The GH-Method

Viscoelastic Medicine Theory (VMT #337): Multi-Tiered VMT Energy Method Uses Multiple Tiers of Input Causes to Predict Longevity via CVD, CKD and Cancers Based on GH-Method: Math-Physical Medicine (No. 937)

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Abstract

Since January 2021, the author has been utilizing the space-domain viscoplastic energy model (SD-VMT) from physics and advanced engineering in his medical research endeavors. Focused on the VMT methodology, he has authored a total of 337 research papers to date. In the United States, heart diseases & strokes (CVD), kidney diseases (CKD), and various cancers contribute to over 1.5 million deaths annually, surpassing 50% of the total annual death cases (approximately 3 million per year in recent years). This article aims to explore longevity by examining both the age difference (biological age minus health age) and health age in relation to three selected mortality diseases. The author adopts a multi-tiered VMT research approach that considers various influential factors across three stages. These three stages comprise poor lifestyles in the first stage, induced metabolic disorders in the second stage, and the contribution of the three selected fatal diseases in the third stage. Consequently, the author compares the VMT-based longevity calculations with the metabolism index (MI)-based longevity estimations, assessing his prediction accuracy and waveform correlation. This study utilizes a three-tiered SD-VMT model, analyzing the interactions among multiple influential factors and multiple disease symptoms. The data for this analysis were collected between January 1, 2015, and September 23, 2023. In summary, this longevity study yields four significant findings: 1. The VMT analysis reveals that the total energy ratios for CVD, CKD, and cancers are approximately 31%-32%, 44%-45%, and 24%-25% respectively, for both age difference and health age cases. 2. The energy distribution across time zones shows that 58%-59% of the energy is allocated to the Y15-Y19 period, while 41%-42% is allocated to the Y20-Y23 period, resulting in a 60/40 split. 3. The VMT-based predicted longevity demonstrates an average value identical to the average value of metabolism index (MI)-based longevity, with a prediction accuracy of 100%. Interestingly, there are negative waveform correlations between VMT-based longevity and MI-based longevity for both age difference and health age cases. However, the undeniable finding remains that the author has successfully maintained a younger health age in recent years through his continuous efforts in risk reduction for these three selected fatal diseases. 4. The author's biological age has steadily increased from 67 to 76, while health age has remained relatively stable, ranging between 63 and 67. This discrepancy between his biological and health ages has resulted in the observed negative correlations in the third observation. In conclusion, this multi-tiered VMT model provides a comprehensive understanding and a continuous roadmap that outlines the relationship between key lifestyle factors, four basic metabolic disorders, the risk of developing three selected mortality diseases, and ultimately enhancing prospects for longevity. This concept and practice can be applicable to any patient's case.

Keywords: Viscoelastic; Viscoplastic; Cardiovascular diseases; Chronic kidney diseases; Cancers; Body weight; Diabetes; Exercise

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

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1. INTRODUCTION

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In the United States, heart diseases & strokes (CVD), kidney diseases (CKD), and various cancers contribute to over 1.5 million deaths annually, surpassing 50% of the total annual death cases (approximately 3 million per year in recent years). This article aims to explore longevity by examining both the age difference (biological age minus health age) and health age in relation to three selected mortality diseases. The author adopts a multi-tiered VMT research approach that considers various influential factors across three stages. These three stages comprise poor lifestyles in the first stage, induced metabolic disorders in the second stage, and the contribution of the three selected fatal diseases in the third stage.

Consequently, the author compares the VMT-based longevity calculations with the metabolism index (MI)-based longevity estimations, assessing his prediction accuracy and waveform correlation. This study utilizes a three-tiered SD-VMT model, analyzing the interactions among multiple influential factors and multiple disease symptoms. The data for this analysis were collected between January 1, 2015, and September 23, 2023.

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.

Notes from the author of this paper:

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.

Pathophysiological explanations and statistical data regarding longevity versus CVD, CKD, and cancers:

The following descriptions offer a general information on the pathophysiological explanations and statistical data regarding longevity in relation to cardiovascular disease (CVD), chronic kidney disease (CKD), and various cancers.

1. Cardiovascular disease (CVD)

Pathophysiological explanation

CVD encompasses conditions like coronary artery disease and strokes. The primary culprit is atherosclerosis, the buildup of plaque in arteries. Risk factors include high blood pressure, high cholesterol, smoking, obesity and diabetes.

Statistical data

CVD is a leading cause of death worldwide. Statistics vary by region, but globally, millions of people die from CVD each year. Improvements in lifestyle (diet and exercise), early detection, and medical treatments have increased longevity for many individuals with CVD.

