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The GH-Method

Viscoelastic Medicine theory (VMT #400): A summarized report of three research reports regarding the ability of accurately predicting body weight, fasting morning glucose, and post-meal glucose and their impacts on daily averaged glucose, overall metabolism, and CVD risks using viscoplastic energy model of GH-Method: math-physical medicine (No. 1002)

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Abstract

This article presents a summarized report of three individual analyses conducted by the author on glucose, metabolism, CVD risk and their three common influential factors of both measured and predicted body weight (BW), fasting morning glucose (FPG), and post-meal glucose (PPG):
- Paper number 999: daily average glucose (eAG or M2) vs. BW, FPG, PPG.
- Paper number 1000: metabolism index (MI) vs. BW, FPG, PPG.
- Paper number 1001: cardiovascular disease risks (CVD) vs. BW, FPG, PPG.

The author utilized the space-domain viscoplastic medicine energy theory (SD-VMT) to explore dynamic interactions between these three biomedical outputs and three common influential factors over a period of 8.5 years from 8/1/2015 to 12/15/2023.

In conclusion, the summarized findings, based on SD-VMT energies, are:

Firstly, he developed 3 prediction equations for body weight, FPG and PPG had demonstrated exceptionally high accuracy and very high waveform similarities, both exceeding 99% (based on 90-day moving average data over 8.5 years from 8/1/2025 to 12/15/2923).

Secondly, in these three cases of daily average glucose (eAG or M2), metabolism index (MI), and cardiovascular disease risks (CVD), the most significant influential factor is his fasting glucose (FPG, an indicator of pancreatic beta cells' health state, including insulin resistance), ranking at 38%-39%, followed by his body weight (BW) at 32%, and his post-meal glucose (PPG) at 29%-30%.

Thirdly, all of correlations between outputs and inputs for both measured and predicted cases are high and shown below:
- M2: 91%-99%
- MI: 78%-92%
- CAV: 79%-92%

All of the 18 calculated waveform similarities (correlations) are quite high and greater than 78%.

Key Message:
In conclusion, effective management of both body weight and glucose is crucial for overall health. The impactful influence of fasting glucose on M2 glucose, metabolism index, and CVD risk is notable.

Moreover, improved prediction capabilities using mathematics, physics, and engineering can lead to better health outcomes, aligning with the essential spirit of "preventive medicine".

Keywords: Viscoelastic; Viscoplastic; Preventive Medicine; Diabetes; Glucose; Sleep; Lifestyle; Dementia; Exercise; Cancer; Biomarkers

Abbreviations: CKD: Chronic Kidney Disease CGM: continuous glucose monitoring; T2D: type 2 diabetes; PPG: postprandial plasma glucose; FPG: fasting plasma glucose; SD-VMT: Space-Domain Viscoelastic Medicine Energy Theory; FFT: Fast Fourier Transform; CVD: Cardiovascular Diseases; MI: Metabolism Index; BW: Body Weight

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1. INTRODUCTION

This article presents a summarized report of three individual analyses conducted by the author on glucose, metabolism, CVD risk and their three common influential factors of both measured and predicted body weight (BW), fasting morning glucose (FPG), and post-meal glucose (PPG):

- Paper number 999: daily average glucose (eAG or M2) vs. BW, FPG, PPG.

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The author utilized the space-domain viscoplastic medicine energy theory (SD-VMT) to explore dynamic interactions between these three biomedical outputs and three common influential factors over a period of 8.5 years from 8/1/2015 to 12/15/2023.

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, to optimize 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.

Pathophysiological explanations of the relationship between daily averaged glucose and body weight, fasting morning glucose, and post-meal glucose

The relationship between daily averaged glucose and body weight, fasting morning glucose and post-meal glucose can be explained through various pathophysiological mechanisms.

1. Body Weight: Increased body weight can lead to insulin resistance, which in turn can cause higher blood glucose levels. Adipose tissue produces hormones and inflammatory substances that can impair insulin sensitivity and lead to elevated blood glucose levels.

2. Fasting Morning Glucose: In the early morning, the body's hormonal balance and the effect of the dawn phenomenon can cause an increase in fasting morning glucose. This may be influenced by the release of counter-regulatory hormones such as cortisol and growth hormone, leading to higher blood glucose levels.

