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**Genus- and species-level identification of dermatophyte fungi by surface-enhanced
Raman spectroscopy**

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Abstract

This paper demonstrates that surface-enhanced Raman spectroscopy (SERS) coupled with principal component analysis (PCA) can serve as a fast and reliable technique for detection and identification of dermatophyte fungi at both genus and species level. Dermatophyte infections are the most common mycotic diseases worldwide, affecting a quarter of the human population. Currently, there is no optimal method for detection and identification of fungal diseases, as each has certain limitations. Here, for the first time, we have achieved with a high accuracy, differentiation of dermatophytes representing three major genera, i.e. *Trichophyton*, *Microsporum*, and *Epidermophyton*. Two first principal components (PC), namely PC-1 and PC-2, gave together 97 % of total variance. Additionally, species-level identification within the *Trichophyton* genus has been performed. PC-1 and PC-2, which are the most diagnostically significant, explain 98% of the variance in the data obtained from spectra of: *Trichophyton rubrum*, *Trichophyton mentagrophytes*, *Trichophyton interdigitale* and *Trichophyton tonsurans*. This study offers a new diagnostic approach for the identification of dermatophytes. Being fast, reliable and cost-effective, it has the potential to be incorporated in the clinical practice to improve diagnostics of medically important fungi.

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