Cryptococcus Neoformans as a Rare Cause of Hospital Infection •
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blockers did not seem to be a risk factor for CDI in patients who underwent allogeneic SCT.

Diarrhea was a very common complication of hematologic malignancy in patients who underwent SCT. In fact, only 3 patients did not develop diarrhea during their hospitalization. Almost one-third of the patients who underwent allogeneic SCT also received a diagnosis of CDI. Previous studies have reported increased rates of CDI among allogeneic SCT recipients of 13%[1] and 20%,[2] and a more recent publication[3] reported a CDI rate of 27.3% among such patients—a rate comparable to our reported rate. In our study, all CDI cases occurred among leukemic patients, and 60% of the patients with acute myeloid leukemia developed CDI. This association was evident over a 4.5-year period and was not associated with any temporal clustering of CDI cases. However, leukemia was also associated with higher rates of prior hospitalization and prior antibiotic use.

To our knowledge, this study is the first to report an association between CDI and acute myeloid leukemia in patients undergoing allogeneic SCT. The principal limitation of our study is its small sample size, which did not allow us to perform multivariate analysis. Our findings will need to be investigated in a multicenter study that encompasses a sample size large enough to allow multivariate analysis to control for confounding. Despite the small sample size and the complex nature of the patient population, we determined that leukemic patients undergoing allogeneic SCT have a very high risk of developing CDI. Clinicians should maintain a high degree of suspicion for CDI when caring for leukemic patients (and for those with acute myeloid leukemia in particular) who have undergone allogeneic SCT and subsequently develop diarrhea, and they should aggressively pursue this diagnosis, which will allow for early recognition and treatment of CDI.

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Cryptococcus Neoformans as a Rare Cause of Hospital Infection

To the Editor—Cryptococcosis is a systemic mycosis caused by varieties of *Cryptococcus neoformans* and is predominantly an opportunistic infection observed in adults with AIDS or in other cellular immunodeficiency conditions. Most cryptococcal infections are acquired primarily by inhalation of infectious propagules, and there are occasional cases of direct traumatic inoculation.[1,2] Nosocomial transmission of cryptococcosis has been reported previously and is considered to be quite rare.[2-4] We report a case suggestive of nosocomial transmission of cryptococcosis and review the cases reported in the medical literature.

A 65-year-old woman (patient A) was hospitalized because of fever, cough, and headaches on March 28, 2008. The patient underwent liver transplantation because of end-stage chronic hepatitis C liver disease in 2003. Chest radiography revealed an infiltrate with pulmonary nodules in the right lung. *C. neoformans* was isolated from pulmonary nodule biopsy specimens and cerebrospinal fluid specimens on April 24, 2004. She received mechanical ventilation and was transferred to the medical intensive care unit on May 4, 2008. Despite receiving treatment with amphotericin B (50 mg/day) and 5-flucytosine (7250 mg/day), the patient died of refractory respiratory failure on July 27, 2008.

A 67-year-old woman (patient B) was admitted to the same medical intensive care unit (ICU) in a close but not contiguous bed to patient A. Before her admission in the ICU on June 19, 2008, the patient underwent valve replacement and developed hemorrhagic shock. Patient B had previously been healthy, without any underlying diseases, and was not receiving any immunosuppressive therapy. Because refractory respiratory failure and persistent fever occurred despite receipt of broad-spectrum antibiotic treatment, multiple blood samples were drawn for culture, which yielded *C. neoformans* on July 10, 2008. *C. neoformans* was also isolated from cer-

TABLE. Reported Cases of Nosocomial Respiratory Transmission of Cryptococcosis

Patient	Age (years)	Sex	Underlying disease	Samples grew *Cryptococcus* species	Treatment	Outcome	Area	Reference
A	65[a]	Female	Liver transplant	CSF, lung	AMB plus 5-FLU	Death	ICU	Present report
B	67	Female	Valve replacement	Blood	AMB plus 5-FLU	Death	ICU	Present report
C	80	Male	Lung cancer	BAL	NA	Death	ICU	Wang et al[3]
D	77[a]	Male	…	Sputum, BAL, blood, urine, CSF	AMB	Death	ICU	Wang et al[3]

NOTE. AMB, amphotericin B; BAL, bronchoalveolar fluid; CSF, cerebrospinal fluid; 5-FLU, 5-flucytosine; ICU, intensive care unit; NA, not available.
[a] Index patient.

ebrospinal fluid specimens. Large amounts of the fungus were seen in the blood cultures. Patient B underwent mechanical ventilation until July 18, 2008. She had an initial satisfactory response to treatment with liposomal amphotericin B and 5-flucytosine. Unfortunately, she died of septic shock and multiorgan failure on July 27, 2008. The 2 patients were retired and came from different regions of Brazil.

Molecular typing of the isolates was performed by arbitrarily primed polymerase chain reaction (PCR) analyses using 4 random oligonucleotide primers (M13, OPH-15, OPH-19, and ERIC1) and appropriate controls. The 2 isolates were found to be indistinguishable by PCR fingerprinting, which demonstrated a unique, identical banding pattern.[5,6] These simple repetitive sequences (OPH-15, OPH-19, and ERIC1) and a minisatellite core sequence derived from the wild-type phage M13 (5′-GAGGGTGGCGGTTCT-3′) were used as specific, single primers to amplify hypervariable repetitive DNA sequences that can discriminate different isolates.