3. Post-Meal Glucose: After consuming a meal, blood glucose levels rise as the body metabolizes carbohydrates and sugar. In individuals with impaired glucose tolerance, post-meal glucose levels can remain elevated for longer periods due to delayed insulin response or insulin resistance.

These pathophysiological explanations illustrate how factors such as body weight, hormonal fluctuations, and insulin sensitivity can impact daily averaged glucose levels. Understanding these relationships can be valuable in managing and predicting glucose levels in individuals with diabetes or other metabolic conditions.

Pathophysiological explanations of the relationship between overall metabolism and body weight, fasting morning glucose, and post-meal glucose

The relationship between overall metabolism and body weight, fasting morning glucose, and post-meal glucose can be understood through various pathophysiological mechanisms:

1. Body Weight: Metabolism plays a critical role in regulating body weight. An imbalance in energy intake and expenditure can lead to weight gain or loss. Factors such as basal metabolic rate, thermogenesis, and metabolic processes related to energy storage and expenditure can influence body weight.

2. Fasting Morning Glucose: Metabolism affects fasting morning glucose levels through the regulation of glucose production and utilization. During fasting periods, the body relies on gluconeogenesis, glycogenolysis, and hormonal control to maintain blood glucose levels. Disruptions in these metabolic pathways can lead to elevated fasting morning glucose levels.

3. Post-Meal Glucose: Following a meal, metabolism governs the breakdown and

absorption of nutrients, particularly carbohydrates and sugar. The efficiency of glucose uptake by cells and the insulin response to manage postprandial glucose levels are influenced by metabolic processes such as digestion, nutrient transport, and insulin sensitivity.

Overall, metabolism has a profound impact on body weight regulation and the management of fasting and post-meal glucose levels. Dysregulation in metabolic pathways, such as impaired insulin function or disruptions in energy homeostasis, can contribute to variations in glucose levels and body weight. Understanding these pathophysiological relationships is crucial in the management of metabolic disorders and conditions like diabetes.

Pathophysiological explanations of the relationship between CVD risks and body weight, fasting morning glucose, and post-meal glucose:

The relationship between cardiovascular disease (CVD) risks and body weight, fasting morning glucose, and post-meal glucose involve various pathophysiological factors:

1. Body Weight: Excess body weight, particularly in the form of visceral adiposity (belly fat), is associated with an increased risk of CVD. Adipose tissue secretes inflammatory cytokines and adipokines, contributing to systemic inflammation and insulin resistance, which are risk factors for CVD. Additionally, obesity is linked to hypertension and dyslipidemia, both of which are established risk factors for CVD. Hypertension relates to after ruptures and dyslipidemia is related to after blockage.

2. Fasting Morning Glucose: Elevated fasting morning glucose levels are indicative of impaired glucose metabolism (especially insulin resistance), which is linked to an increased risk of CVD. Chronic hyperglycemia can contribute to endothelial dysfunction, oxidative stress, and inflammation, all of which are involved in the development and progression of atherosclerosis and CVD.

3. Post-Meal Glucose: Higher post-meal glucose levels, especially if sustained over time, can contribute to atherosclerosis and endothelial dysfunction. Postprandial hyperglycemia has been associated with an increased risk of CVD events due to its impact on oxidative stress, inflammation, and impaired vascular function.

In summary, the relationship between CVD risks and body weight, fasting morning glucose, and post-meal glucose involves the complex interplay of metabolic imbalances, chronic inflammation, and endothelial dysfunction. These factors contribute to the development and progression of atherosclerosis and ultimately increase the risk of cardiovascular events. Effective management of body weight and glucose levels is crucial in mitigating these risks and promoting cardiovascular health

Note by the author

The author experienced 5 cardio episodes between 1995 and 2004 when he weighed 220 lbs (BMI 32) and had an eAG of 280 mg/dL, FPG at 180 mg/dL, and PPG at 380 mg/dL. However, after 15 years of self-education on internal medicine and making stringent and persistent lifestyle improvements, by 2023, his weight has been reduced to 164 lbs (BMI 24), with an eAG of 100 mg/dL, FPG at 89 mg/dL, and PPG at 104 mg/dL. Since 2005, he has not suffered any heart issues.

1.2 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 (Reference 1) describes his MPM methodology in a general conceptual format. The second paper, No. 387 (Reference 2) outlines the history of his personalized diabetes research, various application tools, and the differences between the biochemical medicine (BCM) approach versus the MPM approach. The third paper, No. 397 (Reference 3) depicts a general flow diagram containing ~10 key MPM research methods and different tools.

