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2023

The GH-Method

Hypothesis of Communication Model between the Brain and Other Organs Based on PPG of Vegetable Meals (No. 233)

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Abstract

In this paper, the author presents the results of his 6-month research project conducted between September 2019 and February 2020. The goal of this study was to identify a potential internal communication model involving the brain, nervous system, and crucial internal organs, specifically the stomach, liver, and pancreas. This hypothesis was developed based on an analysis of his postprandial plasma glucose (PPG) production resulting from 40 vegetable-based meals between May 5, 2018, and February 29, 2020. It is evident that soup-based liquid food generated significantly lower glucose levels compared to pan-fried solid food, despite both liquid and solid meals containing nearly identical nutritional ingredients, sugar and carbohydrates content. The author employed the GH-Method: math-physical medicine (MPM) approach to investigate a type 2 diabetes (T2D) patient's glucose production from a scientific perspective involving the brain and nervous system's functionalities. If this specific approach and the associated hypothesis or interpretation prove to be accurate, it would be possible to "trick" the brain into producing a reduced amount of glucose after food consumption without compromising the essential nutritional balance. Consequently, T2D patients could achieve lower peak PPG values and average PPG levels simply by modifying their cooking methods.

Keywords: Brain; Stomach; Liver; Neuro-communication; Cooking method

Abbreviations: T2D: type 2 diabetes; PPG: postprandial plasma glucose; MPM: math-physical medicine

Available online: 05 December 2023

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1. INTRODUCTION

In this paper, the author presents his 6-month research results, from September 2019 through February 2020, to identify a probable internal communication model between the brain, nervous system, and certain vital internal organs, specifically the stomach, liver, and pancreas. This hypothesis is created based on various postprandial plasma glucose (PPG) production amount of 40 vegetables meals during a period from 5/5/2018 to 2/29/2020.

2. METHODS

The author used a continuous glucose monitor (CGM) device to collect 50,454 glucose data during the past 668 days (from 5/5/2018 through 2/29/2020 on the average of 75.53 glucose measurements per day). After the first bite of his meal, he measured his PPG data every 15 minutes for a 3-hour period (180 minutes). In addition, he also measured his PPG value at 2-hours after his meal via the finger-piercing method. He has focused on studying the relationships among different food nutritional contents, cooking methods, food material's physical phases, and different characteristics and variants from his glucose waveform patterns (i.e. PPG curves). Based on his careful observations of physical phenomena of glucose results, he has created some bold hypotheses for a probable neurology communication model between the brain, and stomach, liver, pancreas via our nervous system regarding glucose production amount, timing, and pattern. He then attempted to verify his created hypotheses via his big data analytics from his collected thousands of data based on various food elements and glucoses along with appropriate mathematical tools and artificial intelligence techniques.

In this particular study, he focused on the following two major meal groups, soup vegetables and pan-fried vegetables. Each of these two kinds of meals include two kinds of vegetables, cabbage and squash.

Figure 1 provides an overview of the food nutritional ingredients, meal preparation, cooking methods for squash and cabbage to create soup-based (liquid) meals and pan-fried (solid) meals. It also includes the carbs/sugar content in one cup of chopped cabbage and sliced squash.

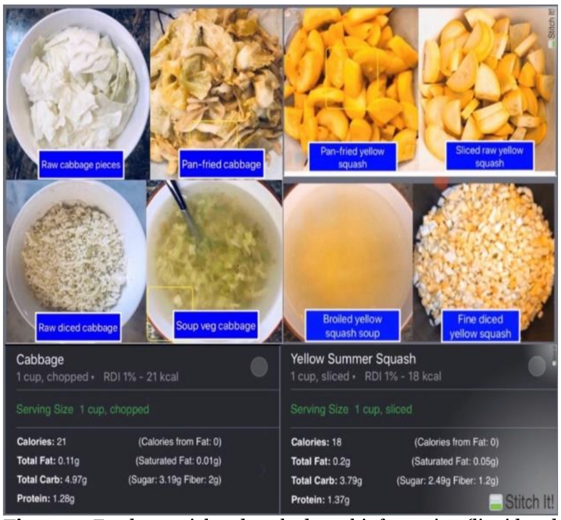

Figure 1: Food material and cooked meal information (liquid and solid, cabbage and squash).

