The GH-Method

Viscoelastic Medicine Theory (VMT #345): Longevity Perspectives versus Body Weight, Glucose, Creatinine and Risks of Cancers and CVD Using Input Data from 2013 to 2023 Applying the Viscoplastic Energy Model of GH-Method: Math-Physical Medicine (No. 945)

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Abstract

The author recently came across an article published on October 9, 2023, which discussed the relationship between certain biomarkers and longevity in centenarians. The study found that people who live to be a hundred years old tend to have lower levels of glucose, creatinine, and uric acid starting from their sixties (see introduction section below). The author, who regularly undergoes physical examinations that include a comprehensive assessment of his blood biomarkers, unfortunately does not have a record of his uric acid data. Therefore, for the purpose of this longevity study, he has chosen to focus on five influential factors: cardiovascular disease (CVD) risk, cancer risk, obesity (body weight, BW), glucose (type 2 diabetes, T2D), and creatinine. To quantitatively analyze longevity using an estimated health age and its association with the aforementioned five influential factors, the author has employed the soace-domain viscoplastic energy model (SD-VMT) for this investigation. The "estimated health age" is calculated using the following formula: Health Age = Real Biological Age * (1 + ((MI - 0.735)/0.735)/2). Here, "MI" refers to the daily "metabolism index" value, which combines four metabolic disorders and six lifestyle details, consisting of over 500 detailed elements. In summary, the analysis yielded the following five observations: 1. Time-domain correlation analysis indicates strong correlations between health age and these five inputs as follows: 95% for CVD, 86% for cancer, 82% for BW, 82% for T2D, and 58% for creatinine. 2. Space-domain viscoplastic energy (SD-VMT) analysis reveals different energy ratios for each input: 15% for CVD, 11% for cancer, 24% for BW, 25% for T2D, and 26% for creatinine. 3. Regarding energy distribution among these five inputs, cancer risk showed the lowest energy contribution, while CVD risk had 4% more energy. Obesity, T2D, and creatinine had nearly equal amounts of energy. When comparing three inputs (BW, T2D, creatinine), each contributed around 1/3 of the total energy. Comparing two inputs (T2D, creatinine), each contributed around 1/2 of the energy. 4. The distribution of energy in two different time zones was significantly different, with 92% attributed to the earlier period of Y13-Y16 and only 8% to the recent period of Y17-Y23. This suggests that the author's energy contribution to longevity during the recent period has been minimal. 5. The VMT-predicted health age curve exhibits a correlation coefficient of 85% with MI-calculated health age curve. This study highlights the significance of creatinine in his overall health and longevity perspectives, especially following his experience of chronic kidney diseases around 2010.

Keywords: Viscoelastic; Viscoplastic; Diabetes; Exercise; Longevity; Body weight; Glucose; Creatinine; Cancers; Cardiovascular diseases

Abbreviations: MI: metabolism index; CVD: cardiovascular diseases; CKD: chronic kidney diseases; T2D: type 2 diabetes; PPG: postprandial plasma glucose; FPG: fasting plasma glucose; SD: space-domain

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1. INTRODUCTION

The author recently came across an article published on October 9, 2023, which discussed the relationship between certain biomarkers and longevity in centenarians. The study found that people who live to be a hundred years old tend to have lower levels of glucose, creatinine, and uric acid starting from their sixties (see introduction section below).

The author, who regularly undergoes physical examinations that include a comprehensive assessment of his blood biomarkers, unfortunately does not have a record of his uric acid data. Therefore, for the purpose of this longevity study, he has chosen to focus on five influential factors: cardiovascular disease (CVD) risk, cancer risk, obesity (body weight, BW), glucose (type 2 diabetes, T2D), and creatinine.

To quantitatively analyze longevity using an estimated health age and its association with the aforementioned five influential factors, the author has employed the space-domain viscoplastic energy model (SD-VMT) for this investigation.

The "estimated health age" is calculated using the following formula:

Health Age = Real Biological Age * (1 + ((MI - 0.735)/0.735)/2)

Here, "MI" refers to the daily "metabolism index" value, which combines four metabolic disorders and six lifestyle details, consisting of over 500 detailed elements.

1.1 Biomedical information

The following sections contain excerpts and concise information drawn from multiple medical articles, which have been meticulously reviewed by the author of this paper. The author has adopted this approach as an alternative to including a conventional reference list at the end of this document, with the intention of optimizing his valuable research time. It is essential to clarify that these sections do not constitute part of the author's original contribution but have been included to aid the author in his future reviews and offer valuable insights to other readers with an interest in these subjects.