The present report corresponds to a case of likely nosocomial spread of cryptococcosis. Nosocomial transmission of cryptococcosis has been described in a few reports. We were able to find 3 reports about nosocomial transmission of cryptococcosis.[2-4] In addition to ours, we found only 1 case suggestive of respiratory transmission of *C. neoformans* (Table).[3] Similar to the present case, the index patient described by Wang et al[3] had pulmonary cryptococcosis and received mechanical ventilation for long periods in a bed close to the nosocomially infected patient. Despite specific antifungal treatment, the outcome was fatal for both patients with hospital-acquired cryptococcosis. Although person-to-person transmission of cryptococcosis may occur, its occurrence must be rare, because we would have seen more of it during the AIDS epidemic. Other reports of nosocomial transmission include a needlestick contaminated with blood from a patient with disseminated cryptococcosis and a contaminated *C. neoformans* corneal transplant with development of cryptococcal endophtalmitis.[2,4] In fact, needlestick with the development of localized cutaneous cryptococcal granuloma has been described in laboratory personnel working with *C. neoformans*.[2]

The hands of medical personnel and the instruments, such as ventilators and other equipment routinely used in the respiratory intensive care unit, could be contaminated by secretions from an index patient. Indeed, we did not perform cultures of ventilator equipment, room air, and hands of hospital personnel. On the other hand, a patient may have acquired the organism through direct inhalation of airborne fungus as a result of the short distance between the 2 beds or through a respiratory care procedure performed with contaminated instruments by medical personnel. We routinely use glutaraldehyde for disinfection and ethylene oxide or stream sterilization methods for hospital equipment sterilization. As previously reported, *C. neoformans* is susceptible to 1% sodium hypochlorite and iodine, although its susceptibility to 70% ethanol and ethylene oxide, which is used to sterilize hospital equipment in intensive care units, is questionable.[3] In addition to instituting respiratory isolation precautions, an appropriate sterilization process of the hospital equipment should be considered in patients with cryptococcosis.

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Legionella in an Ice Machine May Be a Sentinel for Drinking Water Contamination

To the Editor—We congratulate Schuetz et al for their article in *Infection Control and Hospital Epidemiology* about an ice machine contaminated with legionella.[1] Their epidemiologic investigation revealed that an outbreak of hospital-acquired legionnaires' disease was actually a pseudo-outbreak in which syringes of sterile saline used for bronchoscopy were immersed in ice baths. Fortunately, the indication for bronchoscopy was not pneumonia, and thus, the pseudo-outbreak was detectable. If these patients had pneumonia, they might have received an incorrect diagnosis.

We want to point out a facet of the article that was not mentioned by the authors. The fact that the ice machines were colonized by *Legionella pneumophila* may be an important clue that the hospital drinking water was colonized by *L. pneumophila,* simply because the ice machines receive their water from the hospital water distribution system. We have been advocates of the proactive position that knowledge of legionella in a hospital's drinking water system can be used to prevent hospital-acquired legionnaires' disease. It is surprising that this position is controversial, because the idea is transparent: if the hospital drinking water contains legionella, especially at a high percentage of drinking water sites, it is plausible that patients may develop hospital-acquired legionnaires' disease. The importance of drinking water and ice machine contamination is underscored by the fact that the mode of transmission is frequently aspiration; aerosolization has been widely and mistakenly overemphasized.

Numerous well-controlled studies have confirmed that environmental monitoring for legionella can lead to effective preventive measures.[2–4] These measures include warning the physicians that cases of hospital-acquired pneumonia may be caused by legionella and, as a last resort, disinfection of the hospital drinking water. This scenario of uncovering colonization after patients acquire legionnaires' disease has been confirmed so frequently that a substantial number of European countries currently mandate cultures of hospital drinking water as a sentinel for prevention of *Legionella* infection. In contrast, the Centers for Disease Control and Prevention is a prominent opponent of the policy of routinely culturing the drinking water supply for legionella. The Centers for Disease Control and Prevention recommends that cultures be performed only after 1 or 2 patients have had hospital-acquired legionnaires' disease confirmed.

Thus, the report of Schuetz et al[1] might be considered as a sentinel for legionella colonization of the drinking water at Emory University Hospital (Atlanta, GA). This information can be applied as a proactive method for prevention. A well-publicized outbreak of several cases of legionnaires' disease at another Atlanta hospital might have been prevented if cultures for legionella had been routinely performed as a preventive measure. A report about the outbreak at Grady Memorial Hospital (Atlanta, GA) noted that more than $700,000 was spent on consulting fees and measures for disinfection.[5] These costs are excessive because disinfection measures were implemented under the pressures of media scrutiny in an outbreak situation. The cost of proactive prevention is a manageable fraction of this figure. In summary, a formal policy of proactive culturing for legionella in hospital drinking water can be an effective and inexpensive approach to prevention of hospital-acquired legionnaires' disease.

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