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Does Lindioil (Indirubin) treatment affect the composition of *Malassezia* species on psoriatic skin?

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Dear Editor,

We would like to thank Dr. Gaitanis and co-authors for their interest in our study. To date, many studies have investigated the role of the microbiome in chronic skin inflammatory diseases such as psoriasis and atopic dermatitis. *M. restricta* and *globosa* are the two main species of the all *Malassezia* yeast and the most common fungi on psoriatic skin. *M. restricta* and *globosa* were demonstrated to increase the expression of pro-inflammatory cytokines including interleukin (IL)-8, IL-6, and IL-1 α in addition to immune regulatory cytokines such as IL-10 and tumor growth factor- β in keratinocytes.¹

On the other hand, *M. globosa* CBS7966 and other *Malassezia* strains were shown to produce aryl hydrocarbon receptor inducers including indirubin, the main active ingredient of Lindioil ointment, at different levels.² Activation of aryl hydrocarbon receptor signaling can ameliorate skin inflammation in imiquimod-induced psoriasiform-like model.³ *M. globosa* also induced abundant expression of IL-10 that might benefit psoriasis control.¹

The distribution of more virulent *M. restricta* was much higher than *M. globosa* in patients with psoriasis, especially higher in psoriatic lesions.⁴ However, to our knowledge nobody has suggested that differences in fungal composition between psoriatic lesions and non-lesion skin in patients with psoriasis, and between psoriasis patients and people without psoriasis, show that this fungus has an active role in psoriasis pathogenesis.

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The effects of Lindioil ointment on *M. restricta* and *globosa* are still unknown. Indigo naturalis (the source of Lindioil ointment), containing indirubin and tryptanthrin, has antifungal effects on *Aspergillus fumigates* and *Candida albicans*.⁵ Does topical Lindioil treatment result in a decrease of *M. restricta* and an increase of *M. globosa*? It would be interesting to study the fungal biome and its interaction with Lindioil treatment and indirubin in particular in patients with psoriasis.

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