In these two meal groups, pan-fried vegetables were cut into approximately 58 square centimeters (about 9 square inches) for cabbage and about 14.5 square centimeters (approximately 2.25 square inches) for squash. A small amount of olive oil and salt, both with zero carbs/sugar, was used to cook the pan-fried solid food. However, soup-based vegetables were diced into tiny pieces and then boiled in hot water for about 10 minutes to create a semi-liquified broth. Both liquid and solid meals contained the same food nutritional ingredients and nearly identical carbs/sugar amounts. Specifically, one cup of cabbage contains 8.2 grams of carbs/sugar, while one cup of squash contains 6.3 grams of carbs/sugar.

In the first group, the author had 20 soup-based (broth-style) "liquid" phase meals, with "broth" denoting the absence of chunky pieces. In the second group, he had 20 pan-fried "solid" phase meals. During these 40 experiments, no other foods were consumed to maintain the "purity" of the collected data.

3. RESULTS

Figure 2 presents detailed background data for both types of meals, including carbs/sugar amounts in grams, post-meal walking steps, and PPG values in mg/dL measured using both finger-piercing and CGM sensor-collected methods.

CGM Sensor PPG	Soup veg	Pan-fried veg	5/5/18 - 2/29/20	PPG Difference
0 min	112	119	0 min	7
15 min	116	118	15 min	3
30 min	122	129	30 min	7
45 min	120	140	45 min	20
60 min	115	140	60 min	25
75 min	110	132	75 min	22
90 min	109	122	90 min	14
105 min	108	117	105 min	9
120 min	108	115	120 min	7
135 min	107	115	135 min	8
150 min	108	114	150 min	5
165 min	106	114	165 min	8
180 min	104	114	180 min	10
Finger PPG, Carbs, Walking	**Soup veg**	**Pan-fried veg**	**5/5/18 - 2/29/20**	**PPG Difference**
No. of Meals	20	20	No. of Meals	0
Avg Sensor PPG	111	122	Avg Sensor PPG	11
Avg Finger PPG	108	111	Avg Finger PPG	3
Carbs/Sugar grams	11.6	12.7	Carbs/Sugar grams	1.1
Post-Meal Walking	5077	4661	Post-Meal Walking	-416
Candlestick K-Line PPG	**Soup veg**	**Pan-fried veg**	**5/5/18 - 2/29/20**	**K-Line PPG Difference**
Avg PPG	113	123	Avg PPG	10
Open PPG	114	118	Open PPG	4
Closed PPG	104	114	Closed PPG	10
Max PPG	137	158	Max PPG	21
Min PPG	95	103	Min PPG	8

Figure 2: Background data table (CGM sensor, ginger, carbs/sugar, post-meal walking, Candlestick K-Line).

Summarized findings are as follows:

1. Carbs/Sugar Amount: Utilizing his developed optical physics AI system, the author's estimated carbs/sugar amounts were 11.6 grams for liquid meals and 12.7 grams for solid meals (equivalent to about 2 cups of vegetables). These estimates align with his knowledge acquired from nine years of self-studying food nutrition.

2. Post-Meal Walking: All post-meal walking exercises exceeded 4,000 steps, ranging from 4,661 to 5,077. This suggests that exercise's influence on PPG can be disregarded in this research. The author's body weight remained in a constant range of 170-174 lbs (77-79 kg).

3. Finger-Piercing PPG: The finger-piercing PPG values were 111 mg/dL for liquid meals and 122 mg/dL for solid meals. These results indicate that traditional finger-piercing tests at 2 hours after the first bite of a meal may not yield meaningful findings in this research. More comprehensive glucose waveform data and a larger dataset would be needed to derive more meaningful results for the author's communication between brain and nervous system research.

Figure 3 (liquid soup vegetables) and Figure 4 (solid pan-fried vegetables) show line chart of “synthesized PPG” waveforms over 180-minutes timeframe, and two “candlestick K-Line” chart of meals' glucoses over this investigation period.

