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LETTER TO THE EDITOR

Fungemia caused by non-*Candida* species

Dear Editor,

We read with great interest the article in the *Journal of Microbiology, Immunology and Infection* by Chi et al,[1] reporting a retrospective study of 108 patients with *Candida* species bloodstream infections at a hospital in northern Taiwan. In that study, they concluded that the outcome of candidemia was poor, with mortality of 44.3% and 29.8% in *C. albicans* and non-*albicans* candidemia, respectively. Although these findings of candidemia are interesting, non-*Candida* fungal bloodstream infections also deserve research. Therefore, we performed this study to investigate the clinical significance of non-*Candida* isolates causing fungemia.

The database of the Microbiology Laboratory of Chi Mei Medical Center, Liouying branch, was searched for blood cultures positive for non-*Candida* fungi from January 2005 to December 2010. The clinical charts of all patients included in this study were retrospectively reviewed. Information was collected on age, gender, and underlying

Table 1 Clinical manifestation of 16 patients with non-*Candida* fungemia

Case	Year	Age	Sex	Underlying disease	Fungal species	Treatment	In-hospital mortality
1	2005	40	F	Nil	*Cryptococcus laurentii*	Fluconazole	No
2	2005	44	M	HIV infection	*Cryptococcus neoformans*	Fluconazole	No
3	2005	67	F	Lymphoma receiving chemotherapy	*Cryptococcus neoformans*	Amphotericin B without removal of catheter	Yes
4	2006	68	M	Hepatoma receiving chemotherapy, liver cirrhosis	*Cryptococcus neoformans*	Amphotericin B without removal of catheter	Yes
5	2007	61	M	Lymphoma receiving chemotherapy	*Cryptococcus neoformans*	Amphotericin B without removal of catheter	Yes
6	2007	45	F	Breast cancer receiving chemotherapy	*Cryptococcus neoformans*	Nil	Yes
7	2007	78	M	HIV infection	*Cryptococcus neoformans*	Nil	Yes
8	2007	71	F	Diabetes mellitus	*Cryptococcus neoformans*	Nil	Yes
9	2008	62	F	Lymphoma receiving chemotherapy	*Cryptococcus neoformans*	Fluconazole and removal of catheter	No
10	2008	57	M	Diabetes mellitus	*Cryptococcus neoformans*	Amphotericin B	No
11	2008	80	M	Lung cancer receiving chemotherapy, liver cirrhosis	*Fusarium* spp.	Amphotericin B without removal of catheter	No
12	2008	58	M	Liver cirrhosis	*Trichosporon* spp.	Amphotericin B	No
13	2009	64	F	Lung cancer receiving chemotherapy	*Rhodotorula* spp.	Fluconazole without removal of catheter	Yes
14	2009	68	F	Hepatoma, liver cirrhosis	*Cryptococcus neoformans*	Nil	Yes
15	2009	83	F	Colon cancer	*Trichosporon* spp.	Fluconazole and removal of catheter	No
16	2010	70	M	Diabetes mellitus, lymphoma receiving chemotherapy	*Cryptococcus neoformans*	Fluconazole without removal of catheter	Yes

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immunocompromising conditions, including history of immunosuppressant drug, diabetes mellitus, liver cirrhosis, malignancy, and HIV infection.

During the study period, a total of 967 specimens from 428 patients had positive blood cultures for fungus. Based on the number of patients with fungemia, the most prevalent species were *Candida* spp. ($n = 407$, 95.1%), followed by *Cryptococcus* spp. ($n = 12$, 2.8%), *Trichosporon* spp. ($n = 5$, 1.2%), *Fusarium* spp. ($n = 2$, 0.5%), *Rhodotorula* spp. ($n = 1$, 0.2%), and *Penicillium* spp. ($n = 1$, 0.2%). After reviewing the associated history, true non-*Candida* spp. fungemia was confirmed in 16 patients, and transient fungemia due to non-*Candida* species was diagnosed in five patients. The clinical features of 16 patients with non-*Candida* species bloodstream infections are summarized in Table 1. The mean $\pm$ standard deviation age was 63.5 $\pm$ 12.6 years, and most of the patients ($n = 15$, 93.8%) had underlying diseases. Cancer was the most common underlying disease (solid cancer, $n = 7$; hematological cancer, $n = 4$). Diabetes mellitus and liver cirrhosis were the second most common underlying diseases, follow by HIV infection ($n = 2$). Although the antifungal treatments were various, in-hospital mortality developed in more than half of the patients.

In the present work, there were several significant findings. First, *Candida* spp. remains the most common fungal agent causing bloodstream infection, consistent with previous studies.[2,3] Second, most of the patients with fungemia due to non-*Candida* species had underlying immunocompromised conditions, especially cancer. This suggests that physicians should keep alert to these invasive fungal infections in this era of a growing population of immunosuppressed patients.[4] Third, among 12 patients with cryptococcemia, the mortality was as high as 75%, which may be attributed to two reasons: diagnosis of cryptococcemia was not made before four patients die; and most of the patients in this series had cancer.

This retrospective study had two notable limitations. Because of the rarity of these unusual fungal infections, the number of the patients was small and may not be generalized to other hospital in Taiwan. Additionally, we did not perform molecular identification and the *in vitro* susceptibility to antifungal agents. Both of these deficits still need further large-scale study with advanced laboratory methods.

In conclusion, although non-*Candida* fungemia is a rare clinical entity, it can develop in immunocompromised patients, and result in poor outcome.

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