In vitro activity of antibiotics against biofilms produced by MRSA SCCmec IV isolates from hospitals in Rio de Janeiro

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Methicillin resistant Staphylococcus aureus (MRSA) is one of the major nosocomial pathogens. Biofilm formation is common in medical devices, such as catheters and prostheses, and allows the pathogen to resist to the host immune response and antimicrobials. To quantify the biofilm formation ability and to evaluate the in vitro activity of different antimicrobial agents, alone or in combination, against prevalent MRSA SCCmec IV isolates from hospitals in Rio de Janeiro. The in vitro biofilm production ability was assessed for 43 clinical isolates, including 14 of sequence type (ST) 5, 9 ST1, 4 ST30 and 16 from other ST's, according to Stepanovic et al (2000). The biofilm susceptibility to gentamicin (Gen), linezolid (Lin), rifampicin (Rif) and vancomycin (Van) was determined for 6 isolates from three prevalent lineages (USA400/ST1, USA800/ST5, USA1100/ST30).

After biofilm formation (24 h), the isolates were exposed to concentrations from 0.25 to 64μg/mL of each antimicrobial agent, applied alone or in combination. Before and after antibiotic treatment, biofilms were characterized in terms of total biofilm mass (by crystal violet) and number of viable cells (CFU/cm²). The biofilm production was considered positive for 8 (57%) USA800/ST5 isolates (6 weak and 2 moderate), a single isolate USA400/ST1 was considered weak producer, and 2 USA1100/ST30 isolates were weak biofilm producers. After biofilm exposure to concentrations equal to or greater than 4 μg/ml of Rif or Lin, a biomass reduction of 50% was observed. For Gen or Van, it was verified a reduction of about 45% but only after exposure to concentrations equal to or greater than 16μg/mL.

Data demonstrated that antibiotic synergisms involving Lin 2μg/mL + Rif 2μg/mL and Rif 2μg/mL + Van 4μg/mL appear to be good therapy choices, since both produced greater reductions in biomass and number of cells in staphylococcal biofilms.