2. Chronic kidney disease (CKD)

Pathophysiological explanation

CKD involves the gradual loss of kidney function over time. Causes can include obesity, diabetes, high blood pressure, and certain genetic factors. CKD can lead to kidney failure, necessitating dialysis or transplantation.

Statistical data

CKD prevalence has been on the rise, often linked to the global increase in obesity, diabetes and hypertension. While CKD itself may not be a direct cause of death, it increases the risk of complications and can reduce longevity. The average surviving years after starting kidney dialysis can vary depending on several factors, including the individual's overall health, age, underlying medical conditions, and adherence to treatment. However, on average, studies suggest that individuals on kidney dialysis can expect to survive for approximately 5-10 years.

3. Cancers

Pathophysiological explanation

Cancer is a complex group of diseases characterized by uncontrolled cell growth. There are various types, each with its own pathophysiology. Risk factors include genetics, lifestyle choices, exposure to carcinogens, and age.

In addition, obesity and diabetes have been shown to play some roles in the development and progression of certain types of cancers.

1. Obesity

Research has indicated that obesity is associated with an increased risk of developing various cancers, including colorectal cancer, breast cancer (in postmenopausal women), endometrial cancer, kidney cancer, pancreatic cancer, and liver cancer. Several mechanisms may contribute to this increased risk, such as chronic inflammation, altered hormone levels (e.g., insulin and estrogen), and changes in the immune system.

2. Diabetes

Type 2 diabetes has also been linked to an increased risk of certain cancers. People with diabetes often have elevated levels of insulin, which can promote the growth of cancer cells. Individuals with diabetes are at a higher risk for developing liver, pancreatic, endometrial, colorectal, breast, and bladder cancer. Additionally, some studies have suggested an association between diabetes and an increased risk of kidney, ovarian, and lung cancer, although the evidence is not as strong.

It's important to note that while there is an association between obesity, diabetes, and certain cancers, these conditions do not necessarily guarantee the development of cancer. Many other factors, such as genetics, lifestyle choices, and environmental factors, also play a role in cancer development. Maintaining a healthy weight, following a balanced diet, engaging in regular physical activity, and managing diabetes effectively can help reduce the risk of developing obesity- and diabetes-related cancers. Regular check-ups and screenings are also important for early detection and treatment.

Statistical data

Cancer is a major global health concern. Its impact on longevity varies by type and stage. Advances in early detection, treatment modalities like chemotherapy, radiation, and immunotherapy, have improved survival rates for many cancer patients.

It's important to note that while these conditions can impact longevity, individual outcomes vary widely based on factors like early diagnosis, access to healthcare, and lifestyle choices. Advances in medical science and public health initiatives continue to shape these statistics and improve longevity for individuals with these conditions.

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 4 data tables of longevity.

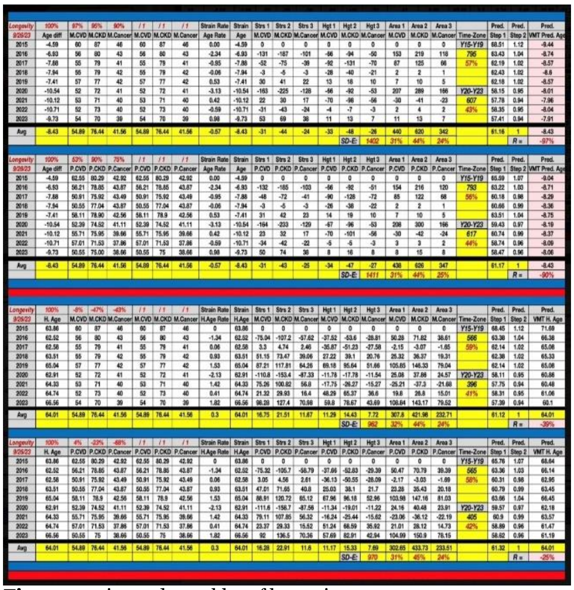

Figure 1: 4 input data tables of longevity.

Figure 2 shows 6 output diagrams of longevity.

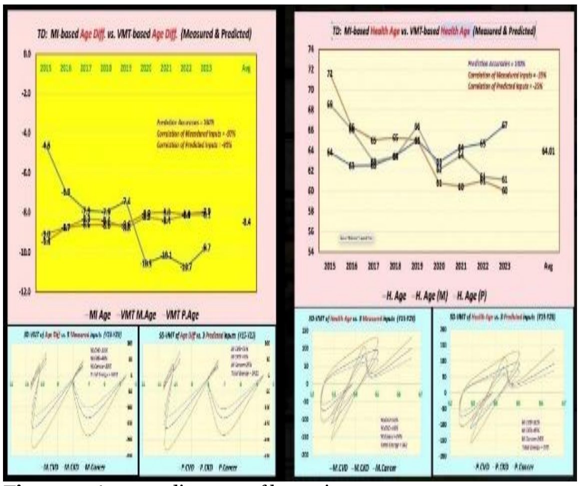

Figure 2: 6 output diagrams of longevity.