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 developing 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 travelled 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 travelling 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-travelling, low-stress, and regular daily life routines. Of course, his in-depth knowledge of chronic diseases, sufficient practical lifestyle management experiences, and his 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 checked 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 of over 40,000 hours and reading 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.

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 example, the combination of hyperglycemia and hypertension would cause micro-blood vessel leakage in kidney systems which is one of the major causes 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) influence 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 have continuously improved during the past 13-year time window.

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 the 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, 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 a 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, and 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 the 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).

2. RESULTS

Figure 1 shows three data tables. Figure 2 shows the inputs and SD-VMT energy output diagram.

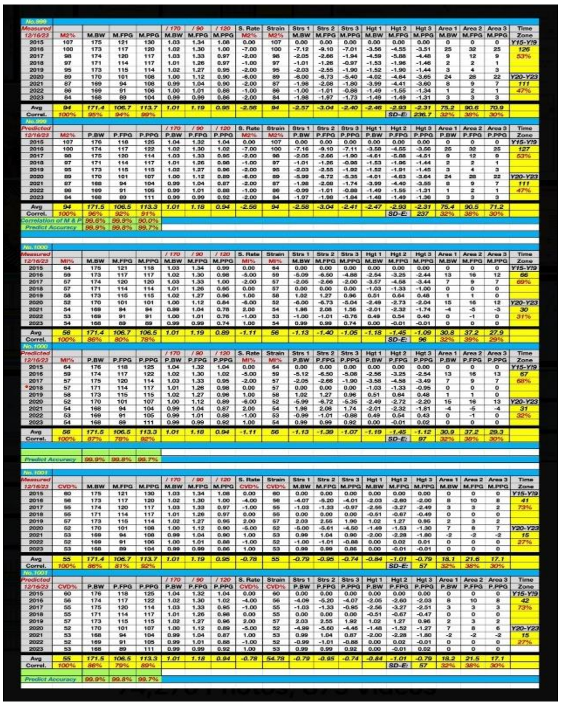

Figure 1: Three data tables.

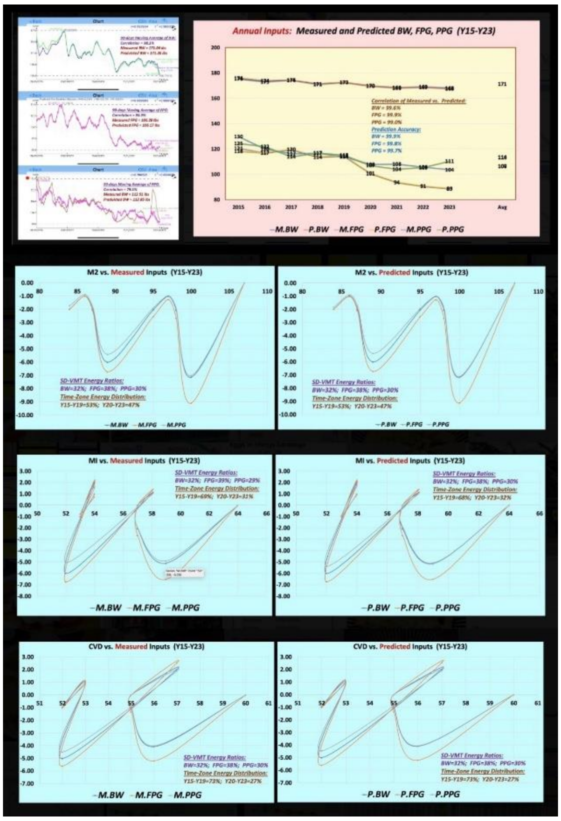

Figure 2: Inputs and SD-VMT energy output diagram.

3. CONCLUSION

In conclusion, the summarized findings, based on SD-VMT energies, are:

Firstly, his developed 3 prediction equations for body weight, FPG and PPG had demonstrated exceptionally high accuracy and very high waveform similarities, both exceeding 99% (based on 90-days moving average data over 8.5 years from 8/1/2025 to 12/15/2923).

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Thirdly, all of correlations between outputs and inputs for both measured and predicted cases are high and shown below:

- M2: 91%-99%

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- CAV: 79%-92%

All of 18 calculated waveform similarities (correlations) are quite high and greater than 78%.

