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Contamination of Hospital Water with Aspergillus fumigatus and Other Molds

Str—in the 1 November 2001 issue of Clinical Infectious Diseases, Anaissie and Costa [1] presented their hypothesis that implicated hospital water as a major source of filamentous fungi. More recently, Dr. Anaissie and other colleagues reported the results of a study that showed an association of fusariosis with pathogenic Fusarium species recovered from a hospital water distribution system [2]. We agree with the authors of these 2 studies that there has been an increase in data that support hospital water as a potential source of filamentous fungi and, in particular, Aspergillus fumigatus, as well as preliminary data that support the possibility of waterborne transmission of these molds.

Still, the origin of filamentous fungi that contaminate hospital water has yet to be resolved. We have previously shown that 94% of water samples obtained from inside the National Hospital (Oslo, Norway) harbored filamentous fungi. Of the variety of molds recovered from tap water samples obtained from the pediatric bone marrow transplantation unit of this hospital, A. fumigatus accounted for 35% of the total number of colony-forming units [3]. During a recent survey performed in the hematology ward of the University Medical Center Nijmegen (Nijmegen, The Netherlands), we cultured Fusarium species from several environmental samples obtained by swabs from showerhead surfaces, but we were unable to culture any molds, including A. fumigatus, from hospital water samples, itself.

We assumed that the kind of natural reservoir that serves as the water source for hospital water systems determines the level of contamination of hospital water with molds. In Norway, the population and industry within the city of Oslo are supplied drinking water for which surface water is the origin. This water undergoes only a simple treatment process that involves aeration, microstraining, and chlorination. In contrast, in Nijmegen, the Netherlands, ground water is the origin of the water supply for drinkable water, including the water supply for the hospital. Rainwater diffuses through layers of sand that serve as a natural filter. The ground water is pumped to the surface from a great depth and has a temperature of ~4°C. This water undergoes no further treatment other than correction of the pH. After the water is pumped to the surface, it is stored in large closed tanks.

Water samples that were obtained from each of the water sources, both before and after the purification procedure was performed, showed a remarkable difference in the recovery of molds, including A. fumigatus (for the recovery methods used, see [3]). No molds were recovered from samples obtained from ground water, whereas 100% of the samples taken from surface water yielded molds. Furthermore, 55% of the surface water samples yielded A. fumigatus. In Oslo, the number of colony-forming units cultured from the water samples was not affected by the purification process.

These results strongly suggest that the type of water source has a significant impact on the recovery of molds from hospital water. If water is stored in a manner that allows it to have contact with ambient air (e.g., storage in a surface water reservoir), fungal contamination will occur, and a diversity of molds can be recovered from outlets (e.g., taps, showers) inside the hospital. On the contrary, in “closed water supply systems” (e.g., storage of ground water in reservoirs where contact with ambient air is prevented), fungal contamination appears to be insignificant. Furthermore, our results suggest that current water purification procedures, such as chlorination, do not eliminate fungal spores.

Another remarkable observation involves the disparity noted in the recovery of A. fumigatus in our studies, compared with the recovery reported by Anaissie et al. [2]. In their study, only 1% of the samples taken from water and water-related surfaces inside the hospital yielded A. fumigatus [4], whereas our study showed that A. fumigatus was present in 40% of all water samples obtained from inside the hospital in Oslo [3]. Indeed, the natural reservoir may be responsible for this enormous disparity in recovery of A. fumigatus.

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Caspofungin in Combination with Itraconazole for the Treatment of Invasive Aspergillosis in Humans

Str—Caspofungin (Cancidas; Merck) belongs to a new class of antifungal agents, the echinocandins. It has in vitro fungicidal activity against numerous fungal pathogens, including Aspergillus species. Although no published studies have evaluated the use of caspofungin for treatment of invasive aspergillosis (IA) in humans, limited data have been reported that clinical improvement or complete response occurred in 41% of caspofungin-treated patients with IA who were intolerant of or had infections refractory to standard antifungal therapies [1]. No clinical data exist on the use of caspofungin in combination with other antifungal agents, which is an intriguing possibility, given caspofungin’s unique mechanism of action. We report our experience with the use of caspofungin in combination with itraconazole in 2 immunocompromised patients with IA.

The first patient was a 50-year-old woman with acute lymphoblastic leukemia who underwent induction chemotherapy. By day 28 of chemotherapy, she was not in remission, so she underwent reinduction and soon developed neutropenic fever and a dry cough. Administration of broad-spectrum antibiotics was started, and a chest radiograph revealed right upper and right lower lobe opacities. A thoracic CT scan revealed a cavitary lesion in the right lower lobe. Shortly thereafter, the patient complained of pain and rapidly progressive vision loss in her right eye. Bronchoscopic evaluation with lavage and vitrectomy were performed. Cultures of samples obtained from both procedures grew Aspergillus terreus, an amphotericin B–resistant organism. The patient received caspofungin (50 mg/day given iv) and itraconazole (200 mg t.i.d. given by mouth [po]), which she tolerated well. She stabilized clinically and underwent right lower lobectomy 4 weeks later. She received a total of 8 weeks of combination antifungal therapy. Five weeks after completing therapy, she underwent bone marrow transplantation; although the transplantation was not successful, she remained free of Aspergillus infection for >7 months before dying of leukemia.

The second patient was a 64-year-old man who underwent left single-lung transplantation for end-stage obstructive airway disease. In the 7 months after undergoing transplantation, he received high-dose corticosteroid therapy and antiviral therapy for recurrent acute and chronic rejection and cytomegalovirus pneumonia. Nine months after he underwent transplantation, a chest radiograph revealed a new nodule in his native lung. Despite administration of empiric antimicrobial therapy, the nodule progressed in a consolidative process involving the right lower lobe. A specimen obtained by CT-guided fine-needle aspiration of the lung grew Aspergillus fumigatus on culture. Therapy with itraconazole (400 mg/day given po) and amphotericin B lipid complex (5 mg/kg/day given iv) was initiated, but the patient’s serum creatinine level increased from 1.1 mg/dL to 2.5 mg/dL while he was receiving the initial doses of amphotericin B lipid complex. Consequently, amphotericin B lipid complex was replaced with caspofungin (70 mg/day given iv) and itraconazole treatment was continued. The patient tolerated this combination without difficulty, and his serum creatinine level returned to the baseline value. The chest radiograph findings improved gradually, and administration of both medications was discontinued after 12 weeks. He has had no recurrence of Aspergillus infection in the subsequent 6 months.

We were able to use caspofungin in combination with itraconazole in 2 immunocompromised patients to eradicate IA that likely would have otherwise resulted in significant morbidity or death. On the basis of this limited experience, we believe that caspofungin can be successfully used in combination with itraconazole to treat invasive fungal infections, such as IA, that have traditionally been difficult to treat. Its unique mechanism of action and fungicidal activity may provide an alternative when standard therapy, such as treatment with amphotericin B, is either ineffective or intolerable.

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References