



Corrigendum

Corrigendum to “Activity of cefiderocol and innovative β -lactam/ β -lactamase inhibitor combinations against isogenic strains of *Escherichia coli* expressing single and double β -lactamases under high and low permeability conditions” [International Journal of Antimicrobial Agents Volume 63, Issue 5 (2024) 107150]



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The authors regret that the printed version of the above article contained some inaccuracies in the MICs of meropenem/xeruboractam for some recombinant isolates expressing metallo- β -lactamases. The main corrigendum is given in [Table 1](#), [Table 2](#), [Table 3](#), [Table S1](#), Abstract, and Results and Discussion. These errors resulted in a very few numbers of minor changes in the manuscript. Please note that these minor changes did not affect the main findings or conclusions of the study. The correct and final version follows. The authors would like to apologize for any inconvenience caused.

DOI of original article: [10.1016/j.ijantimicag.2024.107150](https://doi.org/10.1016/j.ijantimicag.2024.107150)

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<https://doi.org/10.1016/j.ijantimicag.2024.107264>

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Corrigendum to the Tables – with amendments highlighted**Table 1**

Antibiotic susceptibility data for newly developed β -lactams and β -lactam/ β -lactamase inhibitor combinations against isogenic *E. coli* TG1 transformants expressing the most relevant class A, B, C and D β -lactamases found in Enterobacterales.

Strain	Ambler class	Main Phenotype	MIC (mg/L) ^a	
			MEM (R>8)	M/X (R>8)
TG1 + VIM-1	B	Carbapenemase	0.5	≤0.06
TG1 + VIM-2		Carbapenemase	≤0.06	≤0.06
TG1 + VIM-20		Carbapenemase	≤0.06	≤0.06
TG1 + IMP-13		Carbapenemase	0.125	≤0.06
TG1 + IMP-28		Carbapenemase	≤0.06	≤0.06
TG1 + NDM-1		Carbapenemase	2	≤0.06
TG1 + NDM-5		Carbapenemase	16	≤0.06
TG1 + NDM-7		Carbapenemase	8	≤0.06
TG1 + NDM-23		Carbapenemase	2	≤0.06

MEM: meropenem; M/X: meropenem/xeruboractam.

^a EUCAST breakpoints indicated for Enterobacterales.

Table 2

Antibiotic susceptibility data for newly developed β -lactams and β -lactam/ β -lactamase inhibitor combinations against isogenic *E. coli* HB4 transformants expressing the most relevant class A, B, C and D β -lactamases found in Enterobacterales.

Strain	Ambler class	Main Phenotype	MIC (mg/L) ^a	
			MEM (R>8)	M/X (R>8)
HB4 + VIM-1	B	Carbapenemase	2	≤0.06
HB4 + VIM-2		Carbapenemase	1	≤0.06
HB4 + VIM-20		Carbapenemase	2	≤0.06
HB4 + IMP-13		Carbapenemase	8	0.125
HB4 + IMP-28		Carbapenemase	16	≤0.06
HB4 + NDM-1		Carbapenemase	>64	4
HB4 + NDM-5		Carbapenemase	>64	2
HB4 + NDM-7		Carbapenemase	>64	4
HB4 + NDM-23		Carbapenemase	64	0.5

MEM: meropenem; M/X: meropenem/xeruboractam.

^a EUCAST breakpoints indicated for Enterobacterales.

Table 3

Antibiotic susceptibility data for *E. coli* TG1 and HB4 recombinant isolates expressing double carbapenemases.

Strain	Ambler class	Main Phenotype	MIC (mg/L) ^a	
			MEM (R>8)	M/X (R>8)
TG1 + KPC-3 + VIM-1	A + B	Double carbapenemase	1	≤0.06
TG1 + KPC-3 + IMP-28		Double carbapenemase	2	≤0.06
TG1 + KPC-3 + OXA-48	A + D	Double carbapenemase	2	≤0.06
TG1 + NDM-1 + OXA-48	B + D	Double carbapenemase	8	0.125
TG1 + OXA-48 + VIM-1		Double carbapenemase	0.25	≤0.06
TG1 + OXA-48 + IMP-28	A + B	Double carbapenemase	0.5	≤0.06
HB4 + KPC-3 + VIM-1		Double carbapenemase	32	≤0.06
HB4 + KPC-3 + IMP-28	A + D	Double carbapenemase	32	≤0.06
HB4 + KPC-3 + OXA-48		Double carbapenemase	16	≤0.06
HB4 + NDM-1 + OXA-48	B + D	Double carbapenemase	>64	4
HB4 + OXA-48 + VIM-1		Double carbapenemase	8	0.125
HB4 + OXA-48 + IMP-28		Double carbapenemase	8	≤0.06

MEM: meropenem; M/X: meropenem/xeruboractam.

