

Specimen F1-14

The F1-14 challenge was a simulated catheter tip specimen from a 34-year-old male with catheter-associated thrombophlebitis. The challenge contained *Candida lipolytica*. A response of *Candida lipolytica*; *Candida* sp., not *albicans*; *Candida* sp.; Yeast, not *C. albicans*; Yeast, sent to reference lab for identification; or Yeast seen was considered satisfactory.

Table 1. Summary of Participant Responses

F1-14	Identification	Referees (36)		Participants (578)	
		No.	%	No.	%
	<i>Candida lipolytica</i>	26	72.2	342	59.2
	<i>Candida</i> sp., not <i>albicans</i>	3	8.3	20	3.5
	<i>Candida</i> sp.	-	-	13	2.3
	Yeast, not <i>C. albicans</i>	1	2.8	24	4.2
	Yeast, referred for ID	6	16.7	137	23.7
	Yeast	1	2.8	26	4.5

Table 2. Results by Method

System	No. Labs	% of Laboratory Designation		
		<i>Candida lipolytica</i>	<i>Candida</i> sp. not <i>albicans</i>	<i>Candida</i> sp.
API	74	36.5	18.9	6.8
PCR/Molecular	2	50.0	-	-
MicroScan	64	84.4	3.1	4.7
Remel RapID Yeast Plus	40	77.5	-	2.5
Sequencing	4	100.0	-	-
Vitek 2	282	92.6	2.1	1.1
Other Commercial Kit	43	20.9	2.3	-
Manual method	79	-	2.5	1.3

Discussion

Macroscopic morphology: The isolate grew well on routine fungal media including media containing cycloheximide. Within 2 days, wrinkled, cream colonies appeared after incubation at 30°C. This challenge failed to grow when incubated at 42°C.

Microscopic morphology: The germ-tube test was negative. Distinctive cornmeal morphology was that of branching chains of long pseudohyphae. *Candida lipolytica* produces long "stick-like" pseudohyphae and true hyphae with blastoconidia in short chains when cultured on cornmeal agar.

Growth on media containing cycloheximide and absence of growth at 42°C are useful features that help differentiate *C. lipolytica* from other *Candida* species (see table 3).

	Growth at 42°C	Germ tubes	Growth (25°C) with cycloheximide	Urease (25°C)
<i>C. lipolytica</i>	-	-	+	+
<i>C. albicans</i>	+	+	+	-
<i>C. dubliniensis</i>	Poor/Variable	+	+	-
<i>C. tropicalis</i>	+	-	Variable	-
<i>C. lusitaniae</i>	+	-	-	-
<i>C. guilliermondii</i>	+	-	+	-
<i>C. kefyr</i>	+	-	+	-
<i>C. zeylanoides</i>	-	-	+	-
<i>C. glabrata</i>	+	-	-	-
<i>C. krusei</i>	+	-	-	Variable
<i>C. parapsilosis</i>	-	-	-	-
<i>C. rugosa</i>	Variable	-	-	-

Table 3. Growth and urease reactions of major *Candida* species (produced from data in references 1 and 2).

Ecology: Found in humans and other mammals, also isolated from corn and olive sources.

Disease: *Candida lipolytica* is an emerging opportunistic fungus that may infect immunocompromised patients as presented in the clinical history for this challenge.

Comment: Commercial system performance varied with the system being utilized. Vitek 2 and sequencing identified over 90% of the isolates to the genus and species level. The other systems did not fare so well. Note worthy is the performance by the laboratories utilizing API sugar assimilation strip method where only 36.5% of these laboratories identified this organism to the species level and only 62.2% of participants identified to *Candida* spp.

References

1. Larone DH. *Medically Important Fungi*. 4th ed. Washington, DC: ASM Press; 2002.
2. Sutton DA, Fothergill AW, Rinaldi MG. *Guide to Clinically Significant Fungi*. Baltimore, Md: Williams & Wilkins; 1998.

Specimen F1-16

The F1-16 challenge was a simulated blood specimen from a 45-year-old male with chronic myeloid leukemia. The challenge contained *Blastoschizomyces capitatus* and *Staphylococcus epidermidis*. A response of *Blastoschizomyces capitatus*; *Blastoschizomyces sp.*; Yeast not *Candida albicans*; Yeast, sent to reference lab for identification; was considered satisfactory.

