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

Sari S Rasheed¹,²,³, Kohar Annie Kissoyan¹,², Usamah Hadi⁴, Marwan El-Sabban⁵, Ghassan M Matar¹,²

¹ Department of Experimental Pathology Immunology and Microbiology, Faculty of Medicine, American University of Beirut, Beirut, Lebanon
² Center for Infectious Diseases Research (CIDR), American University of Beirut, Beirut, Lebanon
³ Department of Microbial Natural Products, Helmholtz Institute for Pharmaceutical Research Saarland (HIPS), University of Saarland, Saarbrucken, Germany
⁴ Department of Otolaryngology and Head and Neck Surgery, Faculty of Medicine, American University of Beirut Medical Center, Beirut, Lebanon
⁵ Department of Anatomy Cell Biology and Physiology, Faculty of Medicine, American University of Beirut Medical Center, Beirut, Lebanon

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: Relative 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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Corresponding author

Ghassan M. Matar, M.S., Ph.D.
Department of Experimental Pathology, Immunology and Microbiology
Laboratory Director, Center for Infectious Diseases Research (CIDR)
American University of Beirut
Riad El-Solh St. P.O.BOX 11-0236
Beirut 1107 2020
Lebanon
Phone: +961 1 350 000 Ext. 5128
E-mail: gmatar@aub.edu.lb

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