**Abstract**

**Objective:** To report a case of *Lophomonas blattarum* isolated from bronchoalveolar lavage fluid and to review the literature on the subject.

**Method:** Observational, qualitative, descriptive study of a case report with a descriptive literature review supported by original scientific articles in the PubMed and Scientific Electronic Library Online databases.

**Literature Review:** *L. blattarum* consists of a protozoan of rare human involvement responsible for infections in the respiratory tract, mainly in immunosuppressed people. The infection is difficult to diagnose, requiring visualization of the parasite, distinction between lung hair cells and characteristic movement in fresh light microscopy. Once the diagnosis is made, treatment is usually quick and effective.

**Result:** A 61-year-old male patient, white, immunosuppressed by a fourth dose of infliximab for the treatment of ulcerative colitis, who attended the Hospital Santa Casa de Misericórdia de Vitória complaining of dry cough, dyspnea, fever, abdominal pain, weight loss, loss of appetite, inappetence and diarrhea. The clinical picture and complementary exams were nonspecific and the diagnosis was made by analysis of the bronchoalveolar lavage fluid, which showed the presence of a flagellate parasite, defined as *L. blattarum*. Treatment was with metronidazole 500 milligrams every eight hours for ten days and the patient achieved clinical resolution of the infectious condition.

**Final considerations:** The information obtained in this study may increase the knowledge of the scientific community about this pathogen, offering better management of infections and collaborating in favor of the patient.

**Keywords:** Bronchoalveolar lavage; Parasite; Lung
**INTRODUCTION**

*Lophomonas blattarum* is a species of protozoan that can normally parasitize the intestines of termites and several species of cockroaches. Its involvement in humans is rare and few studies have reported the microorganism as an etiological agent of human infections. The bronchopulmonary site is the most commonly affected, given the nature of the entry of the pathogen through inhalation, although there are reports of sinusitis and urinary tract infections.

Pulmonary infection by *L. blattarum* presents a clinical picture with symptoms such as low-grade fever, cough, dyspnea and hemoptysis, which leads to the suspicion of various pulmonary pathologies. The results of blood and imaging tests are also nonspecific, which leads to doubts in the clinical diagnosis of the disease.

Thus, it is necessary to search for more specific laboratory tests, including the analysis of bronchoalveolar lavage under an optical microscope, with a fresh 400x objective, to visualize the microorganism in movement and carry out the confirmatory laboratory diagnosis, which still requires correct handling of the sample and search for evidence with the support of the examiner’s experience and taxonomic classification, since the visualization of the movement of the flagellar parasite is an inclusion factor to start its identification.

Infections by *L. blattarum* may be more common than data show, because, in addition to being difficult to diagnose in clinical practice, the main host of these parasites (cockroaches of various species) is routinely found in the homes of our population and in diverse environments, providing risks to human health.

The objective of this study is to report the case of a patient at the Holy House of Mercy of Vitória Hospital (HHMVH) being followed up at the gastroenterology service and to carry out a descriptive literature review on the subject. The project was approved by the Research Ethics Committee (CEP) of Emescam with Opinion No. 4,674,889.

**LITERATURE REVIEW**

*Lophomonas* is a genus of protozoa belonging to the Excavata clade, the Parabasalia class and the Craspedodora order. The species *Lophomonas blattarum* is a multiflagellate protozoan parasite of the intestine of termites and several species of cockroaches, including *Blatta orientalis*, *Periplaneta americana* and *Blatella germanica* and has also been described in the intestine of termites and several species of cockroaches.

Although it rarely infects humans, a limited number of studies have reported *L. blattarum* and other flagellate parasites as a cause of bronchopulmonary infection and sinusitis in humans. Studies indicate that the first case of human lung infection by *L. blattarum* was reported in China in 1993, and since then, about 140 may have appeared by 2016. Among the diseases observed, 96% of cases are associated with respiratory tract infection, although there are reports of sinusitis and urinary tract infections.

The actual transmission mechanism for humans is still not clearly defined. Inhalation of aerosols with *Lophomonas* oocysts is believed to be the most common form of infection, but eating food contaminated with cockroach feces is also considered an option. Poor hygiene conditions and the presence of large populations of cockroaches in human habitats are important risk factors. Another risk factor is immunodeficiency, as these protozoa more commonly infect immunocompromised individuals, however, infected young immunocompetent adults have been reported.

Upon reaching the human body, the cysts transform into trophozoites in the respiratory tract and cause chronic pulmonary symptoms of cough, fever, dyspnea and hemoptysis.

