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RESEARCH ARTICLE

# Postprandial Plasma Glucose (PPG) Behavior Based on Six Breakfasts by Using AI Glucometer Based on GH-Method: Math-Physical Medicine (MPM)

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## Introduction:

By using data from six consecutive breakfasts at the same McDonald's restaurant in Honolulu, this study describes general Postprandial Plasma Glucose (PPG) patterns and behavior using AI-based Glucometer (AIG) formulated with the GH-Method: Math-Physical Medicine.

Math-physical medicine (MPM) starts with the observation of the human body's physical phenomena (not biological or chemical characteristics), collecting elements of the disease related data (preferring big data), utilizing applicable engineering modeling techniques, developing appropriate mathematical equations (not just statistical analysis), and finally predicting the direction of the development and control mechanism of the disease [1].

## Method:

In 2012 during the early stages of Gerald's diabetes research, He experimented by eating the same meal with different portion combinations for 30 consecutive days at a Denny's restaurant in Las Vegas, Nevada to study the food nutritional impact on his finger postprandial plasma glucose (PPG) [2]. Currently in Honolulu, he is conducting a similar experiment to study his postprandial plasma glucose (PPG) patterns and behaviors, specifically the estimation of his pancreas health state (Figure 1). However, after consuming the same breakfast six times, he must discontinue this experiment due to the high fat and cholesterol content from Spam and Portuguese sausage, which are harmful for his overall lipid and heart conditions [3]. In addition, the six cases have collected sufficient data to examine his postprandial plasma glucose (PPG).

By applying his findings from the past 9-years of medical research, he was able to write 174 medical papers which were used to analyze this special case (Figures 2&3). There are no implicated analysis tools utilized except simple statistics [4].

## Results:

1. The average sensor postprandial plasma glucose (PPG) over 3 hours is 130 mg/dL, which is 8% higher than the average finger postprandial plasma glucose (PPG) of 120 mg/dL measured at two hours after the first bite. The average peak of sensor postprandial plasma glucose (PPG) is 147 mg/dL which is 23% higher than the average finger postprandial plasma glucose (PPG). These two data demonstrate that Sensor provides an upper bound, while finger provides a lower bound of PPG wave fluctuations.
2. The average sensor peak occurs at 98 minutes after the first bite of food which is higher than the peak occurring around 60 minutes after the first bite from his big data analysis of 1,383 sensor postprandial plasma glucose (PPG) waveforms (5/5/2018 - 8/10/2019). This is due to the author's intensive walking immediately after breakfast, which delays a moderate peak occurring at a later time (38 minutes later). This sensor peak value is not very high due to the author's knowledge and self-control over his carbs/sugar intake (~13.2 grams) that gives ~27 mg/dL extra glucose values. The measured "open" glucose of 123 plus 27 would give "peak" glucose at 150 mg/dL (3 mg/dL higher than his measured sensor peak of 147 mg/dL).
3. Gerald's average post-breakfast 5,983 walking steps have reduced ~30 mg/dL of his PPG value. His moderate amount of ~13 grams of carbs/sugar intake

