Heliport-associated Nosocomial Mucormycoses

To the Editor:

Nosocomial fungal infections have been associated with construction in or near hospitals[1-4] and contamination of ventilation systems,[3] air conditioner filters,[5] fireproofing material,[6] and Elastoplast® dressings.[7-8] We report the epidemiologic and microbiologic investigation of an apparent heliport-associated outbreak of nosocomial fungal infections.

Two cases of disseminated mucormycosis and one case of rhino cerebral mucormycosis were recognized in three newly diagnosed leukemia patients in a 162-bed pediatric teaching hospital between March and September 1985. The intervals between diagnosis of leukemia and onset of mucormycosis for the three cases were 12, 14, and 16 days. Each of the patients had been hospitalized for between six and nine days in the period between diagnosis of leukemia and onset of mucormycosis.

Review of microbiology, pathology, and nosocomial infection records from 1978 to 1985 revealed no cases of mucormycosis prior to March 1985. The three cases diagnosed in the remainder of 1985 represented a statistically significant aberration ($p = .004$, Poisson heterogeneity test). The number of cases of mucormycosis per newly diagnosed acute leukemia patient in 1985 was 3 per 60, versus 0 per 108 in the years 1982 to 1984 ($p = .08$, two-tailed Fisher's exact test). In the period of risk for nosocornlal mucormycosis (January through August 1985), leukemia was newly diagnosed in 38 patients, compared with 30 patients in the same period of 1984 ($p = .33$, Poisson heteroge neity test).

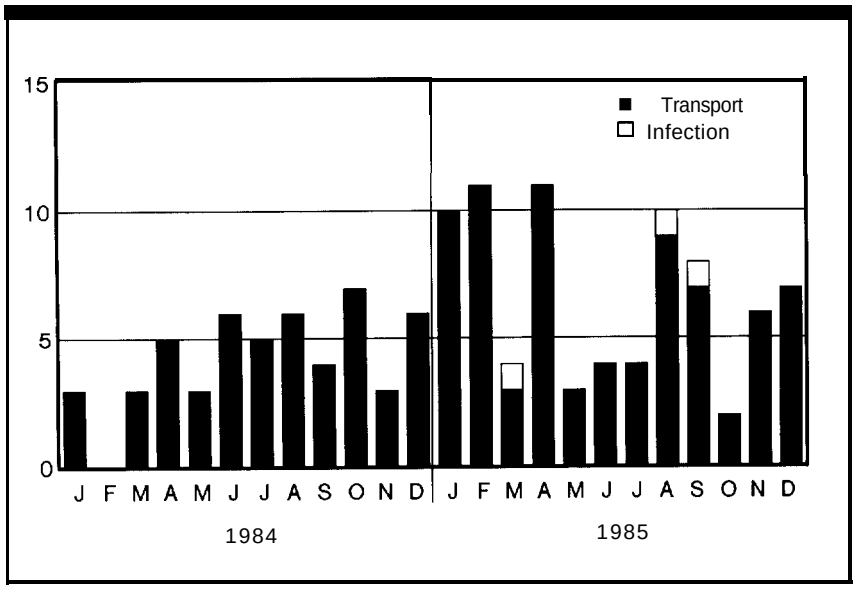

FIGURE. Helicopter transports and cases of mucormycosis infection in pediatric oncology patients, 1984 through 1985. There were 51 transports in 1984, compared with 77 in 1985. Infections occurred after periods of particularly heavy use of the heliport.

The ventilation pathway for the oncology unit was traced via hospital blueprints from outside the building to the patient rooms. The air that ventilates the oncology unit is transferred to the unit via an air handler whose intake vents are 20 yards from the hospital heliport. The heliport is elevated on columns and braces and sits 6.5 feet above the roof of the hospitals fifth floor. The roof area comprises 10,000 square feet, and at the time of the outbreak, was paved with a 1.5-inch-deep layer of gravel and sand. The air intake vents are 18 inches above the roof. When a helicopter was not present and the wind velocity was five or less miles per hour, air was "inhaled" into the air handler at a minimum speed of eight miles per hour (measured with an anemometer). When a helicopter landed or took off, air, along with dust and small particles from the roof, was blown into the air handler at speeds of 70 or more miles per hour. After the air enters the air handler through the intake vents, it passes through a prefilter, which filters approximately 40% of particulate matter, and then through a bag filter, which traps approximately 90% of particles. The air is then delivered to the patient care units at a speed of one foot per second via air ducts that enter above the ceiling panels into patient rooms.

