ANTIBIOFILM ACTIVITY OF CIPROFLOXACIN AND SULFADIAZINE COMBINATION AGAINST *ESCHERICHIA COLI* BIOFILMS: A SCANNING ELECTRON MICROSCOPY ANALYSIS

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INTRODUCTION

Bacterial biofilms display a high level of antibiotic resistance compared to their planktonic counterparts. Given their implications in infectious diseases and multidrug resistance, it is urgent to explore effective antimicrobial strategies to regulate biofilm formation. Eradicating bacteria within biofilms is challenging, needing combination therapy to combat persistent biofilm-related infections. In previous studies, we demonstrated the synergistic and partially synergistic effects of Ciprofloxacin (CIP) combined with antibacterial sulfonamides (SA) against *Escherichia coli* ATCC 25922 and a clinical strain with intermediate quinolone resistance (*E. coli* IRQ). Notably, the CIP+ sulfadiazine (SDZ) combination exhibited superior efficacy.

OBJECTIVE

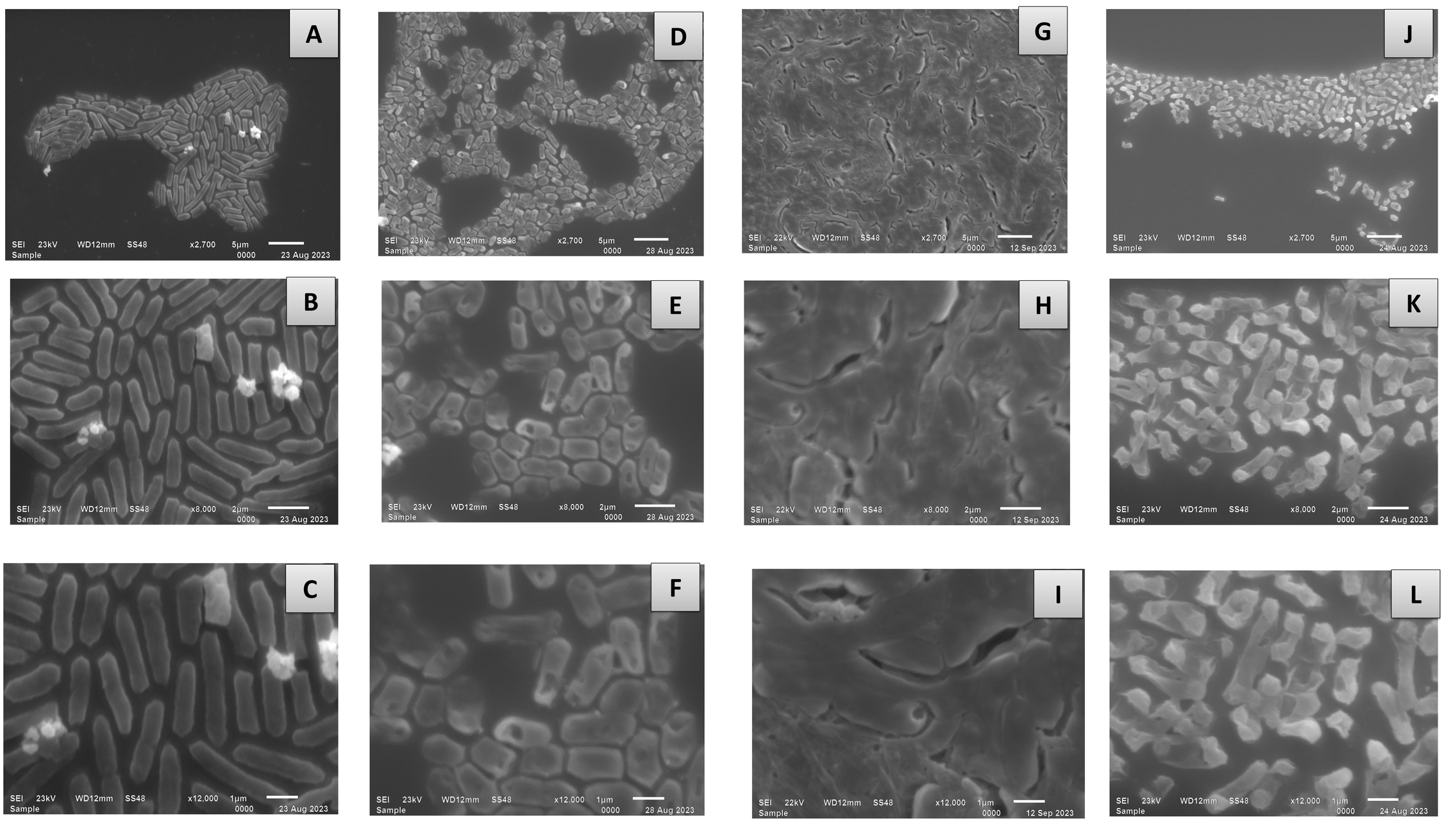
The aim of this work was to evaluate the efficacy of CIP+SDZ combination and individual drugs against mature biofilms of clinical strain *E.coli* IRQ by SEM analysis

MATERIALS AND METHODS

The antibiofilm activity was assessed through SEM analysis. Bacterial inoculum of *E.coli* IRQ (1x10^6 CFU/mL) was incubated with glass discs, sterilized using dry heat, in tryptic soy broth (supplemented with 25% glucose) at 37°C for 24 hours. Subsequently, the mature biofilm was subjected to antibiotic treatment. The biofilm was treated with CIP, SDZ and their combination (CIP+SDZ) for 24 hours at 37°C. Antibiotic concentrations were determined based on the minimal fractional inhibitory concentrations (FIC) from previous studies. The experiment was conducted in triplicate. The following treatments CIP (FICx100) + SDZ (FICx10), CIP (FICx100), and SDZ (FICx10) were included.

RESULTS

SEM micrographs of the biofilm-coated discs treated and untreated with the antibacterial agents can be observed in the following images:



Microphotographs **A** (2700x), **B** (8000x), and **C** (12000x) depict untreated *E. coli* IRQ. Microphotographs **D** (2700x), E (8000x), and **F** (12000x) display *E. coli* IRQ treated with CIP (FICx100). Microphotographs **G** (2700x), **H** (8000x), and **I** (12000x) show *E. coli* IRQ treated with SDZ (FICx10). Microphotographs **J** (2700x), **K** (8000x), and **L** (12000x) show *E. coli* IRQ treated with CIP (FICx100) + SDZ (FICx10).

CONCLUSION

SEM micrographs highlighted an enhanced antibiofilm effect of CIP+SDZ combinations compared to individual drugs. Specifically, CIP (FICx100) + SDZ (FICx10) significantly reduced biofilm formation, caused disorganization, reduced extracellular matrix, and induced bacterial cell destruction, outperforming untreated and individually treated biofilms. These findings provide new insights into the partially synergistic effect of this combination on *E. coli* IRQ, attributed to cooperative actions targeting diverse stages of DNA synthesis. This study underscores CIP+SDZ as a promising combination for treating biofilm-related infections.

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