and death [10, 11].

Most cases involving aquarium Zoanthids have involved dermal exposure [1, 2, 12, 13]. While inhalational toxicity from marine aerosols is well known, the first case of inhalational toxicity from aquaria was reported in 2008, a second case was reported in 2010, and a third case in 2012 [3, 4, 14, 15]. This case report represents the fourth case of inhalational toxicity incidental to aquarium Zoanthids.

Very few data is available regarding inhalational toxicity. In 2003, 2006 and 2008 outbreaks of inhalational toxicity from blooms of algae occurred in Europe and the Mediterranean sea. All those affected needed medical attention for high fever, coughs and wheezing [16, 17]. Therefore, exposure to aerosolization results mostly in respiratory illness, fever, mild dyspnea, bronchoconstriction, cough, sore throat, headache, rhinorrhea, lacrimation, expectoration, myalgia, arthralgia, dermatitis, odynophagia, fatigue, dry throat and, occasionally, conjunctivitis. There are anecdotal reports in online marine aquarium forums of individuals poisoned via inhalation from cleaning organisms or

aquaria under steaming water. However, there are only a few published case reports of inhalational palytoxin toxicity from exposure to aquarium Zoanthids. The cases are summarized in Table 1.

In our case, the cleaning attendant became sick first, followed by the parents, and then the two children. The parent's complaint of feeling hungover is consistent with previous reports of poisoning from contact with aquarium Zoanthids. In one case, the patient exhibited dizziness, slurred speech, and glassy eyes [1]. Clearly, the symptoms in the adults in this case were of lesser severity than that in the children. Additionally, the two-month-old female developed symptoms earlier than her brother and was considered more sick. This would indicate greater susceptibility. However, the paucity of reported cases in children does not permit a comparison of inhalational toxicity from palytoxin in adults and children.

Creatine kinase levels of approximately 1000 U/L are suggestive of rhabdomyolysis. Creatine kinase levels were normal in the three-year-old, but mildly elevated in the two-month-old. However, elevated LDH in our patients may be indicative of mild rhabdomyolysis which was asymptomatic. Rhabdomyolysis is one of the most dangerous complications of palytoxin poisoning because it can lead to acute renal failure. Both patients also had hyperkalemia which is an early and fast-rising manifestation of rhabdomyolosis and mild hyperphosphatemia.

While all the cases were presumptive, the appearance of symptoms in five individuals simultaneously after cleaning an aquarium is highly suggestive of palytoxin toxicity.

Although animal studies have shown that vasodilators, such as papaverine and isosorbide dinitrate, can be used as antidotes if injected directly into the heart immediately following exposure [18], there is no specific antidote for palytoxin poisoning. Treatment is supportive. Both patients received hydration and were closely monitored in the PICU.

Table 1: Summary of Published Case Reports of Inhalational Palytoxin Toxicity.

Snoeks and Veenstra, 2012	4 individuals- husband, wife, twins Aquarium- attempted Zoanthid removal with boiling water Symptoms- fever, hypotension , metallic taste, nausea, headache, shivering, muscle cramps, leukocytosis, elevated CRP
Deeds and Schwartz, 2010 (occurred 2007)	1 case- Aquarium- attempted Zoanthid removal with boiling water Symptoms-within 20 minutes- rhinorrhea, coughing; within 4 hours- difficulty breathing, lightheadedness, chest pain, bronchial inflammation and bronchoconstriction, temperature not reported. Lab- No *creatine phosphokinase* levels reported Treatment- antihistamine, inhaled corticosteroid, analgesic, cough suppressant Two weeks post-exposure- bronchial inflammation; bronchoconstriction
Majilesi, 2008	1 case- Aquarium-attempted Zoanthid removal boiling water Symptoms- shortness of breath, chest pain, tachycardia, BP 140/80 mmHg, afebrile, respiratory rate 24, 100% oxygen saturation, wheezing, EKG-sinus tachycardia Chest X-ray- no infiltrates or pneumothorax Lab- Metabolic panel and cardiac enzymes were normal; leukocytosis (WBC 21,000/μL) Treatment- nebulized albuterol Recovery after 48 hours

CONCLUSION

Zoanthids are commonly sold by pet stores and found in home aquariums. Precautions should be taken as palytoxin can travel in water vapor and cause poisoning by inhalation. Cases of palytoxin toxicity via inhalational route, while rare, do occur. Exposure is characterized by vomiting, leukocytosis, elevations in lactic dehydrogenase, sometimes creatine kinase, and a febrile syndrome.

