Determining the in vitro Post-Antimicrobial Effect in Staphylococcus epidermidis With Piperine Incorporation

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Staphylococcus epidermidis is a leading cause of infections associated with indwelling medical devices and accounts for over 20% of bloodstream infections in U.S. intensive care units. Although typically a harmless component of the skin microbiome, it can become pathogenic when introduced into the body through medical devices, leading to serious complications such as sepsis and prosthetic valve endocarditis. A major contributor to its antibiotic resistance is the presence of efflux pumps, particularly those belonging to the Major Facilitator Superfamily (MFS), which actively expel antimicrobial agents from the cell. This study investigated the effect of the phytochemical efflux pump inhibitor piperine on antibiotic susceptibility in S. epidermidis. The minimum inhibitory concentration (MIC) and post-antibiotic effect (PAE) of a selected antibiotic were evaluated both alone and in combination with piperine. MIC assays showed that the antibiotic alone had a mean MIC of 62.5 mg, while the addition of piperine reduced the MIC to 31.25 mg, indicating a twofold increase in antibiotic effectiveness. A Welch two-sample t-test yielded a t-value of 2.24 ($p = 0.085$), suggesting that while the reduction approached statistical significance, additional trials are needed to confirm this effect. Furthermore, PAE results demonstrated an increase from 2 hours with antibiotic alone to 4 hours with the combination treatment, indicating prolonged bacterial growth suppression.

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