

Nutrition, the Point of View of Both Physician and Patient (We)

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“To my daughters in law”

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Introduction

Food, feeding practices and lifestyles has largely changed in the last decades. More and more people experience joint pain, headache and bowel functional disorders that are associated with the risks of insulin resistance/fattening. These recurrences may be collectively named as poor health. A lack of one of the 50 nutrient principals is an improbable cause. Yet folic acid deficiency delays the recovery from diarrhea. Defects of nutrients are associated with inconspicuous signs for long time, look at selenium or vitamin D₃. Defects may be suspected in presence of fixed, monotonous, poor diets consisting in only staple food. Processed foods, additives, pesticides and infectious agents are blamed as a cause of poor health. Any suspect requires diagnostic assessments. Bacterial and viral infective agents might be routinely searched. The abundance of processed food increases the possibility of toxic infections by food contaminated by ubiquitous bacteria like Clostridium, Bacillus, and many other spp. I treated these transient disorders in the same way: 24 hours of food suspension followed by carrots (in increasing amounts) with olive oil for two or three days. The relapses were rather due to a rapid increase in energy administration. We moreover found an association of the persistence of symptoms with insulin resistance in children and adults [1-8]. These facts and findings suggest that energy balance may have the main role in the development of bowel, vascular and joint functional disorders. A few physicians object that we have not to eat for the best small bowel. Yet in our studies, the prevention of disorder relapses was associated with improvement in body weight, insulin sensitivity, HbA1c [5,6]. A prime objective in nutrition might be the achievement of these associated events. This achievement coincides with an even energy balance (Homeostasis). In this pursuit, we did not study body energy exchanges. Our initial studies pointed to the energy balance in blood [5-8]. Positive balance in blood and not 2 kg increase of body weight promotes small intestine feed backs (functional slowdown) that end in an activation of inflammation. This inflammation develops far from intestinal mucosa, given the tolerant response of the mucosa [9]. The harmful feedbacks consist in rapid slowdown of intestinal functions. Nutrient progression and absorption almost ceased in studies in rats and in humans during exposition to warm environment (30°C) in comparison to the exposition to cold environment (6°C) [10,11]. We employed the two environments to either decrease or increase the resting metabolic rate, indirectly producing high blood glucose (BG) and low BG, respectively. Well, the slowdown of intestinal progression and absorption was associated with heavy microflora growth and this promotes overall inflammation in body tissues [12-25]. We found a significant increase of 24 times in duodenal micro flora after the consumption of a customary dinner in comparison with the no dinner consumption before the small intestine biopsy (in the subsequent day) [23]. The 130 investigated children were convalescent after bowel functional disorders and were suspected of celiac disease: they were in poor health. We largely studied blood glucose concentration (BG) before meals as an index of meal by meal either positive or negative energy balance [1-8,26]. An even energy balance in blood is associated with a preprandial BG of 76.6 ± 3.7 mg/dL [1-8]. The mean BG of seven days preprandial measurements (Mean BG) revealed to characterize the personal meal pattern better than energy intake and even energy balance [7,8]. Mean BG was stable for 5 months and the low Mean BG suggested the distance from insulin resistance/fattening and from poor health. Mean BG was calculated from home diaries, thus we report our assessment of the measurement error of the personal portable device in comparison with the plasma glucose measurement by the hospital lab auto-analyzer.

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Validity of a Portable Device for BG Measurements

The training was accomplished by home BG preprandial measurements, with a portable device (a portable potentiometer for whole BG measurement with the exokinase method: Glucocard Memory; Menarini Diagnostics; Florence, Italy). The subject had to personally measure BG with the portable instrument against the auto analyzer in the lab as he/she did at home. At blood sampling, we supervised the performance of the comparison. The auto analyzer was checked every morning in comparison with the other 50 laboratories in Tuscany. A difference in BG from the mean had to remain within 1% every day. The heparinized blood sample for the auto analyzer was immediately centrifuged and measured with the exokinase method. In the meantime, the patient performed his/her measurements on the same blood sample by glucometer. The auto analyzer obtained a mean \pm SD of 89.9 ± 11.3 mg/dL (N = 85). Subjects measured 89.0 ± 12.5 mg/dL. The mean difference (0.9 ± 7.1) was not significant. On absolute values, the mean difference was: 5.7 ± 4.3 mg/dL with no bias. This error is low compared to the spontaneous BG wavering of 10% every 12 minutes.

