Case Report

Infection caused by the yeast form of *Paracoccidioides brasiliensis*

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**Introduction:** Paracoccidioidomycosis (PCM) is caused by the dimorphic fungus *Paracoccidioides brasiliensis*. Infection occurs mainly through the upper airways of the host by inhalation of spores or propagules of the micro-organism that settle initially in the lungs. Here, we describe a clinical case report of PCM acquired by a researcher following a scientific laboratory accident; to the best of our knowledge, this is the first report of infection with the yeast form of *P. brasiliensis*.

**Case presentation:** A 40-year-old, white, healthy, male researcher, while undertaking experimental activities in a laboratory environment with *P. brasiliensis* fungus infection in guinea pigs, pierced the thumb of the left hand, with a 1 ml syringe containing 50 μl of a suspension of *P. brasiliensis* at a concentration of $1 \times 10^6$ c.f.u ml$^{-1}$. Seven days after the accident, the region had local swelling, redness and pain on stimulation. He was started on medical treatment and opted for surgical removal. A biopsy revealed an inflammatory infiltrate, numerous epithelioid granulomas and a discrete quantity of yeast organisms on the dermis, some with multiple budding yeast cells presenting characteristics of viability, with conclusive diagnosis of PCM. After 90 days of itraconazole treatment at 200 mg day$^{-1}$, he reported healing with scar formation.

**Conclusion:** The yeast form of *P. brasiliensis* is able to cause infection. According to our knowledge, this is the first time that this has been reported in the medical literature.

**Keywords:** accident; infection; *Paracoccidioides brasiliensis*; Paracoccidioidomycosis.

Introduction

Paracoccidioidomycosis (PCM), caused by the dimorphic fungus *Paracoccidioides brasiliensis*, was first described by Lutz in 1908 and is considered to be the most prevalent systemic mycosis in Latin America. More than 80% of PCM cases are concentrated in Brazil, and it is the eighth leading cause of death among infectious and parasitic diseases (San-Blas et al., 2002; Borges-Walmsley et al., 2002).

PCM is characterized as a serious public health problem for young adults and mostly affects male individuals (Franco et al., 1987). Approximately 85% of cases occur during the most productive period of human life (i.e. 30–59-year-old people) (Negroni, 1993; Wanke & Londero, 1994).

The infection, caused by the pathogen *P. brasiliensis*, occurs mainly through the upper airways of the host by the inhalation of spores or propagules of the micro-organism that settle initially in the lungs. From the lungs, the fungus can spread throughout the body causing internal organ damage (Camargo & Franco, 2000; Valera et al., 2008). Infection by traumatic inoculation of the pathogen through the skin or mucosa is considered to occur in exceptional cases (Restrepo, 1985; Mendes-Giannini et al., 2008). The mechanisms of action in these cases are still not understood (Giraldo et al., 1976).

This paper describes a clinical case report of PCM acquired by a researcher in a scientific laboratory accident with the yeast form of *P. brasiliensis*. To the best of our knowledge,
Case report

A 40-year-old, white, healthy man was conducting experimental research activities in the laboratory with the *P. brasiliensis* fungus in guinea pigs. The man pierced the side edge of the nail on his left thumb with a 1 ml syringe needle (27 gauge) containing 50 $\mu$l of a suspension of *P. brasiliensis* at a concentration of $1 \times 10^6$ c.f.u. ml$^{-1}$. The wound was bleeding and was washed immediately with running tap water and soap, followed by application of 70 % ethanol for disinfection.

The patient was treated for 3 days with daily doses of 100 mg fluconazole as a prophylactic measure. However, 7 days after the accident, the affected region had local swelling, redness and pain on stimulation. The patient’s blood was collected for testing. Dual radial immunodiffusion showed no reaction. After analysis, the patient was treated with 200 mg itraconazole day$^{-1}$ for a period of 90 days. Three days after the start of drug treatment, a biopsy of the swollen spot (0.5 cm diameter) was carried out with the aid of a ‘punch’ that partially removed the lesion, and the material was sent for pathology analysis. The result of this analysis indicated the presence of a lymphocytic and neutrophilic inflammatory infiltrate in the dermis. Numerous epithelioid granulomas with small numbers of yeast cells were also observed; some of these granulomas showed multiple budding and characteristics of viability, which indicated a conclusive diagnosis of PCM (Fig. 1).

For the evaluation of liver and kidney cytotoxicity caused by the use of itraconazole by the patient, the evolution of the case was observed by monthly examinations of liver enzymes (transaminases and creatinine) and a complete blood count. The results of these analyses showed no changes during the 90 days of drug administration (data not shown). In addition, serum samples collected from the patient at 7, 30 and 90 days after the accident were assessed by ELISA using an antibody against *P. brasiliensis* gp43 protein. These analyses showed a significant decrease ($P=0.04952$) in recognition of the *P. brasiliensis* gp43 protein between days 7 and 90 of antifungal treatment.

After suture removal at the site of biopsy, a discrete scar was formed. In addition, there were no inflammatory features, and the patient did not report pain. The patient was subsequently discharged from treatment (Fig. 2).
Discussion

This report documents an infection caused by accidental inoculation of the yeast form of *P. brasiliensis* from a needle used previously in animal experimentation. To the best of our knowledge, this is the first report of this type of infection in the literature.

Multiple entry sites have been suggested for *P. brasiliensis* in the human host. The airway has been the most commonly accepted entry site to date (Restrepo, 1985; Bagagli et al., 2008). Individuals who live in rural areas have a habit of using plant stems to provide oral hygiene, and in the past, it was hypothesized that inoculation of the oral mucosa by *P. brasiliensis* after using plant stems was a frequent cause of PCM. However, there is no scientific evidence to support this. Roldán et al. (2000) introduced 850,000 conidia of *P. brasiliensis* from the filamentous form in suspension to mice jaws and observed systemic infection.

In the present work, the form present in the yeast inoculum was instrumental in the onset of symptoms, following injection of a small amount of yeast into the thumb. Conidia inhaled in nature have been shown to cause PCM in rare cases, but on this occasion, the immune system of the host may have countered the conidia before coming in contact with the yeast.

With reference to the chosen treatment, surgical removal was recommended because of access and lesion size. However, this is not possible in all cases of PCM. In our case, the outcome was favourable due to the onset of early medical treatment and partial or total excision of the lesion.

The present case report is important because it emphasizes the importance of safe laboratory practices and procedures, for instance the use of personal protective equipment by researchers to reduce exposure to hazards as a preventative approach in the case of accidents involving *P. brasiliensis* and other pathogenic fungi.

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References


