EDIFICE
HEALTH

Novel Biomarkers of Chronic Inflammation/ Immune Health and Potential Applications in Aging, Disease, and Nutrition

1. Executive Summary

Non-communicable diseases of aging are the #1 killer worldwide. It is now a consensus in the scientific community that **Systemic Chronic Inflammation (SCI), arising as an immune response to environmental and social insults, is the root cause of these diseases**, which include cardiovascular disease, cancer, neurodegenerative disorders, musculoskeletal conditions, and many others. Despite the major role of SCI on the pathophysiology of these diseases, at present there are no standard biomarkers of this condition and studies aimed at defining 'metrics' for SCI have yielded conflicting results.

Acute vs. Systemic Inflammation

When we hear the word "Inflammation," we think of a red, swollen toenail, broken bone, or immediate injury. These are indeed clinical signs of acute inflammation, which is the body's response to an infection or trauma. Systemic Chronic Inflammation (SCI) is very different from acute inflammation. SCI starts in the womb, increases with age and is triggered by exposure to environmental pollutants, diet/processed foods/nutrition, pesticides, and chronic stress. While acute inflammation is beneficial and temporary, SCI accumulates with time in individuals causing collateral damage to tissues and organs and augmenting the risk of most, if not all, age-associated diseases.

The Stanford 1000 Immunomes Project was established in the year 2008 with the aim of finding immunological biomarkers of human health and disease. By measuring thousands of blood parameters from 1000 humans over 10 years, scientists at the Stanford School of Medicine and the Department of Biomedical Data Science used state-of-the-art artificial intelligence to derive the first score for SCI – or Inflammatory Age (iAge®) – which predicts cumulative chronic diseases and cardiovascular aging even in those apparently healthy individuals, and has applications for many other disease conditions, including immune health.

2. The Problem

A total of 71% of people die from non-communicable chronic diseases of aging worldwide[1]. The economic burden of these diseases is estimated to be $3 trillion/year, 90% of the total annual health expenditures only in the US[2,3].

It is now well accepted in the scientific and medical communities that a major contributor in the development of these diseases is a state of low-grade systemic and chronic inflammation (SCI) that increases with age as an immune response to environmental and social insults, known as the "Exposome"[4]. This type of age-related inflammation impinges collateral damage on tissues and organs causing cellular dysfunction and increasing the risks for cardiovascular disease, cancer, neurodegenerative disorders, musculoskeletal conditions and many other illnesses[5].
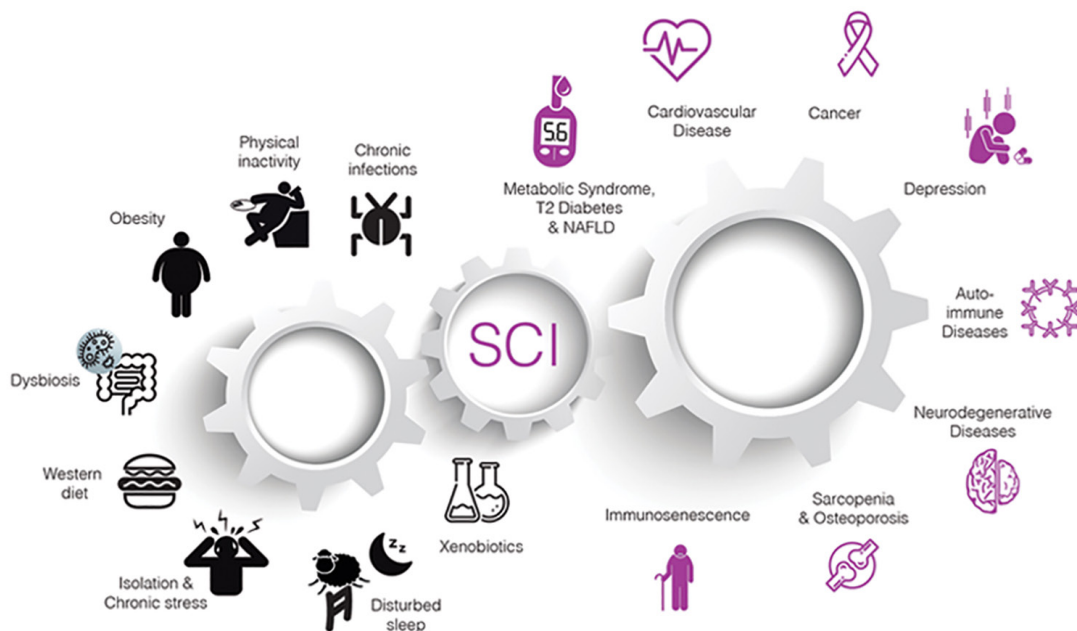
You Are What You Eat

Food ingredients, nutrition and supplements play a key role in regulating individual levels of SCI, immune health and ultimately impact the health span of individuals. Although many products claim to be anti-inflammatory, immune boosting and healthy, there has not been a metric to determine the impact of these claims, until now.

3. The History

During the years 2008-2018 at the School of Medicine and Department of Biomedical Data Science at Stanford University, a group of eight scientists lead by Professor David Furman established the Stanford 1000 Immunomes Project with the aim to answer one important question for medicine and healthcare economics: what are the immunological determinants of human health and disease? With over $30M in funding from NIH grants and other philanthropic institutions and 10 years of scientific effort, using state-of-the-art artificial intelligence and machine learning approaches, the Stanford group were able to identify and develop an inflammatory age score, which they called Inflammatory Age (iAge®), based on the exhaustive analysis of thousands of blood variables (proteomics, genomics, phenomics, metabolomics) collected from 1000 subjects age 9-96.

