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Effectiveness of Linezolid, ¹²⁷I-Linezolid and ¹³¹I-Linezolid Against Methicillin-Susceptible Staphylococcus Aureus by Time Kill Curve Methods

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Abstract

Objective: Linezolid (LNZ) is one of the most effective treatments against Gram positive bacteria. However LNZ resistant intermediate strains have recently emerged in worldwide. The aim of the study was to compare the minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC) and minimum biofilm inhibitory concentration (MBIC) of LNZ, ¹²⁷I-LNZ and ¹³¹I-LNZ against methicillin susceptible Staphylococcus aureus ATCC 35556 (MSSA) biofilms.

Methods: LNZ radiolabeled with ¹³¹I and cold labeling study with ¹²⁷I was performed. Radiolabeling and inactive labeling quality-control studies of LNZ were carried out by using TLC (Thin Layer Radiochromatography) and HPLC (High Pressure Liquid Chromatography). LNZ, ¹²⁷I-LNZ and ¹³¹I-LNZ against biofilm-forming MSSA was investigated, using a twofold serial broth microtiter method, biofilm challenge, and bacterial count recovery.

Results: The binding yield was obtained to be about 86±2% for radiolabeled LNZ. Minimal inhibitory concentration (MIC) and minimal bactericidal concentration for LNZ, ¹²⁷I-LNZ and ¹³¹I-LNZ ranged from 1 to 2 µg/mL respectively. In time-kill studies LNZ, ¹²⁷I-LNZ and ¹³¹I-LNZ were bactericidal against staphylococci, producing ≥3 Log₁₀ decrease in viable counts (cfu/mL) within 6 h at 2xMIC. Following the biofilm formation on polystyrene U-bottom microtiter plates to investigate the minimal biofilm inhibitory concentration (MBIC) of LNZ, ¹²⁷I-LNZ and ¹³¹I-LNZ was defined as the minimal concentration of antibiotic required to inhibit the biofilm. None of the LNZ, ¹²⁷I-LNZ and ¹³¹I-LNZ killed 100% of biofilm associated cells. Mean cell survival in biofilms treated with 64 µg/mL LNZ, ¹²⁷I-LNZ and ¹³¹I-LNZ (64 µg/mL) was 48%, 49%, and 33%, respectively.

Conclusion: Our results show that radiolabeled Linezolid demonstrated that 24 h of exposure to 64 µg/mL, promise in treating biofilm producing Staphylococcus aureus.

Key words: Biofilm, iodine-131, linezolid, radiolabeling, staphylococcus aureus

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Congress Participation and Efficiency of Education of Nuclear Medicine Technologists

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Abstract

Objective: It's aimed to reveal the areas in which technologists have inefficiency.

Methods: The questionnaire is applied to 77 (32 women, 45 men) nuclear medicine technologists with a mean age of 37 (19-59), who are working at 11 different hospitals. The education of the staff was as follows; 6 (8%) high school, 57 (74%) undergraduate, 14 (18%) bachelors degree. 70 of them was working in state hospitals (91%), 7 (9%) working in private sector. 58 technologists (75%) were working at the imaging unit, 13 (17%) working at the laboratory and 6 (8%) working both imaging and laboratory. All hospitals were equipped with gamma cameras and PET/CT. There was SPECT/CT at 4 (36%), uptake device at 6 (55%), bone mineral densitometry at 2 (19%) centers.

Results: 46 technologists (60%) havent participated in any congress and/or educational activity. Almost all of the 31 technologists who have participated before (97%) declared that they benefited from the activities. 22 technologists (48%)

who haven't participated, declared that they haven't heard about the congress or they weren't invited to the congress/education. As a reason for their not participating, 9 technologists (20%) declared that they do not have time because of the workload and 3 technologists (7%) couldn't participate because of economic reasons. The distribution of needs of the technologists for education are; 25 (32%) radiation safety, 14 (18%) imaging techniques and criteria, 8 (10%) up-to-date information, 7 (9%) employee rights, 3 (4%) patient-technologist relations. When we evaluated the opinions and the suggestions of the participants, it appeared that 57% wants free participation in congress and educational activities. 36% of the participants wished eliminating the shortage of staff and improvement of working conditions.

Conclusion: It's thought that technologists should be informed about congresses and educational activities in due time and their participation should be encouraged. Besides, technologists should acquire up to date information about imaging techniques and criteria, radiation safety and employee rights. As a result, patient-technologist cooperation will be improved and the efficiency of nuclear medicine techniques will increase.

Key words: Education, nuclear medicine, technologist

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In Vitro Activities of Moxifloxacin, ¹²⁷I-Moxifloxacin and ¹³¹I-Moxifloxacin Against Staphylococcus Aureus Biofilms

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Abstract

Objective: The aim of the study was to investigate the antimicrobial effect of Moxifloxacin (MXF), radio (¹³¹I) and cold (¹²⁷I) iodinated MXF on methicillin susceptible Staphylococcus aureus ATCC 35556 (MSSA) biofilms.

Methods: MXF was labeled with Na¹³¹I using the iodogen method. The optimum radiodination conditions for ¹³¹I-MXF was determined by thin-layer radio chromatography studies. Thin-layer radio chromatography (TLRC) chromatograms were obtained by using Cyclone Plus Storage Phosphor System. The MICs of MXF, ¹²⁷I-MXF and ¹³¹I-MXF were determined using the microdilution broth method according to CLSI criteria. Time kill curves were performed over 24 h using an inoculum of 2×10⁵ (CFU/mL). Biofilms were grown in microtitre plates, dyed with crystal violet and the mean optical density (OD₆₃₀) was used for quantification. Biofilms were incubated MXF, ¹²⁷I-MXF and ¹³¹I-MXF at various concentration (0.03 to 64 µg/mL).

Results: MXF was labeled with ¹³¹I iodogen method. ¹³¹I-MXF was obtained with high a yield 95±3%. The MIC values for MXF, ¹²⁷I-MXF and ¹³¹I-MXF was 0.06 µg/mL. Bactericidal activity was demonstrated at 0.25 µg/mL 4 hour for MXF, ¹²⁷I-MXF and ¹³¹I-MXF. At MIC levels, MXF, ¹²⁷I-MXF and ¹³¹I-MXF was not showed a marked reduction of metabolic activity in the S. aureus biofilm. The ODs of biofilm after incubation with an increasing antibiotic concentration were significantly lower than the ODs of biofilms without antibiotic p<0.05. The radiolabeled MXF was most effective than MXF, ¹²⁷I-MXF in reducing the number of bacteria in biofilm. After 24 h incubation Log₁₀ CFU/mL values for 32 µg/mL antibiotic concentration: Control, MXF, ¹²⁷I-MXF and ¹³¹I-MXF were 9.5, 4.3, 4.8 and 3.1, respectively.

Conclusion: ¹³¹I and ¹²⁷I were used alone there was no penetration of the S. aureus biofilm and no damage. In contrast our results demonstrate that the radiolabeled Moxifloxacin (¹³¹I-MXF) have potent anti-biofilm activity against S. aureus compare to MXF, ¹²⁷I-MXF and media control. This is suggested that, ¹³¹I labeled antibiotic may have harmful effect on biofilm structure.

Key words: Biofilm, moxifloxacin, radioiodination, staphylococcus aureus ATCC 35556

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