"From: The Independent

Largest study of centenarian blood reveals secrets to longevity

Those who made it to their hundredth birthday tended to have lower glucose, creatinine and uric acid from their sixties

Centenarians tend to have lower levels of glucose, creatinine and uric acid from their sixties onwards, according to the largest study of its kind that may lead to a simple blood test to predict a person's chance of reaching 100.

The research, published on Monday (October 9, 2923) in the journal GeroScience, is the biggest to date to measure and follow up the levels of different molecules in the blood of people born between 1893 and 1920.

Scientists, including those from Karolinska Institutet, Sweden, assessed the data on blood molecules from over 44,500 Swedes who underwent clinical testing between 1985 and 1996 and followed up till 2020.

They focused specifically on people born between 1893 and 1920, who were between 64 and 99 years old when their blood samples were first tested, and followed them up as they grew closer to 100 years of age.

About 1,200 individuals in the study, or about 2.7 per cent of the participants, reached 100.

Researchers compared this subset's data with those of their peers who were younger than them.

The analysis found 12 blood-based molecules associated with metabolism, inflammation as well as liver and kidney function, that were also linked to aging or mortality in previous studies.

These molecules included total cholesterol and glucose as markers of metabolism, uric acid indicating inflammation levels, enzymes indicative of liver health and creatinine as a measure of kidney health.

Researchers also looked at albumin and iron levels in the blood.

Except for a liver enzyme and albumin, all other molecules were found linked to the likelihood of a person becoming a centenarian.

Those with increased levels of total cholesterol and iron had a greater likelihood of becoming centenarians compared to those with lower levels.

However, for molecules including glucose, creatinine, uric acid, and liver enzymes, lower levels were associated with higher chances of living past 100.

“We found that, on the whole, those who made it to their hundredth birthday tended to have lower levels of glucose, creatinine and uric acid from their sixties onwards,” researchers wrote in The Conversation.

“Very few of the centenarians had a glucose level above 6.5 earlier in life, or a creatinine level above 125,” they said.

While the differences found in the study between groups were small in some cases, researchers said the findings still suggest a “potential link” between metabolism, nutrition and longevity.

However, the study falls short of recommending lifestyle factors or genes responsible for these blood molecule levels.

“While chance likely plays a role for reaching age 100, the differences in biomarker values more than one decade prior death suggest that genetic and/or lifestyle factors, reflected in these biomarker levels may also play a role for exceptional longevity,” scientists wrote in the study.

“However, it is reasonable to think that factors such as nutrition and alcohol intake play a role. Keeping track of your kidney and liver values, as well as glucose and uric acid as you get older, is probably not a bad idea,” they said.

From: Centenarian Blood Tests Give Hints of The Secrets to Longevity

9th October 2023

Author: Karin Modig, Associate Professor, Epidemiology

Centenarians, once considered rare, have become commonplace. Indeed, they are the fastest-growing demographic group of the world's population, with numbers roughly doubling every ten years since the 1970s.

How long humans can live, and what determines a long and healthy life, have been of interest for as long as we know. Plato and Aristotle discussed and wrote about the aging process over 2,300 years ago.

The pursuit of understanding the secrets behind exceptional longevity isn't easy, however. It involves unravelling the complex interplay of genetic predisposition and lifestyle factors and how they interact throughout a person's life. Now our recent study, published in GeroScience, has unveiled some common biomarkers, including levels of cholesterol and glucose, in people who live past 90.

Nonagenarians and centenarians have long been of intense interest to scientists as they may help us understand how to live longer, and perhaps also how to age in better health. So far, studies of centenarians have often been small scale and focused on a selected group, for example, excluding centenarians who live in care homes.

Huge dataset

Ours is the largest study comparing biomarker profiles measured throughout life among exceptionally long-lived people and their shorter-lived peers to date.

We compared the biomarker profiles of people who went on to live past the age of 100, and their shorter-lived peers, and investigated the link between the profiles and the chance of becoming a centenarian.

Our research included data from 44,000 Swedes who underwent health assessments at ages 64-99 - they were a sample of the so-called Amoris cohort. These participants were then followed through Swedish register data for up to 35 years. Of these people, 1,224, or 2.7%, lived to be 100 years old. The vast majority (85%) of the centenarians were female.

Twelve blood-based biomarkers related to inflammation, metabolism, liver and kidney function, as well as potential malnutrition and anaemia, were included. All of these have been associated with aging or mortality in previous studies.

The biomarker related to inflammation was uric acid - a waste product in the body caused by the digestion of certain foods. We also looked at markers linked to metabolic status and function including total cholesterol and glucose, and ones related to liver function, such as alanine aminotransferase (Alat), aspartate aminotransferase (Asat), albumin, gamma-glutamyl transferase (GGT), alkaline phosphatase (Alp) and lactate dehydrogenase (LD).

