

# Antibiograms of Carbapenemase Producing Organisms - June, 2016

Notes: Carbapenemase producing organism isolates identified or submitted to the Microbiological Diagnostic Unit Public Health Laboratory (MDU PHL) between 01/01/2012 and 31/02/2016, with susceptibility data tested by VITEK 2 (bioMérieux) are included in the analysis below. All organism and carbapenemase gene combinations comprising fewer than five isolates have been excluded. Aggregate antibiograms are categorised by carbapenemase gene sub-type(s) and isolates may contain other antimicrobial resistance (AMR) mechanisms not indicated. Carbapenemase genes tested by PCR include blaKPC, blaIMP, blaNDM, blaVIM, blaOXA-23-like, blaOXA-24/40-like, blaOXA-48-like, blaOXA-51-like and blaOXA-58-like. Carbapenemase gene subtypes have been determined by Sanger sequencing or whole genome sequence analysis. CLSI breakpoints have been used for all susceptibility interpretation, except piperacillin tazobactam in *Pseudomonas* and *Serratia* species, which have been interpreted using EUCAST guidelines<sup>1,2</sup>. Intermediate susceptibility included as non-susceptible in aggregate antibiograms.

**Table 1: Aggregate antibiogram, carbapenemase producing organisms isolates by number and percentage susceptible to each antimicrobial on VITEK 2, received by MDU PHL 01/01/2012-31/05/2016**

CPO gene(s)	Organism	N	Number susceptible (%)																				
			Ampicillin	Amoxicillin	Clavulanic Acid	Ticarcillin	Clavulanic Acid	Piperacillin	Tazobactam	Meropenem	Cefazolin	Cefoxitin	Ceftriaxone	Ceftazidime	Cefepime	Ciprofloxacin	Norfloxacin	Tobramycin	Gentamicin	Amikacin	Nitrofurantoin	Trimethoprim	Cotrimoxazole
IMP-4	<i>P. aeruginosa</i>	11				0 (0%)	1 (9%)	0 (0%)				0 (0%)	0 (0%)	0 (0%)	0 (0%)		0 (0%)	4 (36%)	6 (55%)				
	<i>C. freundii</i>	6	0 (0%)	0 (0%)	0 (0%)		1 (17%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (33%)	5 (83%)	6 (100%)	0 (0%)	0 (0%)	6 (100%)			5 (83%)	5 (83%)
	<i>E. cloacae</i> complex	17	0 (0%)	1 (6%)	0 (0%)		3/14 (21%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (41%)	12 (71%)	13 (76%)	0 (0%)	1 (6%)	17 (100%)			6 (35%)	6 (35%)
	<i>E. coli</i>	9	0 (0%)	0 (0%)	0 (0%)		4/8 (50%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (78%)	8 (89%)	8 (89%)	1 (11%)	1 (11%)	9 (100%)	7 (78%)		4 (44%)	4 (44%)
	<i>K. oxytoca</i>	9	0 (0%)	1 (11%)	0 (0%)		2 (22%)	1 (11%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	9 (100%)	8 (89%)	9 (100%)	0 (0%)	1 (11%)	9 (100%)			9 (100%)	9 (100%)
	<i>K. pneumoniae</i>	17	0 (0%)	0 (0%)	0 (0%)		3 (18%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	9 (53%)	15 (88%)	15 (88%)	0 (0%)	0 (0%)	17 (100%)			8 (47%)	8 (47%)
	<i>S. marcescens</i>	31	0 (0%)	0 (0%)	2 (6%)		30 (97%)	2 (6%)	0 (0%)	2 (6%)	2 (6%)	1 (3%)	20 (65%)	21 (68%)	25 (81%)	2 (6%)	18 (58%)	31 (100%)			29 (94%)	28 (90%)	
KPC-2	<i>C. farmeri</i>	8	0 (0%)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (25%)	2 (25%)	0 (0%)	0 (0%)	8 (100%)			0 (0%)	0 (0%)	
	<i>K. pneumoniae</i>	58	0 (0%)	1 (2%)	0 (0%)		0 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	19 (33%)	1 (2%)	1 (2%)	1 (2%)	55 (95%)	7 (12%)			13 (22%)	13 (22%)	
NDM-1	<i>E. coli</i>	7	0 (0%)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (14%)	1 (14%)	1 (14%)	0 (0%)	1 (14%)	3 (43%)	6 (86%)		2 (29%)	2 (29%)	
	<i>K. pneumoniae</i>	11	0 (0%)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (18%)	0 (0%)	0 (0%)	2 (18%)	5 (45%)	6 (55%)			1 (9%)	1 (9%)	
NDM-5	<i>E. coli</i>	10	0 (0%)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (10%)	1 (10%)	2 (20%)	2 (20%)	5 (50%)	6 (60%)		0 (0%)	1 (10%)	
	<i>K. pneumoniae</i>	7	0 (0%)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (29%)	2 (29%)	1 (14%)	2 (29%)	3 (43%)			2 (29%)	2 (29%)	
NDM-5, OXA-232	<i>K. pneumoniae</i>	9	0 (0%)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)			0 (0%)	0 (0%)	
OXA-232	<i>K. pneumoniae</i>	11	0 (0%)	0 (0%)	0 (0%)		0 (0%)	1 (9%)	0 (0%)	1 (9%)	1 (9%)	3 (27%)	3 (27%)	1 (9%)	1 (9%)	1 (9%)	4 (36%)	5 (45%)			1 (9%)	1 (9%)	
OXA-181	<i>E. coli</i>	11	0 (0%)	0 (0%)	0 (0%)		0 (0%)	5 (45%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (9%)	0 (0%)	0 (0%)	2 (18%)	4 (36%)	11 (100%)	2 (18%)		3 (27%)	3 (27%)	
OXA-48	<i>E. coli</i>	7	0 (0%)	0 (0%)	0 (0%)		0/6 (0%)	1 (14%)	0 (0%)	2 (29%)	0 (0%)	4 (57%)	6 (86%)	5 (71%)	5 (71%)	5 (71%)	5 (71%)	7 (100%)	5 (71%)		2 (29%)	2 (29%)	
	<i>K. pneumoniae</i>	13	0 (0%)	0 (0%)	0 (0%)		0 (0%)	6 (46%)	0 (0%)	6 (46%)	4 (31%)	5 (38%)	8 (62%)	5 (38%)	5 (38%)	5 (38%)	5 (38%)	10 (77%)			0 (0%)	3 (23%)	
OXA-23-like, OXA-51-like	<i>A. calcoaceticus-baumannii</i> complex	16				0 (0%)	0 (0%)	0 (0%)				1 (6%)	0 (0%)	0 (0%)		4 (25%)	1 (6%)	11 (69%)				8 (50%)	