Infection by *L. blattarum* is difficult to clinically differentiate from other airway infections. The symptoms of this parasitic lung infection are similar to those of other respiratory etiologies, such as bronchial asthma, bronchiectasis, pneumonia and lung abscesses, with dry cough being the most frequent symptom. In addition to coughing, this infection can cause sputum of different characteristics (white, purulent or bloody), fever between 37.5°C and 39°C, signs of airway obstruction, dyspnea, chest tightness, bilateral crepitus and wheezing on auscultation of the lungs. Marked eosinophilia is not a constant finding, being present in only 21.5% to 35% of cases. The most commonly encountered radiological findings include ground-glass opacity, irregular consolidation, and irregular or striped shadows distributed in the lungs bilaterally. Due to the clinical and nonspecific complementary exams, it is possible to induce that the bronchopulmonary infection by *L. blattarum* is eventually not diagnosed in the health system because it requires more specific investigation, experience and professional expertise.

The laboratory diagnosis is based mainly on the observation of the parasite under a fresh optical microscope with a 400x objective. Biological samples frequently used for this purpose are bronchoalveolar lavage and sputum; however, throat brushing can also be used to favor the collection of secretion and the possible presence of the parasite. The characteristic protozoan is ovoid, round or pear-shaped, 20μm to 60μm long and 12μm to 20μm wide. The parasite can be stained by the Papanicolaou method or by regular Giemsa or Wright staining.

Knowing the morphological characteristics of *L. blattarum* is of fundamental importance, considering its similarity with hair cells of the respiratory tract (Figure 1), which can lead to false positives or false negatives. Characteristics such as the ovoid shape of the cell, the tuft of numerous and irregular flagella originating from a rounded base, the granular cytoplasm and the absence of a terminal bar differentiate the protozoan from the epithelial cell, in addition to the fact that *L. blattarum* can present movement during the exam, having an irregular orientation and losing power of movement from 15 to 20 minutes.
The team suspected pneumonia and started treatment with clarithromycin, amoxicillin, prednisone, paracetamol, acetylcysteine syrup and hydration with homemade serum, in addition to nebulization with fenoterol and ipratropium. The condition progressed with the improvement of dyspnea and cough, however, after seven days of treatment, the febrile condition returned and started a stabbing abdominal pain in the right hypochondrium radiating to the left flank, which improved with the use of paracetamol with dicrofenac and in orthostasis, with worsening in decubitus, of medium intensity, unrelated to food, associated with weight loss of five kilos during this period, loss of appetite, lack of appetite and diarrhea. With such symptoms, the patient sought the HHMVH service, where he was admitted.

On physical examination inside the HHMVH, the patient had some fever spikes, crepitation at the base of the left lung, pain on deep palpation of the right hypogastrium and absence of other signs. By correlating the signs and symptoms with the history of use of immunomodulators, the hospital’s medical team had tuberculosis and paracoccidioidomycosis as the main initial diagnostic hypotheses and directed the management by requesting simple chest X-rays in posteroanterior (PA) (Figure 2) and in profile, laboratory tests, computed tomography (CT) of the chest, CT of the entire abdomen and sputum tests.

There has been some skepticism regarding the incorrect identification of bronchial ciliated epithelial cells as L. blattarum, but the recent use of molecular diagnostics has come to help clear up the controversy. Molecular diagnosis is performed by means of a specific polymerase chain reaction (PCR) of nasal secretion, bronchoalveolar lavage or sputum, in which a 214-bp band is observed that would confirm the genus Lophomonas spp. Molecular diagnosis is performed by means of a specific polymerase chain reaction (PCR) of nasal secretion, bronchoalveolar lavage or sputum, in which a 214-bp band is observed that would confirm the genus Lophomonas spp. Molecular diagnosis is performed by means of a specific polymerase chain reaction (PCR) of nasal secretion, bronchoalveolar lavage or sputum, in which a 214-bp band is observed that would confirm the genus Lophomonas spp. 18

Antibacterial, antifungal, or antiviral drugs used in common bronchopulmonary infections are not effective against L. blattarum. Treatment against the protozoan consists of 500 milligrams of oral metronidazole every eight or twelve hours or two grams per day in adults and 7.5 mg/kg to 15 mg/kg every eight hours in children for one week. Severe cases can be treated with intravenous metronidazole 15 mg/kg/h followed by 7.5 mg/kg every six hours as maintenance. Tinidazole has also been used as an alternative medicine. Due to the aforementioned diagnostic difficulties, it is also suggested to consider L. blattarum infection and treatment with metronidazole in cases of chronic allergy, especially those that do not respond to the usual treatment.

● CASE REPORT

Male patient, 61 years old, married, white, residing in Vila Velha - ES, from Colatina - ES, rural producer and asthmatic. Alcoholic from 10 to 39 years old, drinking cachaça on weekends. Smoker from 10 to 44 years of age, using roll tobacco with a smoking load of 5.1 packs/year. Frequent use of illicit drugs from 35 to 45 years of age. Past pathological history of ulcerative colitis (UC)/pancolitis, diagnosed by colonoscopy seven years ago, using mesalamine 2000mg 12/12h and azathioprine 150mg once a day, which were not enough to control the clinical condition, requiring the initiation of treatment with immunobiological.