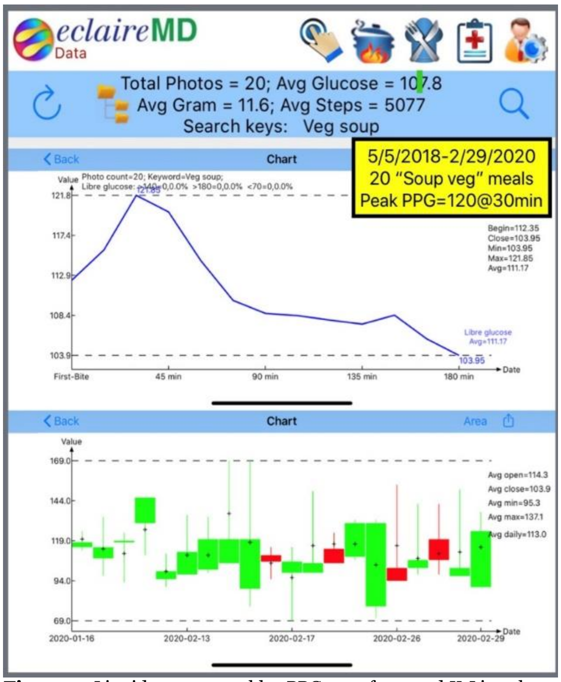

Figure 3: Liquid soup vegetables PPG waveform and K-Line chart.

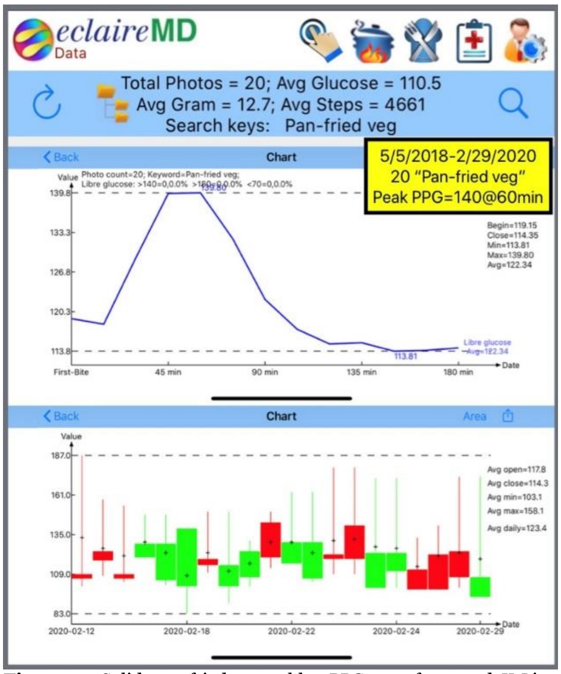

Figure 4: Solid pan-fried vegetables PPG waveform and K-Line chart.

The top diagram of Figure 5 shows waveform (i.e. curve) comparison between liquid meals versus solid meals. It is obvious that PPG curve of 20 pan-fried solid food meals have a much higher value in both peak PPG and average PPG than the 20 soup-based liquid food. It should be further noted that different PPG waveforms would have different starting PPG values (at 0-minute) due to his pre-meal food intake conditions, such as snack and fruit intake, stress in his daily life, weather temperature, or other physical environmental conditions. Therefore, it is more logical to compare the PPG difference between peak PPG and starting PPG as shown in the bottom diagram of Figure 5. It also shows 25 mg/dL difference at 60-minutes. The general shape of all PPG difference bars is similar to a mountain with its peak at 60 minutes. Incidentally, the liquid meals average sensor PPG over three-hour period (111 mg/dL) is very close to finger-piercing PPG measured at two-hours after first bite of food (108 mg/dL) as well as CGM sensor at 120-minutes (108 mg/dL). However, this observation can not be hold true for solid meals case (average sensor 122, Finger 111, Sensor at 120-min 115).

