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Determining The Effects of Sulphide Derivatives on the Efficacy of Clindamycin against *Staphylococcus aureus*

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Structured Abstract

Background: *Staphylococcus aureus* is a significant human pathogen that has the potential to cause a variety of severe infections, particularly in the context of antibiotic resistance. The community nowadays, mostly relying on modern drugs manufactured to treat infection such as clindamycin, and others. However, antimicrobial resistance has become a major issue for public health. Recent studies reported that the reactive sulphur species (RSS) potentially cause the decrease of antimicrobial potency towards several bacteria. The use of RSS derivatives such as glutathione in skin care products has been commonly applied.

Methods: The study utilised *S. aureus* from the American Type Culture Collection and tested the effects of various sulphide compounds (CysSH, Met, NaHS) and clindamycin. The cytotoxicity profile of sulphide compounds against *S. aureus* was assessed using the broth microdilution method in a 96-well microplate, with clindamycin and sulphide donors tested in serial dilutions. The growth was measured with a microplate reader, and the minimum bactericidal concentration (MBC) was identified. Interaction between antimicrobial agents and sulphide donours was analysed using the broth microdilution method and High-Performance Liquid Chromatography (HPLC) with UV detection. Data were statistically analysed using a one-way analysis variance (ANOVA).

Results: The finding suggests that clindamycin alone consistently inhibited bacterial growth, while NaHS showed moderate inhibition while CysSH and Met had minimal effects. When combined with clindamycin, Met enhanced the antibiotic's effectiveness, while NaHS reduced clindamycin's efficacy at higher concentrations. These interactions were further analysed using High-Performance Liquid Chromatography (HPLC), revealing that while clindamycin alone was effective, its combination with CysSH and NaHS showed antagonistic effects, whereas Met had a synergistic effect. This suggests that the sulphide donors' interactions with clindamycin vary, impacting the antibiotic's availability and effectiveness, highlighting the need for further research to optimise antibacterial therapies.

Conclusion: In conclusion, the study showed that clindamycin's antibacterial activity is synergising when combined with Met but reduced by CysSH and NaHS. This study hypothesises that certain sulphur-containing compounds, such as CysSH, Met, and NaHS, interact with the antibiotic clindamycin and affect its efficacy against *S. aureus*.

Keywords: *Staphylococcus aureus*, Clindamycin, Reactive Sulphur Species, Antibacterial Activity

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