After receiving the fourth dose of 100mg infliximab, the patient developed a fever that was not measured, associated with dyspnea and dry cough in the following month. On the seventh day of symptoms, he sought the emergency room of another hospital, where the patient suspected pneumonia and started treatment with clarithromycin, amoxicillin, prednisone, paracetamol, acetylcysteine syrup and hydration with homemade serum, in addition to nebulization with fenoterol and ipratropium. The condition progressed with the improvement of dyspnea and cough, however, after seven days of treatment, the febrile condition returned and started a stabbing abdominal pain in the right hypochondrium radiating to the left flank, which improved with the use of paracetamol with dicrofenac and in orthostasis, with worsening in decubitus, of medium intensity, unrelated to food, associated with weight loss of five kilos during this period, loss of appetite, lack of appetite and diarrhea. With such symptoms, the patient sought the HHMVH service, where he was admitted.

On physical examination inside the HHMVH, the patient had some fever spikes, crepitation at the base of the left lung, pain on deep palpation of the right hypogastrium and absence of other signs. By correlating the signs and symptoms with the history of use of immunomodulators, the hospital’s medical team had tuberculosis and paracoccidioidomycosis as the main initial diagnostic hypotheses and directed the management by requesting simple chest X-rays in posteroanterior (PA) (Figure 2) and in profile, laboratory tests, computed tomography (CT) of the chest, CT of the entire abdomen and sputum tests.
to these, other blood tests were requested to assess renal function and concentrations of electrolytes and lactic dehydrogenase, which were shown to be within normal limits.

CT scan of the entire abdomen showed an examination within normal limits, with the exception of a large amount of dry-looking fecal material in the colonic loops. Chest CT showed the following findings: parenchymal consolidation intermingled with air bronchograms, involving the lower lobe of the left lung (Figure 3); consolidations with ill-defined limits, associated with perivascular pulmonary nodules, compromising the posterior region of the right lung; ill-defined pulmonary opacities, with ground-glass components and non-calcified and perivascular pulmonary nodules, involving the middle lobe and the upper segment of the lower lobe of the right lung; small pulmonary nodules, associated with nodular thickening of the interlobular septa, forming a halo, intermingled with ground-glass areas, corresponding to the inverted halo sign; and small bilateral posterior pleural effusion/thickening. The other thoracic structures were preserved.

The sputum microbiological laboratory tests were negative for acid-fast bacilli (AFB), fungi and Mycobacterium tuberculosis by PCR, which weakens the initial diagnostic hypotheses.

Given the undefined picture, it was necessary to perform bronchoscopy, which showed hyperemia in the posterior and superior basal segments of the left lower lobe, with other segments normal.

Bronchoalveolar lavage fluid from the bronchial tree was collected according to the appropriate technique for bronchofibroscopy, instilling isotonic saline solution (0.9% sodium chloride) at room temperature in aliquots that were later recovered by aspiration. The resulting liquid was placed in a sterile flask, free of formaldehyde or alcohol, which is extremely important for the conservation of the living protozoan, since they reduce or nullify the possibility of observing the movement of *L. blattarum*. The technique used was fresh direct optical microscopy for observation of the living protozoan and, thus, its ciliary movement under the optics of reflected light. According to the technique, up to 10 slides are recommended to consider the negative result, in this case, the positivity occurred in the third slide. The material was analyzed in the shortest possible time, about 5 minutes after the slide was prepared, placed in a humid chamber at room temperature (25°C to 30°C) and the presence of flagellate parasites in the bronchoalveolar fluid was observed (Figure 4) in vibrating and irregular movements, in the sense “to and fro”.

**Figure 3:** Chest CT showing parenchymal consolidation with air bronchograms (circle) in the lower lobe of the left lung. Source: HHMVH Image Center, 2019.

**Figure 4:** Lophomonas blattarum (arrow) in the patient's bronchoalveolar lavage fluid under direct microscopy at 400x magnification. Source: Tommasi Clinical Analysis Laboratory, 2019.

It was possible to observe that the pathogenic cell had characteristics typical of *L. blattarum*, such as an ovoid shape, numerous and irregular flagella and a rounded base, in addition to the movement observed in real life. However, as it is a rare and little-known disease, its etiology was not initially defined and it was necessary to study the literature extensively and have a multidisciplinary approach to safely confirm the etiological agent corresponding to the microscopic finding.

Once the microscopic laboratory diagnosis was defined as pulmonary infection by the protozoan *L. blattarum*, home treatment was started with metronidazole 500 milligrams every eight hours for ten days, following the recommendations in the literature. After three months of treatment, the patient returned for the routine consultation, presenting without symptoms and with a new chest CT performed two months after the treatment, showing a clear improvement in the inflammatory process.

