

FEATURE ARTICLE

Systemic *Candida* Infections in Patients With Leukemia: An Overview of Drug Therapy

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With ever-increasing medical progress and the ability to save or prolong the lives of severely ill patients, systemic fungal infections have risen dramatically and come to the forefront of attention and concern (Klepser, 2001). Invasive fungal infections (i.e., mycosis) no longer are a problem only in endemic areas where specific fungi are prevalent in the environment (e.g., the desert area of the American Southwest) but have become a predominant, life-threatening complication of immunocompromised, hospitalized patients (Garber, 2001; Graybill, Kauffman, & Patel, 1999; Meis & Verweij, 2001). Fungi that ordinarily live in the gut and the general environment and would be harmless to individuals with intact immune systems suddenly may become pathogenic to patients who are immunocompromised (Benedict & Colagreco, 1994). One population of patients at very high risk for systemic fungal infections is people diagnosed with acute myeloid leukemia or acute lymphoid leukemia. The incidence of systemic fungal infections among neutropenic patients with acute leukemia is about 20% (Benedict & Colagreco; Rex et al., 2000).

Although diseased leukemia bone marrow sets the stage for infection risk, the use of multidrug chemotherapy in therapeutically intended marrow ablative doses plays out the infectious events. With leukemia chemotherapy, absolute neutrophil count (ANC) immediately falls to 100 cells/mm³ (or fewer) and patients remain in neutropenia (i.e., ANC of fewer than 1,000 cells/

Systemic fungal infections are becoming increasingly common in patients with hematologic malignancies receiving antineoplastic therapy. The presence of acute myeloid or acute lymphoid leukemia, plus the use of chemotherapy to totally ablate malignant bone marrow cells, puts patients in a protracted neutropenic state. During this profound and prolonged neutropenic phase, patients receive antibiotic therapy for suspected or identified bacterial infections. However, when fever or other signs of infection continue despite antibiotic therapy, patients frequently need to be treated for suspected or identified systemic fungal infections. These infections may occur in patients receiving either standard antileukemia therapy or research protocol therapy involving new drugs, new drug combinations, higher doses, or newer schedules of established drugs. After antifungal therapy is initiated, it may be continued postdischarge in outpatient or homecare settings. Therefore, becoming knowledgeable about antifungal therapy is important for all oncology nurses regardless of practice setting.

mm³) for several weeks or longer, leaving them especially vulnerable to infections. Additionally, patients may have underlying medical conditions that contribute to risk; for example, diabetes mellitus is a common coexisting problem (Garber, 2001).

Predominant Cause

Although several fungal species have been implicated in invasive fungal infections (including those in the *Aspergillus*, *Fusarium*, and *Trichosporon* genera), the *Candida* genus is the leading cause (Rex, Walsh, & Anaissie, 1998). *C. albicans* is the most common species implicated in invasive

candidiasis (i.e., systemic *Candida* infection), but *C. krusei*, *C. parapsilosis*, *C. glabrata*, *C. lusitanae*, and *C. tropicalis* have been isolated from bloodstream infections (i.e., septicemia) in hospitalized patients (Garber, 2001; Hoffman & Pfaller, 2001). Species of the *Candida* genus produce a broad range of infections from nonlife-threatening mucocutaneous candidiasis to invasive candidiasis that can affect any organ or combination of organs, acutely or chronically (Kontoyannis, 2001).

Candida species are the fourth leading cause of nosocomial septicemia and are associated with rates of mortality as high as 38% (Rex et al., 2000). In addition to their impact on mortality, systemic fungal infections produce significant morbidity and debility. Even when infections are not life-threatening, they often are associated with persistent, severe symptoms that diminish quality of life (Benedict & Colagreco, 1994; Garber, 2001). Furthermore, bloodstream infections with *Candida* (i.e., candidemia) are associated with prolonged hospitalization and increased treatment costs (Klepser, 2001; Sobel, 2000).

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