

CLINICAL IMAGES

A Puff of Spores

Mystery case

One dry summer day after several rainy days disrupting their camping trip, four 10-year-old campers were throwing a Frisbee in a field when one observed a tennis ball-sized brown ball loosely attached to the moist grass (Figure 1). He decided to stomp on the ball, which made a popping noise and released a powdery cloud of brown dust when crushed. He summoned his 3 friends over to gather several of the brown balls as pretend hand grenades to pelt each other with. One of the boys was hit in the upper chest with an exploding “grenade,” which covered his neck and chin with brown dust. Shortly after the war games were over and the group

returned to Frisbee games, the “wounded” boy became dyspneic and walked back to his tent to retrieve his inhaler. He had a history of nonsteroid-dependent asthma. He went home, and over the next 2 days, he became febrile and developed a nonproductive cough with end-expiratory wheezing. Because the inhaler did not improve his wheezing and his fever continued despite oral acetaminophen, his mother called his pediatrician, who recommended a medical examination in the closest emergency department.

What is your diagnosis? How would you manage this case?



Figure 1. A tennis ball-sized brown ball loosely attached to the moist grass in an upland meadow. Source: Photograph courtesy of David K. Lirette, PhD.

Disclaimer: The case reported in this article is fictitious.

DIAGNOSIS

Lycoperdonosis, extrinsic hypersensitivity alveolitis after inhalation of spores (conidia) from the common puffball, *Lycoperdon utriforme*.

MANAGEMENT

On arrival in the emergency department, the child was febrile (38.5°C), dyspneic, and coughing. His respiratory rate was 36 breaths per minute, and oxygen saturation by pulse oximetry was 94% on room air. Chest auscultation demonstrated crepitant rales at end-exhalation. The chest radiograph demonstrated bilateral reticulonodular infiltrates. An intravenous catheter was inserted, and nasal cannula oxygen was instituted at 2 L/minute. The child was admitted to the hospital with a presumptive diagnosis of pneumonia. Blood cultures were drawn, but sputum cultures could not be obtained. Empiric antibiotic therapy with intravenous amoxicillin was instituted. Labored breathing continued over the next 12 hours. The blood cultures revealed no growth.

A bronchoalveolar lavage (BAL) sample was obtained for additional cultures, including acid fast and fungal cultures. On microscopic examination of Giemsa-stained BAL slides, a consulting pathologist described non-budding yeast-like cells. A consulting mycologist also reviewed the BAL slides and confirmed the yeast-like cells as *Lycoperdon* species spores. Intravenous antibiotic therapy was discontinued, and intravenous corticosteroid and antifungal therapy were instituted with dexamethasone, 4 mg twice a day, and voriconazole, 6 mg/kg twice a day. Rapid improvement in breathing was observed over the next 12 hours. The patient's fever resolved, and the chest became clear to auscultation. The infiltrates cleared on the chest radiograph. All medications were discontinued after 2 days. The patient was discharged home on hospital day 5 for follow-up with his pediatrician.

Discussion

Lycoperdonosis is an extrinsic hypersensitivity alveolitis caused by the inhalation, insufflation, or ingestion of spores released by puffballs, primarily from the genus *Lycoperdon*. Puffballs are mushrooms without gills and stems; they release spores when they dry, decay, and rupture. If the puffballs are forcibly crushed, the spores can be aerosolized. Puffball spores have been administered medicinally as folk remedies for epistaxis.¹ Puffball spores have also been intentionally ingested and insufflated by adolescents seeking hallucinogenic effects.²

Taxonomy, distribution, and ecology

Puffballs belong to the mushroom family Lycoperdaceae and are distributed worldwide. They may be found during warm seasons in clusters in moist shaded areas and grassy fields. Puffballs are similar to truffles and are edible seasonally when young and white. Unlike truffles, puffballs grow above ground and not below (Figure 1). Puffballs turn brown with age, desiccate, and fill with brown spores (Figure 2). They later decay and spontaneously burst, releasing trillions of spores (Figure 2).

Most species of puffballs that have been implicated in case reports of lycoperdonosis have belonged to the genus *Lycoperdon* and have included *L perlatum*, *L pyriforme*, *L gemmatum*, and *L utriforme*.³ Inhalation of spores from the family relative giant puffball (*Calvatia gigantea*) has also been implicated less commonly in cases of lycoperdonosis.³

Toxicology and toxicity in humans and animals

The first human cases of lycoperdonosis were reported by Strand et al in 1967 in an adolescent and a 4-year-old who were prescribed *Lycoperdon* spore insufflation as home remedies for epistaxis.³ Their condition was characterized by the rapid onset of nasopharyngitis, nausea, vomiting, coughing, and pneumonitis. This prodrome progressed over a few days to wheezing, dyspnea, myalgias, fever, and chest pain mimicking pneumonia. The chest radiograph demonstrated a reticulonodular pattern of apical infiltrates that resembled *Pneumocystis carinii* pneumonia or histoplasmosis.

In 1994, Taft et al reported a case series of 8 teenagers aged 16–19 years in Wisconsin who inhaled and chewed puffball mushrooms at a party.² The puffballs were later expert-identified as *L utriforme*. No illicit drugs were



Figure 2. The carefully opened *Lycoperdon utriforme* puffball initially seen intact in Figure 1. Note the fine brown powder filling the puffball and composed of trillions of microscopic spores. Source: Photograph courtesy of David K. Lirette, PhD.

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