EUCAST EUROPEAN COMMITTEE ON ANTIMICROBIAL SUSCEPTIBILITY TESTING
European Society of Clinical Microbiology and Infectious Diseases

European Committee on Antimicrobial Susceptibility Testing

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

Version 5.0, valid from 2024-12-02

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General	Page
Changes	1
Clinical breakpoints and ECOFFs for yeasts	2
Clinical breakpoints and ECOFFs for moulds	7
Clinical breakpoints and ECOFFs for dermatophytes	10
Antimicrobial susceptibility tests on groups of organisms or agents for which there are no EUCAST breakpoints	Link to Guidance document for interpretation of MICs for yeasts when there are no breakpoints

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Version 5.0, valid from 2024-12-02

Version 5.0, valid from 2024-12-02	**Changes** Cells containing a change or an addition from document v.4.0 are marked yellow (Format changes are not marked yellow).
Yeasts	The anidulafungin ECOFF and breakpoint for *C. albicans* lowered one dilution and established for *C. dubliniensis*; and ECOFFs have been set for *C. auris*, *C. kefyr*, *C. lusitaniae* and *S. cerevisiae.* The micafungin ECOFF and breakpoint for *C. albicans* increased one dilution, and the ATU was removed, breakpoints have been established for *C. dubliniensis* and *C. tropicalis*, and ECOFFs set for *C. auris, C. dubliniensis, C. kefyr C. lusitaniae* and *S. cerevisiae.* Breakpoints for rezafungin and *Candida albicans, C. dubliniensis, C. glabrata, C. krusei, C. parapsilosis* and *C. tropicalis* have established and included. It is important to note, that the rezafungin breakpoints apply for MICs determined with the modified EUCAST methodology using Tween 20 supplemented growth medium (final concentration 0.002%) as described specifically for rezafungin in the E.Def 7.4 method document. Included reference to the "What to do when there are no breakpoints, rare yeast" document for the species where pragmatic recommendations are available (*C. guilliermondii, C. lusitaniae, S. cerevisiae; C. kefyr*).
Moulds	The former ATUs for itraconazole and voriconazole of 2 mg/L have been omitted, as they did not represent classification uncertainty dependent on technical issues. However, the agents may be used in some special situations where no other alternatives are available for treating chronic pulmonary aspergillosis, provided high exposure is obtained and ensured via therapeutic drug monitoring is acknowledged and advice included regarding reporting of isolates with MIC 2 mg/L.

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

For species not in the table, please consult: **Guidance for interpretation of MICs for yeasts when there are no breakpoints**

Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Comments
		WT ≤	S ≤	I	R >	ATU	
C. albicans	Amphotericin B	1	1		1		
	Anidulafungin	0.016	0.016		0.016		
	Micafungin	0.03	0.03		0.03		
	Rezafungin	0.008	0.008		0.008		Breakpoints apply for MICs determined with Tween 20 supplemented medium according to the EUCAST E.Def 7.4 method.
	Fluconazole	0.5	2	4	4		
	Isavuconazole	ND	ND		ND		
	Itraconazole	0.03	0.06		0.06		
	Posaconazole	0.06	0.06		0.06		
	Voriconazole	0.03	0.06	0.125-0.25	0.25		
C. auris	Amphotericin B	2					
	Anidulafungin	0.25					
	Micafungin	0.25					
	Rezafungin	0.125					
	Fluconazole						
	Isavuconazole						
	Itraconazole						
	Posaconazole						
	Voriconazole						
	5-flucytosine	0.5					
C. dubliniensis	Amphotericin B	0.25	1		1		
	Anidulafungin	0.03	0.03		0.03		
	Micafungin	0.06	0.06		0.06		
	Rezafungin	0.016	0.016		0.016		Breakpoints apply for MICs determined with Tween 20 supplemented medium according to the EUCAST E.Def 7.4 method.
	Fluconazole	(0.5)*	2	4	4		
	Isavuconazole	ND	ND		ND		
	Itraconazole	0.06	0.06		0.06		
	Posaconazole	0.06	0.06		0.06		
	Voriconazole	0.03	0.06	0.125-0.25	0.25		

