

# A Neuroscientific Study of Postprandial Plasma Glucose Investigation Based on High-Protein Breakfast Meals (GH-Method: Math-Physical Medicine)

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## Abstract

The author developed his GH-Method: math-physical medicine (MPM) by applying mathematics, physics, engineering modeling, and computer science (big data analytics and AI). He believes in “prediction” and has developed five models, including metabolism index, weight, fasting plasma glucose (FPG), postprandial plasma glucose (PPG), and hemoglobin A1C. All prediction models have reached to 95% to 99% accuracy. His focus is on preventive medicine, especially on diabetes control via lifestyle management. In this paper, he interprets the brain stimulator and its associated simulation model of predicted breakfast PPG via a food nutrition segmentation analysis and Sensor PPG waveform characteristics study by utilizing the PPG data of meals from McDonald’s breakfasts and 240 eggs, including McDonald’s breakfasts, to conduct his research.

**Keywords:** *Neuroscientific study; Postprandial plasma glucose; A1C; GH-Method: math-physical medicine; Investigation*

## 1. Introduction

To prove his hypothesis in this paper, the author interprets the brain stimulator and its associated simulation model of predicted breakfast postprandial plasma glucose (PPG) via a food nutrition segmentation analysis and Sensor PPG waveform characteristics study [1-3]. He used PPG data of meals from both 228 McDonald’s breakfasts and 240 eggs (including McDonald’s breakfasts) to conduct his research [4,5].

## 2. Methods

In his previous papers regarding brain neuroscience functions, he presented one hypothesis: carbs/sugar intake along with post-meal exercise are two major brain stimulators of PPG formation.

The author has been using a continuous glucose monitoring device (Sensor) applied to his left upper arm and has collected 76 glucose data each day in average since 5/5/2018. However, by the mid-2019, he noticed that many of his post-breakfast

glucose values escalated approximately one hour after the first bite of his breakfast, even when eating pure protein such as eggs (without any carbs/sugar content). Therefore, during October of 2019, he modified his computer software in order to be able to sort out different food contents (including carbs/sugar amount) and also plotted out their corresponding PPG curves.

Besides eating a plain cooked egg at home, he sometimes having his breakfast at McDonald's restaurants. This American fast-food chain offers some meals that do not increase PPG values too high because of the smaller portion of its meals and limited variety of food selection. Usually, he eats one egg, one piece of sausage, occasionally half a muffin or one hash brown along with drinking one cup of coffee. As a comparison, he utilized the same segmentation analysis tool to analyze McDonald's breakfast as well in addition to breakfasts including eggs.

### 3. Results

He selected a period of 601 days (5/5/2018 - 12/26/2019) for the time window of his PPG analysis which contains 45,676 data in total.

A summarized data table of breakfast PPG analysis is listed below with the format (number of meals; average carbs/sugar grams; average post-meal walking steps; average finger PPG; and average sensor PPG):

Egg: (240 meals; 7.5 g; 4700 steps; 114.7 mg/dL; 136.72 mg/dL)

McDonald: (228 meals; 10.0 g; 4616 steps; 117.7 mg/dL; 137.68 mg/dL)

There are four observations drawn from FIG. 1 and 2 as follows:

1. There were 12 meals of egg only, not in McDonald's chain restaurant.
2. They both were low-carb meals (within 0-14.9 grams range).
3. Two post-meal walking steps were comparable.
4. Finger PPG of McDonald's was 3 mg/dL higher than Egg meals. However, Sensor PPG of McDonald's was only 1 mg/dL higher than Egg meals.

FIG. 2 and 3 can draw another 4 observations from calculation of PPG differences (Gap) between egg meals and McDonald's breakfasts.

1. At time of 0-minute, there were an exceedingly small gap of 0.4 mg/dL with an averaged PPG ~125 mg/dL.
2. At time of 30-minutes, the gap has a moderate growth to ~ 4X to 1.7 mg/dL with an averaged PPG ~139 mg/dL.
3. At time of 60-minutes, the gap has a largest growth of ~ 9X to 3.5 mg/dL with an averaged PPG ~150 mg/dL.
4. At time of 105-minutes, the gap has shrunken to 0.3 mg/dL again as the time at 0-minute with an averaged PPG ~137 mg/dL. It should be pointed out that PPG still had about 10% of excessive glucose in comparison with PPG at 0-minute.