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In conclusion, effective management of both body weight and glucose is crucial for overall health. The impactful influence of fasting glucose on M2 glucose, metabolism index, and CVD risk is notable.

Moreover, improved prediction capabilities using mathematics, physics, and engineering can lead to better health outcomes, aligning with the essential spirit of "preventive medicine".

4. REFERENCES

For editing purposes, the majority of the references in this paper, which are self-references, have been removed from 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.

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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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Viscoelastic and Viscoplastic Glucose Theory Application in Medicine

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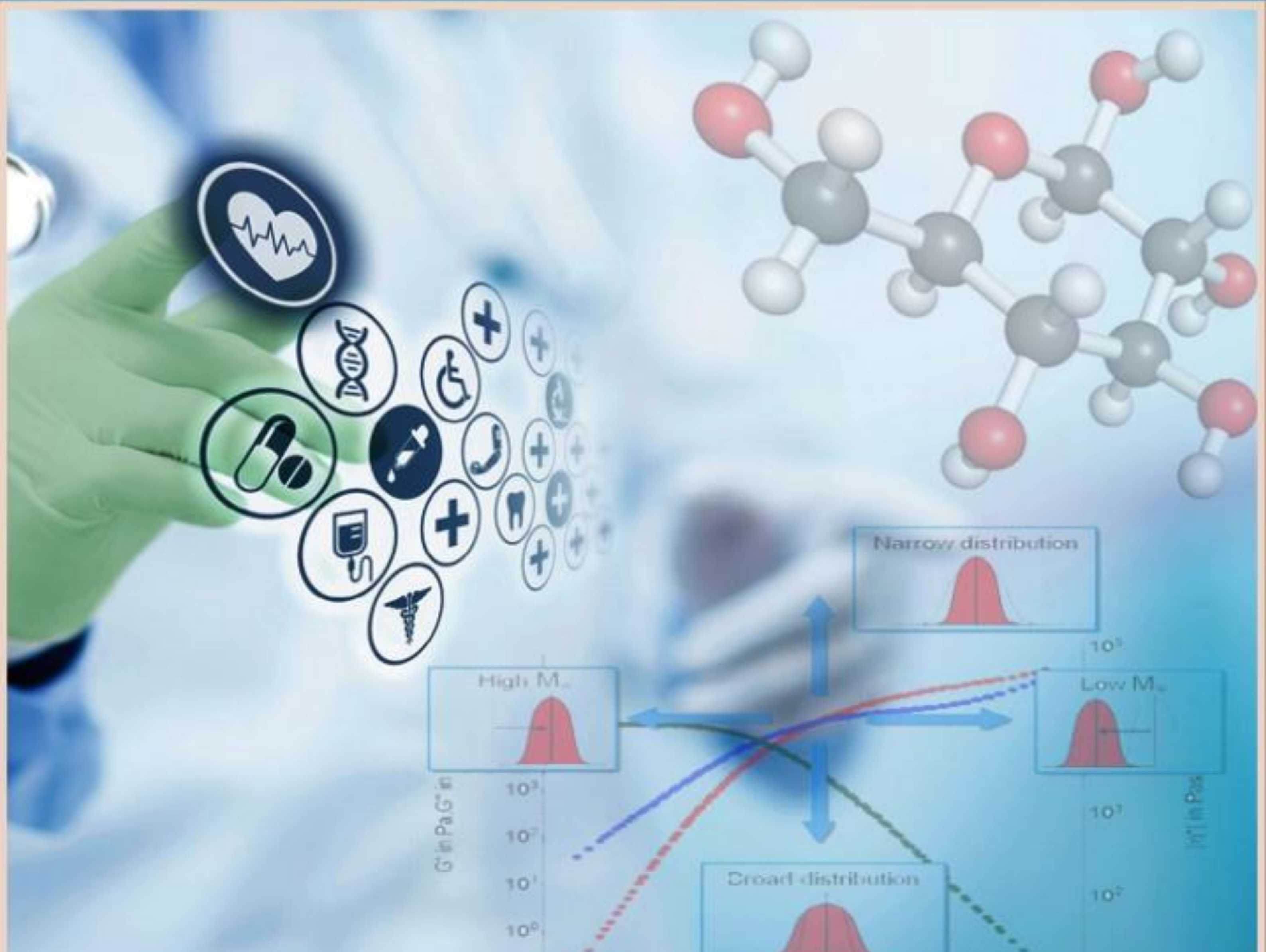

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