Study to overcome atopic dermatitis

Research Purpose

Atopic dermatitis (AD) is a heterogeneous and multifactorial disorder. Although an individualized approach for each patient has been suggested to be crucial for its treatment, suitable methods have not yet been established. The purpose of this study, therefore, is to establish a method for classifying the disease into subgroups and develop a novel predictive treatment algorithm for each subgroup.

Research overview

1. Data-driven research to identify personalized treatment options for atopic dermatitis

To achieve the abovementioned objectives, we performed an integrated analysis of omics data and used multimodal clinical information from patients with atopic dermatitis. We established an integrated data analysis and repository infrastructure, called Medical Data Integration Assistant (MeDIA), in collaboration with RIKEN

2. Comprehensive analysis of the skin microbiome in patients with atopic dermatitis

In this study, we aim to elucidate the clinical and pathological impact of aberrant microbial populations in patients with AD and identify personalized and predictive clinical interventions to establish therapeutic strategies. To this end, we aim to identify pathogenic microbes involved in AD and elucidate the mechanisms of pathogenesis in each patient via clustering of skin microbial community information.

3. Basic research for objectively evaluating skin conditions and barrier function and implementing precision skin care

In order to maintain healthy skin, we aim to develop an algorithm to identify “precision skin care” strategies, which provide optimal skin care according to the skin condition. We are collecting multifaceted data skin properties, which is the basis for this research.

4. System development research to improve the quality of medical care for atopic dermatitis by integrating life logs and medical data

We have developed an application called “Skin Diary, “ which can be installed on smartphones. It records the daily treatment status and life-log data. We developed a system that utilizes this app for medical care, applied it to telemedicine, and identified exacerbating factors based on the input data.

Selected Publications

1. Ito Y, Sasaki T, Li Y, Tanoue T, Sugiura Y, Skelly AN, Suda W, Kawashima Y, Okahashi N, Watanabe E, Horikawa H, Shiohama A, Kurokawa R, Kawakami E, Iseki H, Kawasaki H, Iwakura Y, Shiota A, Yu L, Hisatsune J, Koseki H, Sugai M, Arita M, Ohara O, Matsui T, Suematsu M, Hattori M, Atarashi K, Amagai M, Honda K. Cell Reports 35(4) 109052, doi.org/10.1016/j.celrep.2021.109052, 2021.

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2. Koseki K†, Kawasaki H†, Atsugi T, Nakanishi M, Mizuno M, Naru E, Ebihara T, Amagai M, Kawakami E: Assessment of skin barrier function using skin images with topological data analysis. NPJ Syst Biol Appl 6 (1), 40, doi: 10.1038/s41540-020-00160-8, 2020.

3. Yasuda-Sekiguchi F, Shiohama A, Fukushima A, Obata S, Mochimaru N, Honda A, Kawasaki H, Kubo A, Ebihara T, Amagai M, Sasaki T: Single nucleotide variations in genes associated with innate immunity are enriched in Japanese adult cases of face and neck type atopic dermatitis. J Dermatol Sci, doi: 10.1016/j.jdermsci.2020.11.005, 2020.

4. Takahashi S, Ishida A, Kubo A, Kawasaki H, Ochiai S, Nakayama M, Koseki H, Amagai M, Okada T. Homeostatic pruning and activity of epidermal nerves are dysregulated in barrier-impaired skin during chronic itch development. Sci Rep. 2019 Jun 13;9(1):8625. doi: 10.1038/s41598-019-44866-0.

5. Miyamoto A, Lee S, Cooray NF, Lee S, Mori M, Matsuhisa N, Jin H, Yoda L, Yokota T, Itoh A, Sekino M, Kawasaki H, Ebihara T, Amagai M, Someya T. Inflammation-free, gas-permeable, lightweight, stretchable on-skin electronics with nanomeshes. Nat nanotechnol. 12(9):907-913, 2017