LETTER TO EDITOR

Co-Existence of Two Multidrug-Resistant Non-Fermenter Gram-Negative Bacilli: The Dead End or is There Still Hope?

Preethy Edavaloth[1], Sahjid Mukhida[2], Sriram Kannuri[3], Heer Shah[4], Amitesh Datta[5*]

[1-5]Dr. D. Y. Patil Medical College, Hospital and Research Centre, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India

DOI: 10.55489/njcm.140820233139

Keywords: Multidrug-resistant, non-fermenter gram-negative bacilli, Healthcare-associated infections, *Pseudomonas aeruginosa, Acinetobacter baumannii*

ARTICLE INFO

Financial Support: None declared
Conflict of Interest: None declared
Received: 14-06-2023, **Accepted**: 23-06-2023, **Published**: 01-08-2023
***Correspondence:** Amitesh Datta (Email: microamitesh@gmail.com)

Sir,

The battle between bugs and humans started more than a century ago. Both are evolving to maintain their existence. Humans won first when Alexander Fleming discovered the first weapon, Penicillin, which was proved as a destructor (Bramhastra) against the bugs in the battle. As days and years passed, the bugs upgraded themselves by undergoing mutation in their structure to save themselves from antibiotics, commonly known as antimicrobial resistance.[1] Simultaneously, humans also discovered various classes of antimicrobials thus adding newer members to the antimicrobial family.

Drug resistance means the drug is neither able to inhibit bacterial growth nor able to kill the bacteria. Non-judicial and/or inappropriate use of antibiotics is responsible for the development of antibiotic resistance.[2] Superbugs have mutated to survive and have developed resistance to frequently used antibiotics. According to the CDC (Centre for Disease Control and Prevention), Multidrug-resistant organisms (MDRO) are those resistant to at least one antibiotic in three or more drug classes.[3]

Healthcare-associated infections (HAIs), which are on the rise and are known to increase mortality, typically involve non-fermenting Gram-negative bacilli (NFGNBs).[4] HAIs caused by NFGNBs include ventilator-associated pneumonia, sepsis, wound infections, urinary tract infections, and meningitis following neurosurgery, etc. It's also important to note that such infections are more prevalent in immunocompromised patients.[5] Utilization of invasive medical equipment, such as intravenous or urinary catheters, together with hospitalization in intensive care units are contributing to an increase in the prevalence of HAIs caused by *Pseudomonas aeruginosa* and *Acinetobacter baumannii* which are the two most common NFGNBs.[6] A few other non-fermenters, their common infection, and other types of infections are listed in the table:1.

The rapid rise of antimicrobial resistance in NFGNBs has recently become a global public health concern. The widespread use of antibiotics has resulted in the selection of strains that are resistant to several classes of antibiotics.[7] Carbapenems, the last resort, are widely used to treat severe bacterial infections on an empirical basis and thus increasing the probability of therapeutic failure due to the advent of carbapenem-

How to cite this article: Edavaloth P, Mukhida S, Kannuri S, Shah H, Datta A. Co-Existence of Two Multidrug-Resistant Non-Fermenter Gram-Negative Bacilli: The Dead End or is There Still Hope?. Natl J Community Med 2023;14(8):547-548. DOI: 10.55489/njcm.140820233139

www.njcmindia.com | pISSN09763325 | eISSN22296816 | Published by Medsci Publications

Table 1: Non-Fermenter Gram-Negative Bacilli and infections caused by them

Organism	Most common infection	Other infections
Myroides species	Catheter-associated urinary tract inf.	Bloodstream infection
Burkholderia cepacia complex	Ventilator-associated infection	Cystic fibrosis, Respiratory tract inf.
Stenotrophomonas maltophillia	Bloodstream infection	Respiratory tract infection
Pseudomonas fluorescens	Bloodstream infection	Respiratory tract infection
Pseudomonas putida	Skin and soft tissue infection	Bloodstream infection
Ochrobactrum anthropi	Central-line associated bloodstream inf.	Brain empyema endophthalmitis
Acromobacter xylosoxidance	Meningitis	Endocarditis, Bloodstream infection
Pseudomonas stutzeri	Bloodstream infection	Brain abscess, Meningitis
Elizabathkingiia meningoseptica	Meningitis	Bloodstream infection, Respiratory tract inf.

resistant bacteria.[8] For those carbapenem-resistant organisms, the only option available is polymyxins including colistin but few of them are intrinsically resistant to polymyxins too.[9] Currently, newer combination therapy is in practice like Ceftazidime + Avibactam along with Aztreonam, many of them exhibit intrinsic resistance to one of the components of the combination, which reduces the therapeutic window and makes it challenging to treat these infections.[10] In this situation, wait for death or go with the prolonged continuous infusion of the antibiotics which also drags the patient to the dead end.

