

# SURVEILLANCE OF ACTIVITY OF ANTIFUNGALS: DATA FROM THE ANALYSIS OF RESISTANCE IN ANTIFUNGALS (ARIA) 2020 STUDY

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## Introduction

ARIA is a new annual global surveillance initiative collecting yeast and fungal isolates from worldwide designed to determine resistance to antifungal agents and trends over time. The ARIA program was developed in 2020 to provide a repository of recent clinical fungal isolates with known susceptibility profiles and to monitor resistance trends over time. ARIA reports the susceptibility patterns of its earliest data concerning echinocandins, second-generation triazoles, and fluconazole against clinical *Candida albicans*, non-*albicans* strains including *C. auris*, *Aspergillus* and *Fusarium* isolates from worldwide sources.

## Methods & Materials

Isolates (n=942) were collected from hospitals located in Europe (Germany, Italy, Turkey, Spain, UK), Argentina, Australia, India, Panama and the USA, shipped to the IHMA Switzerland central laboratory, and re-identified by MALDI-TOF or molecular methods. The country of origin and number of each species collected is shown in Figures 1 and 2. Isolates were derived from multiple infection sources (Figure 3).

MIC determinations were performed at a central laboratory following the Clinical and Laboratory Standards Institute (CLSI) broth microdilution method [1] using amphotericin B (AMB), anidulafungin (AFG), caspofungin (CFG), fluconazole (FLC), isavuconazole (IVC), micafungin (MFG), posaconazole (PSC) and voriconazole (VRC).

Percentage susceptibility (%S) or wild-type (%WT) were calculated according to CLSI breakpoints [2].

## Conclusions

ARIA is a wide-reaching antifungal resistance surveillance study with sites from multiple countries worldwide (Figures 1-2). In addition, organisms are collected from multiple infection sources (Figures 3-4). ARIA to date has collected isolates of *Candida* spp., *C. neoformans* and various filamentous fungi including *Aspergillus* spp. and *Fusarium* spp. As ARIA is evolving, in addition to these organisms other yeasts, moulds and filamentous fungi are being added to the collection.

Susceptibility data to standard antifungal agents (Tables 1-2) is provided to highlight awareness of the overall ARIA dataset. Interested parties are able to add additional test molecules to the ARIA test panels whereby some or all of the collection of organisms can be tested. As ARIA evolves it will also become an essential tool to monitor and assess changes in antifungal resistance by geography and over time thus ARIA data will be helpful to assist clinicians make informed choices for antifungal agent therapy.

