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Review Article

# Age Gracefully: Keep the Immune System Healthy

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## Abstract

Inflammation clock or iAge clock which was developed recently that can measure inflammation products in the body of an individual and can predict immunological decline. It is also capable of predicting incurring age-associated diseases. The quantity and quantity of these inflammatory products is also related physiological age. This will be useful information in the hands of researchers who are engaged in drug development. This will also be a helpful tool in therapeutics for clinicians.

**Key Words:** immunity ; iage;

## Introduction

For age the calendar years are the same for everyone, but not all humans age biologically at the same rate; some older people are extremely disease-prone, while others are not. As we grow older, a low-grade, constant, body wide chronic inflammation begins to kick in. This systemic and chronic inflammation causes diseases such as, cancer, heart attacks, strokes, neurodegeneration and autoimmunity. "Immunity" has become a household word in this pandemic era due to Corona-19. Now the man on the street knows people who have strong immunity Corona wouldn't attack.Till date, there have been no metrics for accurately assessing individuals' inflammatory status in a way that could predict these clinical problems and point to ways of addressing them or staving them off, Furman said. But now, he said, the study has produced a single-number quantitative measure that appears to do just that. Scientists were also engaged during this time, stressed more on research on immunity and recently developed an 'Inflammation clock' which can reveal a body's biological age using inflammatory markers such as cytokines and CXCL9 [1].

## Development of Inflammation clock

This new 'clock' assesses chronic inflammation caused by age related disorders such as cardiovascular and neurodegenerative disease and can predict whether someone is at risk of developing such diseases. Chronological age is easy to measure but so far there is no way to measure one's physiological age. This new clock solves the problem of measuring 'biological age', which takes health into consideration and can be higher or lower than a person's chronological age [2].The new study employed artificial intelligence to boil all this data down to a composite the researchers refer to as an inflammatory clock. The strongest predictors of inflammatory age, they found, were a set of about 50 immune-signaling proteins called cytokines. Levels of those, massaged by a complex algorithm, were sufficient to generate a single-number inflammatory score that tracked well with a person's immunological response and the likelihood of incurring any of a variety of aging-related diseases. Inflammatory age proved superior to chronological age in predicting frailty seven years later.

Vishwa Deep Dixit, an immunobiologist at Yale has expressed "is a further reinforcement of the fact that the immune system is critical, not only for predicting unhealthy ageing, but also as a mechanism driving it" [3].

Though' (iAge), is the recent invention [2] where for the first time,used inflammation to assess health. In fact even earlier people who tried to develop such physiological clocks used epigenetic markers, chemical groups that tag a person's DNA as they age and are passed along as cells divide [4]. Because inflammation is not that serious disease and can be treated, recently developed the inflammation clock researchers think that by measuring inflammation level the patient can be treated before setting off diseases, and thus would benefit from intervention — potentially extending the number of years a person lives in good health[5, 6]. Among a new cohort of 97 25- to 90-year-old individuals selected from the 1000 Immunomes Project for their apparently excellent health, with no signs of any disease, the investigators looked for subtle signs of cardiovascular deterioration. A key substance, CXCL9 has been implicated in cardiovascular disease it is secreted not only by immune cells but by endothelial cells — the main components of blood-vessel walls. The researchers showed that advanced age both correlates with a significant increase in endothelial cells' CXCL9 levels and diminishes endothelial cells' ability to form microvascular networks, to dilate and to contract.

Using a sensitive test of arterial stiffness, which conveys heightened risk for strokes, heart attacks and kidney failure, they tied high inflammatory-age scores — and high CXCL9 levels — to unexpected arterial stiffness

and another portent of untoward cardiac consequences: excessive thickness of the wall of the heart's main pumping station, the left ventricle.

It is a well-known fact that during ageing people's bodies experience chronic,systemic inflammation because their cells become damaged and emit inflammation- causing molecules; these after the threshold value start damaging body tissues and organs. Since iAge was developed to measure the degree of inflammatory material, before recharging the threshold value one can get a health warning signal. To give the warning signal the researchers used the participants' chronological ages and other parameters and health conditions, combined with a machine learning algorithm, to identify the protein markers in blood that most clearly signal systemic inflammation [4]. People who have a healthy immune system will be able to neutralize this inflammation product to some extent and age slower, whereas others will age faster [7].

Sayed says that "CXCL9 being a key component of iAge gives new credence to the adage that "you're only as old as your arteries" [2]

## In vitro testing

Also, in laboratory experiments conducted on tissue from mice and on human cells, reducing CXCL9 levels restored youthful endothelial-cell function, suggesting that CXCL9 directly contributes to those cells' dysfunction and that inhibiting it could prove effective in reducing susceptible individuals' risk of cardiovascular disease.

Furman and his colleagues used lab grown human endothelial cells as a model for testing the production of CXCL9 as a biomarker of systemic inflammation which make up the walls of blood vessels, in a dish and artificially aged them by letting them divide repeatedly. The researchers observed that high levels of the protein drove the cells into a dysfunctional state. On silencing the expression of the gene that encodes CXCL9, the cells regained some function, suggesting that the protein's harmful effects might be reversible [2]. If caught early, "inflammation is one of the best things we can treat ", says Mittelbrunn. "We have developed amazing anti-inflammatory tools, so I think it's a biological process that we have a lot of knowledge about and can target easily." For instance, researchers have long known about salicylic acid (a starting material for making aspirin), and have more recently developed JAK/STAT inhibitors for inflammatory conditions such as rheumatoid arthritis .To further assess inflammatory age's effect on mortality, Furman's team turned to the Framingham Study, which has been tracking health outcomes in thousands of individuals since 1948. The Framingham study lacked sufficient data on bloodborne-protein levels, but the genes whose activity levels largely dictate the production of the inflammatory clock's cytokines are well known. The researchers measured those cytokine-encoding genes' activity levels in Framingham subjects' cells. This proxy for cytokine levels significantly correlated with all-cause mortality among the Framingham participants.

"Our inflammatory aging clock's ability to detect subclinical accelerated cardiovascular aging hints at its potential clinical impact," Furman said. "All disorders are treated best when they're treated early." If caught early, "inflammation is one of the best things we can treat", says Mittelbrunn. "We have developed amazing anti-inflammatory tools, so I think it's a biological process that we have a lot of knowledge about and can target easily." For instance, researchers have long known about salicylic acid (a starting material for making aspirin), and have more recently developed JAK/STAT inhibitors for inflammatory conditions such as rheumatoid arthritis.

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