

## ABSTRAK

### Perbedaan Profil Gen *bla* Pada *Carbapenem-resistant Non-lactose Fermenting Gram Negative Bacilli* dari Isolat Klinis dan Lingkungan di RSUD Dr. Soetomo Surabaya

Pristiawan Navy Endraputra

**Latar Belakang** *Carbapenem-resistant non-lactose fermenting Gram negative bacilli* merupakan penyebab infeksi oportunistik pada pasien yang sedang menjalani perawatan di rumah sakit melalui produksi enzim *carbapenemase*. Enzim tersebut dikode oleh gen yang terletak pada *mobile genetic elements* seperti *plasmid*. Penggunaan *carbapenem* menjadi salah satu faktor yang dapat menginduksi resistensi melalui *selective pressure* pada lingkungan di rumah sakit seperti air limbah. Sehingga, air limbah menjadi *reservoir* bakteri resisten dan gen resistensi antibiotik yang dapat menyebar ke komunitas.

**Metode** Penelitian ini merupakan studi analitik observasional dengan pendekatan *cross sectional*. Sampel klinik *Carbapenem-resistant Acinetobacter baumannii* (CRAB) dan *carbapenem-resistant Pseudomonas aeruginosa* (CRPA) diperoleh dari spesimen urine, darah, pus, sputum, dan isolat tersimpan. Sampel lingkungan diperoleh dari isolat *carbapenem-resistant Acinetobacter species* dan *carbapenem-resistant Pseudomonas species* yang tumbuh pada media selektif *MacConkey* dengan *meropenem* dan kemudian dilakukan identifikasi secara molekuler. Seluruh isolat yang didapatkan dilakukan deteksi gen *bla* menggunakan *multiplex PCR* dengan *primer* spesifik.

**Hasil** Terdapat 121 isolat yang terdiri dari 76 isolat klinik dan 45 isolat lingkungan. Dari isolat klinik, didapatkan 41 CRAB dengan prevalensi gen *bla<sub>OXA-23-like</sub>* 21 (51%), *bla<sub>OXA-24-like</sub>* 17 (41%), *bla<sub>NDM-1</sub>* 1 (2%) serta 35 CRPA dengan distribusi gen *bla<sub>OXA-24-like</sub>* 13 (37%) dan *bla<sub>IMP-1</sub>* 6 (17%). Pada isolat lingkungan didapatkan 13 CRPA dengan distribusi gen *bla<sub>OXA-23-like</sub>* 6 (46%), *bla<sub>OXA-24-like</sub>* 7 (54%), *bla<sub>OXA-48-like</sub>* 1 (8%), *bla<sub>NDM-1</sub>* 2 (15%), *bla<sub>IMP-1</sub>* 2 (15%) dan 32 *carbapenem-resistant Pseudomonas species* dengan distribusi gen *bla<sub>OXA-23-like</sub>* 2 (6%), *bla<sub>OXA-48-like</sub>* 1 (3%), *bla<sub>NDM-1</sub>* 12 (38%), *bla<sub>VIM</sub>* 12 (38%), dan *bla<sub>IMP-1</sub>* 2 (6%).

**Kesimpulan** Gen *bla<sub>OXA-24-like</sub>* dan *bla<sub>OXA-23-like</sub>* banyak ditemukan pada isolat klinik dan lingkungan dengan perbedaan yang signifikan secara statistik pada *bla<sub>OXA-24-like</sub>*, *bla<sub>NDM-1</sub>*, dan *bla<sub>VIM</sub>* antara *carbapenem-resistant non-lactose fermenting Gram negative bacilli* dari isolat klinik dan lingkungan di RSUD Dr. Soetomo, Surabaya.

**Kata Kunci** CRAB, CRPA, gen *carbapenemase*, OXA, air limbah

## ABSTRACT

### Comparative Analysis of *bla* Genes among Non-lactose Fermenting Gram Negative Bacilli between Clinical and Environmental Isolates at RSUD Dr. Soetomo, Surabaya

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**Background** Carbapenem-resistant non-lactose fermenting Gram negative bacilli have been notoriously known as opportunistic pathogen for those with medical hospitalization through production of carbapenemase. The gene responsible for this hydrolytic activity towards carbapenem is located within mobile genetic elements such as plasmid. Antibiotic residues, carbapenem in particular, may trigger selective pressure in hospital environment including wastewater and thus create a hotspot for multi-drug resistant bacteria along with antibiotic resistance genes which may spread into community water body.

**Methods** This observational analytic study was performed by cross sectional method. Clinical samples of *carbapenem-resistant Acinetobacter baumannii* (CRAB) and *carbapenem-resistant Pseudomonas aeruginosa* (CRPA) were collected from urine, blood, pus, sputum, and isolates from previous study. While environmental samples were collected from *carbapenem-resistant Acinetobacter species* and *carbapenem-resistant Pseudomonas species* which exhibited growth on MacConkey supplemented with meropenem prior to molecular identification. All samples were carried out for *bla* genes using multiplex PCR with specific primers.

**Results** Total 121 isolates comprised of 76 clinical and 45 environmental isolates. Out of 76 clinical isolates, 41 were CRAB harboring 21 (51%) *bla<sub>OXA-23-like</sub>*, 17 (41%) *bla<sub>OXA-24-like</sub>*, 1 (2%) *bla<sub>NDM-1</sub>* and 35 CRPA harboring 13 (37%) *bla<sub>OXA-24-like</sub>* and 6 (17%) *bla<sub>IMP-1</sub>*. Environmental isolates made up 13 CRPA with 6 (46%) *bla<sub>OXA-23-like</sub>*, 7 (54%) *bla<sub>OXA-24-like</sub>*, 1 (8%) *bla<sub>OXA-48-like</sub>*, 2 (15%) *bla<sub>NDM-1</sub>*, 2 (15%) *bla<sub>IMP-1</sub>* and 32 *carbapenem-resistant Pseudomonas species* with 2 (6%) *bla<sub>OXA-23-like</sub>*, 1 (3%) *bla<sub>OXA-48-like</sub>*, 12 (38%) *bla<sub>NDM-1</sub>*, 12 (38%) *bla<sub>VIM</sub>*, and 2 (6%) *bla<sub>IMP-1</sub>*.

**Conclusions** *bla<sub>OXA-24-like</sub>* and *bla<sub>OXA-23-like</sub>* were abundant in both clinical and environmental isolates while *bla<sub>OXA-24-like</sub>*, *bla<sub>NDM-1</sub>*, and *bla<sub>VIM</sub>* were significantly different among *carbapenem-resistant non-lactose fermenting Gram negative bacilli* from clinical and environmental isolates at RSUD Dr. Soetomo, Surabaya.

**Keywords** CRAB, CRPA, carbapenemase gene, OXA, wastewater