IN VITRO BIOFILM FORMATION BY STAPHYLOCOCCUS AUREUS AND THEIR ASSOCIATION WITH ANTIMICROBIAL RESISTANCE

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Introduction. Antimicrobial resistance is a long-standing problem of significant magnitude, and its rapid spread has made it the most serious current public health issue globally. Among the many bacterial infections, S. aureus is the leading cause of nosocomial infections by gram-positive bacteria. The increasing incidence of bacterial infections in therapeutic failure in recent years is explained by the unjustified use of antimicrobials and the dissemination of antibiotic resistance factors. The increasing resistance of S. aureus strains to antimicrobials, together with methicillin resistance and biofilm formation poses serious challenges for the treatment of infections caused by this species.

Aim. The study elucidated the biofilm formation capacity of S. aureus strains and its association with antimicrobial resistance.

Material and methods. The antimicrobial susceptibility of 189 Staphylococcus aureus strains isolated from various clinical biosubstrates was studied. The pathological specimens were cultured on selective and non-selective media, and the identification was based on cultural and morphological characteristics, the presence of coagulase and biochemical properties. Antibiotic susceptibility was determined by the Kirby-Bauer diffusion metric method and the VITEK 2 COMPACT system. The methodology of the determination and the interpretation of antibiotic susceptibility were carried out in a standardized way, in accordance with EUCAST guidelines. Biofilm production by S. aureus strains was quantitatively determined using the microtitration method.

Results. The results of the research showed that S. aureus strains exhibited a high degree of resistance to fluoroquinolones (ciprofloxacin – 69.9%; levofloxacin – 59.7%) and macrolides, lincosamides, streptogramins (erythromycin – 56.8%). S. aureus strains were found to be more sensitive to tetracyclines (tetracycline – 93.9%), amphenicols (chloramphenicol – 91.1%) and oxazolidones (linezolid – 80.2%). Notably, no strain of S. aureus showed resistance to vancomycin. 81 (42.9%) of the strains analyzed showed resistance to methicillin and 108 (57.1%) were sensitive to this preparation. Methicillin-resistant S. aureus strains exhibited higher resistance to all antibiotic groups than methicillin-sensitive strains. Of the 189 clinical strains of S. aureus, 74 (39.2%) produced detectable biofilm, and 115 (60.8%) did not produce biofilm. Among the biofilm-producing strains, 29 (39.2%) strains produced strongly adherent biofilm, 28 (37.8%) – moderately adherent biofilm and 17 (23.0%) – weakly adherent biofilm. A higher level of resistance was recorded in biofilm-producing S. aureus strains compared to non-producing ones.

Conclusions. The study results indicate a high capacity for biofilm formation in clinical strains of S. aureus and the predominance of high rate of antimicrobial resistance. The data obtained show a strong correlation between the formation of biofilms and antimicrobial resistance patterns. The implementation of relevant tests to determine the antimicrobial susceptibility of biofilm-producing strains will improve the management of cases of infections caused by these microorganisms and will facilitate the development of feasible strategies to prevent their spread.