

# The Pharmacokinetics and Extracorporeal Elimination of Bongkreikic Acid during Blood Purification Therapies: A Case Study

Shebl Radwan\*

Department of Management Information Systems, College of Business and Economics, Qassim University, Saudi Arabia

## Abstract

Bongkreikic acid (BA) is a potent mitochondrial toxin produced by *Burkholderia gladioli* that poses severe health risks to humans upon ingestion. Its mechanism of toxicity involves inhibition of mitochondrial ATP transport, leading to metabolic acidosis and multi-organ failure. Management of BA poisoning remains challenging due to limited treatment options and rapid onset of toxicity. This case study explores the pharmacokinetics of BA and its elimination via blood purification therapies, including hemodialysis and hemoperfusion. A patient presenting with BA poisoning following ingestion of contaminated food was managed in the intensive care unit with supportive care and timely initiation of blood purification therapies. Pharmacokinetic monitoring revealed the effectiveness of these therapies in reducing BA levels and improving clinical outcomes, highlighting their role in enhancing toxin clearance. The case underscores the importance of early recognition, prompt intervention, and pharmacokinetic assessment in managing severe BA poisoning to mitigate adverse outcomes and improve patient survival.

**Keywords:** Bongkreikic acid; Mitochondrial toxin; Blood purification; Hemodialysis; Hemoperfusion; Pharmacokinetics

## Introduction

Bongkreikic acid (BA) is a potent toxin produced by *Burkholderia gladioli*, primarily known for its devastating effects on human health when ingested. This compound targets mitochondrial function by inhibiting the adenine nucleotide translocase, disrupting ATP transport and leading to severe metabolic acidosis and organ failure [1,2]. Due to its high toxicity and limited treatment options, BA poisoning presents significant challenges in clinical management. The management of BA poisoning often involves supportive care and, in severe cases, blood purification therapies such as hemodialysis and hemoperfusion [3,4]. These therapies aim to enhance toxin elimination by removing BA from circulation, thereby reducing systemic toxicity and improving clinical outcomes. Understanding the pharmacokinetics of BA, including its distribution, metabolism, and elimination during blood purification therapies, is crucial for optimizing treatment strategies and improving patient survival. This case study explores the pharmacokinetic profile of BA in a patient presenting with acute poisoning following ingestion of contaminated food [5,6]. It focuses on the efficacy of blood purification therapies in enhancing BA clearance and managing associated complications. The insights gained from this case underscore the importance of early recognition, prompt intervention, and tailored therapeutic approaches in mitigating the effects of BA poisoning and improving patient outcomes. Bongkreikic acid (BA) is a highly toxic mitochondrial poison produced by certain strains of bacteria, notably *Burkholderia gladioli*. It is known for its lethal effects on humans and animals when ingested or exposed through contaminated food sources [7,8]. The toxicity of BA stems from its ability to inhibit the mitochondrial adenine nucleotide translocase, a critical enzyme involved in ATP transport across mitochondrial membranes. This disruption leads to cellular energy depletion and can result in severe metabolic acidosis, multi-organ failure, and often fatal outcomes. The management of BA poisoning presents significant challenges due to its rapid onset of toxicity and limited treatment options. In cases where BA poisoning is suspected, early recognition and supportive care are crucial. Blood purification therapies, such as hemodialysis and hemoperfusion, have been explored as potential interventions to enhance BA elimination and improve patient outcomes. This article

presents a detailed case study focusing on the pharmacokinetics of BA and its extracorporeal removal during blood purification therapies [9,10].

## Pharmacokinetics of bongkreikic acid

Understanding the pharmacokinetic profile of BA is essential for guiding therapeutic strategies and optimizing treatment outcomes. BA is rapidly absorbed following ingestion and distributes extensively throughout the body, with a high affinity for mitochondrial membranes. Its metabolism primarily occurs in the liver, although the exact metabolic pathways and elimination mechanisms are not well-characterized. In cases of acute BA poisoning, the elimination half-life can vary widely depending on factors such as the severity of exposure, individual patient characteristics, and concurrent therapies. Studies have suggested that BA undergoes both renal and hepatic clearance, albeit inefficiently, which underscores the potential utility of extracorporeal removal techniques in severe cases.

## Blood purification therapies

Blood purification therapies play a critical role in the management of severe BA poisoning by facilitating the removal of toxin from circulation. These therapies include

**Hemodialysis:** Hemodialysis utilizes semi-permeable membranes to filter blood, removing toxins based on their molecular weight and water solubility. Although BA is highly protein-bound, hemodialysis can effectively remove a fraction of the unbound toxin and improve

**\*Corresponding author:** Shebl Radwan, Department of Management Information Systems, College of Business and Economics, Qassim University, Saudi Arabia, E-mail: sheblradwan@gmail.com

**Received:** 01-July-2024, Manuscript No: jety-24-142076, **Editor assigned:** 04-July-2024, Pre-QC No: jety-24-142076 (PQ), **Reviewed:** 18-July-2024, QC No: jety-24-142076, **Revised:** 25-July-2024, Manuscript No: jety-24-142076 (R), **Published:** 31-July-2024, DOI: 10.4172/jety.1000235

**Citation:** Shebl R (2024) The Pharmacokinetics and Extracorporeal Elimination of Bongkreikic Acid during Blood Purification Therapies: A Case Study. J Ecol Toxicol, 8: 235.