We also looked at creatinine, which is linked to kidney function, and iron and total iron-binding capacity (TIBC), which is linked to anaemia. Finally, we also investigated albumin, a biomarker associated with nutrition.

Findings

We found that, on the whole, those who made it to their hundredth birthday tended to have lower levels of glucose, creatinine and uric acid from their sixties onwards. Although the median values didn't differ significantly between centenarians and non-centenarians for most biomarkers, centenarians seldom displayed extremely high or low values.

For example, very few of the centenarians had a glucose level above 6.5 earlier in life, or a creatinine level above 125.

For many of the biomarkers, both centenarians and non-centenarians had values outside of the range considered normal in clinical guidelines. This is probably because these guidelines are set based on a younger and healthier population.

When exploring which biomarkers were linked to the likelihood of reaching 100, we found that all but two (alat and albumin) of the 12 biomarkers showed a connection to the likelihood of turning 100. This was even after accounting for age, sex and disease burden.

The people in the lowest out of five groups for levels of total cholesterol and iron had a lower chance of reaching 100 years as compared to those with higher levels. Meanwhile, people with higher levels of glucose, creatinine, uric acid and markers for liver function also decreased the chance of becoming a centenarian.

In absolute terms, the differences were rather small for some of the biomarkers, while for others the differences were somewhat more substantial.

For uric acid, for instance, the absolute difference was 2.5 percentage points. This means that people in the group with the lowest uric acid had a 4% chance of turning 100 while in the group with the highest uric acid levels only 1.5% made it to age 100.

Even if the differences we discovered were overall rather small, they suggest a potential link between metabolic health, nutrition and exceptional longevity.

The study, however, does not allow any conclusions about which lifestyle factors or genes are responsible for the biomarker values. However, it is reasonable to think that factors such as nutrition and alcohol intake play a role. Keeping track of your kidney and liver values, as well as glucose and uric acid as you get older, is probably not a bad idea.

That said, chance probably plays a role at some point in reaching an exceptional age. But the fact that differences in biomarkers could be observed a long time before death suggests that genes and lifestyle may also play a role."

Notes from the author:

Upon reviewing the upcoming excerpts from other published articles, it becomes evident that these findings are predominantly conveyed using qualitative statements. On occasion, these statements include a limited number of numerical values, typically sourced from statistical data within epidemiological studies. However, a recurring deficiency among them is the lack of robust quantitative findings to underpin their qualitative conclusions. Consequently, the author of this paper has deliberately opted to leverage his familiar methodologies from mathematics, physics, and engineering fields in his medical research pursuits. This strategic choice is intended to yield substantial conclusions supported by sound proofs via quantitative data, effectively bridging the current gap in the realm of biomedical research.

Creatinine is an important biomarker for body health:

Creatinine is a waste product that is produced in the muscles during the normal breakdown of a compound called creatine phosphate. It is a chemical waste molecule generated from the metabolism of creatine, which is an energy source for muscles. Creatinine is produced at a relatively constant rate and is expelled from the body through the kidneys into the urine.

Creatinine levels in the blood can be used as a measure of kidney function. When the kidneys are functioning properly, they filter out most of the creatinine and excrete it through urine. If the kidneys are not functioning properly, the creatinine levels in the blood can become elevated, indicating a potential problem with kidney function.

Creatinine levels are often measured through a simple blood test. Elevated creatinine levels can be indicative of various conditions, such as kidney disease, kidney damage, dehydration, certain medications, or muscle disorders. Regular monitoring of creatinine levels is important in assessing kidney function and overall health.

The normal range for creatinine can vary slightly depending on the laboratory and the reference range used. However, generally accepted normal ranges for creatinine levels in adults are:

-Adult males: 0.6 to 1.2 milligrams per deciliter (mg/dL) or 53 to 106 micromoles per liter (μmol/L).

-Adult females: 0.5 to 1.1 mg/dL or 44 to 97 μmol/L.

It's important to note that these ranges are provided as a general guideline, and individual laboratories may have slight variations in their reference ranges. Additionally, the normal range can be influenced by factors such as age, gender, muscle mass, and overall health. It is always advisable to consult with a healthcare professional for proper interpretation of creatinine levels in relation to an individual's specific health and medical history.