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Author Contributions

Martha M Rumore – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Blaine M Houst – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

REFERENCES

1. Hoffmann K, Hermanns-Clausen M, Buhl C, et al. A case of palytoxin poisoning due to contact with zoanthid corals through a skin injury. Toxicon 2008;51(8):1535–7.
2. Nordt SP, Wu J, Zahller S, Clark RF, Cantrell FL. Palytoxin poisoning after dermal contact with zoanthid coral. J Emerg Med 2011;40(4):397–9.
3. Deeds JR, Schwartz MD. Human risk associated with palytoxin exposure. Toxicon 2010;56(2):150–62.
4. Snoeks L, Veenstra J. [Family with fever after cleaning a sea aquarium]. Ned Tijdschr Geneeskd 2012;156(12):A4200.
5. Deeds JR, Handy SM, White KD, Reimer JD. Palytoxin found in palythoa sp. Zoanthids (anthozoa, hexacarallia) sold in the home aquarium trade. PLoS ONE 2011;6(4):e18235.
6. Moore RE, Scheuer PJ. Palytoxin: a new marine toxin from a coelenterate. Science 1971;172(3982):495–8.
7. Kaul PN, Daftari P. Maine pharmacology: bioactive molecules from the sea. Ann Rev Pharmacol Toxicol 1986;26:117–42.
8. Artigas P, Gadsby DC. Na+/K+-pump ligands modulate gating of palytoxin-induced ion channels. Proc Natl Acad Sci USA 2003;100(2):501–5.
9. Pelin M, Zanette C, De Bortoli M, et al. Effects of the marine toxin palytoxin on human skin keratinocytes: roles of ionic imbalance. Toxicology 2011;282(1-2):30–8.
10. Okano H, Masuoka H, Kamei S, et al. Rhabdomyolysis and myocardial damage induced by palytoxin, a toxin of blue humphead parrotfish. Internal Med 1998;37(3):330–3.
11. Shinzato T, Furusu A, Nishino T, et al. Cowfish (Umisuzume, Lactoeria diaphana) poisoning with rhabdomyolysis. Intern Med 2008;47(9):853–6.
12. Moshirfar M, Khalifa YM, Espandar L, Mifflin MD. Aquarium coral keratoconjunctivitis. Arch Ophthalmol 2010;128(10):1360–2.
13. Steel DH. Dead man's finger' keratoconjunctivitis. Br J Ophthalmol 1993;77(1):63.
14. Tichadou L, Glaizal M, Armengaud A, et al. Health impact of unicellular algae of the Ostreopsis genus blooms in the Mediterranean Sea: experience of the French Mediterranean coast surveillance network from 2006 to 2009. Clin Toxicol (Phila) 2010;48(8):839–44.
15. Majilesi N, Su MK, Chen GM, Lee DC, Greller HA. A case of inhalational exposure to palytoxin. Clin Toxicol 2008;46:637.
16. Ciminiello P, Dell'Aversano C, Fattorusso E, et al. The Genoa 2005 outbreak. Determination of putative palytoxin in Mediterranean Ostreopsis ovata by a new liquid chromatography tandem mass spectrometry method. Anal Chem 2006;78(17):6153–9.
17. Barroso Garcia P, Rueda de la Puerta P, Parron Carreno T, Marin Martinez P, Gullen Enriquez J. [An epidemic outbreak with respiratory symptoms in the province of Almeria [Spain] due to toxic microalgae exposure]. Gac Sanit 2008;22(6):578–84.
18. Wiles JS, Vick JA, Christensen MK. Toxicological evaluation of palytoxin in several animal species. Toxicon 1974;12(4):427–33.

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