GLOBAL SKIN HEALTH

INVESTIGATION OF FUNCTIONAL INTERACTIONS GOVERNING MICROBIOME BALANCE ON THE SKIN

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Commensal skin microbiota plays an active role in maintaining skin health and function. Several clinical phenotypes are associated with an imbalance in the relative proportions of these microbiota including, atopic dermatitis, psoriasis, and dandruff. For example, dandruff, a scalp disorder characterized by abnormal flaking and irritation, is correlated with a higher incidence of Malassezia restricta and Staphylococcus epidermidis, and a lower incidence of Cutibacterium acnes, as compared to normal scalps. Despite considerable advancements in the field, there is limited information on the mechanisms that lead to this imbalance (or maintenance of balance in normal state). To understand these control mechanisms, it is necessary to determine the microbial and host factors that govern skin-microbiome interactions. This knowledge would yield a deeper understanding of the skin microbiome and help develop novel interventional strategies to modulate it in favor of health.

To study the mechanisms by which skin microbes maintain stable communities, a robust and reproducible model was developed with three major skin microbial species: S.epidermidis, C.acnes and M.restricta. Growth conditions were established to allow their co-cultivation, and standardized methods were developed to label, quantify, and track their relative abundances within the community. One intriguing observation is that the mixed-species community produces significantly higher biofilm biomass than the mono-species. Dissection of this collaborative behavior revealed both cooperative and antagonistic interactions between different members, suggesting that function interactions between microbes play an important role in shaping the community and could dictate the microbiome balance/imbalance on the skin. Based on these results, we have defined the inter-microbial interaction network and have gained a detailed understanding of community dynamics between skin microbes. This model could be modulated to mimic conditions on the skin and is being investigated for the development of a fully characterized skin microbiome model that could lead to development of novel microbiome-targeted strategies.