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

For species not in the table, please consult: **Guidance for interpretation of MICs for yeasts when there are no breakpoints**

Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Comments
		WT ≤	S ≤	I	R >	ATU	
C. glabrata	Amphotericin B	1	1		1		
	Anidulafungin	0.06	0.06		0.06		
	Micafungin	0.03	0.03		0.03		
	Rezafungin	0.016	0.016		0.016		Breakpoints apply for MICs determined with Tween 20 supplemented medium according to the EUCAST E.Def 7.4 method.
	Fluconazole	16	0.001	≤16	16		
	Isavuconazole	ND	ND		ND		
	Itraconazole	2	ND		ND		
	Posaconazole	1	ND		ND		
	Voriconazole	1	ND		ND		
C. krusei	Amphotericin B	1	1		1		
	Anidulafungin	0.06	0.06		0.06		
	Micafungin	0.25	ND		ND		
	Rezafungin	0.03	0.03		0.03		Breakpoints apply for MICs determined with Tween 20 supplemented medium according to the EUCAST E.Def 7.4 method.
	Fluconazole	128	ND		ND		
	Isavuconazole	ND	ND		ND		
	Itraconazole	1	ND		ND		
	Posaconazole	0.5	ND		ND		
	Voriconazole	1	ND		ND		
C. parapsilosis	Amphotericin B	1	1		1		
	Anidulafungin	4	4		4		
	Micafungin	4	4		4		
	Rezafungin	4	4		4		Breakpoints apply for MICs determined with Tween 20 supplemented medium according to the EUCAST E.Def 7.4 method.
	Fluconazole	2	2	4	4		
	Isavuconazole	ND	ND		ND		
	Itraconazole	0.125	0.125		0.125		
	Posaconazole	0.06	0.06		0.06		
	Voriconazole	0.06	0.125	0.25	0.25		

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

For species not in the table, please consult: **Guidance for interpretation of MICs for yeasts when there are no breakpoints**

Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Comments
		WT ≤	S ≤	I	R >	ATU	
C. tropicalis	Amphotericin B	1	1		1		
	Anidulafungin	0.06	0.06		0.06		
	Micafungin	0.06	0.06		0.06		
	Rezafungin	0.03	0.03		0.03		Breakpoints apply for MICs determined with Tween 20 supplemented medium according to the EUCAST E.Def 7.4 method.
	Fluconazole	1	2	4	4		
	Isavuconazole	ND	ND		ND		
	Itraconazole	0.125	0.125		0.125		
	Posaconazole	0.06	0.06		0.06		
	Voriconazole	0.125	0.125	0.25	0.25		
C. guilliermondii	Amphotericin B	(0.5)	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Anidulafungin	2	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Micafungin	1	ND		ND		
	Rezafungin	ND	ND		ND		
	Fluconazole	(16)	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Isavuconazole	ND	ND		ND		
	Itraconazole	(1)	ND		ND		
	Posaconazole	0.25	ND		ND		
	Voriconazole	ND	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
C. lusitaniae	Amphotericin B	(0.5)	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Anidulafungin	(0.125)	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Micafungin	0.125	ND		ND		
	Rezafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Isavuconazole	ND	ND		ND		
	Itraconazole	0.125	ND		ND		
	Posaconazole	ND	ND		ND		
	Voriconazole	ND	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

For species not in the table, please consult: **Guidance for interpretation of MICs for yeasts when there are no breakpoints**

Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Comments
		WT ≤	S ≤	I	R >	ATU	
S. cerevisiae	Amphotericin B	(0.5)	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Anidulafungin	(0.25)	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Micafungin	(0.5)	ND		ND		
	Rezafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Isavuconazole	ND	ND		ND		
	Itraconazole	(2)	ND		ND		
	Posaconazole	ND	ND		ND		
	Voriconazole	ND	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
C. kefyr	Amphotericin B	(1)	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Anidulafungin	0.125	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Micafungin	0.125	ND		ND		
	Rezafungin	ND	ND		ND		
	Fluconazole	(1)	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
	Isavuconazole	ND	ND		ND		
	Itraconazole	ND	ND		ND		
	Posaconazole	ND	ND		ND		
	Voriconazole	ND	ND		ND		Guidance for MIC interpretation found in the "What to do when there are no breakpoints - guidance for rare yeasts!" document
C. neoformans	Amphotericin B	(1)	1		1		
	Flucytosine	ND	ND		ND		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Rezafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Isavuconazole	ND	ND		ND		
	Itraconazole	ND	ND		ND		
	Posaconazole	0.5	ND		ND		
	Voriconazole	0.5	ND		ND		

