

Background

- Fungal blood cultures (FBC) are usually ordered when there is suspicion for sepsis resulting from a disseminated fungal infection. However, there are no current guidelines regarding indications for FBC. Furthermore, current blood culture systems can detect the most common fungemias such as candidemia.
- We aimed to analyze whether positive FBC had an added clinical impact over other conventional microbiological tests.

Methods

- We performed a retrospective study of hospitalized adults who had FBC collected between June 2018 and March 2022 at Barnes-Jewish Hospital (BJH), a 1250-bed tertiary-care academic hospital in St. Louis, MO.
- We reviewed medical records to assess the clinical impact of positive FBC during the index admission.
- FBC at BJH use the Wampole Isolator system. The blood from the isolator tube undergoes lysis and centrifugation. The concentrate is plated into chocolate, brain heart infusion, and Sabouraud dextrose agars. Yeasts were identified using matrix assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS)(Bruker Daltonics) and filamentous molds using a combination of macroscopic and microscopic characteristics and sequence-based methods performed at a reference laboratory.
- We evaluated the microbiologic result of the FBC and treating team's response to determine clinical outcome. Each FBC was then identified as having positive, negative, or no clinical impact based on which pre-defined clinical scenario the case met (Table 3).

Results

Table 1. Clinical characteristics of fungal blood cultures.

Variable, n (%) or Median (IQR)	N=4444
Age, years	59 (47-68)
Sex, male	2637 (59)
Comorbidities	
Solid tumors	3701 (83)
Hematological malignancy	784 (18)
Solid organ transplant	785 (18)
Neutropenia	701 (16)
Bone marrow transplant	361 (8)
HIV	181 (4)
Rheumatological condition	109 (2)
Other immunosuppressive condition	667 (15)
Sepsis	2187 (49)

- In total 4444 FBC were performed during 3626 admissions. The overall positivity rate was 6.4% (n=284), of which only 2.9% (130) were fungi.
- The most common isolated fungi were *Candida* spp. (71, 55% of fungus positive FBC), followed by *Histoplasma* spp. (16, 12%), *Cryptococcus* spp. (12, 9%), and unidentified molds (9, 7%) (Table 2). The median time to positivity was 106 hours (IQR 79-177).

Table 2. Microbiological characteristics of fungal blood cultures.

Fungal blood cultures, n (%)	N=4444
Positive fungal blood culture	284 (6.4)
Fungi	130 (2.9)
<i>Candida</i> spp.	71 (1.6)
<i>Histoplasma</i> spp.	16 (0.4)
<i>Cryptococcus</i> spp.	12 (0.3)
Mold	9 (0.2)
<i>Cladosporium</i> spp.	5 (0.1)
<i>Aspergillus</i> spp.	2 (0)
Fungi and bacterial	7 (0.2)
Bacterial species	156 (3.5)
Mycobacterial species	5 (0.1)
Positive fungal blood cultures for fungi	N= 130
Time to positivity, h (IQR)	106 (79-177)
Time to identification, h (IQR)	134 (81-327)

Table 3. Clinical impact scenarios of fungus positive fungal blood cultures.

Clinical impact, n (%)	N=130
No clinical impact	109 (84)
Result with new organism but result not acted upon	26 (20)
Result confirmed conventional microbiological diagnosis and not acted upon	72 (55)
Patient died before result available	17 (13)
Positive clinical impact	17 (14)
New diagnosis and not confirmed by other conventional microbiological methods	13 (10)
Early diagnosis and later confirmed by other conventional microbiological methods	4 (3)
Result in initiation of appropriate therapy	11 (8)
Result confirmed clinical diagnosis not confirmed by other microbiological methods	1 (1)
Negative clinical impact	4 (3)
Result led to unnecessary treatment	4 (3)
Result led to unnecessary diagnostic interventions	1 (1)

- Only 21 (16%) of the 130 fungal results led to a change in management.
- Most frequent organisms where FBC had a positive impact included *C. albicans* (n=4), and *C. parapsilosis* (n=3).
- Fungal results including *Candida* spp. (n=57), *Histoplasma* spp. (n=13) and *Cryptococcus neoformans* (n=10) had no clinical impact, largely because other tests confirmed diagnoses prior to FBC results.
- Cladosporium* spp. (n=2) was the most frequent fungi with a negative clinical impact, which was unnecessary treatment.

Discussion/Conclusions

- Most fungus positive FBC resulted in no immediate clinical impact due to more rapid result return from other microbiological tests such as standard blood cultures and antigen testing, or because isolates were thought to be not clinically significant. This identifies FBC as a possible target for better diagnostic stewardship.
- However, we only assessed the clinical impact on the index admission, and future studies should evaluate the long-term impact of fungemia in some of these patients.

References:

- Mess T, Daar ES. Utility of fungal blood cultures for patients with AIDS. Clin Infect Dis. Dec 1997;25(6):1350-3. doi:10.1086/516140
- Arvanitis M, Anagnostou T, Fuchs BB, Caliendo AM, Mylonakis E. Molecular and nonmolecular diagnostic methods for invasive fungal infections. Clin Microbiol Rev. Jul 2014;27(3):490-526. doi:10.1128/cmr.00091-13
- Kosmin AR, Fekete T. Use of fungal blood cultures in an academic medical center. J Clin Microbiol. Nov 2008;46(11):3800-1. doi:10.1128/jcm.00796-08