Creatinine value is an important biomarker for assessing body health, particularly kidney function. Here are some reasons why creatinine is considered an important biomarker:

1. Kidney function assessment

Creatinine is a byproduct of muscle metabolism that is filtered by the kidneys and excreted in urine. Monitoring creatinine levels helps assess how well the kidneys are functioning in filtering waste products from the blood. Elevated creatinine levels may indicate impaired kidney function or renal disease.

2. Detection of kidney disease

Creatinine levels can help identify the presence of kidney disease at an early stage. In individuals with chronic kidney disease (CKD), higher creatinine levels can indicate decreased or deteriorating kidney function. Regular monitoring of creatinine levels allows healthcare professionals to track the progression of kidney disease and determine appropriate interventions.

3. Evaluation of drug toxicity

Some medications, especially those that are eliminated from the body through the kidneys, can cause kidney damage or toxicity. Monitoring creatinine levels helps healthcare professionals assess the potential impact of certain medications on renal function and adjust dosages accordingly.

4. Assessment of hydration status:

Creatinine levels can also provide information about hydration status. Dehydration can lead to an increase in creatinine concentration since there is a reduced volume of urine production. Monitoring creatinine levels along with other hydration markers can help evaluate fluid balance and guide appropriate management.

5. Indication of muscle mass

Creatinine production is directly related to muscle mass. Monitoring creatinine levels can give an indication of a person's muscle health and function. Significant decreases in muscle mass, such as in certain medical conditions or malnutrition, can lead to lower creatinine levels.

While creatinine is primarily used as a biomarker for kidney function, it can also provide additional insights into aspects of overall body health, hydration status, and muscle mass. It is important to interpret creatinine levels in the context of an individual's medical history, age, gender.

Pathophysiological explanations and statistical data regarding relationship between longevity and creatinine stability:

The relationship between longevity and creatinine stability is complex and multifactorial. While high levels of creatinine can be indicative of kidney dysfunction, the specific impact on longevity requires a deeper understanding of the underlying pathophysiology and statistical data. Here are some key explanations and insights:

1. Kidney function

Creatinine is primarily filtered by the kidneys and excreted through urine. As individuals age, kidney function can decline, leading to higher creatinine levels. Impaired kidney function can have a negative impact on overall health and longevity.

2. Chronic kidney disease (CKD)

Elevated creatinine levels, particularly in the context of persistent renal dysfunction, may indicate the presence of CKD. CKD is associated with a higher risk of mortality and can contribute to various complications, such as cardiovascular disease and metabolic disorders.

3. Inflammation and oxidative stress

High creatinine levels may reflect chronic inflammation and oxidative stress, both of which are linked to aging and age-related diseases. These processes can contribute to the development of chronic conditions that negatively affect longevity.

4. Other health factors

Creatinine stability is influenced by various health factors, such as muscle mass, hydration status, and overall metabolic health. These factors can interact with longevity biomarkers and impact overall lifespan.

Regarding statistical data, studies examining the specific relationship between creatinine stability and longevity are limited. Most research focuses on creatinine as a marker of renal function and its associations with various health outcomes. However, studies exploring the impact of CKD on mortality and factors influencing creatinine stability can provide insights into longevity risks.

It is important to integrate multiple health indicators, including creatinine levels, in assessing overall health and longevity. Consulting with healthcare professionals, considering other relevant biomarkers, and evaluating individual medical history are essential for a comprehensive understanding of the relationship between creatinine stability and longevity in specific contexts.

Uric acid is an important biomarker for body health:

Uric acid is a compound that is produced during the breakdown of purines, which are substances naturally found in the body and certain foods. While high levels of uric acid can be associated with health issues like gout and kidney stones, uric acid also serves some important functions in the body. Here are a few reasons why uric acid is important for health:

1. Antioxidant activity

Uric acid acts as an antioxidant in the body, meaning it helps neutralize harmful free radicals and protect cells from oxidative damage. Oxidative stress, caused by an imbalance between free radicals and antioxidants, is linked to various chronic diseases, including cardiovascular diseases, cancer, and neurodegenerative disorders. Uric acid's antioxidant activity contributes to overall cellular health and function.

2. Neuroprotective effects

Uric acid has been shown to have neuroprotective properties. It can help protect nerve cells in the brain and spinal cord from damage, reducing the risk of neurodegenerative diseases like Parkinson's and Alzheimer's. Uric acid also acts as a scavenger of harmful molecules that can contribute to neuronal damage and inflammation.

3. Nitric oxide regulation

Uric acid is involved in regulating nitric oxide (NO) levels in the body. Nitric oxide is a crucial signaling molecule that helps relax and dilate blood vessels, improving blood flow and reducing blood pressure. Uric acid can enhance the bioavailability of nitric oxide, aiding in maintaining healthy cardiovascular function.