<sup>1</sup> CLSI. *Performance Standards for Antimicrobial Susceptibility Testing; Twenty-Third Informational Supplement*. CLSI document M100-S23. Wayne, PA: Clinical and Laboratory Standards Institute; 2013.

<sup>2</sup> The European Committee on Antimicrobial Susceptibility Testing. *Breakpoint Tables for Interpretation of MICs and Zone Diameters*. Version 6.0, 2016.

Available: <http://www.eucast.org>

Percentage susceptible: 0-20% 21-40% 41-60% 61-80% 81-100%



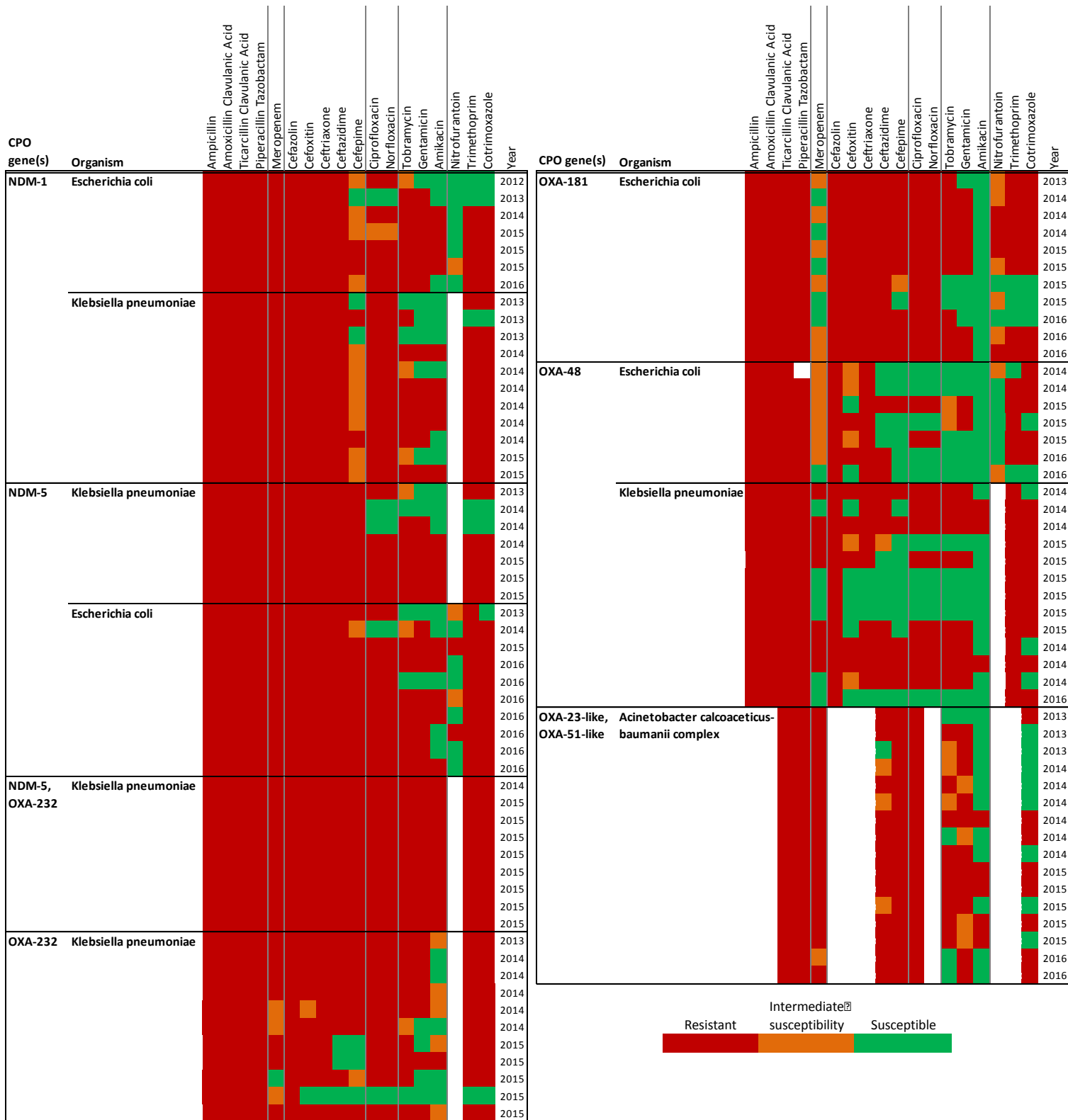




# Antibiograms of Carbapenemase Producing Organisms -

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Table 2c: Individual isolate graphical antibiograms by VITEK 2, NDM and/or OXA producing organisms, received by MDU PHL 01/01/2012-31/05/2016



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Notes: Each row in the follow individual isolate graphical antibiograms corresponds to one isolate of the specified carbapenemase gene and organism combination. Travel location data collection methods have varied across the included time period and data are not complete. Absence of travel location should not imply location acquisition. Where known, cases have been classified by country and region of travel in the 12 months prior to isolation. Please note, patients reporting multiple risk factors for CPO acquisition have not been excluded, and additional risk factors and/or travel locations may be present. As such, acquisition of CPE may not have occurred in the categorised location. For further information, please see notes on page 1.

**Table 3: Individual isolate graphical antibiograms by VITEK 2 amongst those reporting travel in 12 months prior to isolation, by country of travel, received by MDU PHL 01/01/2012-31/05/2016**

Travel group	Gene	Organism	Travel location(s) (12 months prior to identification)	Overseas healthcare contact	Ampicillin	Amoxicillin Clavulanic Acid	Ticarcillin Clavulanic Acid	Piperacillin Tazobactam	Meropenem	Meropenem MIC	Cefazolin	Cefoxitin	Ceftriaxone	Ceftazidime	Cefepime	Ciprofloxacin	Norfloxacin	Tobramycin	Gentamicin	Amikacin	Nitrofurantoin	Trimethoprim	Cotrimoxazole	Year		
