Necrotizing lung infection caused by the protozoan *Balantidium coli*

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CASE REPORT

*Balantidium coli*, a ciliated protozoan, is well known to cause intestinal infection in humans. Extraintestinal spread to the peritoneal cavity and genitourinary tract has rarely been reported. There have also been a few cases of lung involvement from this parasite. A case of *B coli* causing a thick-walled right upper lobe cavity in an organic farmer who had contact with aerosolized pig manure is reported. Bronchoalveolar lavage fluid examined for ova and parasite revealed trophozoites of *B coli* in large numbers. Treatment with doxycycline hyclate led to marked improvement. Necrotizing lung infection caused by the protozoan *B coli* should be considered in individuals who report contact with pigs.

Key Words: *Balantidium coli*, Necrotizing lung infection

CASE SUMMARY

A 42-year-old white man, a lifelong nonsmoker, presented with two episodes of hemoptysis. These occurrences were two weeks apart. On each occasion he coughed up 50 to 200 mL of bright red blood. The patient had no associated symptoms of cough, sputum production, fever, chills, night sweats, chest pain or weight loss. A right upper lobe cavitary lesion was seen on chest radiograph. The patient had a history of insulin-dependent diabetes mellitus and previous diarrheal illnesses from intestinal protozoa. Several years ago *Blastocystis hominis*, *Dientamoeba fragilis* and *Entamoeba coli* were isolated from his stool. Treatment with metronidazole resulted in the resolution of his diarrhea. He worked as an organic farmer, where he used pig manure to fertilize his vegetables. Approximately six months before the onset of his symptoms, the patient had travelled to the South American countries of Paraguay and Argentina. He did not fall ill during his travel. A Computerized Tomography (CT) scan of his thorax confirmed a 2 cm cavitary right upper lobe lesion with thick walls and fibrotic strands extending from the wall measuring 3 to 4 mm (Figure 1). Sputum Gram stain, acid-fast bacilli stain and culture were negative, except for one culture, which was positive for *Mycobacterium avium-intracellulare*. A needle biopsy of the cavitary lesion did not reveal the presence of malignant cells; the aerobic, anaerobic and mycobacterial cultures were negative. Bronchoscopy and bronchoalveolar lavage (BAL) performed twice at two-week intervals showed no growth on bacterial, mycobacterial and fungal cultures. On repeat bronchoscopy, blood-tinged bronchoalveolar lavage fluid was obtained, no organisms were cultured, and the acid-fast bacilli culture was negative. To rule out *Paragonimus* species because of his travel history, the BAL specimen was also examined for ova and parasites. Direct examination revealed several large ciliated protozoa, which were identified as *Balantidium coli* trophozoites on wet preparation and iron-hematoxylin stain. The trophozoites measured approximately 70 by 50 µm, had a pointed anterior and a rounded posterior end and contained two nuclei. The BAL fluid cytology contained macrophages and other cells including lymphocytes and eosinophils, which were in the normal range. The HIV serology, antineutrophilic cytoplasmic antibody and antinuclear antibody tests were negative. Multiple (five) stool examinations for ova and parasites were reported to be negative during this illness. The patient was treated with a three-week course of doxycycline hyclate 100 mg daily. His hemoptysis resolved rapidly and follow-up CT scans of the thorax performed at three-month intervals showed gradual resolution of the right upper lobe cavity one year later (Figure 2).
DISCUSSION

Protozoal infections are the most prevalent intestinal infections worldwide; they rarely involve the lungs and pleura. Pulmonary infections with free-living amebas, Toxoplasma species, Babesia species, Cryptosporidium species, Leishmania species, and Microsporidia species have been well documented. Recently a case of pneumonitis where Giardia lamblia was isolated from BAL fluid was published (1). There have been very rare published reports of B. coli infections in humans. B. coli, originally described by Malmsten (2) in 1857, is a large ciliated protozoan that has a trophozoite and a cyst stage. The trophozoites are ovoid in shape, are of greenish-yellow colour, and measure 50 to 70 µm in length and 40 to 50 µm in breadth (Figure 3). The organism is covered by longitudinal cilia that propel the body forward in a spiral motion, and contains two nuclei and several contractile vacuoles. The cysts are ovoid or spherical, measure 45 to 65 µm in diameter and appear greenish-yellow in colour.

