



STUDY OF THE COMBINED ACTIVITY OF POLYHEXAMETHYLENE GUANIDINE HYDROCHLORIDE AND TETRAMETHYLENEDIAMINETETRAMINE AGAINST CLINICAL ISOLATES

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Background: The widespread availability and use of antibacterial and antiseptic agents have led to the emergence of antimicrobial resistance among many strains of pathogenic and conditionally pathogenic microorganisms. Antibiotic resistance poses a particular challenge in the treatment of nosocomial infections in hospital settings, especially in intensive care units (ICUs). Addressing the pharmacotherapy of nosocomial infections in ICUs remains one of the most pressing issues in modern medicine. To tackle this problem, novel antimicrobial agents as well as their combined activity are being investigated. Synergistic interactions between antimicrobials can facilitate therapy and enhance efficacy at lower doses, thereby reducing adverse and toxic effects on the human body.

Objective: To evaluate the combined antimicrobial activity of two antiseptic agents against clinical strains of *Escherichia coli* and *Staphylococcus aureus* using the checkerboard method.

Materials and Methods: Six clinical isolates obtained from the Vitebsk Regional Clinical Center were included in the study: *E. coli* (strains №778, №779, №809) and *S. aureus* (strains №767, №765, №975). Additionally, reference strains from the American Type Culture Collection (ATCC) were tested: *E. coli* ATCC №25922 and *S. aureus* ATCC №25923. The combined activity of two antimicrobial agents—belonging to the classes of quaternary ammonium compounds (QACs) and biguanides—was assessed.

Results: Minimum inhibitory concentrations (MICs) of the individual compounds against the reference strains (*E. coli* ATCC №25922 and *S. aureus* ATCC №25923) and the clinical isolates (*E. coli* №778, №779, №809; *S. aureus* №767, №765, №975) had been previously determined. Based on these data, the combined antimicrobial activity was evaluated in duplicate experiments.

The combination demonstrated synergistic activity against the reference strain *E. coli* ATCC №25922. Neutral (indifferent) interactions were observed for the clinical isolates *E. coli* №778, *S. aureus* №767, and *S. aureus* №975. Additive effects were found for *E. coli* №779 and №809, *S. aureus* №765, and *S. aureus* ATCC №25923. Notably, against certain multidrug-resistant isolates, the combination exhibited additive or synergistic activity, highlighting its potential for the pharmaceutical development of topical antimicrobial formulations.

Conclusions: The observed synergistic and additive interactions enable the use of lower concentrations of each active substance compared to monotherapy. Reduced concentrations may decrease the incidence of adverse effects and slow the development of microbial resistance, thereby significantly improving the management of multidrug-resistant microorganisms.