The situation becomes more challenging when a patient in the critical care unit gets coinfection with two such organisms at a time. In addition, clinicians must consider the patient's clinical status, medication nephrotoxicity, and bioavailability, location of the action, loading dose, and many other factors. Due to this condition, the patient's chances of survival are extremely low, and everything appears to be coming to an end. Fortunately, source removal can be used to treat HAIs.[11] Sometimes infection therapy is required even after the source has been eliminated. In such a situation, combination therapy can be used to treat one of the uncommon non-fermenters, which only needs a short course of treatment, before treating another non-fermenter that requires a long course of treatment.[12] Specimen could be sent for culture once more after 3–7 days of treatment, and if the unusual bacterium is not grown, we can omit the antibiotics used to treat it from the treatment plan. It could be helpful to save patients. There are few antibiotics under clinical trials, but this may take time.[10,13,14]

Although we are unsure whether medications will be effective or not against both non-fermenters, we are optimistic that the illness caused by two MDR NFGNBs won't be fatal. There is one last ray of hope, medical scientists will discover newer options to treat the coinfection of two MDR NFGNBs.

References

1. Gaynes R. The Discovery of Penicillin—New Insights After More Than 75 Years of Clinical Use. Emerg Infect Dis. 2017 May;23(5):849–53. doi: 10.3201/eid2305.161556. PMCID: PMC5403050.
2. Grover N, Das NK, Kumar M, Sriram R, Dudhat VL, Prasanna S, Pandit P. An Evaluation of Antibiotic Profile, Molecular Characterization and Risk Factors Associated with Carbapenem Resistant Non Fermentative Gram Negative Isolates in a Tertiary Care Centre. Int. J. Curr. Microbiol. App. Sci. 2017;6(5): 1057-1066. doi: 10.20546/ijcmas.2017.605.11
3. Multidrug-resistant organisms (MDRO) management published by Centre for Disease Control and Prevention on 2006. Last reviewed on November 2015. Available at https://www.cdc.gov/infectioncontrol/guidelines/mdro/introduction.html Last accessed on 11th June 2023.
4. Tucaliuc D, Alexa O, Tuchiluş CG, et al. Antibiotic resistance spectrum of non-fermenting Gram-negative bacilli isolated in the Orthopedic Traumatology Clinic of "Sf. Spiridon" Clinical Emergency Hospital Iaşi. Rev Med Chir Soc Med Nat Iasi. 2015; 119:536-43.
5. Antunes LC, Visca P, Towner KJ. Acinetobacter baumannii: evolution of a global pathogen. Pathog Dis. 2014; 71:292-301.
6. Gokale SK, Metgud SC. Characterization and antibiotic sensitivity pattern of nonfermenting gram-negative bacilli from various clinical samples in a tertiary care hospital, Belgaum. J Pharm Biomed Sci. 2012; 17:1-5.
7. Bengtsson-Palme J, Kristiansson E, Larsson DGJ. Environmental factors influencing the development and spread of antibiotic resistance. FEMS Microbiol Rev. 2018; 42:53.
8. Britt N, Ritchie D, Kollef M, Durkin M, Hampton N, Micek S. Clinical epidemiology of carbapenem-resistant gram-negative sepsis among hospitalized patients: Shifting burden of disease? AJIIC.2018;46(10):1092-1096
9. CLSI. Performance Standards for Antimicrobial Susceptibility Testing. 33rd Ed. CLSI Suppl. M100. Clinical Laboratory Standard Institute; 2023 Clinical Laboratory & Standard Institute.
10. Buzila ER, Nastase EV, Lunca C, Badescu A, Miftode E, Iancu LS. Antibiotic resistance of nonfermenting Gram-negative bacilli isolated at a large Infectious Diseases Hospital in North-Eastern Romania, during an 11-year period. GERMS. 2021; 11(3):354-362.
11. World Health Organization. Regional Office for South-East Asia. (2002). Guidelines on prevention and control of hospital associated infections. WHO Regional Office for South-East Asia. https://apps.who.int/iris/handle/10665/205187 Last accessed on 22 June 2023
12. Bhaumik S, Das NK, Gandham NR, Mirza S, Misra RN, Gupta NS, et al. Microbiological Profile and Antibiotic Susceptibility Pattern of Gram-Negative Isolates from Tracheal Secretions in a Tertiary Care Setup. Med J D.Y. Patil Vidyapeeth .2022; 15(3): 440-443.
13. Bassetti M, Russo C, Vena A, Giacobbe DR. New antibiotics for the treatment of nonfermenting Gram-negative bacteria. Curr Opin Infect Dis. 2021 Dec 1;34(6):701-709. doi: 10.1097/QCO.0000000000000757.
14. Mukhida S, Vyawhare C, Das P, Das NK. In need of new drugs: Forgetting current use of the available drugs for tuberculosis. Lung India 2023;40(3):289-290. DOI: 10.4103/lungindia.lungindia_23_23