Case Report: Analytically Confirmed Severe Albendazole Overdose Presenting with Alopecia and Pancytopenia

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Abstract. Internet-facilitated self-diagnosis and treatment is becoming more prevalent, putting individuals at risk of toxicity when drugs are acquired without medical oversight. We report a patient with delusional parasitosis who consumed veterinary albendazole purchased on the Internet, leading to pancytopenia, transaminase elevation, and alopecia. A 53-year-old man was sent to the emergency department (ED) by his gastroenterologist because of abnormal laboratory results. The patient had chronic abdominal pain and believed he was infected with parasites. He purchased two bottles of veterinary-grade albendazole on the Internet, and over the 3 weeks before his ED visit, he consumed 113.6 g of albendazole (a normal maximal daily dose is 800 mg). Five days before admission, he noticed hair loss and a rash on his face. His examination was notable for significant scalp hair loss and hyperpigmentation along the jaw line. Laboratory studies were remarkable for pancytopenia (most notably a white blood cell count (WBC) of 0.4×10^3 cells/mm³, with an absolute neutrophil count (ANC) of 0×10^3 cells/mm³) and transaminase elevation (aspartate aminotransferase [AST] 268 IU/L, alanine aminotransferase [ALT] 89 IU/L). He developed a fever and was treated with antibiotics and colony-stimulating factors for presumed neutropenic bacteremia. Over the course of 1 week, his hepatic function normalized and his ANC increased to $3,000 \times 10^3$ cells/mm³. Serial albendazole and albendazole sulfoxide concentrations were measured in serum and urine by liquid chromatography–quadrupole time-of-flight mass spectrometry. On day 2, his serum concentrations were 20.7 ng/mL and 4,257.7 ng/mL for albendazole and albendazole sulfoxide, respectively. A typical peak therapeutic concentration for albendazole sulfoxide occurring at 2–5 hours post-ingestion is 220–1,580 ng/mL. Known adverse effects of albendazole include alopecia, transaminase elevation, and neutropenia. Pancytopenia leading to death from septic shock is reported. In our patient, prolonged use of high-dose albendazole resulted in a significant body burden of albendazole and albendazole sulfoxide, leading to pancytopenia, transaminase elevation, and alopecia. He recovered with supportive therapy.

INTRODUCTION

Internet-facilitated self-diagnosis and treatment is becoming more prevalent.¹ Unfortunately, the reliability of Internet-facilitated diagnosis is poor² and may lead individuals to seek out treatments without medical oversight, resulting in adverse events. We report a patient with delusional parasitosis who consumed veterinary albendazole purchased on the Internet and developed severe toxicity manifested as pancytopenia, hepatitis, and alopecia. We were able to confirm the presence of albendazole and its metabolite albendazole sulfoxide in the patient's blood and urine.

CASE REPORT

A 53-year-old man was sent to the emergency department (ED) by his gastroenterologist because of abnormal laboratory results. The patient had a past medical history of alcohol-related cirrhosis and used opioids, cocaine, and alcohol. At the time of admission, his only prescribed medication was buprenorphine/naloxone. He complained of a rash on his face and hair loss that had begun 5 days before presentation. On further questioning, the patient stated that he was taking albendazole for the previous 3 weeks to treat a parasitic infection. He stated he had been suffering from constipation and

abdominal pain for many years, which he believed was due to a parasitic infection. He had seen multiple health-care professionals and had several investigations including a colonoscopy, which were all normal. One month before his ED visit, he presented to another ED complaining of worms in his stool and coming out of his nose. During his previous ED visit his laboratory values were the following: WBC 4.0×10^3 cells/mm³, hemoglobin 12 g/dL, platelets 120×10^3 cells/mm³, and his stool was negative for ova and parasites. There was no other documented workup for parasitosis available. He claimed that during that presentation, he was prescribed albendazole and had resolution of his symptoms while taking the medication; a documented prescription was not found. He stated his symptoms returned once his albendazole course was complete. He attributed his symptoms to an undiagnosed parasitic infection and sought out other ways to obtain antiparasitic medication to no avail. He ultimately went to eBay and purchased veterinary-grade albendazole—two 500 mL bottles of albendazole 11.36% (113.6 mg/mL – 56.8 g/500 mL). Over the 3 weeks before his ED visit, he consumed both bottles, totalling 113.6 g of albendazole (averaged 5.4 g/day). His last dose was on the day of presentation. He admitted that since starting the veterinary albendazole, he had been feeling more fatigued and confused, but had attributed these symptoms to his parasitic infection. He denied any recent nausea, vomiting, diarrhea, melena, or hematochezia. He also denied any shortness of breath, cough, chest pain, urinary symptoms, headaches, or rashes. His primary care provider had ordered a CBC on the patient 2 months prior, which was reported as normal. He denied any recent travel, intravenous drug use, or high-risk sexual behavior.

