



## CASE REPORT

# Acute Bilateral Fixed Mydriasis Caused by Lupini Bean Intoxication

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Lupini beans are legume seeds of the genus *Lupinus*, consumed in many parts of the world. The main species are *Lupinus mutabilis*, *Lupinus angustifolius*, and *Lupinus albus*. The latter is commonly eaten as a snack in Mediterranean countries. The beans are very rich in alkaloids, which give them a bitter taste. One of these alkaloids was shown to cause anticholinergic effects. Lupini beans, if improperly prepared, can cause toxicity manifesting as an anticholinergic syndrome. We present the case of a 50-y-old woman who presented with bilateral mydriasis, mouth dryness, and anxiety. We confirmed that the patient consumed partially debittered lupini beans a few hours before presentation. The rest of her physical and ophthalmic examination results were within normal limits. Her symptoms resolved without therapy within 12 h from presentation and were attributed to ingestion of incorrectly prepared lupine seeds.

**Keywords:** lupini seeds, anticholinergic syndrome, pupillary abnormalities, ophthalmology, toxicity

## Introduction

Lupini beans are the yellow seeds of the *Lupinus* plant (Figure 1). They are commonly consumed in the Middle East and in Southern Europe. In the Middle East, they are known as turmus and are usually ingested as a snack or an appetizer.<sup>1</sup> They are also very nutritious and high in protein. Lupini beans are extremely bitter and contain more than 150 quinolizidine alkaloids. Lupanine, the most prevalent alkaloid in lupini seeds, is associated with high anticholinergic effects.<sup>2</sup>

Lupini poisoning occurs as a result of consuming incorrectly prepared lupini beans. Insufficient soaking allows an important amount of the anticholinergic alkaloids to remain in the beans. To avoid this toxicity, the seeds should be “debittered” before consumption. Debittering involves methodical rinsing for several days, which eliminates the toxic alkaloids and makes them

more satisfactory for human consumption by reducing their associated bitterness.<sup>3</sup>

To the best of our knowledge, only a limited number of adverse events associated with the ingestion of incorrectly prepared lupini beans have been reported.

## Case Report

A 50-y-old Lebanese woman presented to the emergency department with acute onset of bilateral nonreactive mydriasis. She reported dryness of her mouth and eyes. Although she was very anxious, we found no positive findings on review of her medical history. She had not been medicated and had no known allergies. Her last ophthalmic examination was 8 mo before presentation and was within normal limits. Before this incident, she had been healthy. She denied any recent drug use or head injury, and no focal neurologic findings were noted on physical examination. She reported that her husband was experiencing similar symptoms, except for pupillary dilatation, and reported stomach pain and general malaise.

Upon further questioning regarding suspicious food intake, she, along with her spouse, noted having consumed

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**Figure 1.** Lupinus plant: Lake Tekapo and Lupine flower in New Zealand. Shutterstock photo ID:1602625402. Republished with permission.

an excessive amount of lupini beans (Figure 2) hours before presentation. She emphasized the bitterness of the seeds and explained that she had not soaked them long enough before consumption. She reported the onset of her current symptoms shortly after ingestion of the seeds.

On ophthalmic examination, her visual acuity was 20/20 and her intraocular pressure was 12 mm Hg bilaterally. On slit lamp test, no significant findings were noted except for some corneal dryness with a short tear film break-up time and few punctate epithelial erosions. The mydriasis (Figure 3) was completely nonreactive, and her pupillary light reflex (direct and consensual) and accommodation-convergence reflex were abnormal. All extraocular movements were intact. Her vital signs were



**Figure 2.** Lupini beans.



**Figure 3.** Bilateral fixed mydriasis.

also normal (blood pressure: 120/80 mm Hg, heart rate: 88 beats·min<sup>-1</sup>, temperature: 37.2°C, respiratory rate: 14 breath·min<sup>-1</sup>).

The improperly prepared lupini beans were determined to be the cause of her anticholinergic symptoms, including bilateral mydriasis, dry mouth, and anxiety. When other potential causes of intoxication were ruled out and the patient was stabilized, she was discharged home and was asked to return the next day for follow-up. Her symptoms gradually resolved within 12 h of presentation with no therapy or intervention.

