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Research Article

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A Neuroscientific Study of the Brain Stimulator and Glucose Simulation Model to Analyze High-Protein Meals Using GH-Method: Math-Physical Medicine

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Introduction

To prove his hypothesis in this paper, the author interprets the brain stimulator and its associated simulation model of predicted postprandial plasma glucose (PPG) using meal case studies with three different kinds of high protein.

Methods

In his paper No. 130, glucose stimulation and simulation model of the brain's neuroscientific functions using three case studies of high-protein meals, he explained why carbs/sugar intake and post-meal exercise are two major PPG simulation model.

The author used a continuous glucose monitoring device (Sensor) applied to his upper left arm and has collected ~74 glucose data each day since 5/5/2018. In this particular case study, he selected the entire Sensor period of 542 days (5/5/2018 - 10/28/2019) with 40,108 Sensor glucose data and 2,168 Finger glucose data. However, he has mainly used sensor data to examine their respective PPG waveforms (i.e. curves) due to low carbs/sugar intake amount from high-protein content meals.

The three high-protein meals are based on egg, cheese, and sashimi (Japanese style raw fish), respectively. The selected meals were not "100% pure protein" due to the difficulty of nutritional balance associated with a proper meal preparation. As a result, these meals included other food materials which have some carbs/sugar ingredient.

The author has developed a specific method to analyze PPG waveforms by utilizing the following steps:

- Identify five glucoses of "open, peak, 120-minutes, close, and average".
- Calculate the declining speed of PPG wave from the peak to 120-minutes.
- Compare this declining speed against carbs/sugar intake amount of each kind of meal.

Results

During this period of 542 days (5/5/2018 - 10/28/2019), he had 345 meals (20%) with eggs, 27 meals (2%) with cheese, and 28 meals (2%) with sashimi. All meals used these three separated high-protein material as the main ingredient. In addition, he has collected and calculated the total 1,685 meals within those 542 days as the baseline and used for comparison.

He applied the individual meal percentage as the weighting factor to calculate a set of glucoses for these "synthesized protein meals". The simple mathematical formula is as follows:

Synthesized glucose =
(Egg glucose * egg % +
Cheese glucose * cheese % +
Sashimi glucose * sashimi %) /
(Three-proteins %)

As shown in Figures 1, 2, 3, and 4, he has summarized a few prominent data:

