Ian A. Myles, M.D., M.P.H.
National Institute of Health (NIH)

Ian A. Myles, M.D., M.P.H.
Credit: NIAID
Staff Clinician, Epithelial Therapeutics Unit
Chief Medical Research Officer, U.S. Public Health Service Commissioned Corps

Major Areas of Research

- Therapeutic effects of microbiome manipulation in the treatment of eczema (atopic dermatitis)
- Role of the microbiome during the normal processes of tissue repair and wound healing
- Mechanisms of susceptibility to epithelial infections with Staphylococcus aureus
- Dietary influences on immune development
- Role of environmental exposures in creating dysbiosis

Program Description

Our group focuses on how human health is affected by the normal microorganisms that live on our skin (collectively termed the microbiome). Our emphasis is on eczema (also called atopic dermatitis or AD), which is an inflammatory disease of the skin associated with reduced quality of life and high risk of developing asthma, allergic rhinitis, and food allergies. AD afflicts 5 to 25 percent of children globally and has a reported prevalence of 8 to 18 percent in the United States. Patients with AD require increased health care utilization, suffering substantially greater out-of-pocket costs than matched controls. The underlying pathology of AD includes defective skin barrier function, susceptibility to Staphylococcus aureus skin infection, and immune dysregulation. Current therapeutic options are limited by their requirement for multiple-times-per-day applications and/or substantial cost. While the natural history of AD suggests that 50 to 90 percent of patents will self-resolve by approximately 10 to 15 years of age, the prolonged barrier defects may put patients at risk for development of associated allergic diseases.

Recent work has uncovered that the skin microbiome is significantly different between healthy controls and patients with AD and that early commensal diversity may protect against development of AD. These realizations suggest that the skin microbiome contributes to AD presentation through both harmful and protective pathways. Our group identified a species of bacteria from normal healthy skin, called Roseomonas mucosa, which showed promising features in cell culture and mouse models that suggested the bacteria might be able to treat patients with eczema. We have since transitioned into a clinical trial using Roseomonas mucosa as a topical treatment for eczema. While guided by the science, our group strives to find treatments that not only improve symptoms but also provide relief without worsening the financial and/or time burdens that disease places on patients and their families.
Beyond the immediate clinical trial, our group is interested in the role the microbiome plays in normal tissue repair and wound healing. The skin, the colon, and the lungs all have to 'renew' themselves

naturally due to normal day-to-day wear-and-tear. These tissues cannot correctly do so without contact with various microorganisms, and we endeavor to better understand why. Furthermore, we are interested in how environmental factors can influence health through effects on the microbiome. For example, we are interested in uncovering how a healthy diet encourages the types of microorganisms that support good health. This includes not only dietary fats and sugars, but also early exposures like breast milk. We also work to uncover what chemical exposures (such as soaps or topical preservatives) may benefit or harm the microbial balance in ways that influence health and disease.

Biography

Dr. Myles was born and raised in Colorado. He graduated with a B.S. in biology from Colorado State University in 2001 and then obtained an M.D. from the University of Colorado in 2005. He completed an internal medicine residency at The Ohio State University prior to beginning fellowship training in allergy and clinical immunology at NIH. He worked under the mentorship of Dr. Sandip Datta investigating the mechanistic details of susceptibility to S. aureus skin infections. In 2011, Dr. Myles became a commissioned officer in the United States Public Health Service Commissioned Corps. LCDR Myles has supported several USPHS missions, from the Ebola virus vaccine trial in West Africa to congressional Gold Medal Ceremonies at the U.S. Capitol. In 2013, he was awarded a position as an assistant clinical investigator in the NIAID Transition Program in Clinical Research. Dr. Myles received his M.P.H. from George Washington University in 2016. In 2018, Dr. Myles became the head of the newly formed Epithelial Therapeutics Unit to evaluate the efficacy and safety of a topical, live bacterial treatment for atopic dermatitis (eczema). He is currently a staff clinician who will soon transition to the Lasker Clinical Research Scholars program.

