even in the earliest stages of infection. Virological evaluation of CSF may be important in understanding the pathogenetic aspects of HIV infection and in the clinical management of infected patients. The present observations have potentially important implications for the design of therapeutic strategies for patients with acute primary HIV infection.

Our data indicate that the CNS is an early tissue reservoir for HIV that cannot be evaluated by plasma-based laboratory tests. Early CNS involvement must be taken into account when therapeutic strategies are planned. Serial observations of patients with primary HIV infection in relation to progression of neurological involvement may provide an answer to the significance of CSF abnormalities identified in these patients.

**References**

Figure 1. Rapid progression of *Mycobacterium kansasii* pulmonary disease in a woman with leukemia. A, Initial chest radiograph that reveals right paratracheal fullness. B, Chest radiograph from 3 weeks later that demonstrates upper lobe consolidation, increased paratracheal adenopathy, and right hilar and sub carnial adenopathy. The bronchus intermedius is narrowed by the adenopathy. C, Chest radiograph from 5 weeks after the one depicted in B that reveals extensive right lung consolidation and patchy left lung consolidation. Right paratracheal adenopathy and hilar adenopathy are obscured by the consolidation. Subcarinal adenopathy is seen.
Figure 2. Slow progression of *Mycobacterium kansasii* pulmonary disease in a woman with breast cancer. Initial chest radiograph (A) and CT scan (B) revealed ill-defined nodules. Two and one-half years later, a chest radiograph (C) revealed extensive left lung nodular and cavitary changes, and a CT scan (D) revealed extensive caviation in the left lung. A tree-in-bud appearance is seen posteriorly in the left lung and laterally in the right lung, a finding indistinguishable from *M. tuberculosis* pulmonary disease [4].

modifies the host’s susceptibility to or the clinical pattern of disease caused by these mycobacteria. To better define the incidence, epidemiology, and clinical and radiological characteristics of *M. kansasii* infections in the cancer population during the current era of more intensive and immunosuppressive therapies, we reviewed a 10-year experience at the University of Texas M. D. Anderson Cancer Center (MDACC) in Houston.

We reviewed the medical records of all patients with cancer who were cared for at MDACC from January 1987 through December 1996 and from whom *M. kansasii* was isolated. Cases were classified as disseminated or pleuropulmonary infections. Disseminated infection was defined as isolation of the organism from a sterile, closed, extrathoracic body site. We defined pleuropulmonary infections as isolation of the organism from the respiratory tract and classified them using the following criteria, modified from those of the American Thoracic Society [2]. Bacteriologic criteria were isolation of *M. kansasii* from ≥2 sputum specimens (or a sputum specimen and a bronchial washing), pleural fluid, or a lung tissue specimen; radiographic criteria were unexplained parenchymal infiltrates; and clinical criteria...
were exclusion of other reasonable etiologies for the disease process.

We classified patients as having definite infection if all criteria were met; probable infection if there was only 1 respiratory isolate, but the remainder of the criteria were met; possible infection if other reasonable causes could not be excluded, but the remainder of the criteria were met; and colonization if no evidence of mycobacterial disease.

*M. kansasii* was cultured and identified to the species level by the MDACC Microbiology Laboratory using standard media and biochemical techniques or on the basis of DNA/rRNA hybridization using the AccuProbe system (Gen-Probe, San Diego). Antimycobacterial drug susceptibility testing was performed on request by the City of Houston Health and Human Services Laboratory using the modified proportion agar dilution test [3].

During the 10-year study period, *M. kansasii* was isolated from 25 patients. The incidence of *M. kansasii* infection was 25 cases per 100,000 cancer patient registrations. Nineteen patients (76%) were male. The mean age of the men was 53 years (range, 23–83 years), and that of the women was 63 years (range, 47–78 years).