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

For species not in the table, please consult: **Guidance for interpretation of MICs for yeasts when there are no breakpoints**

Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Comments
		WT ≤	S ≤	I	R >	ATU	
C. gattii	Amphotericin B	(0.5)	ND		ND		
	Flucytosine	ND	ND		ND		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Rezafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Itraconazole	ND	ND		ND		
	Posaconazole	1	ND		ND		
	Voriconazole	ND	ND		ND		
	Isavuconazole	ND	ND		ND		

Comments: * ECOFFs indicated in brackets ( ) are tentative (TECOFF).
ND: Not determined.

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Comments
		WT ≤	S ≤	I	R >	ATU	
A. flavus	Amphotericin B	4	-		-		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Isavuconazole	2	1	#	2	2	If voriconazole wild-type (voriconazole MIC ≤ 2 mg/L) report as isavuconazole S and add the following comment: The MIC of 2 mg/L is one dilution above the S breakpoint but within the wild-type isavuconazole MIC range for *A. flavus* . Clinically documented isavuconazole resistance in absence of voriconazole resistance is extremely rare and mechanisms conferring isavuconazole monoresistance have not been described. See rationale documents for more information. If voriconazole non wild-type report as isavuconazole R and refer to reference laboratory for CYP51A sequencing and confirmation of MICs[3]
	Itraconazole	1	1		1		For isolates with confirmed MIC 2 mg/L (one dilution above the breakpoint), itraconazole may be considered for treatment of chronic pulmonary aspergillosis when no alternative is available and when sufficient exposure (>2 mg/L) is ensured via TDM.
	Posaconazole	0.5	ND		ND		
	Voriconazole	2	ND		ND		
A. fumigatus	Amphotericin B	1	1		1		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Isavuconazole	2	1	#	2	2	If voriconazole S, report as isavuconazole S and add the following comment: The MIC of 2 mg/L is wild type but one dilution above the S breakpoint due to overlapping wt and non-wt populations.* Clinically documented isavuconazole resistance in absence of voriconazole resistance is extremely rare and mechanisms conferring isavuconazole monoresistance have not been described. See rationale documents for more information. If not S to voriconazole, report as isavuconazole R and refer to reference laboratory for CYP51A sequencing and confirmation of MICs*
	Itraconazole	1	1		1		For isolates with confirmed MIC 2 mg/L (one dilution above the breakpoint), itraconazole may be considered for treatment of chronic pulmonary aspergillosis when no alternative is available and when sufficient exposure (>2 mg/L) is ensured via TDM.
	Posaconazole	0.25	0.125	#	0.25	0.25	If S to itraconazole, report as S and add the following comment: The MIC is 0.25 mg/L and thus one dilution above the S breakpoint due to overlapping wt and non-wt populations. If not S to itraconazole, report as R and refer to reference laboratory for *CYP51A* sequencing and confirmation of MICs.
	Voriconazole	1	1		1		For isolates with confirmed MIC 2 mg/L (one dilution above the breakpoint), voriconazole may be considered for treatment of chronic pulmonary aspergillosis when no alternative is available and when sufficient exposure (>2 mg/L) is ensured via TDM.

