



Blue Ridge Poison Center's

Tox Talks

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TETRODOTOXIN POISONING

DOES YOUR FACILITY HAVE TELEMEDICINE?

The Blue Ridge Poison Control Center offers CME-accredited toxicology lectures through telemedicine. To request a topic, schedule a lecture for your staff, or more information contact Heather Collier: 434-924-5185 or HLC8E@virginia.edu.

THE UVA CENTER OF CLINICAL TOXICOLOGY associated with the Blue Ridge Poison Center manages over 500 patients each year on site in the University of Virginia Health System - from outpatient clinic visits to critically ill inpatients managed in our pediatric and adult intensive care units. In addition, over 2,000 requests are made each year for consultation with our physicians from other healthcare facilities by phone or telemedicine. Our Boarded Medical Toxicologists are internationally known for the expertise in the care of poisoned patients. Call 1-800-222-1222 24 hours a day, every day. [Cell users: 1-800-451-1428]

IN CHARLOTTESVILLE

Reminder: At University of Virginia Hospital, the first Wednesday of every month features toxicology Grand Rounds. For more information, contact Heather Collier: 434-924-5185 or HLC8E@virginia.edu

Register to receive this newsletter via email:
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CASE: A 30 year old male presents to the emergency department about four hours after eating a small piece of a seafood “delicacy” a friend brought from Japan. He reported that 15 minutes after ingesting the fish he noticed tingling of his tongue and lips, followed by a floating sensation, chest tightness, nausea and vomiting. This was followed by progressive weakness particularly in his legs which worsened to the point he could not walk, prompting his wife to call 911. What type of fish was he given? What toxin was he exposed to and how does it work? How should he be treated?

Tetrodotoxin (TTX) is best described following ingestion of *Fugu*, or puffer fish. *Fugu* is considered a delicacy in some parts of the world, especially Japan. TTX is found in other species of the order *Tetraodontidae*, which includes the toad fish, blow fish, balloon fish, porcupine fish and puffer fish. These fish contain varying amounts of TTX, with the highest concentrations found within the liver, ovaries, intestines and skin. TTX has also been found in other animals, including certain mollusks, the horse-shoe crab, the Californian newt, and the blue ringed octopus. Despite legislation addressing *fugu* preparation and marketing that has led to a decrease in the numbers of deaths from *fugu*, tetrodotoxin poisoning continues to be encountered owing to the sale by unlicensed cooks and unskilled preparation of puffer fish.

TTX poisoning has been encountered throughout history. One of the earliest recorded depictions of poisoning due to TTX occurred by Captain James Cook on September 7, 1774:

“Without the least suspicion of it’s being of a poisonous quality we had ordered it for supper... only the Liver and Roe was dressed of which the two Mr. Fosters and myself did but taste. About 3 or 4 o’clock in the morning we were seized with an extraordinary weakness in all our limbs attended with a numbness or sensation like to that caused by exposing one’s hands or feet to a fire after having been pinched by a frost, I

almost lost the sense of feeling nor could I distinguish between light and heavy bodies, a quart pot full of water and a feather was the same in my hand.”

TTX is heat stable and is not damaged by freezing. TTX binds to and blocks sodium channels found on excitable tissues such as nerves and muscle. This inhibition of sodium entry through these ion channels renders these tissues nonfunctional.

The severity and delay of symptom onset and speed of symptoms varies, depending on the amount of TTX ingested. Paresthesias are common and typically the first symptom to be reported, usually beginning within an hour after ingestion. Paresthesias initially affect the tongue, lips, and mouth, and progress to involving the extremities. Gastrointestinal symptoms may be seen and include nausea and vomiting, and less often diarrhea. Muscle weakness, headache, ataxia, dizziness, urinary retention, floating sensations, and feelings of doom may occur. If enough toxin has been ingested an ascending flaccid paralysis can develop. Other reported effects include sweating, difficulty swallowing and speaking, pleuritic chest pain, dilated pupils, seizures, bradycardia, hypotension, and heart blocks. Death can occur within hours secondary to respiratory muscle paralysis or cardiac dysrhythmias. Clinical effects in the mildest of cases resolve within hours, whereas the more severe cases may not resolve for days.

The diagnosis is accomplished by observing symptoms consistent with TTX toxicity along with a history of eating a causative fish. Confirmation of TTX poisoning in human urine and/or blood samples can be performed, using high-performance liquid chromatography with tandem mass spectrometry detection methods. TTX is rapidly metabolized and primarily excreted through the urine. Therefore, urine analysis is the preferred method. It is important to remember that the diagnosis is made on clinical observations and laboratory confirmation will not be available to help with treatment decisions.

There is no specific antitoxin against TTX. Therefore, treatment of poisoning is largely supportive. Symptomatic patients should be admitted to the hospital for observation until peak effects have passed. These patients must be carefully observed for progression of muscle weakness for at least 24 hours. Patients who become weak enough to have their respiration affected should be intubated and placed on mechanical ventilation. Vasopressor support may be necessary for hypotension refractory to intravenous fluids. Atropine has been used for symptomatic bradycardia.

The patient was admitted for observation and initially treated with intravenous fluids. Over the next 8 hours his muscle weakness progressed until he developed respiratory insufficiency requiring endotracheal intubation. The patient gradually recovered muscle strength and was able to be extubated on day three and made a full recovery. This case illustrates that although tetrodotoxin is a potentially deadly poison, with recognition of the symptoms, close observation and appropriate supportive care patients can make a full recovery.

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