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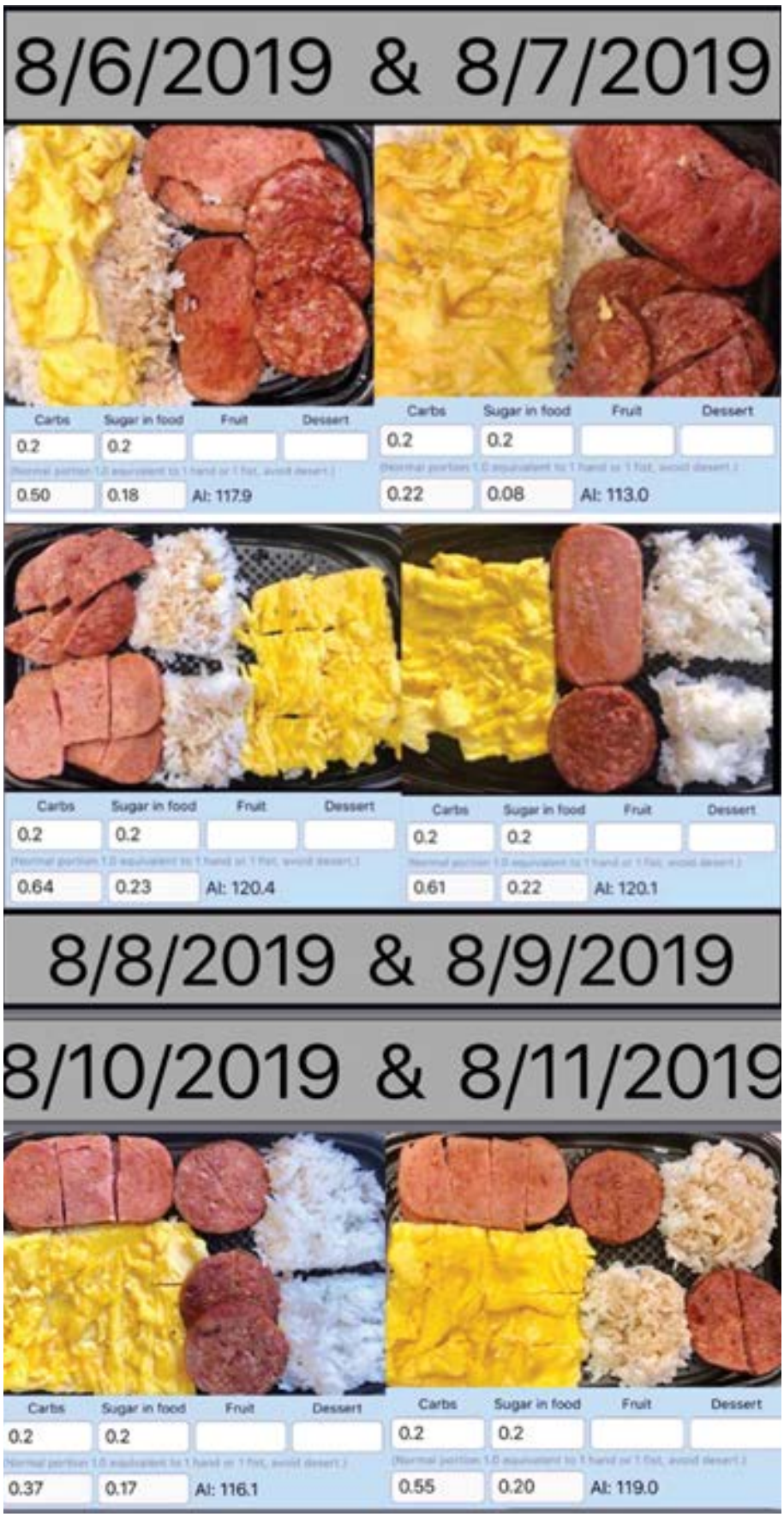
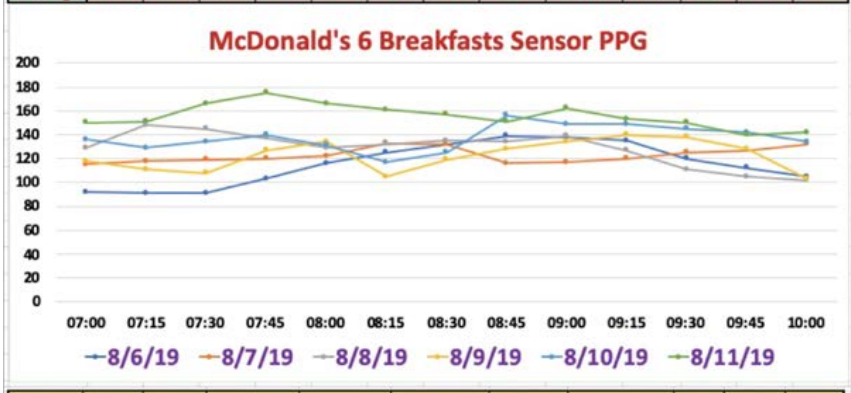