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Comments
		WT ≤	S ≤	I	R >	ATU	
A. nidulans	Amphotericin B	(4)**	-		-		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Isavuconazole	0.25	0.25		0.25		
	Itraconazole	(1)	1		1		For isolates with confirmed MIC 2 mg/L (one dilution above the breakpoint), itraconazole may be considered for treatment of chronic pulmonary aspergillosis when no alternative is available and when sufficient exposure (>2 mg/L) is ensured via TDM.
	Posaconazole	0.5	ND		ND		
	Voriconazole	1	1		1		For isolates with confirmed MIC 2 mg/L (one dilution above the breakpoint), voriconazole may be considered for treatment of chronic pulmonary aspergillosis when no alternative is available and when sufficient exposure (>2 mg/L) is ensured via TDM.
A. niger	Amphotericin B	(0.5)	1		1		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Isavuconazole	4	ND		ND		
	Itraconazole	2	ND		ND		
	Posaconazole	0.5	ND		ND		
	Voriconazole	2	ND		ND		
A. terreus	Amphotericin B	8	-		-		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Isavuconazole	1	1		1		
	Itraconazole	0,5	1		1		For isolates with confirmed MIC 2 mg/L (one dilution above the breakpoint), itraconazole may be considered for treatment of chronic pulmonary aspergillosis when no alternative is available and when sufficient exposure (>2 mg/L) is ensured via TDM.
	Posaconazole	0.25	0.125	#	0.25	0.25	If S to itraconazole, report as S and add the following comment: The MIC is 0.25 mg/L and thus one dilution above the S breakpoint due to overlapping wt and non-wt populations.* If not S to itraconazole, report as R and refer to reference laboratory for *CYP51A* sequencing and confirmation of MICs.*
	Voriconazole	2	ND		ND		

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Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Comments
		WT ≤	S ≤	I	R >	ATU	
***Fusarium* (*Gibberella*) *fujikuroi* SC**	Amphotericin B	(8)	ND		ND		
***Fusarium solani* SC**	Amphotericin B	(8)	ND		ND		

Comments: # means there is no "I" category as the MIC in between S and R represents only an ATU because this MIC corresponds to both wt and non-wt isolates (MIC is 1 dilution below the ECOFF), and shall be translated to S or R as described in the "Recommendation for ATU results" column.
ND: Not determined.
"-" indicates that susceptibility testing is not recommended as the species is a poor target for therapy with the drug. Isolates may be reported as R without prior testing.
* Itraconazole and posaconazole R isolates but S to voriconazole and isavuconazole are not uncommon in azole treated patients. Refer the isolate to a reference laboratory for CYP51A sequencing and confirmation of MICs.
** ECOFFs indicated in brackets ( ) are tentative (TECOFF).

Overview of antifungal ECOFFs and clinical breakpoints for yeasts, moulds and dermatophytes using the EUCAST E.Def 7.4, E.Def 9.4 and E.Def 11.0 procedures

Version 5.0, valid from 2024-12-02

Species	Drug	ECOFF (mg/L)	Clinical Breakpoints (mg/L)				Recommendation for area of technical uncertainty (ATU) results
		WT ≤	S ≤	I	R >	ATU	
T. indotineae [2]	Amorolfin	(0,5)[1]	ND		ND		
	Amphotericin B	ND	ND		ND		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Isavuconazole	ND	ND		ND		
	Itraconazole	(0,25)[2]	ND		ND		
	Posaconazole	ND	ND		ND		
	Terbinafine	(0,125)	ND		ND		
	Voriconazole	(1)	ND		ND		
T. rubrum	Amorolfin	(0,125)	ND		ND		
	Amphotericin B	ND	ND		ND		
	Anidulafungin	ND	ND		ND		
	Micafungin	ND	ND		ND		
	Fluconazole	ND	ND		ND		
	Isavuconazole	ND	ND		ND		
	Itraconazole	(0,25)[2,3]	ND		ND		
	Posaconazole	ND	ND		ND		
	Terbinafine	(0,03)	ND		ND		
	Voriconazole	(0,125)	ND		ND		

Comments:

[1] ECOFFs indicated in brackets ( ) are tentative.

[2] TECOFFs against *T. indotineae* (formerly the Indian variant of *T. interdigitale*) and *T. rubrum* were determined based on a shared isolate collection tested in 10 laboratories as part of a recently published study (Multicentre validation of a EUCAST method for the antifungal susceptibility testing of microconidia-forming dermatophytes; J Antimicrob Chemother, 2020) and a comment supporting the name change (J Antimicrob Chemother, 2022).

[3] MIC distributions were wider than normally, the TECOFF is therefore associated with uncertainty. They apply to MICs determined using E.Def 11.0 and with 50% endpoint criteria.