Research Group

Carlo Castillo, Intramural Research Training Assistant

Selected Publications

Myles IA, Earland NJ, Anderson ED, Moore IN, Kieh MD, Williams KW, Saleem A, Fontecilla NM, Welch PA, Darnell DA, Barnhart LA, Sun AA, Uzel G, Datta SK. First-in-human topical microbiome transplantation with Roseomonas mucosa for atopic dermatitis. JCI Insight. 2018 May 3;3(9).

Myles IA, Anderson ED, Earland NJ, Zarember KA, Sastalla I, Williams KW, Gough P, Moore IN, Ganesan S, Fowler CJ, Laurence A, Garofalo M, Kuhns DB, Kieh MD, Saleem A, Welch PA, Darnell DA, Gallin JI, Freeman AF, Holland SM, Datta SK. TNF overproduction impairs epithelial staphylococcal response in hyper IgE syndrome. J Clin Invest. 2018 Aug 1;128(8):3595-3604.

Myles IA, Williams KW, Reckhow JD, Jammeh ML, Pincus NB, Sastalla I, Saleem D, Stone KD, Datta SK. Transplantation of human skin microbiota in models of atopic dermatitis. JCI Insight. 2016 Jul 7;1(10). pii: e86955.

Myles IA, Zhao M, Nardone G, Olano LR, Reckhow JD, Saleem D, Break TJ, Lionakis MS, Myers TG, Gardina PJ, Kirkpatrick CH, Holland SM, Datta SK. CD8+ T cells produce a dialyzable antigen-specific activator of dendritic cells. J Leukoc Biol. 2017 Jan;101(1):307-320.

Myles IA, Fontecilla NM, Valdez PA, Vithayathil PJ, Naik S, Belkaid Y, Ouyang W, Datta SK. Signaling via the IL-20 receptor inhibits cutaneous production of IL-1β and IL-17A to promote infection with methicillin-resistant Staphylococcus aureus. Nat Immunol. 2013 Aug;14(8):804-11.

Myles IA, Fontecilla NM, Janelsins BM, Vithayathil PJ, Segre JA, Datta SK. Parental dietary fat intake alters offspring microbiome and immunity. J Immunol. 2013 Sep 15;191(6):3200-9.

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Clinical Trials

- NCT03018275, Beginning Assessment of Cutaneous Treatment Efficacy of Roseomonas in Atopic Dermatitis
- NCT02262819, Human Immunity Against Staphylococcus Aureus Skin Infection
- NCT00006150, Study of Clinical Features and Genetics of Hyperimmunoglobulin E Recurrent Infection

Abstract

"Assessing the Effects of Common Topical Exposures on Skin Bacteria Associated with Atopic Dermatitis"

Background: While patients and families struggling with atopic dermatitis (AD) have documented concerns for a contributory role of skin care products in AD pathology, nearly all the skin microbiome studies to date have asked participants to avoid topical products (such as soaps or select medications) for the preceding days to weeks prior to sample collection. Thus, given the established role of the microbiome in AD, the interactions between topical exposures, dysbiosis, and AD remains underrepresented in the academic literature.

Objectives: To address this knowledge gap, we expanded our previous evaluations to test the toxicological effects of a broader range of common chemicals, AD treatment lotions, creams, and ointments using both health- and AD-associated strains of Roseomonas mucosa and Staphylococcus spp.

Methods: Use of in vitro culture techniques and mouse models were deployed to identify chemicals with dysbiotic or pre-biotic potential. A proof-of-concept study was subsequently performed in healthy volunteers to assess global microbiome shifts after exposure to select chemicals using dermatologic patch testing.

Results: Numerous chemicals possessed anti-biotic properties, including many not marketed as antimicrobials. Through targeted combination of potentially beneficial chemicals, we identified combinations which promoted the growth of health associated isolates over disease associated strains in bacterial culture and enhanced microbe-specific outcomes in an established mouse model of AD. Additional studies would likely further optimize the combination of ingredients use. Similar results were seen in the proof-of-concept human studies.

Conclusions: Our results could offer a systematic, multiplex approach to identify which products carry dysbiotic potential and thus may guide formulation of new topicals to benefit patients with atopic dermatitis.