

The Red Seed: *Abrus Precatorius*

David H. Jang, M.D.

Lewis S. Nelson, M.D.

A 20 year-old man presented to the emergency department (ED) complaining of nausea, vomiting, and watery diarrhea for approximately 6-8 hours prior to arrival. He denied any drug or medication use, recent illness or antibiotic use, travel, or changes in his diet. He was alert and in no apparent distress. His vital signs included: blood pressure, 119/55 mmHg; heart rate 92 beats/minute; respiratory rate 18 breaths/minute; and temperature 99.8° F. His heart and lung examinations were unremarkable. The abdomen was soft, and bowel sounds were hyperactive, and a stool sample was negative for occult blood. The general neurologic examination was normal with intact strength, sensation, cranial nerves, gait, and reflexes. Initial pertinent laboratory results included: white blood cell count 12,300 cells/mm³; hemoglobin 11 g/dL; platelets 390x10³/μL; normal serum chemistry including anion gap, renal function, and hepatic studies. An acetaminophen concentration was <10 ug/mL.

The patient was initially diagnosed as having viral gastroenteritis. Several additional episodes of diarrhea and emesis are partially relieved with the combination of ondansetron and metoclopramide, and intravenous normal saline was administered to correct presumed intravascular volume depletion. The patient subsequently admitted to feeling depressed but denied any pill ingestion. While awaiting psychiatry evaluation the patient's father arrived with a box of small hard red and black seeds and thinks that his son ingested them in a suicide attempt [figure 1]

1. What seeds could this patient have ingested?

Many seeds and berries can induce gastroenteritis when ingested, either through irritation of the gastrointestinal tract (such as *Dieffenbachia*) or due to their content of pharmacologically active xenobiotics. Pokeweed (*Phytolacca americana*) berries, which are green (not red) when unripe, induce severe gastrointestinal effects, though these berries are less toxin when mature and purple-colored. The presence of a mitogen in pokeweed results in a marked lymphocytosis that lasts several days. The small, firm, red (tomato-like) berries of American bittersweet or woody nightshade (*Solanum dulcamara*) contain solanine and related solanaceous alkaloids, which are also found in green potatoes and unripe tomatoes. Solanaceous alkaloids may also produce central nervous system effects including delirium and coma. The common or European Yew (*Taxus baccata*) is an evergreen shrub with nontoxic, soft, red, fleshy berries with a hard green core that contains cardiotoxic taxine alkaloids. The nicotine-like component found in *Wisteria* vine results in nicotinic cholinergic effects including vomiting and diarrhea, as well as hypertension, diaphoresis, and muscle weakness. Golden Chain (*Laburnum*) seeds contain cytisine another nicotinic agonist, and Betel nut (*Areca catechu*) contains arecholine.

Case Continuation:

Upon the discovery of ingestion of these seeds, the Poison Control Center was contacted. The seeds were described as approximately 1 cm in size with a red shiny coat and a black band at

one end. A picture of the seeds was transmitted to the NYCPCC through electronic mail, allowing their identification as *Abrus precatorius*. The patient was re-interviewed and admitted to chewing 10 seeds and swallowing them 4-6 hours prior to the development of his symptoms.

2. What is *Abrus* seed and why are they available?

Abrus precatorius is a plant that originates from Southeast Asia and now can be found in subtropical areas of the world. The name *Abrus*, meaning beautiful or graceful, is used to describe the appearance of the seed. The seed is found in a variety of colors such as black, orange, and most commonly, red with a glossy appearance with the black band at the end that attaches to the plant. The seeds are used in a variety of jewelry, trinkets, and ornaments; the *Abrus* seed itself is known by a variety of names that include rosary pea, prayer bead, and jequirity bean. Precare (from which the species name is derived), meaning to pray, references its common use in rosaries.

The seeds of *Abrus precatorius* have been used through history in a variety of roles. Due to their uniform size and weight, they were once known as rati, and used as weights for weighing gold and silver. The *Abrus* seeds have also been used for medicinal purposes, including the treatment of chronic eye disease. Arabic culture has purportedly used the seed as an aphrodisiac known as coq's eye. The toxicity of the *Abrus* seed was associated with its use as a fish poison as well as a homicidal agent.

3. What is the mechanism of toxicity of abrin?

While all parts of the plants are considered toxic, the seeds - which contain abrin, are the most toxic portion of the plant. Abrin (similar in mechanism to ricin) is considered one of the most toxic plant substances. Abrin consists of two dissimilar, disulfide-linked polypeptide chains known as the A-chain and B-chain. The A-chain is a glycosidase that removes an adenine residue from an exposed loop of 28 S ribosomal RNA, which stops protein synthesis. The B-chain is the portion that binds β -D-galactopyranoside moieties on the cell membrane, allowing the complex to undergo endocytosis, bringing the A-chain internally to exert its toxic effect.

4. How dangerous is the *Abrus* seed?

Abrin has an estimated human fatal dose of 0.1-1 μ g/kg, and there are reported deaths after both accidental and intentional poisoning. Most cases of *Abrus* seed ingestions are unintentional and occur in children. Ingesting the intact seeds typically results in no clinical findings, as they pass through the gastrointestinal tract without incident due to the hard shell. Abrin released during chewing is poorly absorbed systemically from the gastrointestinal tract, though the gastrointestinal mucosal cells themselves are affected. This manifests as significant vomiting and diarrhea with resultant hypovolemia and electrolyte disturbances, which can be severe and life threatening, particularly in areas with less advanced healthcare systems. Parenteral administration of abrin or ricin is considerably more concerning and has been associated with a high fatality rate in reported cases. Death in this situation is due to multisystem organ failure as cellular protein synthesis is disrupted throughout the body. There are a few reported cases of abrin causing acute demyelinating encephalitis.

5. What is the treatment for patients with abrin poisoning?

Patients with concerning (e.g., numerous or chewed) ingestions of chewed or otherwise damaged (e.g., strung as rosaries) *Abrus* seeds should be admitted and observed since the onset

of clinical toxicity may be delayed for many hours. While there are no antidotes for poisoning by abrin, management consists primarily of supportive care. Attention to intravascular volume status as well as electrolyte replacement should be sufficient. Differentiating systemic toxicity from sepsis or systemic inflammatory response syndrome can be difficult, and they may be coexistent. The few reported cases of acute demyelinating encephalitis suggest success with the use of corticosteroids, though this is not adequately studied.

Case Conclusion:

The patient was admitted to the intensive care unit (ICU) for observation and management of his fluid and electrolyte status. He continued to have frequent episodes of emesis as well as diarrhea that were ameliorated with antiemetics. The patient was observed for two days during which time he gradually improved. The patient admitted to ordering a box of *Abrus* seeds online from Asia after reading on the Internet about the use of this seed in suicide. He was evaluated by psychiatry and was eventually discharged with no permanent sequelae for outpatient follow-up.

References

Fernando C. Poisoning due to *Abrus precatorius* (jequirity bean). *Anaesthesia* 2001;56:1178-1180.

Nair, V. Sankaran. The Bean that Weighs Beads. <http://www.boloji.com/environment/49.htm>

Nelson LS, Shih RD, Balick MJ. *Handbook of Poisonous and Injurious Plants*. Springer/New York Botanical Garden. New York. 2007.

Olnes S. The history of ricin, abrin and related toxins. *Toxicon* 2004;44:361–370.



Figure 1: The *abrus* seeds brought in by family members.

References: