The Skin Microbiome—Untold Stories Workshop

Tuesday, May 3
2:00–5:00 pm

Organizer: N. Dayan, Dr. Nava Dayan LLC, USA.

2:00 pm Introduction to the Skin’s Microbiome. R.J. Gadberry, Cosmetic Sciences, UCLA Extension, USA.

Abstract
In less than five years, the skin’s microbiome has gone from the dustbin of orphan research to recently being recognized as the skin’s ‘Second Barrier’ and ‘Second Genome’. Explore the gut-skin axis and gain a roadmap to what some consider a newly discovered organ. We’ll discuss:

- The Human Microbiome Project
- Commensals vs. pathogens
- Topical locations and functions of each genera and specific species
- How current skin care practices create dysbiosis
- Microbial imbalances associated with aging, eczema, rosacea, vitiligo, and acne
- Probiotics, prebiotics, and synbiotics
- Possibilities for cosmetics
- Citizen science projects

Biography
Rebecca Gadberry is a dynamic, highly acclaimed educator and journalist who is valued as one of the US skin care industry’s preeminent ingredient authorities. She is the first Marketing Fellow of the Society of Cosmetic Chemists, a recipient of the Henry Maso award in 2014, past chair of the SCC’s California Chapter, and the former CEO of YG Laboratories, manufacturers of high performance skin care for niche and professional brands worldwide. Senior Instructor and Program Director for UCLA Extension’s Cosmetic Sciences program since 1986, Rebecca is now dedicating her career to creating awareness of disruptive biosciences in the cosmetic industry, including microbiomics, epigenetics, and synthetic biology. She hosts two Facebook communities: Trends in Cosmetic Science and Skin Care Ingredient Experts - an open platform where cosmetic chemists, product developers, estheticians, beauty mavens, and other industry professionals interact and share data about skin, ingredients, regulations, myths, and hot topics in the media.
2:30 pm  The Scalp Microbiome and Associated Disorders. N. Dayan, Dr. Nava Dayan LLC, USA.

Abstract
The scalp is unique among skin areas with relatively high follicular density and an elevated rate of sebum secretion. The protected dark and warm environment on the scalp surface provides a welcoming ground for population of microorganism that may be different from those present on other skin areas. Scalp skin is one of the thickest skin areas of the body, and carries supplementary blood circulation. In addition, it is heavily populated with sebaceous glands, which produce sebum that protects hair. Naturally, therefore, scalp associated disorders involve follicular secretions imbalance and innate immunity aspects such as pH, biota and inflammation. Lipophilic yeast Malassezia is widely accepted to play a role in scalp disorders. However, since many of the scalp microorganisms are not culturable using current culture techniques, it is difficult to elucidate the role of other biota in scalp health. Genomic and proteomic techniques utilizing identification of biota and its secretion sequencing can give rise to better understanding of disorders and pave paths for innovation in prevention and treatment. My talk will compare biochemical differences between scalp skin and other skin areas, follicular density and secretion, typical biota, and innovative genomic and proteomic testing opportunities.

Biography
Nava Dayan PhD Pharm has 25 years of experience in skin care segment, and has yielded more than 150 publication credits in numerous industry-respected journals and four books. She has been awarded the In-Cosmetics Gold Award for innovation and commensurate recognition from the NYSCC and the CRS for excellence. Dr. Dayan is the owner of Dr. Nava Dayan LLC, a skin science and research consultancy serving the pharmaceutical, cosmetic, and personal care industries; dermal and transdermal. She offers product feasibility assessment in skin care, composition of R&D plans covering efficacy and toxicology, planning, execution, and data interpretation into claims, formulations, delivery for improved efficacy and attenuated toxicity. Sample of expertise includes: drug-skin interaction, biomarkers (genomics and proteomics), skin/age related sensitivities, inflammatory skin disorders, innate immunity, and biota.

3:10 pm  Innate Defenses of Human Skin and Potential Use of Lipids as Antimicrobial Agents. C.L. Fischer, University of Iowa, USA.

