Antifungal activity of the piroctone olamine in vitro against Candida clinical isolates

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Introduction
Piroctone olamine is an ethanolamine salt of the hydroxamic acid derivative piroctone (Kim et al. [2011]). It is a component of many cosmetic products such as anti-dandruff shampoo and hair rinses for scaly and irritated skin. One reason for scaling and irritation of the scalp is the colonization with Malassezia spp and other yeasts. These microorganisms split parts of the sebum of the capillitium lipolytically into free fatty acids. These free fatty acids and microbial peroxidases lead to irritation of the skin and via an increase of mitosis to scaling (Sigle et al. [2006]). Thus the piroctone olamine (PO) present in the shampoo and hair rinses have the ability to reduce microbial colonization. Its mechanism of action is complex and not completely understood. It is known that this agent has the ability to penetrate the cell membrane and form complexes with irons (Fe2+ e Fe3+), inhibiting energy metabolism in mitochondria of pathogenic fungi (Kim et al. [2011]). The low number of available antifungal agents and the increased reports of yeasts resistant to conventional drugs can further complicate the treatment of fungal infections (Quintero et al. [2010]; Yu et al. [2011]). This work aimed to evaluate the antifungal activity of piroctone olamine in vitro against Candida clinical isolates.

Methods
A total of 43 clinical isolates of Candida spp. used in this study were provided by the URM Culture Collection of Federal University of Pernambuco. All strains were isolated from invasive infections and they were preserved under mineral oil. The susceptibility testing followed the broth microdilution method, in accordance with the standards published in Document M27-A3 from the Clinical and Laboratory Standards Institute. Amphotericin B (AMB) and fluconazole (FLZ) were used in the study as antifungal standards. Ten different concentrations were used, ranging from 0.03 to 16 μg/mL of AMB and 0.125 to 64 μg/mL of FLZ. Piroctone olamine was diluted in dimethyl sulfoxide (DMSO) to a stock solution concentration of 1600 μg/mL. The concentrations of piroctone olamine (PO) ranged from 0.0625 to 32 μg/mL. All Candida strains showed low minimum inhibitory concentrations (MICs) for PO (0.125-0.5 μg/mL) and amphotericin B (AMB) (0.03-1 μg/mL). However, the isolates were less susceptible to fluconazole (FLZ), for which the MICs ranged from 0.5 to 64 μg/mL. The results of this study indicate that PO has good antifungal activity in vitro against clinical isolates of Candida spp.
Results
All Candida strains showed low minimum inhibitory concentrations (MICs) for PO (0.125-0.5μg/mL) and amphotericin B (AMB) (0.03-1μg/mL). However, the isolates were less susceptible to fluconazole (FLZ), for which the MICs ranged from 0.5 to 64 μg/mL.

Discussion and Conclusion
The antimicrobial compound piroctone olamine is known to be effective in vitro against pathogenic fungi such as Candida species, Aspergillus fumigatus and dermatophytes. In addition to this antifungal activity, the drug also has good activity against gram-positive and gram-negative bacteria. Studies with mice, rats and dogs have shown that the PO has low toxicity. Research with animals has not shown any chromosomal abnormalities or acute pharmacological effects on the central nervous, cardiovascular or reproductive system or on other specific metabolic functions (Kim et al. [2011]; Allgood et al. [1991]). Although the chemical properties of PO have been well characterized, no in vivo test of antifungal activity using models of invasive mycoses has been published. Invasive candidiasis is a frequent and life-threatening complication in critically ill surgical patients (Tissot et al. [2013]). The results of this study indicate that PO has good antifungal activity in vitro against clinical isolates of Candida spp.

References