## Results

Figure 1. Distribution of All 942 Isolates Grouped by Geographical Location

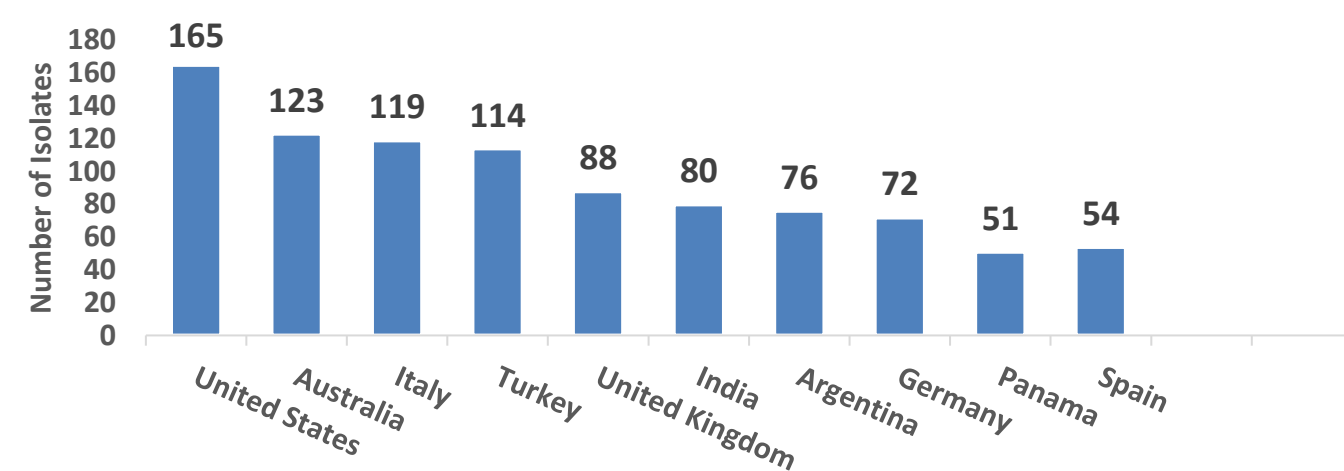


