

# NOVEL MULTILOCUS SEQUENCE TYPES OF CARBAPENEM RESISTANT PSEUDOMONAS AERUGINOSA STRAINS FROM A MALAYSIAN TERTIARY HOSPITAL

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## INTRODUCTION

*Pseudomonas aeruginosa* is an important nosocomial pathogen that exhibits multiple drug resistance with increasing frequency, especially to carbapenems making patient treatment difficult.

## OBJECTIVE

In this study, the incidence of genes responsible for carbapenemase production in carbapenem-resistant *Pseudomonas aeruginosa* (CRPA) and the genetic relatedness of the strains were assessed.

## METHODS

Identification and antimicrobial susceptibility testing of multi-drug resistant (MDR) *P. aeruginosa* strains (n=250) was performed using the VITEK 2 system. Presence of metallo-β-lactamase genes (*bla*<sub>IMP-1</sub>, *bla*<sub>IMP-2</sub>, *bla*<sub>VIM-1</sub> and *bla*<sub>VIM-2</sub>) in the CRPA were detected using polymerase chain reaction (PCR).

Nine of the CRPA strains that were highly resistant to carbapenems were subjected to multi locus sequence typing (MLST) followed by sequence type (ST) alignment using the PubMLST database.

Isolate fields (i)				MLST											
id	isolate	aliases	serotype	year	country	source	acsA	aroE	guaA	mutL	nuoD	ppsA	trpE	ST	clonal complex
7643	153			2015	Malaysia	Other	82	39	3	9	1	2	84	3604	
7644	CTR			2018	Malaysia	Soft Tissue Infection	82	39	3	9	1	2	84	3604	
7646	PA153			2015	Malaysia	Other	82	39	3	9	1	2	4	3606	
7647	PACTR			2018	Malaysia	Soft Tissue Infection	82	39	3	9	1	2	4	3606	
7648	PA21			2017	Malaysia	Other	82	39	3	9	1	2	4	3606	
7649	PA90			2016	Malaysia	Other	82	39	3	9	1	2	26	3607	
7650	PA135			2015	Malaysia	Other	82	39	3	9	1	2	26	3607	
7651	PA157			2015	Malaysia	Bronchial Lavage	82	39	59	9	13	2	4	3608	
7652	PA170			2018	Malaysia	Blood	82	39	3	9	13	2	4	3609	
7653	PA221			2018	Malaysia	Other	2	4	5	31	1	6	11	1153	
7654	PA232			2018	Malaysia	Other	82	39	3	9	1	2	4	3606	
7680	PA153			2015	Malaysia	Other	38	11	3	13	1	2	4	235	
7681	PACTR			2018	Malaysia	Soft Tissue Infection	38	11	3	13	1	2	4	235	
7682	PA21			2017	Malaysia	Other	38	11	3	13	1	2	4	235	
7683	PA90			2016	Malaysia	Other	38	11	3	13	1	2	4	235	
7684	PA232			2018	Malaysia	Other	38	11	3	13	1	2	4	235	
7797	PA48			2017	Malaysia	Sputum	17	5	11	3	4	6	37	882	
7798	PA109			2015	Malaysia	Blood	38	11	3	13	1	2	4	235	
7799	PA148			2015	Malaysia	Other	2	4	5	3	1	6	11	357	
7800	PA208			2018	Malaysia	Other	18	4	5	3		17	13		

## RESULTS

Overall, 165 strains were identified as CRPA with *bla*<sub>IMP-1</sub> and *bla*<sub>VIM-1</sub> genes present in 25 and four strains, respectively. MLST of the nine strains that were highly resistant to carbapenem indicated four different novel STs, ST3606, ST3607, ST3608 and ST3609.

Four of the strains were identified as *bla*<sub>IMP-1</sub> positive with an identical allelic profile of ST3606, among which two strains were isolated from the same patient in 2015 and 2018.

## CONCLUSION

Identification of novel ST may reveal genetic diversity which is important in shaping the evolution of *P. aeruginosa*. The isolation of CRPA strains is alarming as carbapenems with antipseudomonal activity are important to treat *P. aeruginosa* infections. This warrants strict infection control measures to reduce the spread of carbapenemase encoding genes among the *P. aeruginosa* strains.

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