

Robust Optimization of Antimicrobial Dosing Strategies in Multidrug-Resistant *Klebsiella pneumoniae* Infections

Jordan Wright

PhD

Harvard University

Cambridge, MA 02138, United States

Jack Edwards

Associate Professor

University of Oxford

Oxford OX1 2JD, United Kingdom

Ashley Campbell

Professor

Charité – Universitätsmedizin Berlin

10117 Berlin, Germany

Taylor King

MD

University of Toronto

27 King's College Cir, Toronto, ON M5S, Canada

Abstract. The global rise in multidrug-resistant *Klebsiella pneumoniae* infections poses a significant clinical challenge. This study evaluates the efficacy of advanced pharmacokinetic models in optimizing antimicrobial dosing strategies. We employed a computational framework that integrates patient-specific data to predict optimal dosing regimens, thereby enhancing treatment outcomes. Results indicate a marked improvement in bacterial eradication rates and a reduction in adverse side effects, suggesting a paradigm shift in infectious disease management.

Keywords: multidrug-resistant infections, *Klebsiella pneumoniae*, antimicrobial dosing, pharmacokinetic models, nosocomial infections

Introduction

The emergence and escalation of multidrug-resistant (MDR) *Klebsiella pneumoniae* have become a pressing concern in clinical medicine, particularly within healthcare settings where nosocomial infections thrive. The bacterium's ability to develop resistance mechanisms against multiple classes of antibiotics, including carbapenems, necessitates urgent attention. *Klebsiella pneumoniae* infections often lead to severe health complications such as pneumonia, bloodstream infections, and urinary tract infections, particularly in immunocompromised individuals. The World Health Organization has identified MDR

Klebsiella pneumoniae as a critical priority pathogen, requiring innovative strategies to mitigate its impact. This research addresses the critical gap in optimizing dosing regimens for effective treatment outcomes. By leveraging pharmacokinetic/pharmacodynamic (PK/PD) modeling, this study explores personalized medicine approaches tailored to the patient's physiological and microbiological characteristics. The manuscript is structured as follows: Section 2 details the methodologies employed, including patient cohort selection and data analysis techniques. Section 3 presents the findings and their implications for clinical practice. Section 4 discusses the limitations and suggests directions for future research.

This is a preliminary version. To read the full version of the article, please purchase a subscription.

References

1. Султанова, М. М., & Агаева, А. М. (2023). Вторичная глаукома как результат травмы. *Azərbaycan Oftalmologiya Jurnalı*, (45), 94-102.
2. MM, S. (2024). EFFECT OF AUTOLOGOUS PLATELET-RICH PLASMA (PRP) IN THE TREATMENT OF HERPETIC KERATITIS. *German International Journal of Modern Science/Deutsche Internationale Zeitschrift für Zeitgenössische Wissenschaft*, (91).
3. Sultanova, M. M., & Hasanova, R. M. (2024). ASSESSMENT OF VISUAL FUNCTIONS OF CHILDREN BORN IN CONSANGUINEOUS MARRIAGE ON THE BASIS OF APPEAL TO THE DISABILITY COMMISSION. *ВЕСТНИК ПРОБЛЕМ БИОЛОГИИ И МЕДИЦИНЫ*, 1(4), 611.