Figure 2. Distribution of Fungal Species by Geographical Location

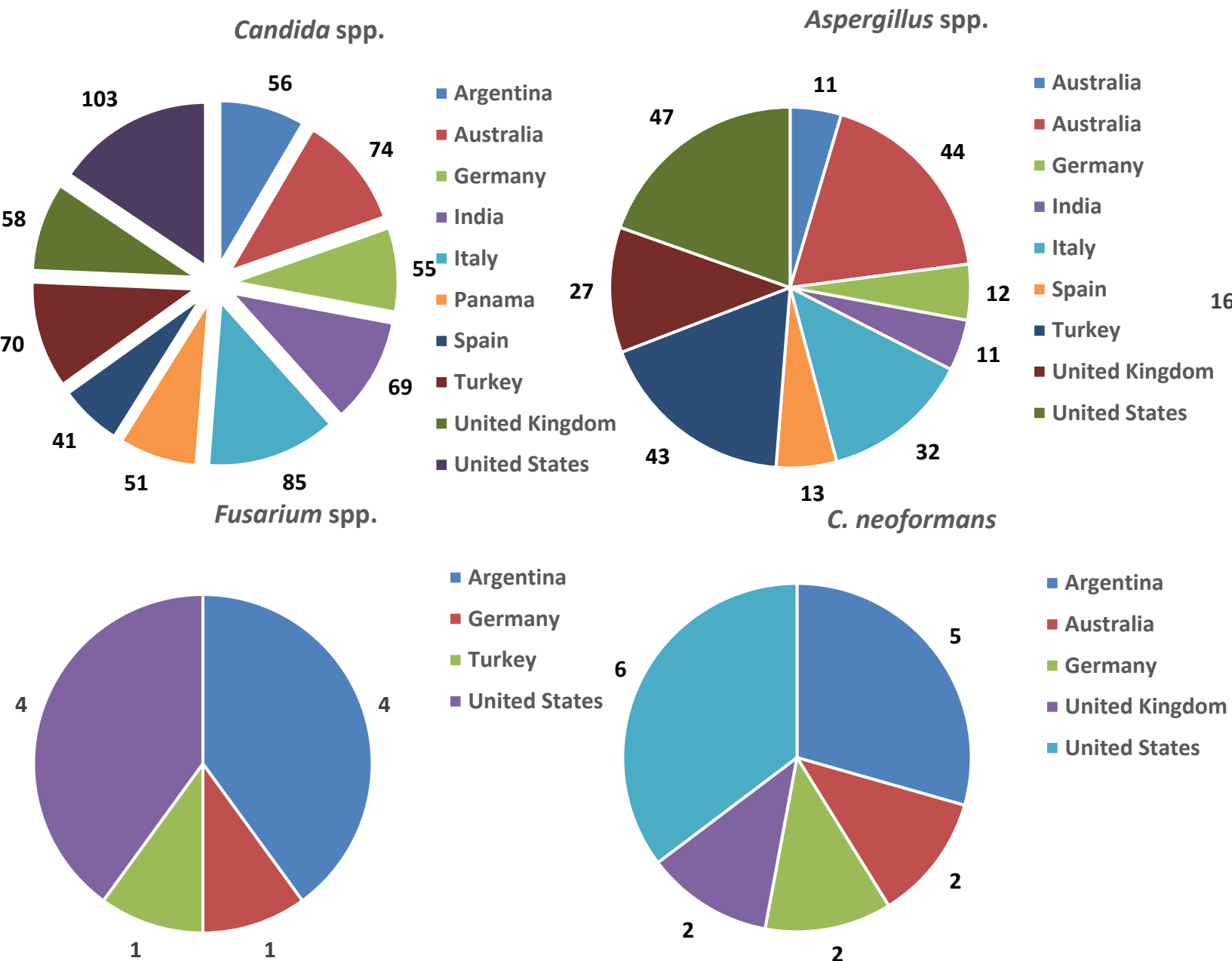