The inflammatory age® of a person determines how much older or younger someone appears with respect to the chronological age and the SCI index™ determines how does one compare to individuals in his age group within the Stanford 1000 Immunomes cohort.
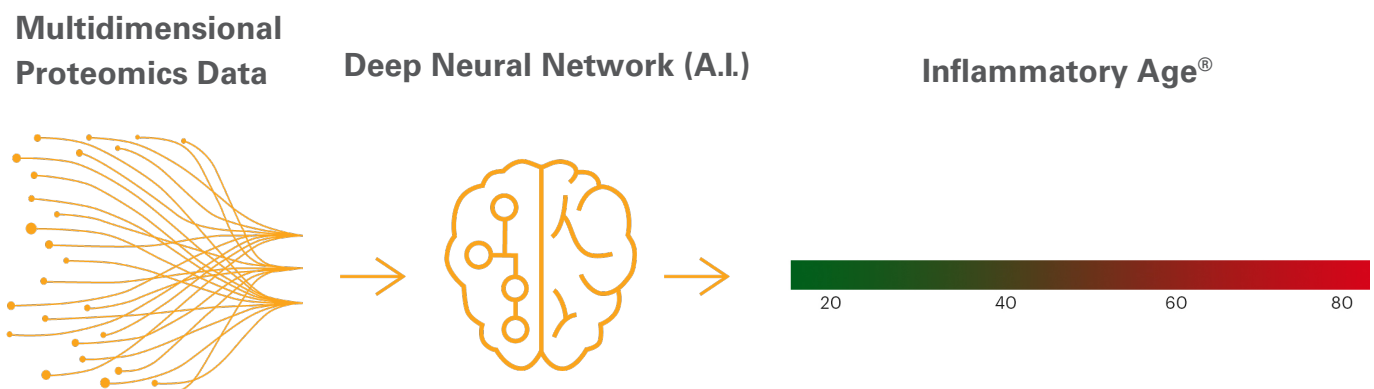
Multidimensional Proteomics Data   **Deep Neural Network (A.I.)**   **Inflammatory Age®**

Figure 2. Artificial Intelligence applied to immunological data from blood samples identifies "Inflammatory Age®."

Using the Stanford 1000 Immunomes Project database, the Stanford researchers applied state-of-the-art analytics to create the first biomarker composite scoring system (or Inflammatory Age, iAge®), which predicts multi-morbidity and cardiovascular aging[8].

This new metric for SCI predicts cumulative damage, as measured by the accumulation of up to 10 diseases of aging (cancer, cardiovascular, respiratory, gastrointestinal, urologic, neurologic, endocrine-metabolic, musculoskeletal, genital-reproductive and psychiatric). Strikingly, in a validation study of cardiovascular function, iAge® identified individuals with increased stiffness of their vasculature and a subclinical cardiac hypertrophy, which were apparently healthy based on standard clinical assessment and laboratory testing procedures[8]. This metric also identifies the immune health of an individual.

In 2018, Professor Furman and colleagues formed Edifice Health, Inc. to bring the iAge® scoring system to the medical community to be used as a new tool for health risk assessment.

4. The Solution

iAge® is the world's first commercially available test to measure SCI and immune health and aligns with our vision to become the world leader in systemic chronic inflammation and immune health. By integrating different technologies and platforms, Edifice Health will position itself in the healthcare space as the first knowledge-based AI-fueled company to create solutions to detect and combat systemic chronic inflammation. Edifice Health's long-term mission is to contribute substantially to a decrease in the incidence and prevalence of chronic diseases with the aim to extent the health span and lifespan globally.

5. Commercial Applications

Food, Nutrition & Ingredient Companies and Developers

Edifice Health's tool can be used to determine if a certain food product and/or ingredient has a positive impact/benefit on an individual's inflammation, immune health and overall health. There are many products/foods on the market claiming to be anti-inflammatory, immune boosting, etc. but now there is a metric to validate and market these claims.

Pharma
(Companion diagnostics developers)

Edifice Health's data can be utilized to evaluate the potential role of pharmacological or nutraceutical preparations in lowering chronic inflammation and decreasing the risk of multiple chronic diseases.

Preventative Medicine

Edifice Health's easy to understand report motivates patients towards improved health with actionable and trackable results while providing insight into the onset of age-related diseases (Alzheimer's, Cancer, Cardiovascular, etc.). The information promotes healthy decision-making by providing guidance on environmental factors that may have an impact on their health, thus empowering patients to take control of their inflammatory aging.

Wellness Healthcare Providers

Edifice Health's Inflammatory Age® can inform health providers about the risks of early aging in nominally healthy populations, which can prompt additional testing procedures and early interventions.

About Edifice Health

Edifice Health is a Silicon Valley-based company focused on diagnostics and interventions of aging and systemic chronic inflammation. We focus on the identification of immune system biomarkers of aging and related diseases to delay and prevent major chronic diseases and decrease the disease burden globally. The mission of Edifice Health is to catalyze data-enabled science and advance current knowledge on interventions to extend healthspan.

References

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Please contact company Edifice Health, Inc. at info@edificehealth.com to get more information about collaboration opportunities and/or to set up an account.