## Discussion

Anticholinergic agents block the action of the neurotransmitter acetylcholine. They inhibit the transmission of parasympathetic nerve impulses, leading to reduced contraction of smooth muscles.<sup>4</sup> Anticholinergic toxicity may affect the nervous, circulatory, and digestive systems in humans. Symptoms include vital signs disturbances (tachycardia, hypertension, hyperthermia), confusion, anxiety, dizziness, malaise, flushed face, tremors, slurred speech, dry mouth, urinary retention, stomach pain, and constipation.<sup>5</sup>

Ophthalmologically, they may cause dilated and unresponsive pupils, dry eyes, and decreased accommodation; moreover, in susceptible individuals, they can increase the risk of or worsen closed-angle glaucoma.<sup>6</sup> Pupillary abnormalities usually cause a diagnostic challenge in the emergency department because of the wide associated differential diagnosis. Establishing a correct diagnosis, after taking a thorough history, is imperative because etiology often dictates therapy and prognosis.<sup>7</sup>

Sudden-onset mydriasis should prompt a careful evaluation of the patient's history and recent medication and substance intake. Anticholinergic agents are found in numerous drugs such as antihistamines, antitussives, anticonvulsants, and antidepressants as well as in a wide variety of plants including *Atropa belladonna* and *Datura stramonium*. Intoxication in general is not uncommon, whereas intoxication specifically caused by lupini beans remains rare.<sup>8,9</sup>

To our knowledge, 7 similar case reports have been published to date.<sup>3,10-15</sup> In all of the cases, patients

presented with manifestations of anticholinergic toxicity, but presenting symptoms varied among the publications. In all other published cases, the symptoms were more numerous and more pronounced compared to our patient (eg, lid drop, palpitations, respiratory distress, photophobia, nausea, and vomiting), but they all shared 1 symptom: bilateral mydriasis. Our case is the one with the fewest symptoms, which made our diagnosis more challenging.

In one of the cases, a 48-y-old man with osteoarthritis presented with anticholinergic syndrome after having ingested lupini beans for their presumed role as an analgesic and antidiabetic, prompting a careful consideration of these seeds' role in homeopathic medicine.<sup>16</sup> Another case reported in Lebanon, similar to our case, involved 2 patients presenting with intoxication after consuming excessive amounts of bitter lupini seeds. In fact, yellow lupini seeds (turmus) are frequently used as a snack in Lebanon.<sup>12</sup> For this reason, it is important to raise awareness concerning the toxic potential of lupini beans, as well as the necessity of proper handling and soaking, especially in countries where their consumption is common.

In all the reported cases we found, the duration of the symptoms varied from 12 to 48 h.<sup>17</sup> Compared with other drug toxicity, the symptoms can last longer and usually depend on the time needed for clearance of the ingested drug from the body.

Ultimately, diagnosis of anticholinergic syndrome caused by lupini beans is clinical and highly dependent on adequate history-taking. No laboratory workup is required, but vital signs should be recorded and monitored. Patients should remain under clinical observation until symptoms resolve, usually within 24 h from presentation. In cases of severe anticholinergic toxicity, treatment is mainly supportive. Benzodiazepines such as diazepam or lorazepam can be given intravenously (IV) for tachycardia, agitation, and delirium. If these symptoms are refractory to standard doses of benzodiazepines, the antidote physostigmine should be considered (0.5–2 mg slow IV). Contraindications to physostigmine administration include seizures, bradycardia, A-V block, QRS widening, or QTC interval prolongation on electrocardiogram. Oral activated charcoal may be given early in the clinical course (1–2 h post-ingestion), but only if the patient is alert and cooperative. There is no proven role for gastric lavage with these types of ingestions.<sup>18</sup> Prognosis is generally favorable, as was the case of our patient, whose symptoms resolved in less than 12 h.<sup>19</sup>

We agree with the recommendations that include adequate handling and soaking of lupini beans; they should be soaked in water for 12 h, then cooked, and

finally rinsed for about 30 s, 3 times per day for 5 d before ingestion.<sup>20</sup>

## Conclusions

Obtaining a detailed medical history is imperative in cases of pupillary abnormalities. When an anticholinergic syndrome is suspected, intoxication by not only drugs but also plants should be considered. Recent intake of lupini beans should prompt consideration of these seeds as a possible etiology. Lupini intoxication and its prevention are important, especially in areas where this food is commonly consumed. Presentation of this toxicity can vary, and bilateral mydriasis can sometimes be the only presenting symptom. Awareness of this potential cause can assist the physician with the diagnosis and help guide appropriate management.

