Abstract

The Antibacterial Efficacy and Drug Safety Profile of Trans-Cinnamaldehyde against Acinetobacter baumannii: Bioinformatics and Cheminformatics Approach †

Ivan Dolanc 1,*, Goran Slivšek 2, Nives Ražnjević 3, Sandra Mijač 4, Antonija Jonjić 1 and Miran Čoklo 1

1 Centre for Applied Bioanthropology, Institute for Anthropological Research, 10000 Zagreb, Croatia; antonija.jonjic@inantro.hr (A.J.); miran.coklo@inantro.hr (M.Č.)
2 Faculty of Veterinary Medicine, University of Sarajevo, 71000 Sarajevo, Bosnia and Herzegovina; goran.slivsek@xnet.hr
3 University Hospital of Split, 21000 Split, Croatia; nives.raznjevic@kbsplit.hr
4 Children's Hospital Srebrnjak, 10000 Zagreb, Croatia; sandra.mijac@vip.hr
* Correspondence: ivan.dolanc@inantro.hr
† Presented at the 1st International Electronic Conference on Toxics, 20–22 March 2024; Available online: https://sciforum.net/event/IECTO2024.

Keywords: Acinetobacter baumannii; antibiotic resistance; bioinformatics; cheminformatics; drug development; toxicity; trans-cinnamaldehyde

Introduction: The discovery of antibiotics saves millions of lives worldwide, but in recent years bacterial antibiotic resistance has become a growing global problem as bacteria have become increasingly able to adapt to all known antibiotics. Projections have shown that in 2019, more than 4.9 million people worldwide died directly or indirectly as a result of antibiotic resistance. Therefore, it is crucial to discover new antibacterial agents that have therapeutic potential and are non-toxic and drug-safe so that humanity can successfully fight antibiotic resistance. Since such studies are usually very expensive and disappointing results are a waste of valuable time, the use of bioinformatics and chemoinformatics tools can help overcome these problems.

Methods: SwissADME (http://www.swissadme.ch/citing.php, accessed on 1 April 2024) software was used to assess trans-cinnamaldehyde’s pharmacokinetics, drug-likeness, and medicinal chemistry friendliness, while potential therapeutic targets in Acinetobacter baumannii were assessed using the RCSB Protein Data Bank online platform tools and evaluated with a comprehensive review of the existing literature.

Results: Trans-cinnamaldehyde fulfils the requirements for the number of rotatable bonds and proton acceptors, which should be readily absorbed in the gut and can cross the blood—brain barrier, but is not a substrate for P-gp, which contributes to its therapeutic potential as it is not immediately excreted from the body. Theoretically, it should not be hepatotoxic as it has no inhibitory effect on liver cytochromes. It meets all five of Lipinski’s rules and, according to these criteria, is a molecule that could have therapeutic effects. The most promising potential targets in Acinetobacter baumannii are the proteins AbOmpA and bap, where trans-cimetaldehyde could destabilise membrane integrity and disrupt biofilm formation.

Conclusions: Bioinformatics and chemoinformatics tools can help obtain resources for developing new antibiotics. In vitro tests need to be performed to confirm the efficacy of trans-cinnamaldehyde as a potential therapeutic agent against Acinetobacter baumannii.

**Author Contributions:** Conceptualization, G.S. and I.D.; methodology, G.S. and N.R.; software, N.R. and G.S.; formal analysis, N.R. and S.M.; data curation, I.D. and A.J.; writing—original draft preparation, S.M. and N.R.; writing—review and editing, G.S. and M.Č.; supervision, M.Č. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** This study did not require ethical approval.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The data supporting the results of this study are available on request from the authors.

**Conflicts of Interest:** The authors declare no conflict of interest.

**Disclaimer/Publisher’s Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.