Two patients with leukemia had disseminated visceral disease. Both patients presented with unexplained fever without respiratory complaints. Of the remaining 23 patients who yielded pleuropulmonary isolates only, 10 (43%) were classified as having definite disease, 3 (13%) as having probable disease, 5 (22%) as having possible disease, and 5 (22%) as having colonization. In the group of patients with definite disease, *M. kansasii* was isolated from 8 sputum specimens (1 patient), 2 sputum specimens (1), 1 sputum specimen and 1 bronchial washing (2), 1 pleural fluid specimen (1), and 1 lung or pleural tissue specimen (5). Data for the 18 patients with definite, probable, and possible disease are reported together (table 1). Patients with leukemia were overrepresented relative to patients with solid tumor, as compared with the corresponding percentages of hospital registrations (115 vs. 14 cases per 100,000 cancer patient registrations, respectively). The most common symptoms were dyspnea (39% of patients), cough (33%), malaise (33%), fever (28%), weight loss (17%), sputum production (11%), and chest pain (6%). It is of interest that most patients did not have fever, cough, or sputum production, and none had hemoptysis. Five patients, including 4 with cavitary disease and 3 with tissue diagnoses, were asymptomatic when an infiltrate was found on the chest radiograph. Representative radiographs in figures 1 and 2 demonstrate the sharply contrasting evolution of *M. kansasii* disease in 2 patients with distinctly different degrees of immunodeficiency. Antimicrobial susceptibility testing for 13 isolates of *M. kansasii* revealed the following: 100% were susceptible to rifampin; 100%, ethambutol; 84%, isoniazid at 1 μg/mL; and 78%, streptomycin.

The 2 patients with disseminated disease had a complete clinical, radiographic, and microbiological response to antimycobacterial therapy. Six of the 18 patients with isolated pleuropulmonary disease did not receive antimycobacterial agents (4 died before culture results were available; 1 was not treated because of advanced underlying cancer; and 1 was treated successfully with resection of focal pulmonary disease). The remaining 12 patients received rifampin-based antimycobacterial regimens that included ≥2 of the following: isoniazid, ethambutol, streptomycin, and clarithromycin or azithromycin. The conditions of 9 of these patients clinically, radiologically, and microbiologically improved or resolved with therapy, although 5 died within 19 months of the underlying malignancies. The conditions of 3 patients did not improve radiographically with therapy. Of the 20 total patients with *M. kansasii* disease, 12 (60%) died 0–20 months after the date of *M. kansasii* isolation (median, 5 months). Death was not attributed to *M. kansasii* in any case.

This study demonstrates that *M. kansasii* is an infrequent but important cause of pulmonary and occasionally disseminated disease in patients with cancer, especially older adults. The spectrum of infection ranges from extensive, progressive pulmonary and disseminated disease to indolent, often asymptomatic, pulmonary disease to mere pulmonary colonization. Patients with cancer, particularly leukemia, are at an increased risk for development of *M. kansasii* infection and may not exhibit typical signs and symptoms of mycobacterial infection despite having extensive radiographically evident involvement. Although *M. kansasii* infections in the general population typically present as cavitary lung disease confined to the upper lobes that resembles tuberculosis, over one-half of these patients with cancer had multilobar infiltrates without cavitation [5–8]. Because *M. kansasii* infections may be associated with extensive disease yet are highly responsive to rifampin-based antimycobacterial regimens, it is important to maintain a high level of clinical suspicion when caring for patients with cancer and unexplained radiographically evident infiltrates with or without symptomatology.

Kalen L. Jacobson, Ramón Teira, Herman I. Libshitz, Issam Raad, Kenneth V. I. Rolston, Jeffrey Tarrand, and Estella Whimbey

1Section of Infectious Diseases, 2Department of Radiology, and 3Section of Microbiology, University of Texas M. D. Anderson Cancer Center, Houston, and 4Section of Infectious Diseases, Hospital de Basurto, Bilbao, Spain

References

Recurrent Blastomycosis of the Central Nervous System: Case Report and Review

Although blastomycosis of the central nervous system (CNS) occurs in ~4% of patients with blastomycosis, recurrent CNS blastomycosis is very rare. We review the clinical features, treatment, and outcome of 4 previously reported cases. We also report a case of recurrent CNS blastomycosis successfully treated with surgery and liposomal amphotericin B after an inadequate response to amphotericin B therapy. This treatment may be an alternate approach for management of similar cases.

