proceedings

MDPI

Abstract

Exploring the Antimicrobial and Anticancer Potential of a Bioactive Peptide from *T. radiatus*: A Comprehensive Study †

Krishnanand Nagarajan *, Latha Subbaiah and Selvamani Palanisamy

Peptide Chemical Biology Laboratory, Department of Pharmaceutical Technology, University College of Engineering Bharathidasan Institute of Technology Campus, Anna University, Tiruchirappalli 620 024, Tamil Nadu, India

* Correspondence: krishwrites@gmail.com

† Presented at the 4th International Electronic Conference on Cancers, 6–8 March 2024; Available online: https://sciforum.net/event/IECC2024.

Keywords: therapeutic peptides; antimicrobial; pore-forming; tumor-targeting; bioassay-guided fractionation; marine peptides

Therapeutic peptides have emerged as a promising frontier in the development of anti-cancer agents, classified into three main groups: antimicrobial/pore-forming peptides, cell-permeable peptides, and tumor-targeting peptides. This classification, delineates the diverse cellular targets of these peptides, offering a comprehensive perspective on their potential applications in cancer treatment. Antimicrobial/pore-forming peptides (AMPs) represent a subset of these therapeutic peptides with natural occurrences across living organisms, integral to the innate immune defense mechanism. This study focuses on a bioassay-guided fractionation approach to purify a bioactive peptide (PAP) from the soft body tissue of marine gastropod *T. radiatus*, highlighting its multifaceted properties, and utilizing sequential procedures such as ammonium sulfate precipitation, cation exchange chromatography, and gel filtration chromatography. The purified antibacterial peptide (PAP), exhibited exceptional efficacy against both Gram-positive and Gram-negative bacteria, demonstrating particular sensitivity towards *E. faecium*, *K. pneumoniae*, and *S. dysenteriae*. Further characterization revealed PAP's stability across broad pH and temperature ranges, serum stability, and the ability to form membrane pores, as evidenced by SEM analysis. PAP displayed stability across diverse conditions and the ability to form membrane pores, suggesting a potent antimicrobial mechanism. Significantly, PAP demonstrated noteworthy anticancer activities by inhibiting proliferation in lung cancer cell lines (A549 and NCI-H460) in a concentration-dependent manner, while exhibiting non-cytotoxicity to normal cells. This selective anticancer effect was further evidenced by the promotion of angiogenesis in chick embryos. The amino acid sequence of PAP (MSMGSFGFALAVMVLAVLVASAA-GAPNTNLVSSACNGNKIPSGNPFFNNLGALLVDLEK) and its three-helix structure with an extended loop were determined through MALDI-TOF-MS/MS analysis and in-silico modeling, respectively.

In conclusion, this research unveils the multifaceted nature of the bioactive peptide from *T. radiatus*, emphasizing its dual-action as a potent antimicrobial agent and a selective anticancer drug candidate. These findings underscore the potential therapeutic significance of marine peptides in addressing global health challenges, particularly in the context of antimicrobial resistance and cancer treatment.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/proceedings2024100020/s1, Conference poster.

check for updates

Citation: Nagarajan, K.; Subbaiah, L.; Palanisamy, S. Exploring the Antimicrobial and Anticancer Potential of a Bioactive Peptide from *T. radiatus*: A Comprehensive Study. *Proceedings* **2024**, *100*, 20. https://doi.org/10.3390/proceedings2024100020

Academic Editor: Ulrich Pfeffer

Published: 27 March 2024

Author Contributions: K.N. conceived and designed the study, analyzed data, drafted and revised the manuscript; L.S. contributed to data analysis, manuscript drafting, and revision; S.P. provided guidance, supervised the study, and critically revised the manuscript. All authors approved the final version for publication.

Funding: This research received financial support from the Government of India through the Science and Engineering Research Board, EMEQ grant no.: SB/EMEQ-034/2014, dated 06.07.2015, and the University Grants Commission, Lr.No.: F1-17.1/2017-18/RGNF-2017-18-SC-TAM-45554, dated 16.08.2017, under the scheme National Fellowship for Scheduled Caste. We sincerely thank both organizations for their generous support.

Institutional Review Board Statement: Not applicable; the study did not require ethical approval.

Informed Consent Statement: Not applicable; no human participants were involved in this study.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.