Phenotypic Detection of Carbenapenemase-Producing Gram-Negative Bacteria in Hospital Environment

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ABSTRACT

The increase use of antibiotics leads to increase number of antibiotic-resistant bacteria; for instance carbapenemase-producing Gram-Negative bacteria. In Indonesia, the study of bacteria producing carbapenemase in clinical setting is limited even none in hospital environment. Meanwhile, the hospital environment can be a source of resistant bacteria. The objective of this study was to detect Gram-Negative bacteria producing ESBL and carbapenemase in a hospital environment in Denpasar Bali. We identified Gram-Negative bacteria from hospital waste-water, air in hospital rooms, and sinks swab. The sample was taken from January to March 2013. The phenotypic detection of bacteria producing ESBL was done by Double Disc Synergy Test (DDST), while carbapenemase-producing bacteria was detected by Modified Hodge Test (MHT).

RESULTS & DISCUSSION

We examined eight waste-water samples from two water treatment plants, 8 samples of air, and 27 samples of sinks swab in treatment room in Sanglah Hospital.

- Of 8 waste-water samples, we found 2 isolates consist of 14 species of Gram-Negative bacteria which were three positive on MHT i.e : Enterobacter cloacae, A. hydrophila, Proteus mirabilis; two positive on DDST i.e : Proteus mirabilis and Citrobacter freundii. Of 17 room air samples, we found 21 isolates consist of ten species of Gram-Negative bacteria which was one positive for MHT i.e. Acinetobacter baemolitics. Of 27 sinks swab, we found 28 isolates consist of nine species which were two positive by MHT i.e : Enterobacter gergoviae and Pantoea agglomerans; four positive by DDST i.e : Enterobacter gergoviae.

CONCLUSIONS

Based on our study, we found:

- Six species of Carbapenemase-producing Gram-Negative Bacteria i.e : Enterobacter cloacae, A. hydrophila, Proteus mirabilis, Pantoea agglomerans, Acinetobacter haemolitics, Enterobacter gergoviae and Pantoea agglomerans by Modified Hodge Test.
- Three species of ESBLs-producing Gram Negative Bacteria i.e : Proteus mirabilis, Citrobacter freundii and Enterobacter gergoviae by Double Disc Synergy Test.

REFERENCES


Preventing the spread of carbapenemase producers needs the accurate detection of colonized patients at an early stage of hospitalization. For phenotypic detection, the Modified Hodge test (MHT) has been used for years. However, molecular techniques remain the gold standard for the precise identification of carbapenemase genes. Most of these techniques are based on PCR and may be followed by a sequencing step. A PCR technique performed directly on colonies can give results within 4-6 h (or less when using real-time PCR technology) with excellent sensitivity and specificity. Similarly, these molecular techniques are useful for this purpose. The main disadvantages of the molecular based technologies are their cost, the requirement for trained microbiologists and the inability to detect novel unidentified genes. Sequencing of the genes is interesting mostly for research and epidemiological purposes.

Very recently evidence shows recent exchange of antibiotic resistant genes between environmental bacteria and clinical pathogens was presented. Future research should identify factors accounting for the selective increase in antibiotic resistance and develop new methods and approaches to reduce accumulation of such resistance.