^a EUCAST breakpoints indicated for Enterobacterales.

Table S1

Cumulative minimum inhibitory concentration (MIC) distribution, MIC₅₀ and MIC₉₀ values for cefiderocol and new β -lactam/ β -lactamase inhibitors against *E. coli* TG1 and HB4 (low permeability) expressing β -lactamases.

Host strain	Drug	Cumulative % of isolates at MIC (mg/L)									MIC (mg/L)	
		≤0.25	0.5	1	2	4	8	16	32	≥64	MIC ₅₀	MIC ₉₀
<i>E. coli</i> TG1 (n=41)	MEM	71.4	80.5	82.9	92.7	92.7	97.6	100			≤0.25	2
	M/X	100									≤0.25	≤0.25
<i>E. coli</i> HB4 (n=41)	MEM	17.1	24.4	39	51.2	58.5	68.3	75.6	82.9	100	2	≥64
	M/X	85.4	90.2	90.2	92.7	100					≤0.25	0.5

MEM: meropenem; M/X: meropenem/xeruboractam.

Corrigendum to the Abstract – with text added

Results

Combination of β -lactamases with porin deficiency (*E. coli* HB4) did not significantly affect the activity of aztreonam/avibactam, cefepime/zidebactam, cefiderocol, meropenem/xeruboractam or meropenem/nacubactam, but limited the effectiveness of the rest of carbapenem- and cefepime-based combinations.

Conclusions

Aztreonam/avibactam, cefiderocol, cefepime/zidebactam, meropenem/xeruboractam and meropenem/nacubactam will help to mitigate to some extent the urgency of new compounds able to resist MBL action, although NDM enzymes represent a growing challenge against which drug development efforts are still needed.

Corrigendum to the section: Results and discussion

3. Results and discussion

3.1. Role of β -lactamases

In this section text is deleted and added as follows: Production of class B carbapenemases (and particularly NDM) was associated with greater resistance to these carbapenem combinations. Xeruboractam and nacubactam decreased up to 8 and 4 two-fold dilutions respectively the MIC of meropenem against NDM enzymes, highlighting their promising role against MBLs in the near future.

3.2. Interplay between β -lactamases and decreased outer membrane permeability

In this section text is added after this sentence and before the final sentence as shown here: Meropenem/xeruboractam was the meropenem-based combination with highest activity serine-type enzymes, particularly active against KPC-2 (MIC=≤0.06 mg/L), KPC-3 (MIC=0.125 mg/L) and OXA-48 (MIC≤0.06 mg/L). Moreover, the previously observed anti-MBL efficacy of meropenem/xeruboractam was maintained even under conditions of low outer membrane permeability (MICs≤0.06–4 mg/L), thus showing the most potent activity among the BOR-based β -lactam/ β -lactamase inhibitor combinations evaluated. [27,28] Finally, meropenem/nacubactam demonstrated globally higher MIC values than other compounds but its activity extended to the whole collection.

3.3. Effects of double carbapenemase production

In this section text the following text has been added at the end of the paragraph

In this regard, probably the most challenging association of carbapenemases was the one resulting from the combination of NDM-1+OXA-48, which reduced the activity of meropenem/xeruboractam in *E. coli* HB4 or conferred reduced cefiderocol susceptibility. Hopefully, aztreonam/avibactam (MIC≤0.06–0.25 mg/L), cefepime/zidebactam (MIC=0.06–1 mg/L), cefiderocol (MIC≤0.06–2 mg/L), meropenem/xeruboractam (MIC≤0.06–4 mg/L) and to a lesser extent meropenem/nacubactam (MIC≤0.06–1 mg/L) will represent valuable options against isolates showing such combinations of resistance mechanisms.