Table 1. Summary of Participant Responses

F1-16	Identification	Referees (35)		Participants (576)	
		No.	%	No.	%
	<i>Blastoschizomyces capitatus</i>	22	62.9	203	35.2
	<i>Blastoschizomyces sp.</i>	-	-	7	1.2
	Yeast not <i>Candida albicans</i>	2	5.7	47	8.2
	Yeast referred	6	17.1	213	37.0

Table 2. Results by Method

System	% of Laboratory Designation		
	No. Labs	<i>Blastoschizomyces capitatus</i>	<i>Blastoschizomyces sp.</i>
API	76	38.2	-
Manual Method	85	2.4	-
MicroScan	60	40.0	1.7
Remel RapID Yeast Plus	40	45.0	-
Sequencing	5	60.0	20.0
Vitek 2	277	54.5	1.8
Other Commercial Kit	38	15.8	-

Discussion

The genus *Blastoschizomyces* contains only one species, *B. capitatus*. Nearly 60% of referees and over 35% of participants correctly identified this organism to the genus and species level, with an additional ~1% reporting *Blastoschizomyces* species. A large proportion of participants correctly identified that a yeast was present, but identified it no further. Commercial systems had rates between 38-55% for identification to the species level.

Macroscopic morphology: *B. capitatus* may be confused with *Candida krusei*, *Trichosporon* species, or *Geotrichum* species.¹ Colonies are yeast-like and may initially be smooth, turning wrinkled with age. This organism will grow on cyclophosphamide-containing media. Sugar assimilation difference among these organisms may be helpful in differentiating these organisms, but morphology on Tween cornmeal agar and limited biochemical such as urease are needed for definitive identification in most cases. The key differentiating features for *B. capitatus* are summarized along with those for *Trichosporon*, *Geotrichum*, and *Candida krusei* (see Table 3).

Microscopic morphology: *B. capitatus* produces both true- and pseudo-hyphae. Although blastoconidia and rare arthroconidia are often seen, identifying the characteristic oblong annelloconidia clustering at the end of slender annellophores in culture is important in making the correct diagnosis.^{1,2} Differentiating the blastoconidia from the annelloconidia may, however be very challenging so sugar assimilation and urease are required for definitive speciation.¹ The organism does not produce urease.

Disease: *Blastoschizomyces capitatus* is considered an emerging fungal pathogen, primarily detected in specimens from immunocompromised hosts. Severe neutropenia appears to impart the greatest risk for acquiring

infection with this agent and is seen in patients with hematologic malignancy, corticosteroid use, treatment with antibiotic and chemotherapeutic agents, and patients with indwelling catheters. Although lung is the primary site for infections, disease often disseminates and may involve other solid organism, skin and the central nervous system.³

Table 3. Key Differentiating Features for *Blastoschizomyces capitatus*, *Candida krusei*, *Geotrichum* species, and *Trichosporon* species.^{1,2,3}

Organism Name	Colony Morphology	Growth with Cycloheximide	Urease	Pseudo-hyphae	True hyphae	Blastoconidia	Arthroconidia	Anneloconidia	Xylose assimilation	Lactose assimilation
<i>Blastoschizomyces capitatus</i>	Yeast-like, smooth – wrinkled, white-cream colored	+	=	+	+	+ Round-oval	+ few	+ Occurring in clusters	=	=
<i>Candida krusei</i>	Dry, flat, spreading colonies with feathered edges, cream-colored	=v	=v	+	+ few	+ Oval to elongate Occurring in clusters	=	=	=	=
<i>Geotrichum</i> species	Moist, yeast-like with "ground glass" appearance of submerged mycelium, white	=	=	=	+	=	+	=	+	=
<i>Trichosporon</i> species	Initially yeasty turning dry and powdery or wrinkled with age, adherent, cream-colored turning yellow or gray with age	+v	+	+	+	+ Oval, occurring singly or in pairs along hyphae, often at septations	+	=	+	+

+ positive, = negative, v is variable

References

1. Larone DH, *Medically Important Fungi: A Guide to Identification*. 4th edition. Washington, D.C. ASM Press, 2002.
2. Polacheck, I, Salkin IF, Kitzes-Cohen R, Raz R. Endocarditis caused by *Blastoschizomyces capitatus* and taxonomic review of the genus. *J Clin Microbiol*. 1992;30:2318-2322.
3. Martino, R, Salavert M, Parody R, et al. *Blastoschizomyces capitatus* infection in patient with leukemia: Report of 26 cases. *Clin Infec Dis*. 2004;38:335-341.
4. Sutton DA, Fothergill AW, Rinaldi MG: *Guide to Clinically Significant Fungi*. Williams & Wilkins, Baltimore, USA, 1998.