4. Immune response

Uric acid has been found to play a role in the immune system. It acts as a danger signal, alerting and activating certain immune cells to mount a response against infections and pathogens. Uric acid triggers inflammation at the site of injury or infection, helping to recruit immune cells to the affected area and initiate the immune response.

While uric acid has these essential functions, it's important to note that excessive levels can lead to health problems. An accumulation of uric acid can crystallize and form deposits in joints, causing the painful condition called gout. Kidney stones can also develop when uric acid levels are high. Therefore, maintaining a balanced level of uric acid is crucial for optimal health.

Statistical data regarding longevity and body weight e.g. obesity:

Statistical data reveals a complex relationship between longevity and body weight, particularly in regard to obesity. Here are some key insights:

1. Increased mortality risk

Numerous studies consistently show that obesity is associated with an increased risk of premature death. Obese individuals tend to have higher mortality rates compared to those with a healthy weight.

2. Reduced life expectancy

Obesity has been linked to a shorter life expectancy. Various studies estimate that obese individuals may experience a reduction in life expectancy of anywhere from 2 to 10 years, depending on the severity of obesity.

3. Impact on chronic conditions

Obesity is strongly associated with the development of chronic conditions such as cardiovascular disease, type 2 diabetes, certain cancers, and respiratory disorders. These conditions can significantly impact longevity.

4. Gender differences

Research suggests that the impact of obesity on longevity can vary by gender. In general, obesity tends to have a more negative effect on life expectancy in men compared to women.

5. Age-related effects

The relationship between obesity and longevity appears to differ across age groups. While obesity is associated with increased mortality in middle-aged and older adults, some studies suggest that obesity in older adults may have a protective effect, potentially due to the "obesity paradox" phenomenon.

6. Socioeconomic factors

Longevity is also influenced by socioeconomic factors. Obesity rates are often higher in socioeconomically disadvantaged populations, which can further impact life expectancy.

It's important to note that statistical data reveals correlations, but it doesn't establish causation. Obesity is a complex condition influenced by various genetic, environmental, and lifestyle factors. Overall, maintaining a healthy weight through a balanced diet and regular physical activity is conducive to longevity.

2. METHODS

2.1 MPM background

To learn more about his developed GH-Method: math-physical medicine (MPM) methodology, readers can read the following three papers selected from his published 760+ papers.

The first paper, No. 386 describes his MPM methodology in a general conceptual format. The second paper, No. 387 outlines the history of his personalized diabetes research, various application tools, and the differences between biochemical medicine (BCM) approach versus the MPM approach. The third paper, No. 397 depicts a general flow diagram containing ~10 key MPM research methods and different tools.

2.2 The author's diabetes history

The author was a severe T2D patient since 1995. He weighed 220 lb. (100 kg) at that time. By 2010, he still weighed 198 lb. with an average daily glucose of 250 mg/dL (HbA1C at 10%). During that year, his triglycerides reached 1161 (high risk for CVD and stroke) and his albumin-creatinine ratio (ACR) at 116 (high risk for chronic kidney disease). He also suffered from five cardiac episodes within a decade. In 2010, three independent physicians warned him regarding the need for kidney dialysis treatment and the future high risk of dying from his severe diabetic complications.

In 2010, he decided to self-study endocrinology with an emphasis on diabetes and food nutrition. He spent the entire year of 2014 to develop a metabolism index (MI) mathematical model. During 2015 and 2016, he developed four mathematical prediction models related to diabetes conditions: weight, PPG, fasting plasma glucose (FPG), and HbA1C (A1C). Through using his developed mathematical metabolism index (MI) model and the other four glucose prediction tools, by the end of 2016, his weight was reduced from 220 lbs. (100 kg) to 176 lbs. (89 kg), waistline from 44 inches (112 cm) to 33 inches (84 cm), average finger-piercing glucose from 250 mg/dL to 120 mg/dL, and A1C from 10% to ~6.5%. One of his major accomplishments is that he no longer takes any diabetes-related medications since 12/8/2015.

In 2017, he achieved excellent results on all fronts, especially his glucose control. However, during the pre-COVID period, including both 2018 and 2019, he traveled to ~50 international cities to attend 65+ medical conferences and made ~120 oral presentations. This hectic schedule inflicted damage to his diabetes control caused by stress, dining out frequently, post-meal exercise disruption, and jet lag, along with the overall negative metabolic impact from the irregular life patterns; therefore, his glucose control was somewhat affected during the two-year traveling period of 2018-2019.