Figure 3. Distribution of All 942 Isolates by Infection Source

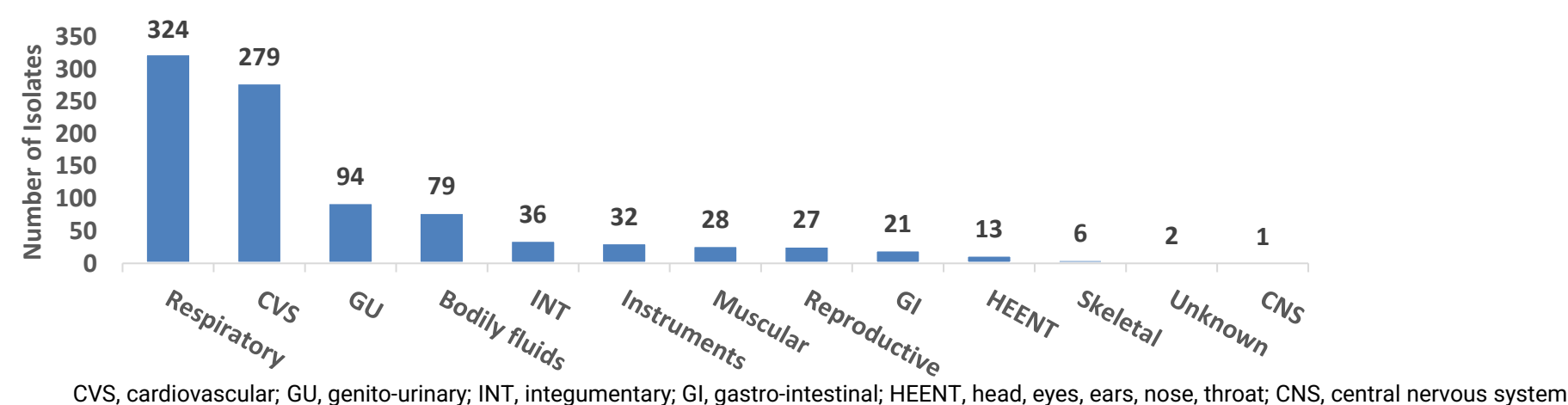
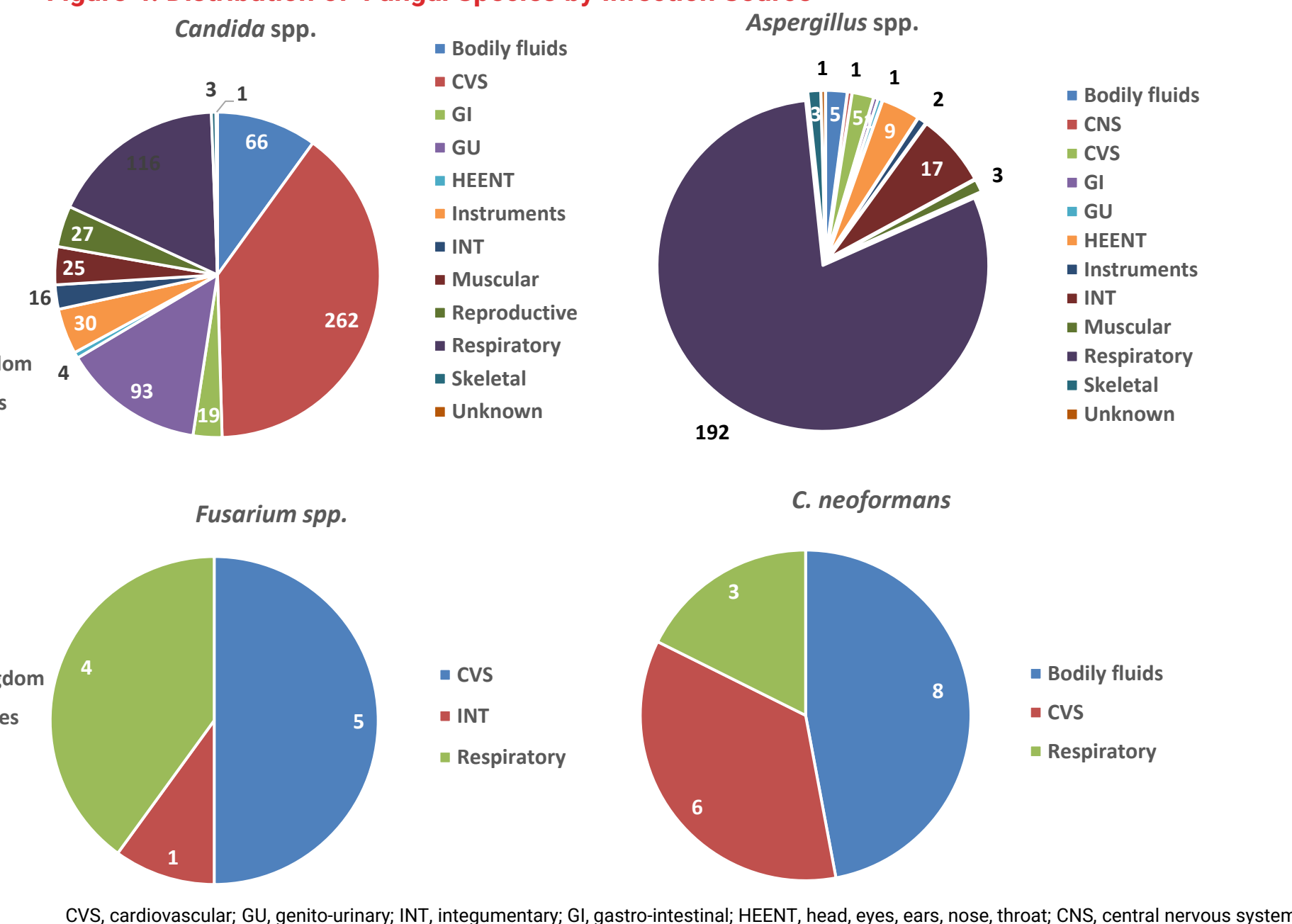


