

Metabolic activity and health of the skin microbiome

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The skin microbiome is considered our first line of defense against pathogens. Across our bodies, we are covered with a diverse assemblage of bacteria. However, the skin can be a harsh environment for beneficial bacteria to live on due to UV exposure, high salinity, and desiccation stress. Research being presented at the annual meeting of the American Society for Microbiology found that these suboptimal conditions may cause some bacteria to enter a dormant state, while other bacteria may simply die.

In this study, Sarah Cummins and her colleagues in Jay T. Lennon's laboratory in the Department of Biology at Indiana University in Bloomington used [fluorescent dyes](#) to stain the cells isolated from the skin, which allowed them to determine the activity of each individual cell. "We measured the metabolic activity levels of [microbial cells](#) isolated from different areas of our skin and found that about 90% of the bacteria on our skin are either dead or inactive" said Cummins. We determined that each skin site harbors different proportions of microorganisms that are metabolically active, inactive, or dead. Out of the three skin habitats that we measured, the upper back had the both highest amount of active bacteria (11%). and the highest amount of dead bacteria (67%). The forearm had the highest proportion of dormant bacteria (55%). The last skin site, the skin crease behind the knee, had activity levels in between the forearm and back. Our results also revealed that as we grow older, the microbes on our skin become less active.

These results are important in health applications and understanding

more about our immune system.

"We developed two main hypotheses to explain these results. The first is that the lack of nutrients and moisture on our skin creates a [harsh environment](#) for the cells, and they are not able to breathe and grow at full capacity, if at all, with this lack of nutrition. The differences in nutrient availability (e.g., oil, sweat) on each skin site accounts for the differences in [activity levels](#). The second hypothesis is that our immune system causes the cells to have a low level of activity, said Cummins." The immune system can recognize specific proteins on pathogens that alert our bodies to their presence. It may be possible that the low activity level might be a way for cells to survive on the skin without detection. "If we discover that the microbiome and the skin are interacting in these or other similar ways, it could have an important impact on how we treat [skin](#)-associated diseases," she added.

Provided by American Society for Microbiology

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