He started his COVID-19 self-quarantined life on 1/19/2020. By 10/16/2022, his weight was further reduced to ~164 lbs. (BMI 24.22) and his A1C was at 6.0% without any medication intervention or insulin injection. In fact, with the special COVID-19 quarantine lifestyle since early 2020, not only has he written and published ~500 new research articles in various medical and engineering journals, but he has also achieved his best health conditions for the past 27 years. These achievements have resulted from his non-traveling, low-stress, and regular daily life routines. Of course, his in-depth knowledge of chronic diseases, sufficient practical lifestyle management experiences, and his own developed high-tech tools have also contributed to his excellent health improvements.

On 5/5/2018, he applied a continuous glucose monitoring (CGM) sensor device on his upper arm and checks his glucose measurements every 5 minutes for a total of 288 times each day. Furthermore, he extracted the 5-minute intervals from every 15-minute interval for a total of 96 glucose data each day stored in his computer software.

Through the author's medical research work over 40,000 hours and read over 4,000 published medical papers online in the past 13 years, he discovered and became convinced that good life habits of not smoking, moderate or no alcohol intake, avoiding illicit drugs; along with eating the right food with well-balanced nutrition, persistent exercise, having a sufficient and good quality of sleep, reducing all kinds of unnecessary stress, maintaining a regular daily life routine contribute to the risk reduction of having many diseases, including CVD, stroke, kidney problems, micro blood vessels issues, peripheral nervous system problems, and even cancers and dementia. In addition, a long-term healthy lifestyle can even "repair" some damaged internal organs, with different required time-length depending on the particular organ's cell lifespan. For example, he has "self-repaired" about 35% of his damaged pancreatic beta cells during the past 10 years.

2.3 Energy theory

The human body and organs have around 37 trillion live cells which are composed of different organic cells that require energy infusion from glucose carried by red blood cells; and energy consumption from labor-work or exercise. When the residual energy (resulting from the plastic glucose scenario) is stored inside our bodies, it will cause different degrees of damage or influence to many of our internal organs.

According to physics, energies associated with the glucose waves are proportional to the square of the glucose amplitude. The residual energies from elevated glucoses are circulating inside the body via blood vessels which then impact all of the internal organs to cause different degrees of damage or influence, e.g. diabetic complications. Elevated glucose (hyperglycemia) causes damage to the structural integrity of blood vessels. When it combines with both hypertension (rupture of arteries) and hyperlipidemia (blockage of arteries), CVD or Stroke happens. Similarly, many other deadly diseases could result from these excessive energies which would finally shorten our lifespan. For an example, the combination of hyperglycemia and hypertension would cause micro-blood vessel's leakage in kidney systems which is one of the major cause of CKD.

The author then applied Fast Fourier Transform (FFT) operations to convert the input wave from a time domain into a frequency domain. The y-axis amplitude values in the frequency domain indicate the proportional energy levels associated with each different frequency component of input occurrence. Both output symptom value (i.e. strain amplitude in the time domain) and output symptom fluctuation rate (i.e. the strain rate and strain frequency) are influencing the energy level (i.e. the Y-amplitude in the frequency domain).

Currently, many people live a sedentary lifestyle and lack sufficient exercise to burn off the energy influx which causes them to become overweight or obese. Being overweight and having obesity leads to a variety of chronic diseases, particularly diabetes. In addition, many types of processed food add unnecessary ingredients and harmful chemicals that are toxic to the bodies, which lead to the development of many other deadly diseases, such as cancers. For example, ~85% of worldwide diabetes patients are overweight, and ~75% of patients with cardiac illnesses or surgeries have diabetes conditions.

In engineering analysis, when the load is applied to the structure, it bends or twists, i.e. deform; however, when the load is removed, it will either be restored to its original shape (i.e, elastic case) or remain in a deformed shape (i.e. plastic case). In a biomedical system, the glucose level will increase after eating carbohydrates or sugar from food; therefore, the carbohydrates and sugar function as the energy supply. After having labor work or exercise, the glucose level will decrease. As a result, the exercise burns off the energy, which is similar to load removal in the engineering case. In the biomedical case, both processes of energy influx and energy dissipation take some time which is not as simple and quick as the structural load removal in the engineering case. Therefore, the age difference and 3 input behaviors are "dynamic" in nature, i.e. time-dependent. This time-dependent nature leads to a "viscoelastic or viscoplastic" situation. For the author's case, it is "viscoplastic" since most of his biomarkers are continuously improved during the past 13-year time window.

