Diversity of skin microbiomes in surfers

Eugene Garvilles, Chaminade University of Honolulu

BACKGROUND

The skin microbiome is a composition of millions of bacteria, fungi and viruses in the skin.[5]
Sensitive skin was found to have significantly lower microbiome diversity compared to non-sensitive skin based on Shannon's diversity index (SDI).[2] A greater SDI means a higher diversity.[3]
The skin is the human body's largest organ composed of the most diverse skin sites which include the forearm, buttock and various parts of the hand.[4]
Study on 279 healthy humans in 22 different parts of the body showing a low diversity of microbiomes in the skin between 1 and 3 of the SDI.[1]
How does surfing frequency affect diversity of microbiomes collected in surfers?

HYPOTHESIS

The diversity of microbiomes in a surfer's skin increases the more often they surf.

METHODS

Of the 505 samples in the Surfer Microbiome Project by Dr. Kapono through QIITA, there were 234 human skin samples (Figure 1).
This subset included 159 males, 62 females and 13 unspecified participants (Figure 2).

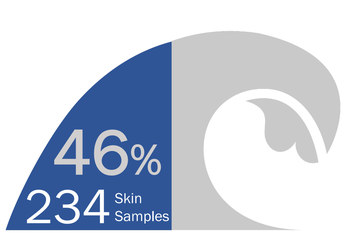


Figure 1. Percentage of participants' skin samples in Surfer Microbiome Project

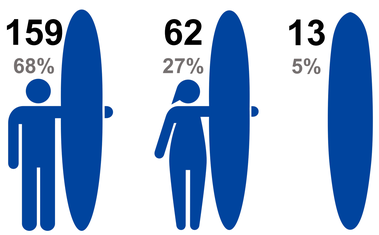


Figure 2. Subset population distribution by sex

R v4.2.0 and analysis of variance (ANOVA) were used to analyze and test differences between groups.