4. CONCLUSION

In summary, this longevity study yields four significant findings:

1. The VMT analysis reveals that the total energy ratios for CVD, CKD, and cancers are approximately 31%-32%, 44%-45%, and 24%-25% respectively, for both age difference and health age cases.

2. The energy distribution across time zones shows that 58%-59% of the energy is allocated to the Y15-Y19 period, while 41%-42% is allocated to the Y20-Y23 period, resulting in a 60/40 split.

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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.

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.

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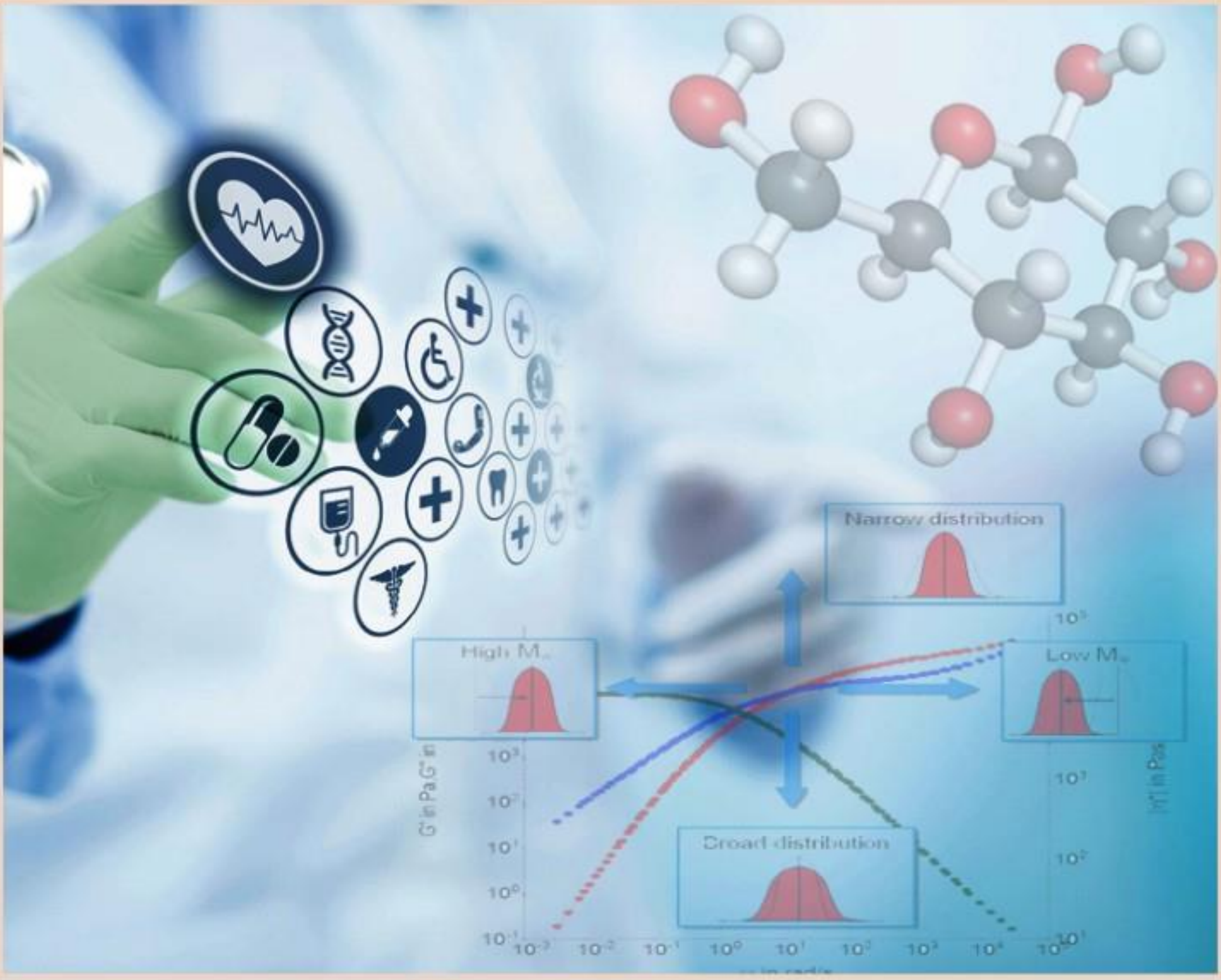

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