Greece	KPC-2	Klebsiella pneumoniae	Greece~	Yes						≥16														2014		
			Greece~	Yes							≥16															2014
			Greece~	Yes							≥16															2014
			Greece~	Yes							≥16															2014
			Greece~	Yes							≥16															2015
			Greece~	Yes							≥16															2016
	NDM-1	Klebsiella pneumoniae	Greece~	Yes						≥16														2015		
	VIM-1	Escherichia coli	Greece~	Yes						≥16														2015		
South east	KPC-2	Klebsiella pneumoniae	Vietnam~, Thailand~	Yes						≥16														2014		
Asia	NDM-1	Escherichia coli	Vietnam	No						≥16														2014		
			Thailand~	Yes							≥16														2016	
			Vietnam~, Thailand~	Yes								≥16													2016	
			Cambodia~, Vietnam	Yes								≥16													2016	
			Vietnam~	Yes								≥16														2015
			Malaysia~, India, Egypt, Israel, Jordan	Yes								2														2016
India	NDM-5	Escherichia coli	India~	Yes						8														2016		
			India~	Yes							≥16														2016	
			India~	Yes							≥16														2016	
			India~	Yes							≥16														2016	
			India	No							≥16															2016
	OXA-181	Escherichia coli	India	No							2														2015	
			India	No							≤0.25														2015	
			Jordan, India	No							1														2015	
	OXA-232	Klebsiella pneumoniae	India~	Yes							1														2016	
			India~	Yes							≥16														2015	
India~			Yes							≥16														2015		
Other	KPC-2	Klebsiella pneumoniae	New Zealand	No						≥16														2012		
			USA, New Zealand	No							≥16														2016	
	NDM-5	Escherichia coli	China~, USA, Europe NFS	No						≥16														2016		
	OXA-48	Escherichia coli	Lebanon~	Yes							0.5														2016	
			Malta~	Yes							8														2015	
		Klebsiella pneumoniae	Turkey	No						≥16														2015		

~Location of hospitalisation or other healthcare contact