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## References

1. Van de Noort M. Lupin: An important protein and nutrient source. In: *Sustainable Protein Sources*. Philadelphia, PA: Elsevier; 2017:165–83.
2. Barceloux DG. Medical toxicology of natural substances: Foods, fungi, medicinal herbs, plants, and venomous animals. *Angewandte Chemie*. 2009;48(24):4278.
3. Di Grande A, Paradiso R, Amico S, Fulco G, Fantauzza B, Noto P. Anticholinergic toxicity associated with lupin seed ingestion: case report. *Eur J Emerg Med*. 2004;11(2):119–20.
4. Purves D, Augustine GJ, Fitzpatrick D, Katz LC, LaMantia AS, McNamara JO, et al. Acetylcholine. In: *Neuroscience*. 2nd ed. Sunderland, MA: Sinauer Associates; 2001.
5. Beaver KM, Gavin TJ. Treatment of acute anticholinergic poisoning with physostigmine. *Am J Emerg Med*. 1998;16(5):505–7.
6. Thibeault L, Brisson S. Intoxication a un anticholinergique. *CMAJ*. 2005;173(10):1162.
7. Kawasaki AK. Diagnostic approach to pupillary abnormalities. *Continuum (Minneapolis)*. 2014;20(4):1008–22.
8. Fatur K, Kreft S. Common anticholinergic solanaceous plants of temperate Europe - A review of intoxications from the literature (1966–2018). *Toxicol*. 2020;177:52–88.
9. Greenblatt D, Shader R. Drug therapy. Anticholinergics. *N Engl J Med*. 1973;288(23):1215–9.
10. Jamali S. Dilated pupils, dry mouth and dizziness: a case study. *Aust Fam Physician*. 2011;40(10):789–90.

11. Litkey J, Dailey MW. Anticholinergic toxicity associated with the ingestion of lupini beans. *Am J Emerg Med.* 2007;25(2):215–7.
12. Awada A, Atallah D, Zoghbi A. Anticholinergic syndrome after intoxication by lupine seeds (Tourmos). *J Med Liban.* 2011;59(4):233–4.
13. Flores-Pamo AE, Pisano E, Carreazo NY. Anticholinergic toxicity in a one-year-old male following ingestion of *Lupinus mutabilis* seeds: case report. *Sao Paulo Med J.* 2018;136(6):591–3.
14. Daverio M, Cavicchiolo ME, Grotto P, Lonati D, Cananzi M, Da Dalt L. Bitter lupine beans ingestion in a child: a disregarded cause of acute anticholinergic toxicity. *Eur J Pediatr.* 2014;173(12):1549–51.
15. Li K, van Wijk XMR, Hayashi S, Lynch KL, Wu AHB, Smollin CG. Anticholinergic toxicity associated with ingestion of water containing lupini bean extract. *Clin Toxicol (Phila).* 2017;55(7):687–8.
16. Alessandro L, Wibecan L, Cammarota A, Varela F. Pupillary disorders in the emergency room: lupinus mutabilis intoxication. *J Clin Toxicol.* 2017;7(4):1–3.
17. Marquez RL, Gutierrez-Rave M, Miranda FI. Acute poisoning by lupine seed debittering water. *Vet Hum Toxicol.* 1991;33(3):265–7.
18. Teoh R, Page AV, Hardem R. Physostigmine as treatment for severe CNS anticholinergic toxicity. *Emerg Med J.* 2001;18(5):412.
19. Kemmerer DA. Anticholinergic syndrome. *J Emerg Nurs.* 2007;33(1):76–8.
20. Pihlanto A, Mattila P, Mäkinen S, Pajari A-M. Bioactivities of alternative protein sources and their potential health benefits. *Food Funct.* 2017;8(10):3443–58.