



# Aspergillus Pneumonia in Adult Patients With Acute Leukemia

Stacey Cadogan, RN, MSN, ACNP, OCN®, and Sharon Miller, CRNP, MSN, AOCNS®

*Aspergillus* pneumonia often is a fatal consequence of prolonged neutropenia in patients with acute leukemia. Despite prompt diagnosis and adequate antifungal therapy, mortality remains high among these patients. Recognizing early signs and symptoms, as well as risk factors, is the key to reducing morbidity and mortality.

Stacey Cadogan, RN, MSN, ACNP, OCN®, is a nurse practitioner at Indiana University Health Ball Memorial Cancer Center in Muncie, and Sharon Miller, CRNP, MSN, AOCNS®, is a senior professional nurse in IV therapy at the University of Pittsburgh Medical Center in Pennsylvania. The authors take full responsibility for the content of the article. The authors did not receive honoraria for this work. No financial relationships relevant to the content of this article have been disclosed by the authors or editorial staff. Cadogan can be reached at [snull@iuhealth.org](mailto:snull@iuhealth.org), with copy to editor at [CJONEditor@ons.org](mailto:CJONEditor@ons.org).

Key words: aspergillus; pneumonia; leukemia

Digital Object Identifier: 10.1188/14.CJON.243-246

Most people are commonly exposed to *aspergillus*, a fungal organism that is present in the soil; however, disseminated and invasive forms occur most often in those who are immunocompromised (Franquet, Giménez, & Hidalgo, 2004). *Aspergillus* pneumonia is a potentially fatal consequence of prolonged neutropenia caused by acute leukemia and can be difficult to treat despite prompt diagnosis and adequate antibiotic therapy (Reichenberger, Habicht, Gratwohl, & Tamm, 2002). Although increasing supportive care has successfully extended life during prolonged neutropenia because of myelosuppressive drugs, this also has led to greater susceptibility to infections in patients, with an associated rise in morbidity and mortality.

## Aspergillus

*Aspergillus* survives well in air, dust, and moisture within healthcare facilities. Any disruption of dust or air within a hospital or healthcare facility can cause a release of airborne fungal spores. Ab-

sorbent building materials, such as wallboards, function as an ideal area for fungal spores to accumulate (Centers for Disease Control and Prevention, 2003). Therefore, the occurrence of *aspergillus* has been directly related to building hygiene and construction work. Construction increases the concentration of *aspergillus* conidia in the air, and inhaled spores can lead to colonization and subsequent infection, otherwise known as invasive aspergillosis (IA) (Reichenberger et al., 2002).

## Invasive Aspergillosis

*Aspergillus fumigatus* is the most commonly found species in *aspergillus* pneumonia (Latge, 1999). In a study of more than 4,000 patients with acute leukemia, the incidence of *aspergillus* pneumonia was 6%, of whom 39% died (Pagano et al., 2010). An intact immune system is essential to successfully combat a fungal infection. Several factors adversely affect immune defenses in patients with hematologic disease and IA, including hematologic malignancy and neutropenia associated with chemotherapy agents used in

induction, consolidation, and conditioning regimens (Safdar, 2008). Prolonged neutropenia remains the greatest risk factor in developing *aspergillus* pneumonia. An absolute neutrophil count (ANC) of less than 500 (neutropenia) for greater than 20 days is the strongest predictive factor in diagnosing *aspergillus* pneumonia (Reichenberger et al., 2002).

In patients with leukemia, damaged white blood cells impair immune response, allowing for fungal colonization (Pagano et al., 2010). Tumor necrosis factor (TNF) and macrophage inflammatory protein (MIP) are important in the defense against fungal infections (Reichenberger et al., 2002). TNF is a cytokine that is naturally present in the body and causes cell death by apoptosis. MIP facilitates neutrophil and macrophage chemotaxis, as well as neutrophil and macrophage activation against invading organisms (Gao et al., 1993). In patients with neutropenia, TNF and MIP are reduced, lowering the body's natural defenses (Reichenberger et al., 2002).

## Diagnosis of Invasive Aspergillosis

The signs and symptoms of *aspergillus* pneumonia often are hard to distinguish from those of bacterial infections. Patients on adequate antibacterial therapy who remain persistently febrile should be evaluated for fungal pneumonia. *Aspergillus* infections tend to occur in the third week of neutropenia or later (Ferrara, MacDougall, & Gallagher, 2011).

Despite severe fungal infections, patients often remain afebrile with normal radiographic testing (Safdar, 2008). Therefore, radiologic imaging is of utmost importance in the diagnosis of *aspergillus*