Thus, the medical team considered the clinical picture to be resolute, with no recurrence so far. The patient continued the outpatient follow-up with the HHMVH gastroenterologists to monitor the UC, maintaining the treatment with mesalazine and azathioprine, without the use of infliximab.

**DISCUSSION**

Pulmonary infection by the protozoan *Lophomonas blattarum* is a rare condition that is not widespread in the medical community. Only 140 cases of the disease were reported between 1993 and 2016, however, it seems that its incidence is progressively increasing, with some authors considering this disease as a differential diagnosis of chronic allergies that do not respond to treatment.

*L. blattarum* affects the tissues of the urinary,
reproductive and respiratory systems and\textsuperscript{5,6}, even though it can affect immunocompetent individuals\textsuperscript{14,15}, it more commonly affects immunocompromised patients\textsuperscript{1}, which may be cancer carriers, human immunodeficiency virus (HIV) carriers, transplanted organ or other disease or condition that generate immunosuppression. In the case of the patient studied, UC, which had already affected him for seven years, required the use of immunobiologicals to control the symptoms. As a choice for this approach, infliximab was introduced to the treatment of UC, and, after the fourth dose of the drug, the symptoms of the pulmonary infection began to appear.

The symptoms of \textit{L. blattarum} infection are nonspecific, the most common being fever, cough (with or without phlegm) and dyspnoea. \textsuperscript{6,9} The patient reported all three symptoms as present, adding abdominal pain, weight loss, loss of appetite, lack of appetite and diarrhea. On physical examination, he demonstrated a sign already known in the literature as possible in the condition: crackles on pulmonary auscultation\textsuperscript{6,9}.

Upon laboratory tests of blood analysis, the patient presented nonspecific alterations, such as anemia and elevation of inflammatory markers. Eosinophilia was not observed in the report, a finding that is not constant in the literature, being present in only 21.5% to 35% of cases\textsuperscript{5,9}. Investigation using imaging tests could not define the etiology of the condition either, indicating only a diffuse inflammatory process in the lungs. Such evidence corroborates the nonspecific nature of the disease described in the literature, which is difficult to differentiate clinically from other airway infections\textsuperscript{16}, such as bronchial asthma, bronchiectasis, pneumonia and lung abscesses\textsuperscript{6}. In the reported case, the patient had been previously diagnosed and treated for bacterial pneumonia in another hospital, an approach that was unsuccessful in resolving the condition.

The medical team that manages a pulmonary infection must be attentive to the differential diagnoses and consider the hypothesis of involvement by \textit{L. blattarum}, requiring the collection and microscopic analysis of the bronchoalveolar lavage fluid for the diagnosis of the disease. Even requesting such an examination, the diagnosis is not always assertive, as the protozoan is very similar to bronchial epithelial cells, which can confuse eyes that are not attentive to their differences and generate false negatives\textsuperscript{16}.

\section*{REFERENCES}

Resumo

Objetivo: Relatar caso de Lophomonas blattarum isolado de lavado broncoalveolar e realizar revisão de literatura acerca do tema. Método: Estudo observacional, qualitativo, descritivo de um relato de caso com revisão de literatura descritiva apoiada em artigos científicos originais nos bancos de dados PubMed e Scientific Eletronic Library Online.

Revisão de Literatura: O L. blattarum consiste em um protozoário de raro acometimento humano responsável por infecções no trato respiratório, principalmente em imunodeprimidos. A infecção é de difícil diagnóstico, necessitando de visualização do parasita, distinção entre células pulmonares ciliadas e movimentação característica em microscopia óptica a fresco. Depois de feito o diagnóstico, o tratamento é usualmente rápido e eficaz.

Resultado: Paciente masculino de 61 anos, branco, imunodeprimido por quarta dose de infliximabe para o tratamento de retocolite ulcerativa, que compareceu ao Hospital Santa Casa de Misericórdia de Vitória com queixa de tosse seca, dispneia, febre, dor abdominal, emagrecimento, perda de apetite, inapetência e diarreia. O quadro clínico e os exames complementares eram inespecíficos e o diagnóstico foi realizado por análise do líquido da lavagem broncoalveolar, que evidenciou a presença de parasita flagelado, definido como L. blattarum. O tratamento foi com metronidazol 500 miligramas de oito em oito horas por dez dias e o paciente obteve resolução clínica do quadro infeccioso.

Considerações finais: As informações obtidas nesse estudo poderão ampliar o conhecimento da comunidade científica acerca desse patógeno, oferecendo melhor manejo das infecções e colaborando em prol do paciente.

Palavras-chave: Lavagem broncoalveolar; Parasito; Pulmão

---