2.4 Time-dependent output strain and stress of (viscous input*output rate)

Hooke's law of linear elasticity is expressed as:

Strain (ε: epsilon)
= Stress (σ: sigma) / Young's modulus (E)

For biomedical glucose application, his developed linear elastic glucose theory (LEGT) is expressed as:

PPG (strain)
= carbs/sugar (stress) * GH.p-Modulus (a positive number) + post-meal walking k-steps * GH.w-Modulus (a negative number)

Where GH.p-Modulus is reciprocal of Young's modulus E.

However, in viscoelasticity or viscoplasticity theory, the stress is expressed as:

Stress
= viscosity factor (η: eta) * strain rate (dε/dt)

Where strain is expressed as Greek epsilon or ε.

In this article, in order to construct an "ellipse-like" diagram in a stress-strain space domain (e.g. "hysteresis loop") covering both the positive side and negative side of space, he has modified the definition of strain as follows:

Strain
= (body weight at certain specific time instant)

He also calculates his strain rate using the following formula:

Strain rate
= (body weight at next time instant) - (body weight at present time instant)

The risk probability % of developing into CVD, CKD, Cancer is calculated based on his developed metabolism index model (MI) in 2014. His MI value is calculated using inputs of 4 chronic conditions, i.e. weight, glucose, blood pressure, and lipids; and 6 lifestyle details, i.e. diet, drinking water, exercise, sleep, stress, and daily routines. These 10 metabolism categories further contain ~500 elements with millions of input data collected and processed since 2010. For individual deadly disease risk probability %, his mathematical model contains certain specific weighting factors for simulating certain risk percentages associated with different deadly diseases, such as metabolic disorder-induced CVD, stroke, kidney failure, cancers, dementia; artery damage in heart and brain, micro-vessel damage in kidney, and immunity-related infectious diseases, such as COVID death.

Some of explored deadly diseases and longevity characteristics using the viscoplastic medicine theory (VMT) include stress relaxation, creep, hysteresis loop, and material stiffness, damping effect based on time-dependent stress and strain which are different from his previous research findings using linear elastic glucose theory (LEGT) and nonlinear plastic glucose theory (NPGT).

Note: For a more detailed description, please refer to the "consolidated method" section which is given at the beginning of the special issue.

3. RESULTS

Figure 1 shows outputs and data tables.

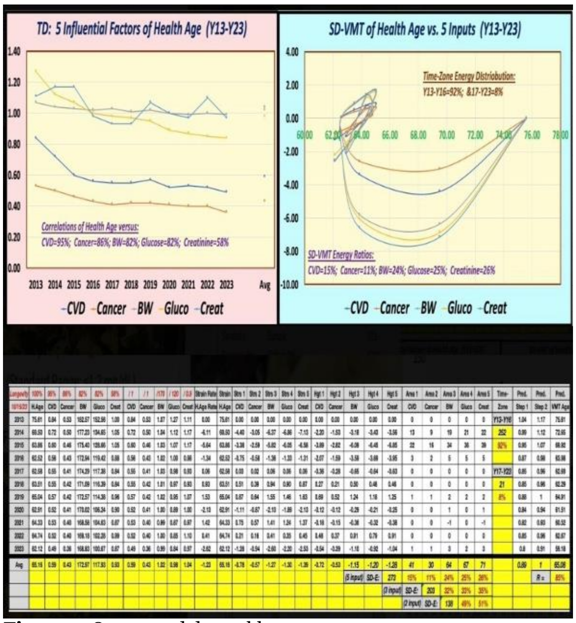


Figure 1: Output and data tables.

4. CONCLUSION

In summary, the analysis yielded the following five observations:

1. Time-domain correlation analysis indicates strong correlations between health age and these five inputs as follows: 95% for CVD, 86% for cancer, 82% for BW, 82% for T2D, and 58% for creatinine.

2. Space-domain viscoplastic energy (SD-VMT) analysis reveals different energy ratios for each input: 15% for CVD, 11% for cancer, 24% for BW, 25% for T2D, and 26% for creatinine.

3. Regarding energy distribution among these five inputs, cancer risk showed the lowest energy contribution, while CVD risk had 4% more energy. Obesity, T2D, and creatinine had nearly equal amounts of energy. When comparing three inputs (BW, T2D, creatinine), each contributed around 1/3 of the total energy. Comparing two inputs (T2D, creatinine), each contributed around 1/2 of the energy.

4. The distribution of energy in two different time zones was significantly different, with 92% attributed to the earlier period of Y13-Y16 and only 8% to the recent period of Y17-Y23. This suggests that the author's energy contribution to longevity during the recent period has been minimal.

5. The VMT-predicted health age curve exhibits a correlation coefficient of 85% with MI-calculated health age curve.

This study highlights the significance of creatinine in his overall health and longevity perspectives, especially following his experience of chronic kidney diseases around 2010.