The heliport was constructed in mid-1983. In 1985 there were 77 helicopter transports, compared with 51 in 1984 ($p = .02$, Poisson heterogeneity test). During the period of risk (January through August 1985) there were 55 transports, compared with 31 during the same time period in 1984 ($p = .01$, Poisson heterogeneity test). The three cases of mucormycosis occurred during or following times of increased heliport use (Figure). No major hospital construction occurred in 1985.

Air sampling and culturing was performed with a centrifugal air sampler (Biotest Diagnostics, Fairfield, New Jersey) containing rose bengal agar. Thirty room air samples from nine patient rooms in the oncology unit obtained over five different days during a three-month period (October through December 1985) yielded a mean of 3.2 colony-forming units (CFU)

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per m^3 of zygomycetes. Eleven air samples from above the false ceiling panels in three patient rooms were similarly cultured on three days in October through November 1985, revealing a mean of 22 CFU per m^3 of zygomycetes. Cultures obtained on two separate days (October and December, 1985) of the gravel that covered the roof near the air intake vents of the air handler that served the oncology unit had a mean of 1.3 CFU per 50 g. Cultures of the prefilters and bag filters inside the air handler yielded more than 50 CFU per cm^2 and 4 CFU per cm^2 of zygomycetes, respectively.

Based on these investigations, the hospital implemented the following control measures at the end of December 1985: high efficiency particulate air (HEPA) filters were used in the oncology patient rooms; and the gravel under the helipad was removed and replaced with an impervious neoprene roofing material. Subsequent cultures of air samples from three oncology patient rooms on one day in February 1986 revealed no zygomycetes, and cultures of air samples from one patient room in April 1986 contained a mean of 0.5 CFU per m^3 of zygomycetes. No further cases of confirmed mucormycosis in oncology patients have been reported as of December 1991.

The clustering of cases of mucormycosis within a limited period of time and the short interval between development of immunosuppression and occurrence of mucormycosis in all three patients suggested that our patients might have been exposed to a common environment contaminated unusually heavily with zygomycetes. Because all three patients had been hospitalized for periods of six to nine days during the two weeks between diagnosis of leukemia and onset of mucormycosis, the hospital was a likely site of exposure.

The findings of our investigation are consistent with the hypothesis that the gravel-paved roof beneath the heliport was a primary reservoir of zygomycetes, with the heavily colonized prefilters serving as a secondary source. Fungal spores were likely deposited from the gravel into the air handler by turbulence created by frequent helicopter landings and takeoffs. The high velocity winds also could have liberated spores from the heavily colonized air handler prefilters into the air supply of the oncology unit, thus exposing our patients to a large inoculum of zygomycetes. The increased use of the heliport during the time of the patients' hospitalizations sup ports this hypothesis. That zygomycetes were infrequently recovered from room air after the roof was paved and HEPA filters were used, despite continuing frequent use of the heliport, supports the efficacy of these interventions. It is also noteworthy that no new cases of mucormycoses have been recognized in our oncology patients.

We suggest that helicopter-created dust and proximity of helicopter ports to ventilation systems are potential environmental risk factors for nosocomial fungal infections.

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REFERENCES

1. Sarubbi FA Jr, Dopf HB, Wilson MB, et al. Increased recovery of *Aspergillus flavus* from respiratory specimens during hospital construction. ***Am Rev Respir Dis.*** 1982;125:33-38.
2. Arnow PM, Anderson RL, Mainous PHD, et al. Pulmonary *Aspergillus* during hospital renovation. ***Am Rev Respir Dis.*** 1978;118:49-53.
3. Lention JR, Rosenkranz MA, Michaels JA, et al. Nosocomial aspergillosis: a retrospective review of airborne disease secondary to road construction and contaminated air conditioners. ***Am J Epidemiol.*** 1982;116:430-437.
4. Grossman ME, Fithian EC, Behrens C, et al. Primary cutaneous aspergillosis in six leukemic children. ***J Am Acad Dermatol.*** 1985;12:313-318.
5. del Palacio Hernanz A, Feres J, Larregla Garraus S, et al. Nosocomial infection by *Rhizomucor pusillus* in a clinical haematology unit. ***J Hosp Infect.*** 1983;4:45-49.
6. Aisner J, Schimpff SC, Bennett JE, et al. *Aspergillus* infections in cancer patients: association with fireproofing materials in a new hospital. *JAMA.* 1976;235:411-412.
7. Mead JH, Lupton GP, Dillavon CL, et al. Cutaneous *Rhizopus* infection: occurrence as a postoperative complication associated with an elasticized adhesive dressing. *JAMA.* 1979;242:272-274.
8. Dennis JE, Rhodes KH, Cooney DR, Roberts GD. Nosocomial ***Rhizopus*** infection (zygomycosis) in children. ***J Pediatr.*** 1980;96:824-828.

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