PARAGONCORP

8TH MICROBIOME R&D & BUSINESS COLLABORATION CONGRESS: ASIA

In Vitro Assessment of *Cutibacterium acnes* Biofilm Formation from Skincare Regimen Products for Future Acne Biofilm non-prescription Treatment

Christianti, Margareta Anindya[1]; Fajrin, Anita[1]; Safitri, Ade Fany[1]; Rahmawati, Yani[1]; Istiqomah, Nurani[1]; Fatmawati, Meti[1]; Utami, Sarah Tania[1]

[1]PT Paragon Technology and Innovation, Tangerang, Indonesia

Poster ID# 22

Introduction

Acne vulgaris (AV) is a common skin disorder with complex causative factors that also correlate with *Cutibacterium acnes*, a Gram-positive, facultative anaerobic microorganism that thrives in the lipid-rich environment. AV conditions may persist on the skin, with approximately 80% of cases in adult female AV patients being persistent. This persistence or relapse in acne treatment indicates *C. acnes* colonization. *C. acnes* colonization readily forms biofilm and plays an essential role in both AV development and progression.[1]

Microbial biofilms are complex surface-attached communities of bacteria held together by a self-produced polymer matrix.[2] Biofilms can attach deeply to pores and are very hard to remove. Traditionally, biofilm colonization on the skin requires prescription treatment. However, a non-prescription skincare regimen can be a perfect alternative to answer the need for persistent or relapse acne treatment.

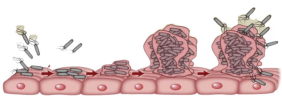
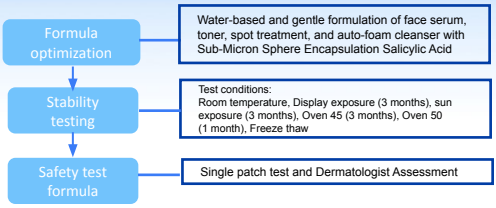


Figure 1. Scheme of Biofilm Formation[3]

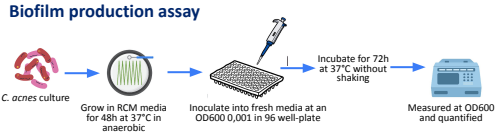
In this study, we aim to evaluate the efficacy of non-prescription skincare regimen (face serum, toner, spot treatment, and auto-foam cleanser) in inhibiting *C. acnes* biofilm formation.

Materials & Methods

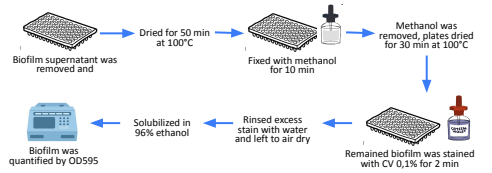
Formulation design



Biofilm production assay



Biofilm quantification



Biofilm production = OD_{595}/OD_{600}

Results & Discussion

The skincare regimen (cleanser, serum, toner, and spot treatment) was specifically designed to treat AV with 3.45% Sub-Micron Sphere Encapsulation (SMSE) Salicylic Acid (1.035% of Salicylic Acid) as antibacterial active. The SMSE SA active used in this regimen has an effective performance to reduce *C. acnes* growth and potentially can be used to reduce *C. acnes* biofilm formation. Product safety was assessed through dermatological evaluation and single patch test. The outcomes confirmed the products' non-irritating, non-comedogenic, and non-acnegenic characteristics. Additionally, the products passed stability test.

The biofilm assay results indicated a reduction in biofilm formation with the use of skincare regimen at concentrations of 0.2%, 1%, and 5%. However, the reduction observed at 1% and 5% was due to a decrease in bacterial growth, rather than a specific mechanism targeting biofilm inhibition.

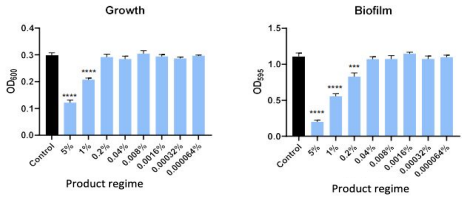


Figure 2. Graphical representation of the effect of Product Regimen in the growth and biofilm production of *C. acnes*

After normalization to bacterial growth and the control condition, the results suggested that the skincare regimen used at concentration of 0.2% reduced the biofilm by 23.4 ± 7.1% in a non-toxic manner towards both the skin and bacterial growth.

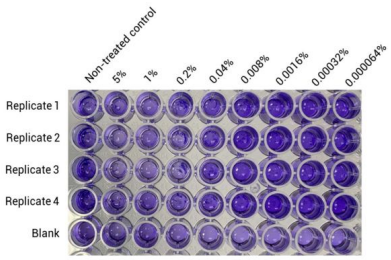


Figure 3. Visualization of biofilm staining by the crystal violet protocol

Conclusions

The tested skincare regimen (serum, toner, spot treatment, and cleanser) has been proven to reduce persistent acne formation that evaluated by *C. acnes* biofilm reduction at low dosage and promisingly can be used as non-prescription alternatives for persistent acne treatment in the future.

Acknowledgements

Thank you to Research and Development Department of PT Paragon Technology and Innovation which has supported this research by providing raw materials, facilities, and funds.

References

1. Coenye, T., Spittaels, K.-J. & Achermann, Y. The role of biofilm formation in the pathogenesis and antimicrobial susceptibility of cutibacterium acnes. *Biofilm* **4,** 100063 (2022).
2. Kim, Y.-G. *et al.* Inhibition of biofilm formation in Cutibacterium Acnes, Staphylococcus aureus, and candida albicans by the phytopigment Shikonin. *International Journal of Molecular Sciences* **25,** 2426 (2024).
3. Kostakioti, M., Hadjifrangiskou, M. & Hultgren, S. J. Bacterial biofilms: Development, dispersal, and therapeutic strategies in the dawn of the postantibiotic era. Cold Spring Harbor Perspectives in Medicine 3, (2013).
4. Kuehnast, T. *et al.* Comparative analyses of biofilm formation among different cutibacterium acnes isolates. *International Journal of Medical Microbiology* **308,** 1027–1035 (2018).