Figure 3. Shannon diversity index per skin site

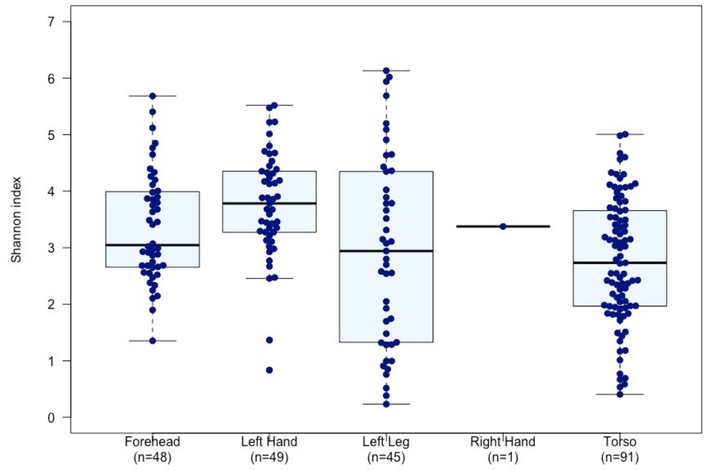


Figure 4. Shannon diversity index of surfers' skin, n=234

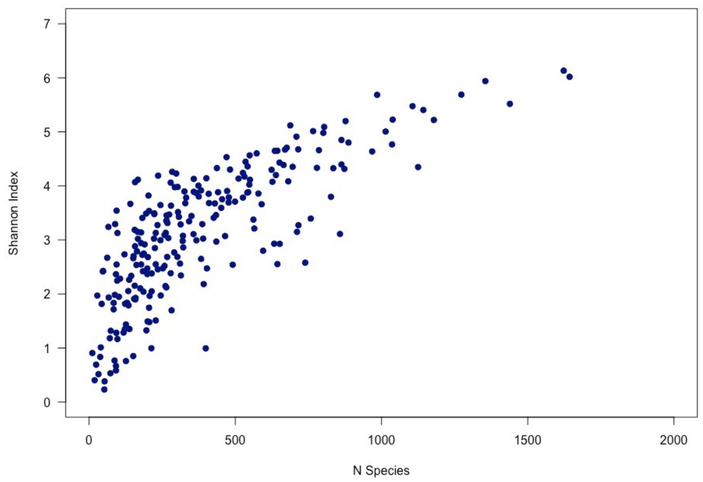
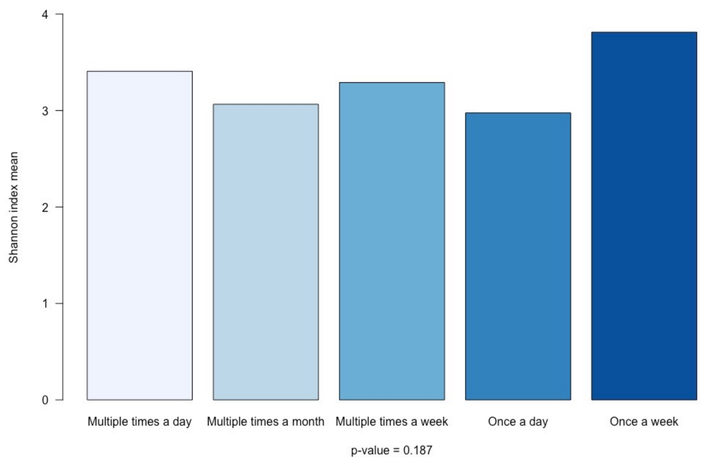


Figure 5. Mean Shannon diversity index between surf frequencies in skin



RESULTS AND DISCUSSION

Distribution of SDI per skin site (Figure 3).
Spread of SDI between 0 and 6 for 234 skin samples with a mean value of 3.13, standard deviation of 1.24 and a positive trend between the Number of Species and Shannon diversity index (Figure 4).
The mean values of SDI for each surfing frequency range from 2.98 to 3.81 (Figure 5) with a 3.31 mean value as a whole.
ANOVA testing between SDIs of the human skin and surfing frequency yielded a p-value of 0.187.

CONCLUSION

Higher surfing frequencies does not significantly impact the diversity of microbiomes in the skin.

LIMITATIONS AND RECOMMENDATIONS

Additional analysis could focus on an indicator bacteria, surfer skin sensitivity and their microbiomes, etc.
Further study could also consider the collection of a larger cohort, definition of frequency, testing in a longer period of time, testing before and after surfing.
Further analysis can be done to look at results by segmenting data based on race, sunscreen application, shower and soap application, surf location, age, and use of wetsuit.

ACKNOWLEDGEMENTS

1. Substantial contributions on the design, analysis and interpretation of the data was provided by Dr. Tipton. Technical guidance and support was also provided by our mentors Caili and Cailey.
2. Data used in this study was acquired from Dr. Kapono's Surfer Microbiome Project through QIITA.
3. Editorial support and final review by Dr. Keahi-Wood and intellectual insight by Dr. Chong and Dr. Speck.
4. This project was made possible by an internship grant from Chaminade University of Honolulu with the partnership and participation of Texas Advanced Computing Center and Extreme Science and Engineering Discovery Environment.

REFERENCES

1. Zhou, Y., Gao, H., Mihindukulasuriya, K.A. et al. Biogeography of the ecosystems of the healthy human body. Genome Biol 14, R1 (2013). https://doi.org/10.1186/gb-2013-14-1-r1
2. https://corp.shiseido.com/en/newsimg/2960_u0j92_en.pdf
3. Bai Y, Wang Y, Zheng H, Tan F, Yuan C. Correlation Between Facial Skin Microbiota and Skin Barriers in a Chinese Female Population with Sensitive Skin. Infect Drug Resist. 2021;14:219-226 https://doi.org/10.2147/IDR.S287844
4. Grice EA, Segre JA. The skin microbiome. Nat Rev Microbiol. 2011 Apr;9(4):244-53. doi: 10.1038/nrmicro2537. Erratum in: Nat Rev Microbiol. 2011 Aug;9(8):626. PMID: 21407241; PMCID: PMC3535073
5. Byrd, A., Belkaid, Y. & Segre, J. The human skin microbiome. Nat Rev Microbiol 16, 143–155 (2018). https://doi.org/10.1038/nrmicro.2017.157
6. Rstudio package 2022.02.3 Build 492