Figure 4. Distribution of Fungal Species by Infection Source



## Results summary

Table 1. Susceptibility of *Candida* spp. and Other Species to Antifungal Agents

Organism	Drug	MIC <sub>50</sub>	MIC <sub>90</sub>	% S	% I	% R	
<i>Candida</i> sp. (n = 650)	Amphotericin-B	0.5	1	89.9	0.0	0.2	
	Anidulafungin	0.03	0.5	99.2	0.0	0.0	
	Caspofungin	0.25	1	57.5	26.5	6.2	
	Fluconazole	0.5	16	76.9	0.3	1.8	
	Isavuconazole	0.015	0.12	na	na	na	
	Micafungin	0.03	0.5	99.2	0.0	0.0	
	Posaconazole	0.015	0.25	na	na	na	
	Voriconazole	0.03	0.12	68.0	1.7	0.2	
	<i>C. albicans</i> (n = 166)	Amphotericin-B	0.5	1	100.0*	na	na
		Anidulafungin	≤0.008	≤0.008	100.0	0.0	0.0
Caspofungin		0.12	0.25	100.0	0.0	0.0	
Fluconazole		0.25	0.5	98.2	0.6	1.2	
Isavuconazole		≤0.004	0.008	na	na	na	
Micafungin		0.008	0.015	100.0	0.0	0.0	
Posaconazole		≤0.008	0.015	98.8*	na	na	
Voriconazole		0.008	0.015	99.4	0.6	0.0	
<i>C. auris</i> (n = 12)		Amphotericin-B	0.5	0.5	na	na	na
		Anidulafungin	0.03	0.06	na	na	na
	Caspofungin	0.5	0.5	na	na	na	
	Fluconazole	>64	>64	na	na	na	
	Isavuconazole	0.12	1	na	na	na	
	Micafungin	0.06	0.12	na	na	na	
	Posaconazole	0.03	0.06	na	na	na	
	Voriconazole	0.25	4	na	na	na	
	<i>C. neoformans</i> (n = 17)	Amphotericin-B	2	8	na	na	na
		Anidulafungin	>8	>8	na	na	na
Caspofungin		>8	>8	na	na	na	
Fluconazole		2	8	100.0*	na	na	
Isavuconazole		0.03	0.06	na	na	na	
Micafungin		>8	>8	na	na	na	
Posaconazole		0.06	0.06	100.0*	na	na	
Voriconazole		0.03	0.12	100.0*	na	na	
<i>A. fumigatus</i> (n = 121)		Amphotericin-B	0.5	1	100.0*	na	na
		Anidulafungin	≤0.008	≤0.008	na	na	na
	Caspofungin	0.12	0.25	63.2*	na	na	
	Fluconazole	>64	>64	na	na	na	
	Isavuconazole	0.25	0.5	100.0*	na	na	
	Micafungin	≤0.004	0.008	na	na	na	
	Posaconazole	0.03	0.03	100.0*	na	na	
	Voriconazole	0.12	0.25	100.0*	na	na	
	<i>Fusarium</i> sp. (n = 10)	Amphotericin-B	0.5	0.5	na	na	na
		Anidulafungin	>8	>8	na	na	na
Caspofungin		>8	>8	na	na	na	
Fluconazole		64	>64	na	na	na	
Isavuconazole		2	4	na	na	na	
Micafungin		>8	>8	na	na	na	
Posaconazole		0.5	0.5	na	na	na	
Voriconazole		1	2	na	na	na	
<i>A. flavus</i> (n = 68)		Amphotericin-B	1	2	100.0*	na	na
		Anidulafungin	≤0.008	≤0.008	na	na	na
	Caspofungin	0.12	0.25	100.0*	na	na	
	Fluconazole	>64	>64	na	na	na	
	Isavuconazole	1	1	100.0*	na	na	
	Micafungin	0.008	0.015	na	na	na	
	Posaconazole	0.06	0.06	100.0*	na	na	
	Voriconazole	0.5	0.5	100.0*	na	na	

\* Wild-type (%WT) were calculated according to epidemiological cut-off values (ECVs)

## References and Acknowledgements

1. CLSI, 2017. Reference Method for Broth Dilution Antifungal Susceptibility Testing of Yeasts. 4th ed. CLSI standard M27. Wayne, PA, USA.
2. CLSI, 2020. Performance Standards for Antifungal Susceptibility Testing of Yeasts. 2nd. ed. CLSI supplement M60. Wayne, PA, USA.
3. CLSI, 2020. Epidemiological Cutoff Values for Antifungal Susceptibility Testing. 3rd. ed. CLSI supplement M59. Wayne, PA, USA.

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