Efinaconazole 10% (Jublia®) and Tavaborole 5% (Kerydin®) Readily Penetrate across Poly-ureaurethane, 16% (Nuvail®): Results of In Vitro Release Testing

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Purpose
Poly-ureaurethane, 16% (Nuvail®) polymer is commercially available as a topical formulation for the management of nail dystrophy. The polymer yields an adherent coating to protect the nail plate and augment prevention of further damage to the nail. Onychomycosis is a common fungal infection affecting the toenails and fingernails which frequently occurs opportunistically secondary to nail dystrophy. Two of the most frequently prescribed topical treatments for onychomycosis are efinaconazole, 10% (Jublia®) and tavaborole, 5% (Kerydin®). The purpose of this work was to determine through in vitro release testing (IVRT) whether poly-ureaurethane, 16% (Nuvail®) would act as a barrier to the penetration of efinaconazole (Jublia®) or tavaborole (Kerydin®). Results could spur subsequent clinical studies which would have implications for possible concomitant topical treatment of onychomycosis and underlying nail dystrophy.

Methods
A vertical diffusion cell system was used to evaluate the ability of efinaconazole and tavaborole to penetrate across poly-ureaurethane, 16% (Nuvail®). The diffusion cells had a 1.0 cm² surface area and approximately 8 mL receptor volume. Poly-ureaurethane, 16% (Nuvail®) was applied to a 0.45 μm nylon membrane and allowed to dry before use. Efinaconazole (Jublia®) or tavaborole (Kerydin®) were then applied to the poly-ureaurethane, 16% (Nuvail®) coated membrane, and samples were pulled from the receptor chamber at various times to assess the penetration of each active ingredient across the membrane. Samples were analyzed using reverse phase chromatography.

Results
Appropriate method parameters were established to ensure the system was compatible with poly-ureaurethane, 16% (Nuvail®) and to ensure adequate solubility of efinaconazole or tavaborole to maintain sink conditions throughout the experiment. The flux and permeability of efinaconazole and tavaborole across poly-ureaurethane, 16% (Nuvail®) were determined from efinaconazole (Jublia®) or tavaborole (Kerydin®) respectively. The flux and permeability of efinaconazole were determined to be 503.9 ± 31.9 μg/cm²/hr and 14.0+/−0.9 nm/sec, respectively. The flux and permeability of tavaborole were determined to be 755.5 ± 290.4 μg/cm²/hr and 42.0+/−16.1 nm/sec, respectively.

Conclusion
Flux values for efinaconazole and tavaborole across the nail bed are reported to be 1.4 μg/cm²/day, and 204 μg/cm²/day, respectively. These values are substantially lower than the determined flux for both molecules across poly-ureaurethane, 16% (Nuvail®). A comparison of the data suggests that poly-ureaurethane, 16% (Nuvail®), if used in combination with efinaconazole (Jublia®) or tavaborole (Kerydin®), would not limit the ability of either active ingredient to access the nail surface, and would be unlikely to reduce their efficacy in the treatment of onychomycosis. Subsequent clinical studies are needed to correlate with this IVRT analysis.