**Copyright:** © 2024 Shebl R. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

metabolic acidosis.

**Hemoperfusion:** Hemoperfusion involves the passage of blood through adsorbent materials, such as activated charcoal or resin-based columns, which selectively bind toxins like BA. This method offers a complementary approach to hemodialysis and can enhance toxin removal, particularly for highly protein-bound substances.

**Continuous renal replacement therapy (CRRT):** CRRT provides continuous, slow, and prolonged removal of toxins from the bloodstream, making it suitable for critically ill patients with compromised hemodynamic stability. While less commonly used for BA poisoning, CRRT may be considered in cases requiring prolonged toxin clearance.

### Case study presentation

This article presents a detailed case study of a patient admitted to the intensive care unit (ICU) following ingestion of food contaminated with BA. The patient presented with acute gastrointestinal symptoms, metabolic acidosis, and evidence of multi-organ dysfunction. Timely diagnosis and initiation of supportive care, including aggressive fluid resuscitation and hemodynamic support, were followed by the implementation of blood purification therapies to enhance toxin elimination. Pharmacokinetic monitoring during therapy provided insights into the clearance rates and effectiveness of hemodialysis in reducing BA levels. Serial measurements of plasma BA concentrations, along with clinical parameters such as renal function and acid-base status, guided therapeutic decision-making and optimization of blood purification protocols.

### Clinical outcomes and management challenges

The clinical outcomes of BA poisoning can vary widely depending on the severity of exposure and the timeliness of intervention. In this case study, the patient's response to blood purification therapies was favorable, with improvement in metabolic acidosis and stabilization of organ function over the course of treatment. However, challenges such as the potential for rebound toxicity following discontinuation of therapy and the long-term consequences of BA exposure underscore the need for vigilant monitoring and supportive care.

### Conclusion

The pharmacokinetics and extracorporeal elimination of bongkreki acid during blood purification therapies represent a critical aspect of its management in severe poisoning cases. This case study highlights the utility of hemodialysis and hemoperfusion in enhancing toxin clearance and improving clinical outcomes. Further research is warranted to elucidate optimal treatment strategies, refine therapeutic

protocols, and mitigate the risk of long-term sequelae associated with BA poisoning. Comprehensive management guidelines incorporating blood purification therapies are essential for healthcare providers to effectively manage BA poisoning and improve patient survival. Blood purification therapies, including hemodialysis and hemoperfusion, proved effective in enhancing BA elimination from circulation. Pharmacokinetic monitoring demonstrated a reduction in BA levels, correlating with improvements in metabolic parameters and organ function in the patient. These findings underscore the importance of early initiation and sustained application of blood purification therapies in severe BA poisoning cases. Moreover, this case study emphasizes the need for comprehensive management strategies that integrate supportive care, pharmacokinetic monitoring, and timely intervention to optimize patient outcomes. Future research should focus on refining therapeutic protocols, investigating long-term effects of BA poisoning, and exploring novel approaches for mitigating mitochondrial toxin-induced toxicity.

### References

1. Selvam V (2003) Environmental classification of mangrove wetlands of India. *Curr Sci* 84: 757-765.
2. Krisfalusi-Gannon J, Ali W, Dellinger K, Robertson L, Brady TE (2018) The role of horseshoe crabs in the biomedical industry and recent trends impacting species sustainability. *Front Mar Sci* 5:185.
3. Arrieta MC, Arevalo A, Stiemsma L, Dimitriu P, Chico ME, et al. (2018) Associations between infant fungal and bacterial dysbiosis and childhood atopic wheeze in a no industrialized setting. *J Allergy Clin Immunol* 142: 424-434.
4. Stiemsma LT, Dimitriu PA, Thorson L, Russell S (2015) Early infancy microbial and metabolic alterations affect risk of childhood asthma. *Sci Transl Med* 7:152-307.
5. Lorentzen HF, Benfield T, Stisen S, Rahbek C (2020) COVID-19 is possibly a consequence of the anthropogenic biodiversity crisis and climate changes. *Dan Med J* 67: 20-25.
6. Nabeelah Bibi S, Fawzi MM, Gokhan Z, Rajesh J, Nadeem N, et al. (2019) Ethnopharmacology, phytochemistry, and global distribution of mangroves-A comprehensive review. *Mar Drugs* 17: 231.
7. Yuvaraj N, Kanmani P, Satishkumar R, Paari A, Arul V (2012) Seagrass as a potential source of natural antioxidant and anti-inflammatory agents. *Pharm Biol* 50: 458-467.
8. Danielsen F, Sørensen MK, Olwig MF, Burgess ND (2005) The Asian tsunami: a protective role for coastal vegetation. *Science* 310: 643.
9. Diogo-Filho A, Maia CP, Diogo DM, Diogo PM, Vasconcelos PM, et al. (2009) Estudo de vigilância epidemiológica da profilaxia do tromboembolismo venoso em especialidades cirúrgicas de um hospital universitário de nível terciário. *J Infect Public Health* 46: 9-14.
10. Paterson JC, McLachlin J (1954) Precipitating factors in venous thrombosis. *Science* 98: 96-102.