The natural habitat of B. coli is the large intestine of pigs, monkeys and humans (3-5). The organism has also been reported in chimpanzees, new world monkeys, domestic and wild hawks and wild rats (3). Human infection usually occurs through contact with pig fecal matter. The cysts are infective; following ingestion excystation releases trophozoites that invade the colonic mucosa, multiply and set up colonies. Within the tissues the B. coli propagate, produce ulcers and form abscesses that may extend to the muscular layer. Invasion of the colonic tissue induces a cellular response consisting of lymphocytes and eosinophils, and leads to ischemic necrosis of the epithelium. Three clinical presentations from B. coli infection have been described: asymptomatic carrier; chronic symptomatic form – these patients may have diarrhea alternating with constipation and nonspecific abdominal symptoms; and acute form – these patients frequently have bloody stools, associated epigastric pain, weight loss and dehydration. The fulminating form may lead to exsanguination from intestinal hemorrhage or severe dehydration and shock.

Widespread infection from B. coli is encountered where human exposure to hogs is common. In New Guinea, the rate of human infection in pig farmers has been reported to be 28%. By contrast, in Egypt, where exposure to pigs is rare, human balantidiasis is rare (6). Human infection from B. coli, despite frequent exposure to the parasite, is rather rare in the temperate climates of Canada and the United States. Cross-infection experiments suggest that humans are relatively refractory to infection by this parasite (7). In North America, epidemics of B. coli infection have been reported from areas where poor environmental sanitation and a low level of personal hygiene exist. A high prevalence of infection with this parasite have occurred in mental institutions in Canada and the United States (8, 9). A study of stool samples submitted for parasitic infection tests from a number of mental institutions in Ontario revealed a prevalence rate of 1.3% for B. coli (9). Similar studies from Italian mental institutions, however, reported a much more rare prevalence of this parasite (10). No recent Canadian data on the prevalence of B. coli in the general population or in people involved in the pig industry is available. This may well be significant in view of the growth in the pig farming and hog industry in Canada.

Rare cases of extraintestinal balantidial infections have been published in the literature. Two cases of peritonitis were reported from Colombia following the rupture of fulminating colon ulcers (11, 12). A case of urethritis and cystitis in a female patient and a few cases of inflammatory vaginitis have also been reported (13, 14). These extraintestinal infections most likely occurred secondary to colonic balantidiasis. While the cervicovaginitis may follow rectovaginal fistula, the common mode of spread may be genital contamination from the anus due to poor personal hygiene (15). Multiple case reports of hepatic abscess caused by B. coli also exist in the literature. Several of these cases were associated with appendicitis or intestinal perforation and treatment with antibiotics along with surgical drainage was curative (16).

Rare cases of lung involvement from B. coli have also been reported. A case report from Venezuela described a 16-year-old pig farmer who died from perforation of the appendix and peritonitis (17). Histological examination of the patient’s lungs revealed trophozoites of B. coli around blood vessels and inflammatory cell infiltration. Another case of pulmonary involvement was reported in a 70-year-old farmer who lived on an Aegean island (18). He had several years’ history of diarrhea, and chronic colitis. A chest radiograph showed a 3 cm mass adjacent to the left hilum, which was confirmed on a chest CT scan. The aspirate on a transthoracic needle aspiration...
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![Image](original magnification x 400)

Figure 3 A photograph of Balantidium coli. (Original magnification x 400)

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protozoans were isolated from pharyngeal swabs of healthy patients in Mexico (24). Among the various protozoans found, B. coli was also cultured; these individuals were asymptomatic carriers of these protozoans in their upper airways. Therefore, it is possible that this patient had colonized his upper airway with the parasite, which then was aspirated into the lung and resulted in invasive disease. Our patient was treated with an extended course of doxycycline hyclate, which resulted in the resolution of hemoptysis and radiological findings. On repeat CT scan, marked improvement in the right upper lobe cavity was evident, although some scarring persists (Figure 2).

Recently, concerns have been raised that increasing the pig population in Canada may pose a public health risk, particularly from the spread of manure on the fields. In Canada, human infection from pig parasites is rare, even among pig producers and their families. However, watershed contamination and subsequent drinking of untreated surface water, unsafe handling of pig manure, poor personal hygiene and impaired immune system may lead to the acquisition of infection from various parasites common in healthy pigs. These include pig roundworm (A. suum), Giardia species, Cryptosporidium species and B. coli. B. coli has not been reported to be a public health concern in industrialized countries. When applied to the fields the pig manure is exposed to temperature, sunlight and dryness; this is sufficient to kill most parasites and bacteria. Unless contamination of surface or ground water occurs, a public health risk does not exist. Furthermore, the housing of pigs indoors and the use of manure containment systems have further reduced the risks of watershed contamination.

B. coli, a ciliated protozoan is a well known cause of intestinal infection and dysentery in humans. Extraintestinal infections have rarely been reported. We report a case of necrotizing lung infection in a farmer who had contact with pig manure. Parasitic infections may be worth considering in patients with cavitary lung involvement who have contact with the pig industry.
REFERENCES