**Figure 1:** 6 consecutive breakfast photos and their predicted Postprandial Plasma Glucose (PPG) using AI Glucometer.

| | 07:00 | 07:15 | 07:30 | 07:45 | 08:00 | 08:15 | 08:30 | 08:45 | 09:00 | 09:15 | 09:30 | 09:45 | 10:00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/6/19 | 92 | 91 | 91 | 103 | 116 | 125 | 132 | 139 | 138 | 135 | 120 | 112 | 105 |
| 8/7/19 | 115 | 118 | 119 | 120 | 122 | 133 | 132 | 116 | 117 | 120 | 125 | 127 | 132 |
| 8/8/19 | 129 | 148 | 145 | 137 | 129 | 132 | 135 | 134 | 139 | 127 | 111 | 105 | 102 |
| 8/9/19 | 118 | 111 | 108 | 127 | 134 | 105 | 119 | 128 | 134 | 140 | 138 | 128 | 103 |
| 8/10/19 | 136 | 129 | 134 | 140 | 131 | 117 | 125 | 156 | 149 | 149 | 145 | 142 | 134 |
| 8/11/19 | 150 | 151 | 166 | 175 | 166 | 161 | 157 | 151 | 162 | 153 | 150 | 140 | 142 |
| Average | 123 | 125 | 127 | 134 | 133 | 129 | 133 | 137 | 140 | 137 | 132 | 126 | 120 |




| Open | Close | Peak | Peak min | Baseline | Libre Avg. | Finger | Finger min | NI | AI | Steps |
|---|---|---|---|---|---|---|---|---|---|---|
| 92 | 105 | 139 | 105 | 96 | 115 | 113 | 120 | 114 | 113 | 5700 |
| 115 | 132 | 133 | 75 | 121 | 123 | 108 | 120 | 114 | 118 | 6200 |
| 129 | 102 | 139 | 120 | 120 | 129 | 138 | 120 | 114 | 120 | 5700 |
| 118 | 103 | 140 | 135 | 113 | 123 | 102 | 120 | 114 | 120 | 5400 |
| 136 | 140 | 156 | 105 | 137 | 137 | 126 | 120 | 114 | 116 | 6500 |
| 150 | 142 | 175 | 45 | 147 | 156 | 131 | 120 | 114 | 119 | 6400 |
| 123 | 121 | 147 | 98 | 122 | 130 | 120 | 120 | 114 | 118 | 5983 |

**Figure 2:** Sensor and Finger Postprandial Plasma Glucose (PPG) values and their extensive analysis results.

| AIG | Carbs | Sugar | Total |
|---|---|---|---|
| 8/6/19 | 0.50 | 0.18 | 0.68 |
| 8/7/19 | 0.22 | 0.08 | 0.30 |
| 8/8/19 | 0.64 | 0.23 | 0.87 |
| 8/9/19 | 0.61 | 0.22 | 0.83 |
| 8/10/19 | 0.37 | 0.17 | 0.54 |
| 8/11/19 | 0.55 | 0.20 | 0.75 |
| C/S Average % | 48% | 18% | 66% |
| Carbs/Sugar (g) | 9.6 | 3.6 | 13.2 |

**Figure 3:** AI Glucometer predicted carbs and sugar intake amount and grams.

and its postprandial plasma glucose (PPG) associated energy are almost totally negated or consumed by his post-meal walking. His carbs/sugar inflated PPG peak of 147 minus 30 would give a postprandial plasma glucose (PPG) of 117 mg/dL at 180 minutes post-meal which is only 4 mg/dL lower than his measured "close" glucose of 121 mg/dL.

4. Gerald's average value of the baseline health state (i.e. the degree of damage to pancreas beta cells) is 122. This baseline value of 122 is approximately located at the mid-point of the inside boundary of his 2009 baseline band (between 114 and 128).

5. Gerald's AI Glucometer predicted postprandial plasma glucose (PPG) result is 118 mg/dL when compared against his measured finger postprandial plasma glucose (PPG) of 120 mg/dL, which provides 98.3% prediction accuracy. Comparing six photos of the McDonald's breakfast, the variances of AI prediction cover a range of 113 to 120 mg/dL. This difference is due to AI judgments from the degree of exposed area of white rice. This finding further demonstrates the reliability and accuracy of applying optical physics, wave and energy theories, signal processing techniques, and his developed AI algorithm.

## Conclusion:

This simple study of six consecutive breakfasts at the same restaurant has demonstrated the high degree of accuracy of his past research findings regarding postprandial plasma glucose (PPG). There are still some small "surprises" existing in his data which only proves the inherited complexity and sensitivity of human metabolism. As Gerald continues his efforts on diabetes research, the more amazed he is with the human body. In his opinion, the human body is one of the three most sophisticated and complicated black boxes, which includes outer space, earth's inner space, and human internal organs.

## References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