

## **Bacteriocin-Antibiotic Synergetic Consortia: Augmenting Antimicrobial Activity and Expanding the Inhibition Spectrum of Vancomycin Resistant and Methicillin Resistant Staphylococcus aureus**

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**Abstract :** Background: Bacteriocins are a subclass of antimicrobial peptides that are becoming extremely important in treatments. It is possible to utilise bacteriocins in place of or in addition to traditional antibiotics. It is possible to treat a variety of infections, including Vancomycin-Resistant Staphylococcus aureus (VRSA) and Methicillin-Resistant Staphylococcus aureus (MRSA), using the targeted spectrum of activity of these microorganisms. Method: This study aimed to examine the efficiency of antibiotics and bacteriocin against VRSA and MRSA. The effects of bacteriocins, such as enterocin KAE01, enterocin KAE03, enterocin KAE05, and enterocin KAE06 isolated from Enterococcus faecium strains, alone and in combination with vancomycin and methicillin antibiotics were examined. The selection technique utilized the minimum inhibitory concentrations (MICs) against Gram-positive indicator strain ATCC 6538 Methicillin-Resistant Staphylococcus aureus (MRSA) and indicator strain KSA 02 Vancomycin-Resistant Staphylococcus aureus (VRSA). Results: We report the isolation and identification of enterocins KAE01, KAE03, KAE05, and KAE06 from food isolates of Enterococcus faecium (KAE01, KAE03, KAE05, and KAE06). After isolating the protein, it was partially purified with ammonium sulphate precipitation and purified with fast protein liquid chromatography (FPLC) procedures. Combinations of enterocin KAE01, 1 citric acid, 1 lactic acid, and microcin J25, 1 reuterin, 1 citric acid, and microcin J25, 1 reuterin, 1 lactic acid shown synergistic benefits (FIC index = 0.5) against Vancomycin-Resistant Staphylococcus aureus (VRSA). In addition, a moderately synergistic (FIC index = 0.75) interaction was seen between pediocin PA-1, 1 citric acid, 1 lactic acid, and reuterin 1 citric acid, 1 lactic acid against L. ivanovii HPB28. In the presence of acids, nisin Z exhibited a modestly synergistic effect (FIC index = 0.625-0.75); however, it exhibited additive effects (FIC index = 1) when combined with reuterin or pediocin PA-1 against L. ivanovii HPB28. The efficacy of synergistic consortiums against Gram-positive bacteria was examined. Conclusion: Combining antimicrobials with various modes of action boosted efficacy and expanded the spectrum of inhibition, particularly against multidrug-resistant pathogens, according to our research.

**Keywords :** Enterococcus faecium, bacteriocin, antimicrobial resistance, antagonistic activity, vancomycin-resistant Staphylococcus aureus, methicillin-resistant Staphylococcus aureus

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