

The Efficacy of Antimicrobial Peptides Against Gentamicin-Resistant *Klebsiella pneumoniae* [Letter]

Meity Mardiana 

Eijkman Research Center for Molecular Biology, National Research and Innovation Agency (BRIN), Cibinong, West Java, Indonesia

Correspondence: Meity Mardiana, Email meit006@brin.go.id

Dear editor

Klebsiella pneumoniae is a Gram-negative, non-motile, and encapsulated bacteria found in the environment. Once this bacterium enters the body, it can exhibit a high degree of virulence.¹ The frequent misuse of antibiotics has led to an increase in antibiotic-resistant cases of *K. pneumoniae*, complicating treatment efforts. Consequently, there is an urgent need for alternative therapies. In the study presented by Chen et al, the authors effectively utilized antimicrobial peptides (AMPs) to treat gentamicin-resistant *K. pneumoniae*. Currently, AMPs are extensively explored due to their ubiquitous presence in nature, their relatively short residue length, and their well-documented activity in killing both Gram-positive and Gram-negative bacteria through interactions with outer membrane structures and lipids, as well as intracellular structures such as nucleic acids and proteins, thereby disrupting bacterial cell functions.² Chen et al revealed that in the gentamicin-resistant *K. pneumoniae*, genes related to efflux pump, porin, and biofilm formation, as well as the minimum inhibitory concentration (MIC), significantly increased. Furthermore, the study also provided evidence that AMPs can mitigate these genetic changes.³ Although this study demonstrated promising results, we believe there are aspects that can be improved. The authors used ATCC13883 as wild-type (WT) strain in this research. While it does not exhibit any antibiotic resistance profile, a comparison with the gradient-un-induced strain would yield more accurate data as there might be other future differences between the ATCC strain and the un-induced strain that could potentially influence the experiment outcomes. The nomenclature for the strains used in this study should also be revised in the data presentation to enhance reader comprehension. For example, use C for the gentamicin-induced strain and C' for the gentamicin-un-induced strain. Furthermore, the authors conducted MIC assays on planktonic bacteria but did not perform a minimum biofilm inhibitory concentration (MBIC) assay on their biofilm experiments. While the percentage of biofilm inhibition assessed in this study is indeed important for evaluating the efficacy of AMPs in inhibiting biofilm formation, MBIC is equally crucial, as it is essential for determining the lowest concentration of AMPs used for therapy and for establishing precise dosages for future applications.⁴ Additionally, the authors could also investigate the ability of AMPs to eradicate biofilm formation, as in clinical settings, many cases involve mature biofilms that are more resistant to antibiotic treatment. Therefore, it is important to ascertain whether AMPs can effectively disrupt mature biofilms as well.

We appreciate the authors for their comprehensive study on the use of AMPs in combating antibiotic-resistant bacterial infections. Yet this area still faces significant limitations, including limited in vivo safety data and the potential for bacterial resistant development.⁵ Additionally, effective AMPs must exhibit characteristics such as low-cost production, environmental stability, and low serum binding capacity.⁶ These factors can also be explored by the authors in the future so that they can provide effective AMPs for clinical applications.

Disclosure

The author reports no conflicts of interest in this communication.

References

1. Ashurst JV, Dawson A. *Klebsiella Pneumonia*. Treasure Island (FL): StatPearls; 2024.
2. de Souza CM, da Silva AP, Junior NGO, Martinez OF, Franco OL. Peptides as a therapeutic strategy against *Klebsiella pneumoniae*. *Trends Pharmacol Sci*. 2022;43(4):335–348. doi:10.1016/j.tips.2021.12.006
3. Chen X, Zhang B, He J, et al. Exploration of antimicrobial peptides in the treatment of gentamicin-resistant *Klebsiella pneumoniae* Infection. *Infect Drug Resist*. 2024;17:2591–2605. doi:10.2147/IDR.S462653
4. Macia MD, Rojo-Molinero E, Oliver A. Antimicrobial susceptibility testing in biofilm-growing bacteria. *Clin Microbiol Infect*. 2014;20(10):981–990. doi:10.1111/1469-0691.12651
5. Kidd TJ, Mills G, Sa-Pessoa J, et al. A *Klebsiella pneumoniae* antibiotic resistance mechanism that subdues host defences and promotes virulence. *EMBO Mol Med*. 2017;9(4):430–447. doi:10.15252/emmm.201607336
6. Li J, Koh JJ, Liu S, Lakshminarayanan R, Verma CS, Beuerman RW. Membrane active antimicrobial peptides: translating mechanistic insights to design. *Front Neurosci*. 2017;11:73. doi:10.3389/fnins.2017.00073

Dove Medical Press encourages responsible, free and frank academic debate. The content of the Infection and Drug Resistance 'letters to the editor' section does not necessarily represent the views of Dove Medical Press, its officers, agents, employees, related entities or the Infection and Drug Resistance editors. While all reasonable steps have been taken to confirm the content of each letter, Dove Medical Press accepts no liability in respect of the content of any letter, nor is it responsible for the content and accuracy of any letter to the editor.

Infection and Drug Resistance

Dovepress

Publish your work in this journal

Infection and Drug Resistance is an international, peer-reviewed open-access journal that focuses on the optimal treatment of infection (bacterial, fungal and viral) and the development and institution of preventive strategies to minimize the development and spread of resistance. The journal is specifically concerned with the epidemiology of antibiotic resistance and the mechanisms of resistance development and diffusion in both hospitals and the community. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/infection-and-drug-resistance-journal>

<https://doi.org/10.2147/IDR.S484430>