ABSTRACT

Antimicrobial resistance of microorganisms is one of the greatest challenges of modern medicine. This issue is particularly relevant to bacteria responsible for healthcare-associated infections, due to the selection pressure present in the hospital environment. *A. baumannii* is an opportunistic pathogen characterized by a high level of resistance to numerous classes of antibiotics. Until recently, carbapenems were the drugs of choice for treating infections caused by *A. baumannii*. Understanding the mechanisms that determine the virulence of these microorganisms and their resistance to carbapenems may contribute to the development of more effective diagnostic, therapeutic, and preventive strategies to limit the spread of antibiotic-resistant strains.

The aim of the studies described in this series of publications was to characterize, at the molecular level, the genes associated with virulence and carbapenem resistance mechanisms in *A. baumannii* clinical strains. Furthermore, due to the growing importance of molecular diagnostics in the identification of resistant strains, the usefulness of methods for detecting carbapenem resistance mechanisms was evaluated, including the self-developed real-time PCR method based on the analysis of melting curves of carbapenemases genes amplification products.

The study demonstrated that virulence genes were widespread among carbapenem-resistant *A. baumannii* clinical strains, with the *bap* and *surA1* genes being the most frequently identified, suggesting their potential role in the pathogenesis of infections caused by this species. Analysis of genes encoding OXA-type carbapenemases and insertion sequences revealed that the presence of bla_{OXA} genes does not necessarily determine phenotypic resistance to carbapenems. At the same time, the frequent prevalence of the IS*Aba1* in the promoter region of the bla_{OXA-23} gene was confirmed, indicating its potential role in the regulation of resistance gene expression.

Furthermore, both conventional PCR and real-time PCR methods proved highly effective for the detection of bla_{OXA} genes. These methods presented high diagnostic sensitivity and enabled the rapid identification of resistant strains. The findings highlight the importance of molecular diagnostics in monitoring resistance mechanisms and supporting rational antimicrobial therapy for infections caused by *A. baumannii*. They also emphasize the complexity of the mechanisms underlying virulence and carbapenem resistance among the representatives of the species. The data presented are of scientific, diagnostic, and clinical

significance and may provide a foundation for further research into the pathogenesis of *A. baumannii* infections, the mechanisms of carbapenem resistance, and the development of rapid molecular diagnostic methods.

KEY WORDS: *Acinetobacter baumannii*, antimicrobial resistance, bla_{OXA}, carbapenems, virulence

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