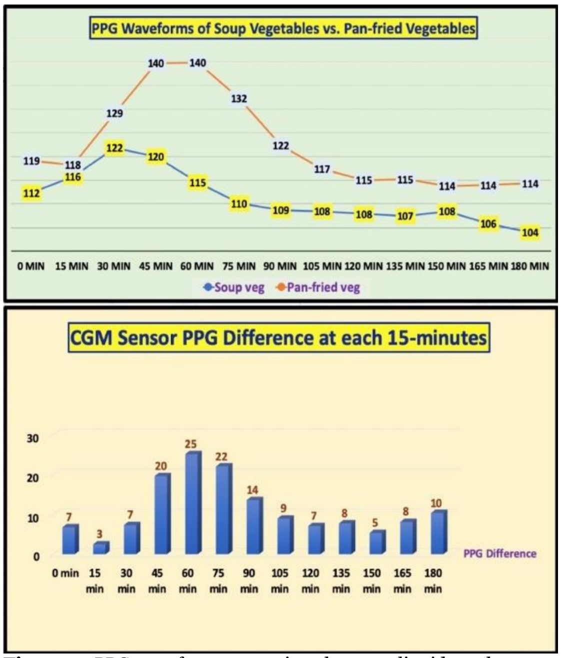

Figure 5: PPG waveform comparison between liquid meals versus solid meals and PPG difference bars at different time.

These two different looks of PPG waveforms associated with different meals are resulted from their different and distinguished “physical phases” of food. The top diagram of Figure 5 has demonstrated the final conclusive diagram of the author’s 6-month research project. It is clear to observe that soup-based liquid food produced a much lower glucose value than the pan-fried solid food. Although both liquid and solid meals have an almost identical nutritional ingredients, contrary from what he has learned on food nutrition, why did this occur?

4. HYPOTHESIS

Over the past nine years, the author has acquired knowledge from both internal medicine and food nutrition, understanding that different food intakes result in varying glucose levels. Yet, the reason behind the observed phenomenon of higher PPG values from solid food and lower PPG values from liquid food remains to be explained.

In high school physics, we learn about the three fundamental phases of matter: solid, liquid, and gas (vapor or steam). This study primarily deals with two phases: the liquid phase for egg drop soup and vegetable (cabbage and squash) soup, and the solid phase for pan-fried vegetables.

The author has gleaned three fundamental facts from his extensive medical research over the past nine years. First, he's discovered that approximately 70% of our daily energy intake is consumed by our brain and nervous system, not the heart as initially believed. Second, he recognizes the brain as the sole internal organ with the power of cognition, judgment, information processing, decision-making, and issuing commands, much like the CPU of a computer system. Third, all internal organs operate in an integrated and highly sophisticated manner under the exclusive command of our brain. On his own interest, he conducted a previous experiment involving the application of a specially designed IC chip to the skin of a human leg, which enabled him to identify electronic flow and signal transmission through the nervous system between the brain and leg muscles. This experiment illustrated the specific functions and significant power of the human brain.

Furthermore, the author realized that glucose is produced by the liver from glycogen and is not "directly transformed" from food, as some nutritionists and physicians may suggest. Glycogen is a substance stored in bodily tissues to house carbohydrates. Initially, the liver breaks down most carbohydrates from the foods we eat and converts them into glucose. When the body doesn't need immediate glucose for energy, it is stored in the liver and muscles in the form of many connected glucose molecules known as glycogen, a type of polysaccharide rather than monosaccharide or oligosaccharide.

The author's perspective on this matter is shaped by his diverse academic background and professional training in mathematics, physics, engineering, and computer science.

He posits that the liver functions as an operating system with a "stimulator" (food as input), a "command center" (the brain as the central processing unit), and a "feedback mechanism" (glucose as output). Therefore, glucose is not directly "converted" from food but is instead "produced and released" by the liver. However, the liver does require food both as an energy source for its existence and as raw material for its glucose manufacturing capabilities.

Drawing from this knowledge and interpretation, the author has developed his hypothesis about glucose production by the liver, attributing the differences in PPG to the specific physical phase of a meal, either "liquid" or "solid." The final physical "phase" of a ready-to-eat meal determines the PPG characteristics and waveforms, including glucose height and curve shapes.

When a specific type of food enters the gastrointestinal system, it triggers an immediate communication between the stomach and the brain. The stomach conveys information about the food's entry signal and its physical phase. Upon receiving these signals, the brain processes the relevant information, makes judgments, and issues directives to the liver concerning the amount of glucose to be produced and the timeframe for its production. This information processing and order issuance is a dynamic process because the biochemical conditions of food ingredients and human organ reactions are continually changing over time. This dynamic nature accounts for the differences in the timing of glucose peaks for different food physical phases.