Recurrent CNS blastomycosis is very rare [1–4] and may present either as meningitis or as a space-occupying lesion. We describe a patient with recurrent CNS blastomycosis that occurred 3 years after the first episode and review the management of recurrent CNS blastomycosis.

In March 1998, a 54-year-old man presented with a 3-week history of gradual weakness and numbness of the left arm and leg. Comorbid conditions included diabetes mellitus, hypertension, hypercholesterolemia, status post myocardial infarction, right hemiparesis, right eye blindness, renal insufficiency, and history of pulmonary blastomycosis treated with itraconazole. He was treated for a cerebellar blastomyctoma in March 1995 with surgery and amphotericin B (3251 mg). Clinical or radiological recurrence was not noted in the following 18 months.

Physical examination revealed decreased leg strength and visual field neglect on the left. The erythrocyte sedimentation rate was 52 mm/h, WBC count was 10 × 10^6 cells/L, and HIV serology was negative. Levels of serum electrolytes, albumin, and transaminases were normal. Brain MRI showed a multilocular right cerebral abscess with associated edema (figure 1). Recurrence of CNS blastomycosis was diagnosed, albeit at a different anatomic location.

He was treated with phenytoin and dexamethasone. The following day, 10 mL of purulent material was aspirated; culture of the material yielded Blastomyces dermatitidis. Although he initially regained strength, he developed left-hand clumsiness that did not respond to a higher dose of dexamethasone. The brain abscess was excised when a brain MRI showed that it had increased in size. The cerebral cortex showed chronic inflammation, with giant cells containing B. dermatitidis. No fungi were isolated from cultures of brain, blood, or urine specimens. Treatment was begun with amphotericin B colloidal dispersion (ABCD; Amphoter, Sequus Pharmaceuticals, Menlo Park, CA). Amphotericin B treatment was restarted when no further recurrence was noted clinically or by MRI.

The subsequent hospital stay was uneventful, and the patient was discharged home; thrice weekly amphotericin B was prescribed at discharge. In June 1998, the patient underwent cholecystectomy. B. dermatitidis was not seen in the gallbladder. In November 1998, he was declared dead on arrival at a local hospital. An autopsy was not done. The cause of death, while suspected to be cardiac, is unknown.

Approximately 2.5% of patients with pulmonary or systemic blastomycosis develop CNS involvement [5, 6]. Recurrent CNS blastomycosis is very rare; in addition to the case we describe here, only 4 other cases have been reported [1–4]. These cases are summarized in table 1. All cases had initial pulmonary or skin involvement. The initial episode of CNS blastomycosis was diagnosed after variable intervals and different treatment modalities were used for management. Recurrent CNS blastomycosis presented as meningitis [2–4], cerebral mass [1]; our patient was the only one who developed an abscess in the primary and recurrent episodes of CNS blastomycosis. Two patients died, 1 after suboptimal treatment [3] and the other of presumed cardiac causes.

We reviewed the current data on drug therapy for primary and recurrent CNS blastomycosis. Our review included information from MEDLINE searches (1966–1999), textbooks, individual articles (especially for the years before 1966), and the articles referenced in textbooks and individual articles. The drug of choice for treatment of CNS blastomycosis is amphotericin B [7]. Table 1 demonstrates that CNS blastomycosis can recur despite the use of appropriate doses of amphotericin B, suggesting that it may not be the drug of choice for treating recurrent CNS blastomycosis. Because CNS blastomycosis can occur after azole treatment of pulmonary blastomycosis [1, 2, 8], these agents should not be used to treat CNS blastomycosis. However, because it achieves higher CSF concentrations than other azoles [9], fluconazole may be an exception. But, other than case reports [10, 11], there is insufficient data to suggest that fluconazole is as effective as amphotericin B in treating CNS blastomycosis. Flucytosine also penetrates the CNS well [12], although there is