Strengthening the Pillars of Biological Aging

Biological aging is functional: how well (and comfortably) your body and mind perform as you get older. Having long studied measures of function that serve as biomarkers of aging, PLMI President Dr. Jeffrey Bland has defined four key measurable arenas of biological aging: 1) physical function, 2) metabolic function, 3) cognitive function, and 4) behavioral/emotional function. One’s chronological age (number of birthdays) can be compared to one’s biological/functional age through testing things like auditory, visual, and tactile sensitivity, decision-making processes, lung and muscle function, and memory, and a number of people function as though years or even decades younger or older than their age in birthdays. At a cellular level, these differences can affect how one responds to stress, how easily one gains weight, one’s susceptibility to inflammation, heart disease, or cancer, and how frequently DNA mutations occur and whether or not disadvantageous changes are corrected.

In The Longevity Diet, famed researcher on aging Valter Longo, PhD, describes how particular foods and eating habits speak to cells—and how this message, over time, affects biological aging. Dr. Longo grew up in areas of Italy noted for long lifespans and healthspans, and later living in Chicago, the US Army, Texas, and Los Angeles gave him ample direct experience of how different approaches to food can result in different rates of biological aging. This depth of understanding led him to develop the Fasting-Mimicking Diet, an intermittent switch in eating patterns that activates deep cellular repair and rejuvenation. It is no exaggeration to say that the Fasting-Mimicking Diet (FMD) presents a new opportunity to intervene in and remodel our internal aging processes, though it should only be carried out under medical supervision.
You've probably heard about how important it is to have long enough telomeres protecting the ends of your chromosomes, especially since the Nasa Twins Study described how living in space changed telomere lengths in now-retired astronaut Scott Kelly. Though we inherit genes and the initial pattern of genetic 'tags' from our parents, the latter epigenetic signal markers (which effectively say STOP and GO in terms of reading genes and translating their messages into proteins or regulatory actions) begin to change even in the womb, marking important exposures and experiences—our completely unique and individual "exposome."

Perhaps it is not surprising, then, that methylation (the main type of epigenetic 'tagging') has a great deal of influence over how well our telomeres are able to maintain our genomic stability. Shorter telomeres have been associated with several disease states (especially biological aging-related conditions like cancers, immune imbalance, and cardiovascular disease), whereas regular physical activity, nutrient sufficiency, and healthful eating patterns relate to longer telomeres. Though telomere length is proportional to one's biological aging, it is impacted by methylation patterns even in youth. A recent study confirmed for the first time that, in healthy adolescents, a higher percentage of genes showing methylation correlates with greater telomere length—and thus more advantageous overall methylation coincides with better protection of DNA by telomeres.

So how can one improve methylation status? Methylation function reflects one’s lifestyle, intakes of toxins as well as beneficial substances, and how one interprets and responds to living experiences. A few adaptive means of influencing methylation include:

- Identifying genetic variations that impact individual metabolism related to methylation
- Receiving individually-appropriate amounts of methylation nutrients like B vitamins, choline, and betaine
- Identifying the eating pattern that optimizes your gene-environment interaction
- Getting enough but not too much of antioxidants like vitamin C and phytonutrients
- Enjoying enough individually-appropriate kinds of physical activity
- Identifying genetic strengths as well as individual risks for disease
- Managing toxic exposures and metabolic detoxification

The human genome spans manifold coding regions, and it is possible to be hypermethylated in some areas and hypomethylated in others. Because genetic variations and lifestyle and exposome factors can predispose one to overly high and/or low levels of methylation (both of which present potential health risk), it is recommendable to work with a Functional Medicine practitioner to optimize this crucial balance.

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**SNiPpets**

How significant to health are particular single nucleotide polymorphisms, also known as SNPs? SNiPpets is a ongoing exploration of this topic. This column is produced by Jeffrey Bland, PhD and the Personalized Lifestyle Medicine Institute.

**With this SNP, Whey Protein May Help Rescue Insulin Function**

In the population at large, consumption of dairy products has been associated with a reduced risk for type 2 diabetes. However, dairy can
alter insulin function for either better or worse in particular individuals, and a 2017 study may partially explain this seeming paradox.

Previous genome-wide association studies (GWAS) have discovered several genetic variations at the GCK gene that can negatively impact glucose regulation by changing how the body calls on insulin to either store or use glucose. This study found that, for those with either an AA or GA haplotype at the rs1799884 locus in the GCK gene (as result of a single or double G-to-A single-nucleotide polymorphism, or SNP), daily consumption of more than 2.2 servings of dairy (~18 or more grams of dairy protein in total) was associated with lower fasting levels of both glucose and insulin as well as significantly better insulin sensitivity. These functional changes would be expected to reduce long-term risk for type 2 diabetes.

Whey proteins appear to be especially good at aiding normal transcription of the GCK gene (the “reading” of its code), which regulates other genes controlling the body’s production of specialized proteins that affect blood glucose levels and how quickly insulin is recruited to lower them. This study accords with earlier findings that a higher-protein diet may aid insulin/glucose balance in certain individuals at certain life stages, and further identifies those who may specifically benefit from whey protein. Those having this particular SNP may wish to consult with a Functional Medicine practitioner to rule out potential difficulties metabolizing dairy products.

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### Has That App Been Road-Tested?

At PLMI’s recent Sixth Annual Thought Leaders Consortium, we learned from true experts in the fields of aging research, Big Data analysis, and lifestyle medicine like Siddhartha Jaiswal, MD, PhD, Kara Fitzgerald, ND, Michael Fenech, PhD, and Larry Smarr, PhD. In discussing personalized tools (devices, platforms, programs, apps, etc.), one concern these experts repeatedly expressed was the sometimes-questionable validity of these tools’ algorithms, which interpret complex -omics information, lifestyle inputs, and laboratory data for deriving personalized recommendations. Only by proving algorithmic validity prior to wide commercialization can personalized products and services deliver on promises of improving performance, health, and wellness. A few key items to consider when evaluating these advanced tools include:

- Has validity been demonstrated among women as well as men, people of all ages, healthy and not-so-healthy users, and individuals from a variety of ethnic backgrounds?
- Are valid and meaningful functional measures (like laboratory biomarkers, digitally-tracked functions, or -omics test results) used, and are they appropriately assayed, processed, and tested?
- Did qualified experts design algorithms, and did qualified, non-biased experts validate them?
- Has evidence of this validity been published in the peer-reviewed scientific literature?

A good example of scientific validation for an app was recently published in the prestigious journal Nature. This study was performed for the express purpose of ensuring that results obtained by users in the general population were as valid as those of controlled study subjects. An unexpected bonus of this laudable demonstration of due diligence was the discovery of novel associations between changes in health-related biomarkers among users—not just a health boost and good reason to trust the app, but a contribution to science, as well!
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