5. REFERENCES

For editing purposes, majority of the references in this paper, which are self-references, have been removed for this article. Only references from other authors' published sources remain. The bibliography of the author's original self-references can be viewed at www.eclairemd.com.

Readers may use this article as long as the work is properly cited, and their use is educational and not for profit, and the author's original work is not altered.

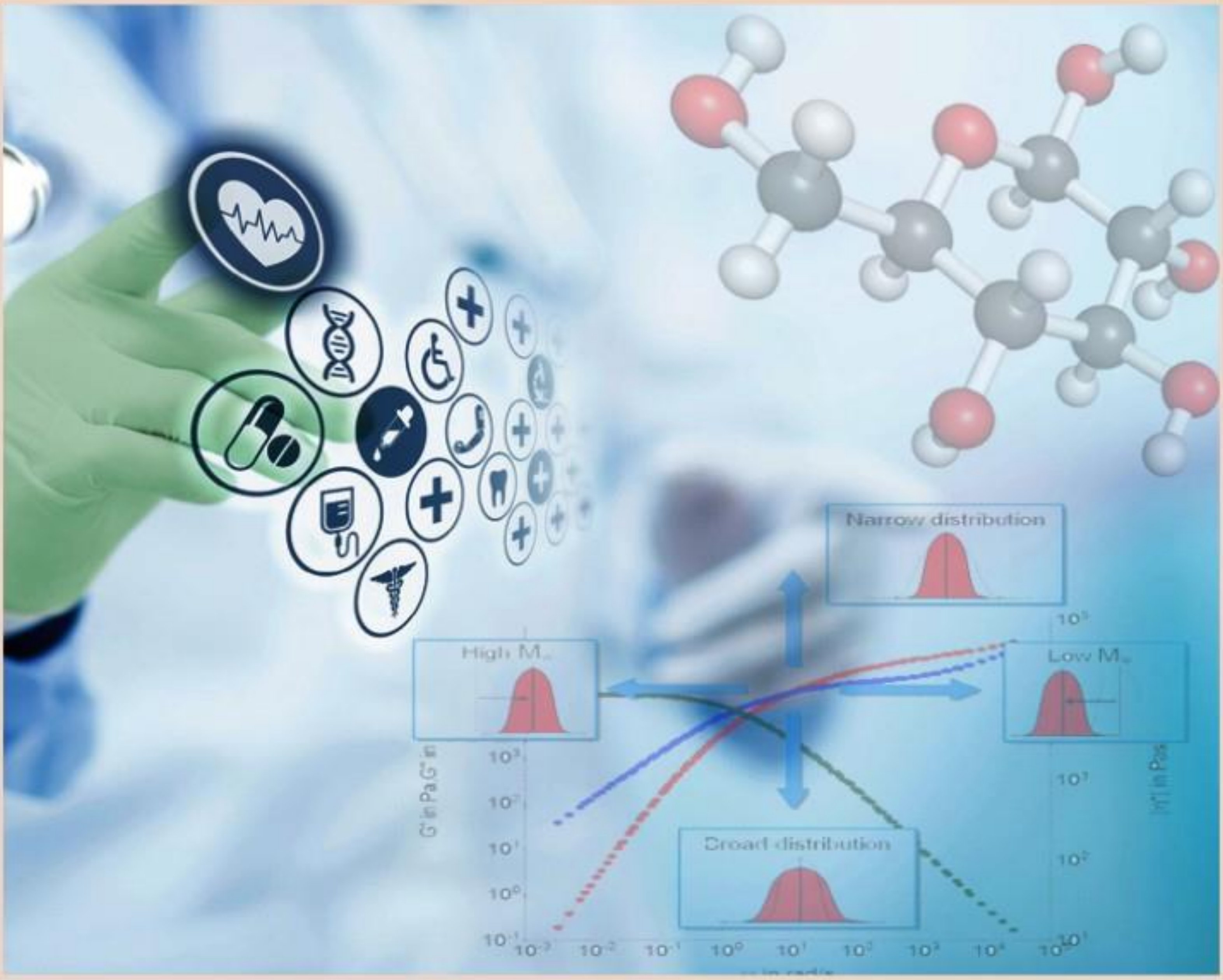
For reading more of the author's published VGT or FD analysis results on medical applications, please locate them through platforms for scientific research publications, such as ResearchGate, Google Scholar, etc.

Special Issue | Issue No. 5

The GH-Method

Viscoelastic and Viscoplastic Glucose Theory Application in Medicine

Gerald C. Hsu



https://theghmethod.com

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