Abstract
Human skin, in addition to providing a physical barrier, houses multiple innate defense mechanisms that help protect against microbial attacks and invasion. Desquamation, low pH, low temperature, and relatively low moisture content all act as defensive barriers to pathogenic microorganisms. The most commonly studied chemical components of the antimicrobial defense are antimicrobial peptides (AMP), produced mainly by keratinocytes, neutrophils, sebocytes, and sweat glands. AMPs have broad spectrum antimicrobial activity, protecting against Gram-positive and Gram-negative bacteria, viruses, and fungi. AMPs act directly on microorganisms, and indirectly – by serving as signaling molecules to activate/modulate various immune processes. Lipids, produced by either epithelial cells (e.g. sphingoid bases) or sebaceous glands (e.g. fatty acids), are also present on the surface of the skin and contribute to the antimicrobial properties of the skin. These lipids exhibit potent – but selective – antimicrobial activity against both Gram-positive and Gram-negative bacteria and probably help shape the skin microbiome. Furthermore, the concentration of lipids present on the skin has been correlated with the presence (or absence) of certain skin conditions, such as ringworm of the scalp (Microsporon audouinii), athlete’s foot (Trichophyton mentagrophytes), and atopic dermatitis (Staphylococcus aureus). We have tested the cytotoxicity of several lipids for various human cells and showed low toxicity within the range of concentrations that are antibacterial, which also falls within physiologic ranges. Because lipids are normal components of skin and exhibit low cytotoxicity, lipid-based treatments are likely to be less irritating to human skin, making them potential candidates for prophylactic or therapeutic intervention of infection.
Biography
Dr. Carol Fischer is a postdoctoral research fellow at the University of Iowa, where she established the selective and differential antimicrobial activity of oral mucosal and salivary lipids against multiple bacterial pathogens. Carol has been involved in research since 2004, completing three years of research as an undergraduate, supported by the McNair Scholar’s Program, the Environmental Research Apprenticeship Program, and a NASA fellowship. During her graduate and post-doctoral work, Carol authored and co-authored 17 articles in peer-reviewed scientific journals, co-authored four book chapters, and presented research at more than 20 research conferences. In 2014, Dr. Fischer received the TRIO Achiever Award. Dr. Fischer is active in multiple professional organizations, including the American Women in Science (AWIS), Women in Science and Engineering (WISE), the American Association for the Advancement of Science, the American Society for Microbiologists, the American Association for Dental Research, and the University of Iowa Post-Doctoral Association, where she served two years as the Dental College Representative for the University of Iowa, including one year on the Policy and Advocacy Committee.

3:40 pm  
Metabolic Activity of the Skin Microbiome: Is Our First Line of Defense Sleeping on the Job? Investigating the Relative Activity and Viability of the Skin Microbiome. S.A. Cummins, University of Indiana, USA.

Abstract
The skin can be a harsh environment for beneficial bacteria to live on due to UV exposure, high salinity, desiccation stress, etc. These suboptimal conditions may cause some bacteria to enter a dormant state, while other bacteria may simply die. In this study, we used fluorescent dyes to stain the cells isolated from the skin, which allowed us to determine the activity of each individual cell. We measured the metabolic activity levels (e.g., growth, respiration) of microbial cells isolated from different areas of our skin. We found that the majority of the microorganisms on our skin are either dead or inactive and not actively respiring. We determined that each skin site harbors different proportions of microorganisms that are metabolically active, inactive, or dead. Our results also suggest that as we grow older, the microbes on our skin become less active. We developed two main hypotheses to explain these results. The first is that 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 influences the cells to have a low level of activity. Our 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.

Biography
Sarah Cummins is a recent Indiana University graduate with dual degrees in Microbiology and Biochemistry. Her main research interests are the variable relative metabolism and viability of the skin microbiome on different areas of the body. She is currently pursuing her Doctor of Pharmacy at Purdue University. She aspires to work in the pharmaceutical industry creating and/or improving products designed to treat issues associated with human.

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Abstract
Hands of health care personnel are one major source of person-to-person transmission of nosocomial pathogens. Frequent hand washing, hand sanitizing, and wearing gloves have been associated with a significant reduction in the risk of nosocomial infections. However, these procedures also have been associated with a higher prevalence of irritant contact dermatitis and other skin problems. But would these changes in skin condition disturb the hand skin microbiota? In this talk, a state-of-the-science literature review of the association between the skin damage and changes in microbiota of the hand of healthcare workers will be presented.

Biography
Dr. Farahmand is Senior Manager of Safety and Regulatory at Living Proof. She has over six years of industrial toxicology experience, and has held post-doctoral positions at the University of Cincinnati and University of California San Francisco, studying deramatexicology, experimental and computational models for dermal delivery and risk assessment, skin sensitization, skin absorption and bioequivalence. Dr. Farahmand has a PhD in Pharmaceutical Science and a PharmD from the Medical University of Tehran, Iran.

4:10 pm Changes in Hands’ Skin Microbiota Associated with Skin Damage in Health Care Workers. S. Farahmand, Living Proof, USA.