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TABLE 1
Serial albendazole and albendazole sulfoxide concentrations over the course of hospital admission

Hospital day	Time (24 hours)	Specimen	Albendazole* (ng/mL)	Albendazole† sulfoxide (ng/mL)
2	0420	Serum	20.7	4,257.7
3	0420	Serum	14.1	1,625.2
4	0420	Serum	< LLOQ‡	505.4
5	0815	Serum	< LLOQ	86.2
4	2120	Urine	< LLOQ	4,233.7
5	0225	Urine	< LLOQ	3,638.1

* No published reference range for albendazole in serum.

† Reference range for albendazole sulfoxide is 500–1,500 ng/mL in serum.

‡ Lower limit of quantification (LLOQ) = 1.0 ng/mL.

On presentation, his vital signs were blood pressure, 112/72 mmHg; heart rate, 82/minutes; respiratory rate, 18/minutes; room air O₂ saturation, 100%; and temperature, 98.3°F (36.8°C). His examination was notable for significant scalp hair loss and hyperpigmentation along the jaw line. He had lost approximately 40% of the hair on his head, and with gentle grasping of his hair, the patient was able to easily remove large clumps of hair. His skin had darkened along his mandible extending into his mid-face. Photos available of the patient taken in the previous month confirmed the stark change in his normal skin pigmentation and hair distribution. He had no signs of purpura or necrotic lesions on his body. He had no other rash. Laboratory studies were remarkable for: WBC 0.4×10^3 cells/mm³, hemoglobin 7.3 g/dL, platelets 100×10^3 cells/mm³, absolute neutrophil count (ANC) 0×10^3 cells/mm³, AST 268 IU/L, ALT 89 IU/L, alkaline phosphatase 100 IU/L, and INR 1.3. Additional testing performed was negative for viral hepatitis (HBsAg, HBsAb, HBcAb, HCV Ab, and HCV RNA) and HIV. His stool was negative for ova and parasites.

He was admitted to the hospital, developed a neutropenic fever to 103°F (39.4°C), and was diagnosed with a *Clostridium difficile* infection. His treatments included cefepime, oral vancomycin, intravenous metronidazole, and filgrastim for febrile neutropenia and *C. difficile*. He was also treated with rifaximin, lactulose, and thiamine for concern of hepatic encephalopathy. Over the course of 1 week, his hepatic aminotransferases normalized and his ANC increased to $3,000 \times 10^3$ cells/mm³. He was diagnosed with delusional parasitosis and transferred to the psychiatry ward.

Serial albendazole and albendazole sulfoxide (metabolite) concentrations were measured in serum and urine by liquid chromatography–quadrupole time-of-flight mass spectrometry, and the results are shown in Table 1. The analysis was carried out at the Clinical Toxicology and Environmental Biomonitoring Lab, University of California San Francisco, San Francisco, CA.

DISCUSSION

Albendazole is a benzimidazole broad-spectrum antiparasitic approved for the treatment of echinococcosis and neurocysticercosis.³ A typical therapeutic dose is 400 mg taken twice daily. Albendazole binds to tubulin to inhibit intracellular functions in parasites.³ Oral absorption is approximately 1–5% in humans at a therapeutic dose.^{4,5} Albendazole undergoes rapid first-pass metabolism primarily via CYP1A1 and CYP3A4 as well as flavin enzymes, generating two metabolites, sulfoxide and sulfone, with albendazole sulfoxide being the active metabolite responsible for the therapeutic effects.^{3,4} With prolonged use, albendazole induces its own

metabolism.⁴ Peak concentrations of albendazole sulfoxide are detected in serum 2–5 hours after a therapeutic dose, with a reported half-life of 12–18 hours.⁶ The reported C_{max} of albendazole sulfoxide in humans ranges from 220 to 1,580 ng/mL after a therapeutic dose.^{4,6} There is no therapeutic concentration for albendazole as it is rapidly metabolized and undetectable in serum shortly after administration of therapeutic doses.⁴ The reported adverse effects associated with therapeutic use of albendazole include neutropenia, elevated liver function tests, abdominal pain, nausea, vomiting, and reversible alopecia.^{7–9} Pancytopenia is a rare effect that occurs more commonly in patients with preexisting liver disease.¹⁰ Death is occasionally reported after therapeutic albendazole use due to pancytopenia and subsequent septic shock.¹¹ Treatment of these complications is primarily supportive care.

To our knowledge, this is the first case report of albendazole toxicity due to repeated supratherapeutic ingestion with confirmed serum albendazole and albendazole sulfoxide concentrations.

CONCLUSION

In this case report, prolonged use of high-dose albendazole resulted in pancytopenia, hepatitis, and alopecia. This case also highlights the dangers of Internet self-diagnosis and unregulated pharmaceutical sales on the Internet.

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