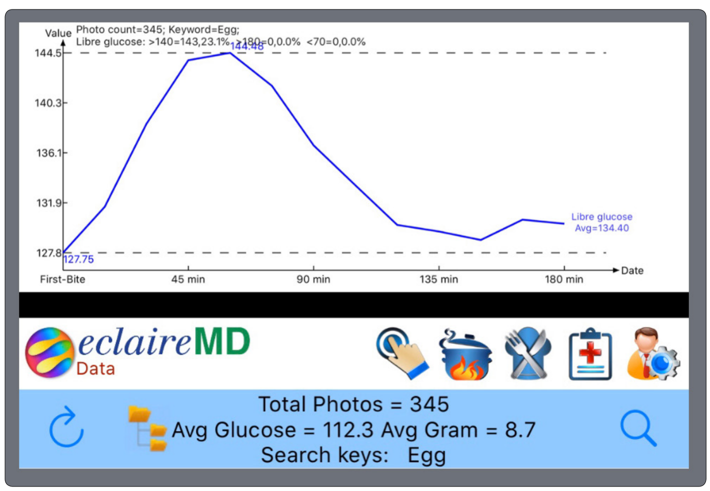

Figure 1: Egg PPG

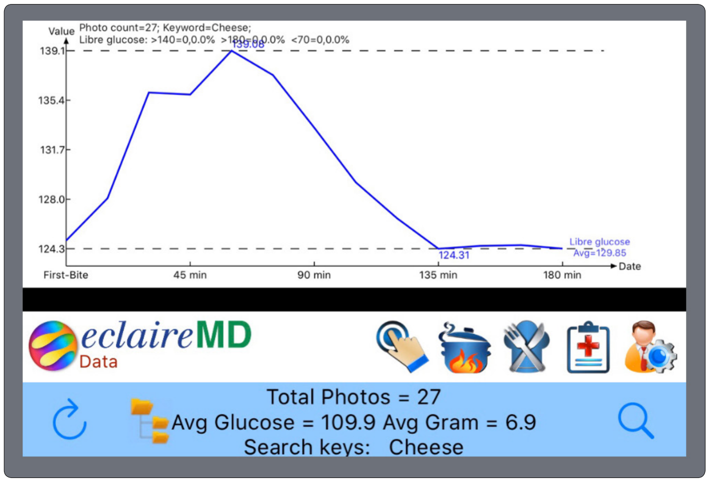

Figure 2: Cheese PPG

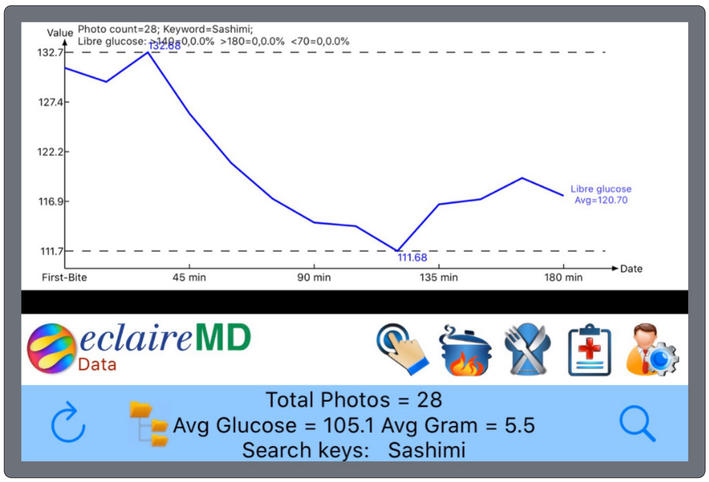

Figure 3: Sashimi PPG

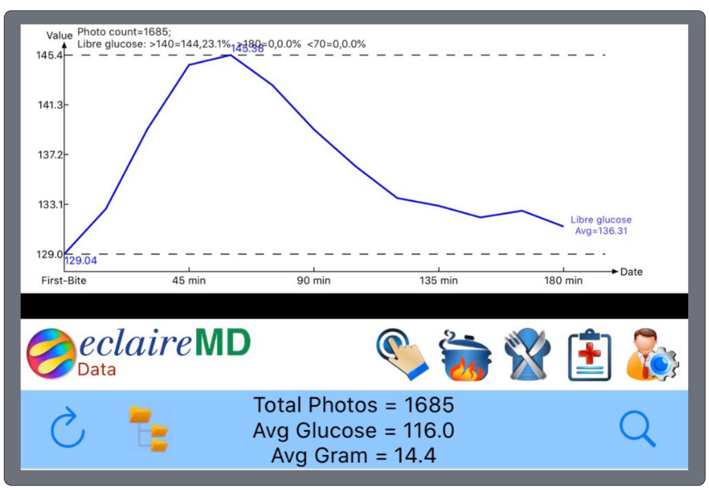

Figure 4: Total PPG

All 1,685 meals (100%):

Peak 145 mg/dL
120-minutes 134 mg/dL
Drop: 11 mg/dL
Carbs/sugar: 14.4 grams

400 Protein meals (24%):

Peak 143 mg/dL
120-minutes 128 mg/dL
Drop: 15 mg/dL
Carbs/sugar: 8.4 grams

As shown, these two peak glucoses are remarkably close to each other (145 vs. 143 with a difference of 2 mg/dL). However, their glucoses at the 120-minutes post-meal are different (134 vs. 128 with a difference of 6 mg/dL). In other words, the synthesized high-protein meals have a bigger glucose drop (11 vs. 15 with a difference of 4 mg/dL) due to 6.0 grams of carbs/sugar intake amounts (low-carb meal of 14.4 grams vs. very-low carbs me of 8.4 grams).

These observations have further enhanced the author's earlier findings of breakfast with egg only in paper No. 130. The brain senses food (regardless of the food's ingredients) when entering into the gastrointestinal system and then quickly issues an order to the liver for glucose production. This explains why the two Peak glucoses are at similar levels. However, approximately 60 minutes after food digestion, the brain realizes the existing insufficient "fuel" (i.e. carbs/sugar amount from high-protein food), and then issues an order to the liver to stop or reduce the liver's glucose production. As a result, the high-protein meal's glucose drops faster (i.e. declining speed is higher). The table in Figure 5 lists all of these detailed calculations.

(5/5/18-10/28/19)	Meals #	Meals %	Open PPG	Peak PPG	120m PPG	Avg PPG (Sensor)	120m (Fnger)	Carbs gram	PPG drop (peak to 120m)
Meal with Egg	345	20%	128	144	130	134	112	8.7	14
Meal with Cheese	27	2%	124	139	126	130	110	6.9	13
Meal with Sashimi	28	2%	130	133	112	121	105	5.5	21
Meal with 3 Proteins	400	24%	128	143	128	133	112	8.4	15
All Meals	1685	100%	129	145	134	136	116	14.4	11
Meal (All - Proteins)			1	2	6	3	4	6	

Figure 5: Table of calculations

It should be noted here that the post-meal walking exercise amounts are maintained at a similar level for all of these cases.

Conclusion

The results offer further interpretation or explanation of his hypothesis regarding the brain stimulator and PPG simulation model. These various case studies provide a reasonable interpretation, logical explanation, and quantitative proof for these physical phenomena of biomedical situations.

By using three high-protein meal cases, this research paper offers some explanations to the author's speculation that when any food enters the stomach, this will trigger the brain to send an order to the liver to begin the glucose production. However, the actual carbs/sugar intake amount and post-meal exercise will then come into the glucose simulation model later (between 60 to 120 minutes) to play their roles of finalizing PPG levels.

This paper further links various functions of our brain, stomach, liver, and pancreas working together [1-6].

Reference

1. Hsu Gerald C (2018) Using Math-Physical Medicine to Control T2D via Metabolism Monitoring and Glucose Predictions. Journal of Endocrinology and Diabetes 1: 1-6.

2. Hsu Gerald C (2018) Using Signal Processing Techniques to Predict PPG for T2D. International Journal of Diabetes & Metabolic Disorders 3: 1-3.

3. Hsu Gerald C (2018) Using Math-Physical Medicine and Artificial Intelligence Technology to Manage Lifestyle and Control Metabolic Conditions of T2D. International Journal of Diabetes & Its Complications 2: 1-7.

4. Hsu Gerald C (2018) Using Math-Physical Medicine to Analyze Metabolism and Improve Health Conditions. Video presented at the meeting of the 3rd International Conference on Endocrinology and Metabolic Syndrome.

5. Hsu Gerald C (2018) Using Math-Physical Medicine to Study the Risk Probability of having a Heart Attack or Stroke Based on Three Approaches, Medical Conditions, Lifestyle Management Details, and Metabolic Index. EC Cardiology 5: 1-9.

6. Hsu Gerald C (2018) Using Signal Processing Techniques to Predict PPG for T2D. International Journal of Diabetes & Metabolic Disorders 3: 1-3.