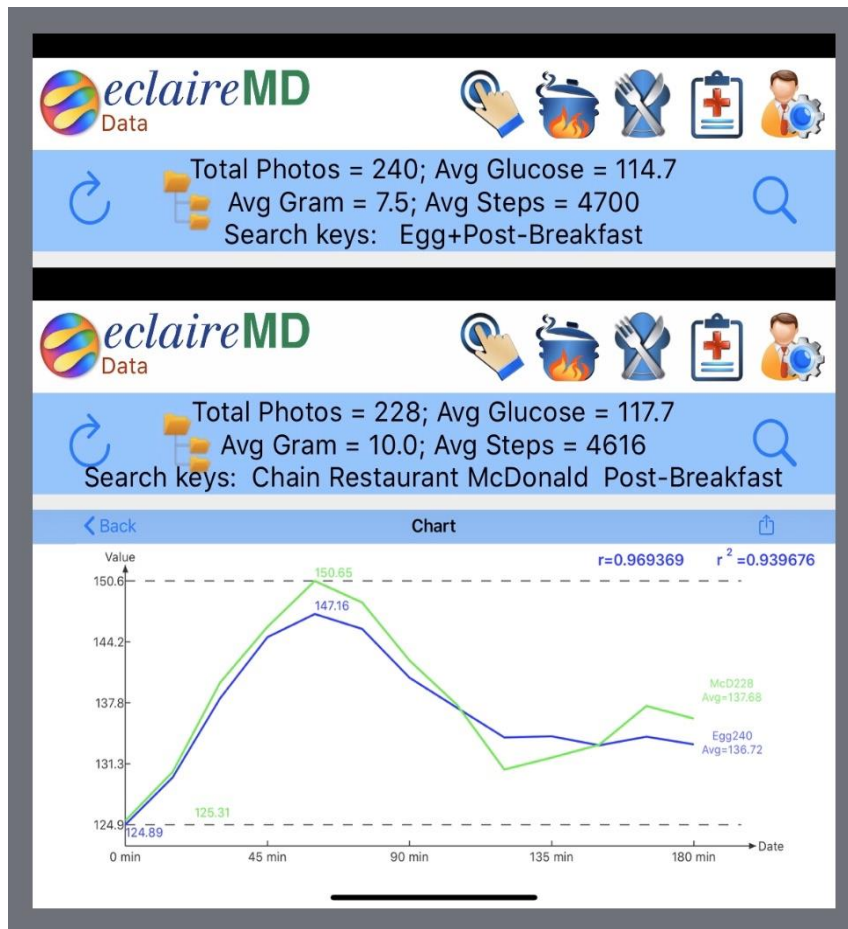


FIG. 1. PPG curves based on meals from both 228 McDonald’s breakfasts and 240 eggs.

	A	B	C
1		Egg240	McD228
2	Avg	136.72	137.68
3	0 min	124.89	125.31
4	15 min	129.89	130.47
5	30 min	138.24	139.90
6	45 min	144.71	145.80
7	60 min	147.16	150.65
8	75 min	145.58	148.37
9	90 min	140.42	142.24
10	105 min	137.25	137.56
11	120 min	134.11	130.72
12	135 min	134.23	131.98
13	150 min	133.28	133.33
14	165 min	134.19	137.44
15	180 min	133.38	136.10

FIG. 2. PPG data analysis of breakfast meals.

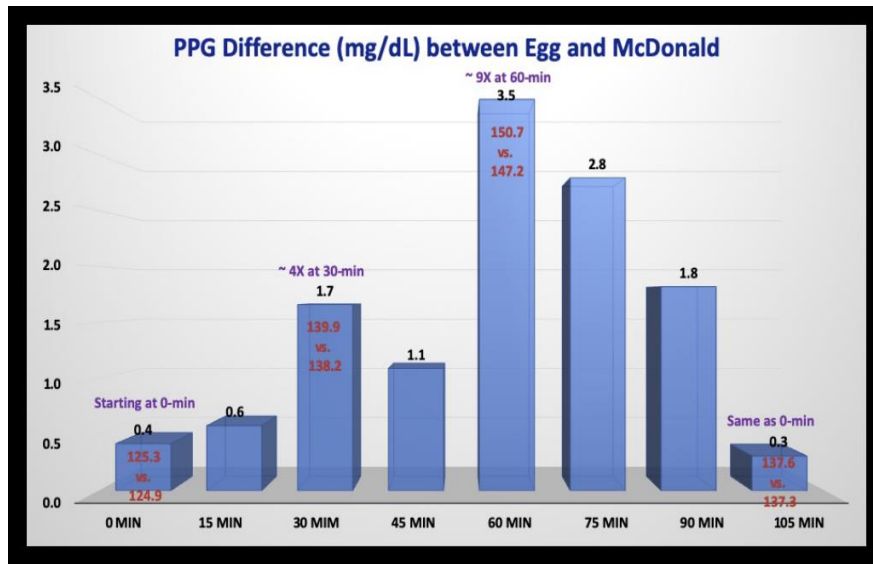


FIG. 3. PPG difference between Egg and McDonald’s breakfast.

The above described physical phenomena of this special case of two breakfasts with protein only and without carbs/sugar at all is remarkably similar to the author’s earlier research findings regarding comparison between low-carb and high-carb meals.

This observed phenomenon has matched his hypothesis that the brain receives the incoming signal, when food enters into his gastrointestinal system, and then the brain issues an outgoing order to the liver for glucose production. However, after one hour, the brain will notice that these two particular breakfasts with protein only eggs which lack of any extra “fuel” of carbs/sugar pumped into his body, i.e. no further energy entering into his body. Based on the energy theory of mechanical engineering, his PPG value will decrease sharply to the “lowest” level around 130 mg/dL according to his simulation model of predicted PPG.

It should be noted here that his post-meal walking exercise is maintained at a similar level for these two cases.

## 5. Conclusions

By using a protein only breakfast case study, this research paper offers some further explanations to his speculation and hypothesis on how and when eating food, this would prompt the brain to send a marching order to both liver and pancreas to start the glucose and insulin production. However, when the actual carbs/sugar intake and post-meal exercise come into the glucose simulation model, around 60 minutes, to play their roles of finalizing PPG waveforms during the period of one-hour to two-hour period.

This paper further links the functions of our brain, stomach, liver, and pancreas working together.

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