Simultaneously, the brain communicates with the pancreas, instructing it on how much insulin should be produced to offset or regulate the excess glucose generated by the liver. However, for diabetes patients with severely damaged pancreatic beta cells, their insulin production capabilities and insulin quality may not function properly.

For example, from the author's observation of 5,728 food and glucose data over the past five years, it is noted that his body usually takes about 10-15 minutes to reach its glucose peak from high-sugar liquid food intake, around 30-60 minutes for liquid food intake, and approximately 60-75 minutes for solid food intake to reach its glucose peak. Figure 5 in the research also demonstrates that the peak PPG for liquid food occurs at 30 minutes after the first bite, while for solid food, it happens at 60 minutes after the first bite. The difference in peak times could partly be attributed to the chyme absorption rate of the small intestine being faster for liquid food compared to solid food. However, this explanation of chyme absorption rate doesn't entirely clarify the amplitude difference between the peak PPG values for liquid (122 mg/dL) and solid (140 mg/dL).

This hypothesis offers insight into how the brain communicates with the stomach, liver, and pancreas through the nervous system, influencing the quantity and pattern of PPG production during the 180-minute period after the first bite of a meal. The reason for lower PPG values and the relatively flat curve pattern associated with liquid phase meals may stem from this particular food phase's ability to "trick" the brain into perceiving it as a similar food entry type, such as drinking tea or water. Consequently, this doesn't trigger an alert to increase glucose production by the liver.

Up to this point, the author has conducted experiments using meals with a single material. However, recognizing that most people prefer meals with multiple ingredients, he intends to continue experiments in this direction. Additionally, he encourages other type 2 diabetes (T2D) patients who are using CGM devices to conduct similar experiments, contributing to the collection of more glucose data from individuals with different DNA genes and various diabetes conditions.

5. CONCLUSION

The author employed the GH-Method, a math-physical medicine (MPM) approach, to delve into the glucose production dynamics in type 2 diabetes (T2D) patients from a scientific perspective that considers the functions of the brain and nervous system. If this specific approach and the hypothesis and interpretation mentioned above prove to be accurate, it would be possible to "trick" our brain into producing a reduced amount of glucose after food intake without having to compromise the essential nutritional balance of the food. Consequently, T2D patients could potentially lower both their peak postprandial plasma glucose (PPG) values and their average PPG levels by simply altering their cooking methods.

However, it's crucial for T2D patients to consistently steer clear of foods rich in carbohydrates, such as starchy grains or flours, and high-sugar contents like sweetened cakes or beverages.

By sharing his research findings with fellow medical researchers, the author aspires to prompt them to offer alternative interpretations, provide suitable explanations, or present further justifications to the broader medical and healthcare community. This could involve leveraging different or traditional research methodologies, such as the biochemical medicine (BCM) approach using biology and chemistry.

5. REFERENCES

1) Hsu, Gerald C., eclaireMD Foundation, USA, "No. 94: Stimulators and simulation models of the brain from viewpoints of diabetes disease and its control (GH-Method: math-physical medicine)".

2) Hsu, Gerald C., eclaireMD Foundation, USA, "No. 126: A study on weight, a brain stimulator, and fasting plasma glucose production, simulation model, using GH-Method: math-physical medicine.

3) Hsu, Gerald C., eclaireMD Foundation, USA, "No. 130: A brain neuroscience study of the stimulator and glucose simulation model due to breakfasts using GH-Method: math-physical medicine.

4) Hsu, Gerald C., eclaireMD Foundation, USA, "No. 135: Using PPG segmentation analysis, waveform characteristics analysis, and energy theory to investigate the linkage among brain, liver, and gastrointestinal system (GH-Method: math-physical medicine).

5) Hsu, Gerald C., eclaireMD Foundation, USA, "No. 148: Two clinical cases to demonstrate the communication model between the brain and certain internal organs as well as the health state of the pancreatic beta cells".

6) Hsu, Gerald C., eclaireMD Foundation, USA, "No. 230: Hypothesis on glucose production's communication model between the brain and other internal organs, especially the stomach and liver".

