

Always Cook Your Boba

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A 45-year-old man with an unremarkable medical history presented with right-sided facial spasm and cheek swelling.

Case

A 45-year-old Chinese man with no known medical history presented to the ED with right-sided facial spasm and cheek swelling, which began immediately after he bit into a piece of taro root, approximately 2 hours prior to presentation. The patient stated that the root was an ingredient in a soup that a relative had made. According to the patient, after biting into the root, he immediately experienced a burning pain on the right side of his mouth. He further noted that he swallowed less than two bites of the root and stopped eating because the act of chewing was too painful.

Initial vital signs at presentation were: blood pressure, 140/100 mm Hg; heart rate, 84 beats/min; respiratory rate, 14 beats/min; and temperature, 97.6°F. Oxygen saturation was 98% on room air. The patient's physical examination was remarkable for pain upon opening the mouth, as well as right-sided cheek and lip swelling and tenderness. The tongue and oropharynx were not erythematous or swollen. The patient was only able to speak in short sentences, secondary to oropharyngeal pain, but he was in no respiratory distress. No urticaria,

pruritus, wheezing, or stridor was present.

During the patient's workup, his 40-year-old wife also presented to the same ED for evaluation of burning pain and spasm on the left side of her mouth, which she stated also developed immediately after she bit into a piece of taro root contained in the same soup as that ingested by the patient.

The wife's vital signs were unremarkable, and she was in no respiratory distress. Her physical examination was remarkable only for left-sided cheek and lip swelling and tenderness, associated with an erythematous oropharynx and pain with speaking.

What is taro? What are the manifestations of taro toxicity?

Taro commonly refers to plants from the *Araceae* family, usually *Colocasia esculenta*.¹ Taro is ubiquitous in Southern Asia and Southeast India. It is a widely naturalized and perennial tropical plant primarily grown as a root vegetable, and is a common flavor in boba (bubble) tea. All members of *Araceae* contain calcium oxalate crystals in the form of raphides, sharp needle-shaped crystals packaged in idioblasts and contained within the waxy leaf.² Pressure on

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the idioblasts, such as from mastication, triggers the release of the raphides. The needles pierce the surface of any tissue with which they come into contact, creating a gateway for proteolytic enzymes to enter the consumer.³ The leaves and root of *Araceae* must be cooked before eating to inactivate the raphides.

Oral exposure to uncooked taro leaves or taro root can result in mouth irritation and swelling that can progress to angioedema and airway obstruction. Although the traditional method of removing taro raphides is to soak the root in cold water overnight,^{4,5} this does not fully remove all of the raphides. Instead, taro root should be thoroughly cooked in boiling water to draw-out oxalates from the root into the cooking water, which must then be discarded. Consuming taro with warm milk also reduces the effect of the oxalates by about 80%.⁶

Many other plants of the *Araceae* family, such as *Dieffenbachia* (dumbcane), share similar toxicity and are commonly kept in the home and office.

Patients with oral exposure to taro may experience a delayed (also termed biphasic) anaphylactic reaction, ie, the development of anaphylactic symptoms more than 4 hours after the inciting event. Delayed anaphylaxis is distinct from delayed hypersensitivity, though both may be immunoglobulin E-mediated. Delayed hypersensitivity presents later (2-14 days) and with less immediately life-threatening effects, most commonly dermatitis (eg, poison ivy dermatitis).

While both of the patients in this case presented with mild symptoms, life-threatening angioedema of the oropharynx, anaphylaxis, and hypocalcemia have been reported^{7,8} and should be considered in any symptomatic patient with exposure to taro.

What is the differential diagnosis of plant-related mouth pain?

The oral mucosa is composed of superficial layers of mucin and epithelial cells that lie over the dermis and connective tissue.



Local immune cells, including mast cells and Langerhans cells, reside in the deeper layers. The differential diagnosis of plant-based mouth pain can be divided into mechanical, chemical, and thermal causes.

Mechanical Causes. Causes of mechanical plant-based oral pain include structural damage when foreign matter, such as barbs, sharp leaves, or hard seeds, pierce the layers of the oral mucosa.

Chemical Causes. Chemical-related causes of oral pain include caustic ingestion, for example from detergents or cleaning agents that contaminate the broth. *Araceae*, such as taro or arum, have sharp calcium oxalate crystals tipped with phospholipases and proteases that cause mechanical pain on piercing mucous membranes, and chemical pain by enzymatically degrading epithelium and mucosa. Both chemical and mechanical irritation can lead to an inflammatory response. Raw taro can cause irritant contact stomatitis as the raphides pierce the oral mucosa. It can also cause allergic stomatitis if antigens related to the phospholipases or proteases are presented to Langerhans cells.⁹

Thermal Causes. The hot temperature of the ingested broth could cause thermal

injury, but the injury is likely to be more diffuse.

How common is taro exposure, and how is it treated?

From 1995 to 1999, 15 cases of taro poisoning were reported to the Drug and Toxicology Information service in Zimbabwe.¹⁰ From 2005 to 2009, 21 out of 31 cases reported to the Hong Kong Poison Control Center involving gastrointestinal irritation involved the consumption of *Colocasia fal-lax*, a form of taro more common in Tibet, the Himalayas, and northern Indochina.⁷ Of the 31 cases, six patients were treated with diphenhydramine, epinephrine, and dexamethasone for angioedema.

From 2011 to 2013, two cases of mouth irritation and swelling after eating raw taro leaves were reported to the British Columbia Poison Control Center.¹¹ Those two pa-

tients were observed for 6 hours without specific treatment and discharged.

Case Conclusion

Due to concerns of the potential for anaphylaxis, both patients were treated intravenously with 50 mg diphenhydramine and 10 mg dexamethasone. The husband was also given 650 mg acetaminophen orally for pain relief; his wife declined pain medication. Laboratory evaluation, including a complete blood count, basic metabolic panel, liver function panel, and urinalysis were ordered for both patients; all results were within normal limits for both patients.

After an uneventful 6-hour observation period, both patients were discharged home with instructions to return to the ED if they develop any signs of allergic reaction and to call emergency medical services for any sign of anaphylaxis.

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