RESEARCH LETTERS

Analysis of the role of nail polish in the transmission of onychomycosis*

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Dear Editor,

Onychomycosis is one of the most important nail fungal infections in the world. Dermatophytes are the most common fungal agent, with *Trichophyton rubrum* being the most prevalent. The prevalence of *T. rubrum* is due to its high virulence and keratinophilic nature. This agent is also the species most adaptable to humans, causing chronic diseases.[1] Transmission of onychomycosis occurs through direct or indirect contact with contaminated objects. The role of nail tools in transmitting dermatophytes is known, though there are few studies discussing the possibility of fungal transmission through nail polishes. Hence, this study aimed to analyze the viability of *Trichophyton rubrum* in nail polishes, base coat and top coat, which were experimentally contaminated, after different periods of time.

This study used a clinical strain of *Trichophyton rubrum* from the fungal collection of the Mycology Laboratory of the School of Medicine, Universidade Federal do Rio Grande (FURG). *T. rubrum* was incubated for 7 days at 25°C in potato agar (PDA) to obtain a young culture. After this period, the fungal inoculum was standardized according to the protocol M38-A2 (CLSI).[2] The inoculum concentration was adjusted to 2-6x10^4 CFU/ml, using the Neubauer chamber.

The nail polishes used in this study comprised a red, a white, a base coat, and a top coat from three main commercial brands ("X", "Y" and "Z"). In a biosafety cabinet, using a sterile pipette, 3.0–3.5 ml of nail polishes was removed from each bottle, leaving a total volume of 4.5ml. Next, 500µl of the standardized inoculum was added to each bottle (1:10 dilution), resulting in a contamination with 2-6x10^3 UFC of *T. rubrum*/ml of nail polishes.

To determine the fungal viability after homogenization, 100µl from each bottle of contaminated nail polish were incubated in duplicate on Petri plates. The samples were spread over Sabouraud agar using their respective nail polish brushes and a Drigalski spatula. The inoculations were performed at time 0 (immediately following contamination and homogenization), at 72 hours, and 60 days post-contamination; the bottles remained closed and stored at room temperature until the end of the experiment. The plates were incubated at 25°C, with daily readings and evaluation of growth until 15 days after incubation to assess the retrocultures of the microorganism.

Fungal growth was not observed on the plates inoculated with either the red or white contaminated nail polishes, nor with the contaminated base coat, at any testing time (0, 72 hours and 60 days). In contrast, positive retrocultures of *T. rubrum were found* in the top coat of all brands ("X", "Y" and "Z") at time 0, and of two brands at 72 hours and 60 days (Figure 1).

This study has shown the capacity for *T. rubrum* development in top coat, even 60 days after inoculation. These results are consistent with the study of Gonçalves *et al.*,[3] in which tested nail polishes showed fungal growth after 30 days. These findings emphasize the possibility for top coat to act as a fomite, confirming its significance in the dispersal and indirect transmission of onychomycosis.

Given that the clinical features of onychomycosis include frequent and often abundant peeling of the nails, abrasion of the polish brush on an affected nail would probably be sufficient to carry a fragment of infected keratin to the entire bottle. This would maintain fungal viability, as keratin is the main substrate on which

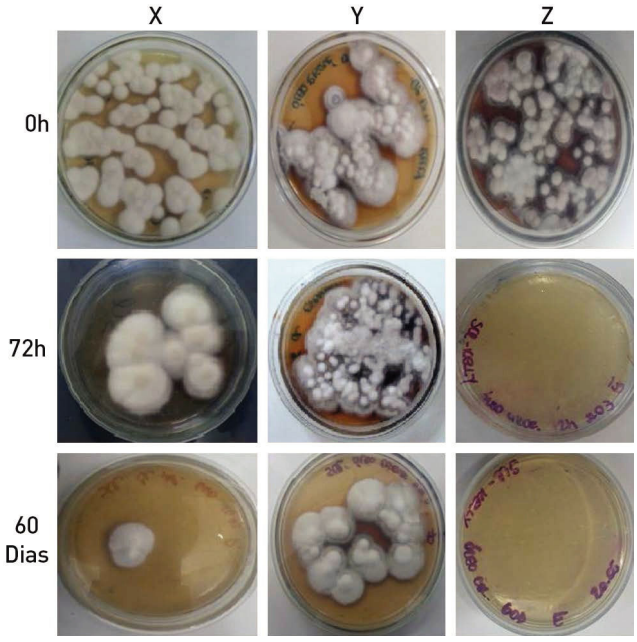

Figure 1: Fungal growth in top coat samples of brands X, Y and Z, tested at time 0, 72 hours and 60 days

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dermatophytes develop. In our study, *T. rubrum* was able to grow in top coat even in the absence of keratin.

In contrast, the red and white nail polishes and the base coat inhibited *T. rubrum* growth at all analyzed times. The difference in fungal growth between the tested nail polishes could be due to differences in their chemical features. Most of the top coats marketed in Brazil contain mineral oil and soy oil; red/white nail polishes and base coats, however, do not contain these substances, but do contain highly toxic chemicals such as toluene, xylene, formaldehyde, chromium and nickel. Furthermore, the preservatives and biocides commonly present in aqueous cosmetics, such as sodium benzoate, potassium sorbate, benzoic acid and phenols, decrease microorganism contamination. These substances are not added to oil-based cosmetics.[4]

Various *in vivo* conditions predispose onychomycosis by dermatophytes, including aspects inherent to the host (skin health; genetic characteristics; individual habits and customs).[5] However, the viability of dermatophytes in top coat, as described in this study, suggests that the propagation and dispersal of this pathogen in the population can be reduced through an important prevention measure: avoidance of sharing personal cosmetic items. ❑

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Active search for cases of leprosy in the city of Manaus*

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Brazil together with India are the countries that have the highest rates of endemicity of leprosy in the world.[1] Among the measures to reduce these levels and the stigma that accompanies the disease for centuries, due to the incapacities that it can lead to, are early diagnosis and immediate polychemotherapeutic treatment against *Mycobacterium leprae* for the breakdown of the transmission chain.[2] Amazonas, a state with a high level of leprosy, was a pioneer in the implementation of multidrug therapy in Brazil in the early 1980s, which, along with other routine control activities such as training and supervision of health teams, examination of intradomiciliary contacts of new cases and active search in school students

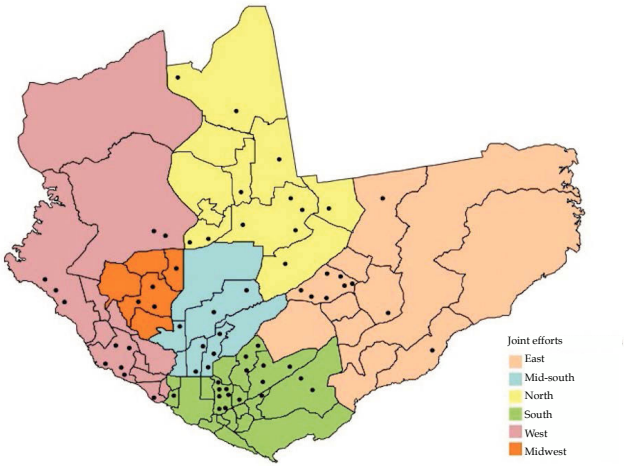

Figure 1: Distribution of the joint efforts according to the areas of the city of Manaus

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