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Differential Susceptibility of Terbinafine-Resistant and Sensitive Isolates of the *T. mentagrophytes* Complex to Cold Atmospheric Plasma

Fatemeh Hemmatyar¹, Zahra Salehi², Seyed Mohammad Atyabi^{3*}

¹Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran

²Department of Mycology, Pasteur Institute of Iran, Tehran, Iran

³Department of Nanobiotechnology, Pasteur Institute of Iran, Tehran, Iran

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ABSTRACT

Introduction: *Trichophyton mentagrophytes* is one of the most common dermatophytes in Iran and a major cause of tinea corporis, tinea cruris, and onychomycosis. The increasing emergence of terbinafine-resistant isolates has led to considerable therapeutic challenges and highlighted the need for alternative therapies. Cold atmospheric plasma (CAP) has recently been introduced as a promising antifungal approach. This study reports the effectiveness of CAP against both terbinafine-resistant and -sensitive isolates of the *T. mentagrophytes* complex.

Materials and Methods: Fifty clinical isolates and one reference susceptible strain (PFCC 5809) were studied. Terbinafine susceptibility was determined using the CLSI M38-A3 broth microdilution method, defining resistance as minimum inhibitory concentrations greater than 0.25 µg/mL. The resistant and susceptible isolates were subjected to CAP for 180 and 210 seconds. Growth inhibition was evaluated using mycelial dry weight in Sabouraud maltose broth and colony-forming unit (CFU) on Sabouraud dextrose agar. All studies were conducted in duplicate, with statistical significance set at $p < 0.05$.

Results and Discussion: Exposure to CAP decreased the growth of fungi in both resistant and susceptible isolates; however, the resistant strains showed greater inhibition. The most significant reduction was observed after 210 seconds of treatment, supported by dry weight and CFU analysis.

Conclusion: CAP exhibited potent inhibitory action against the terbinafine-resistant strains of *T. mentagrophytes*. In the light of increasing antifungal resistance and clinical burden caused by dermatophytosis, CAP may offer a promising alternative or adjuvant therapy. Further studies are required to optimize treatment parameters and evaluate clinical applicability.



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Keywords: Cold atmospheric plasma, Fungal growth inhibition, Plasma-based antifungal therapy, Terbinafine-resistant dermatophytes, *Trichophyton mentagrophytes* complex

Corresponding Author: Seyed Mohammad Atyabi

Department of Nanobiotechnology, Pasteur Institute of Iran, Tehran, Iran; E-mail: mohammadatyabi@yahoo.com



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