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Assessing the effect of micafungin on *Pseudomonas aeruginosa* biofilm formation using confocal microscopy and gene expression

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Abstract

Introduction: 1,3-β-D-glucan of the fungal cell wall and extracellular matrix (ECM) of *Candida* biofilm is also present as a periplasmic glucan and within the ECM of *P. aeruginosa* biofilm. Micafungin inhibits the synthesis of β-D-glucans. This project evaluates the effect of micafungin on *P. aeruginosa* biofilm formation, by determining transcription levels of biofilm formation encoding genes and measuring the thickness of biofilms in treated and untreated samples from BALB/c mice.

Methodology: Rrelative gene transcription levels of *P. aeruginosa* biofilm-encoding *pelC*, *algC*, and *ndvB* genes were assessed by RT-qPCR on treated and untreated samples. Thickness calculation by Z-stacking of treated and untreated biofilms obtained from *in vitro* and *in vivo* samples was determined by confocal scanning laser microscopy (CSLM).

Results: Samples from micafungin-treated mice showed decreased *pelC*, *ndvB*, and *algC* transcription levels with values of 260, 74, and 2-fold decreases, respectively. Reduction in biofilms thickness was confirmed with Z-stacking using CSLM that revealed a 16.8% drop in the thickness of biofilms after treatment with micafungin *in vitro*, and a 64% reduction in thickness post treatment with micafungin *in vivo*.

Conclusion: Micafungin inhibits biofilm formation as measured by decrease in transcription levels of biofilm encoding genes and confocal microscopy. This reflects the events occurring in the course of an acute infection with *P. aeruginosa*, whereby the administration of micafungin would inhibit subsequent slime production, thus eliminating such barrier that could prevent antibacterial delivery to the core planktonic cells in biofilms.

Key words: micafungin; biofilm; Pseudomonas.

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