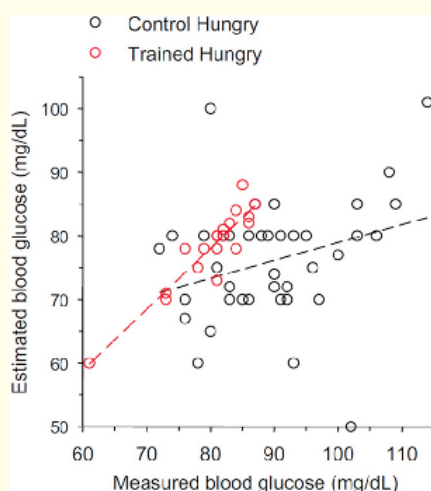


Figure 1: Estimated vs measured blood glucose of subjects reporting to be hungry at the final laboratory investigative session.

Notes: Hollow red circles, trained hungry subjects (n = 18); hollow black circles, control (untrained) hungry subjects (n = 42). Linear correlation was significant for the trained data (dashed red line; $r = 0.92$; $p = 0.0001$) but not for the control data (dashed black line; $r = 0.29$, $p = 0.06$). (Courtesy of the Authors [3]).

Construction of an even energy balance

We elaborated an Initial Hunger Meal Pattern to eliminate days and months with high preprandial BG and the associated activation of inflammation in body tissues, the basis for poor health.

1st Recognition of current energy availability, indexed by blood glucose.

2nd Achievement of three Initial Hunger (IH) arousals per day (Figure 1, 2).

3rd Awareness on energy content per 100 grams of food.

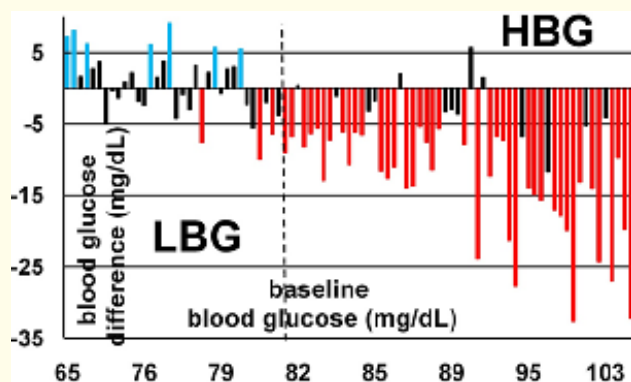


Figure 2: Difference of mean preprandial BG after training versus BG at recruitment for each trained subject.

Notes: Column height shows 5 months after pre training mean BG difference in each trained subject. Significant increases are indicated by blue bars, significant decreases by red bars, and not significant changes by black bars. Mean BG is reported in sequentially increasing order at recruitment, not in linear correlation with segment length on the X-axis scale. The vertical dashed line indicates the most significant division between subjects who showed no mean BG decrease after training (low BG group, $n = 34$) and those who showed significant decrease of mean BG (high BG group, $n = 55$; Chi-squared analysis: $P = 0.00001$). This threshold blood glucose at recruitment (demarcation point) is 81.8 mg/dL (4.54 mmol/L) at recruitment. Subjects above this threshold accounted for most of the improvements in weight and insulin resistance. Copyright © 2011, Dove Medical Press Ltd. Reproduced with permission from Ciampolini M, Sifone M [5].

4th adapting intake on subsequent interval expenditure. Going in a warm bed may require no additional energy intake even if hungry. Hunger and IH arousals depend on previous expenditure, but small intestine progression and absorption are related to the square root of energy intake and on the current expenditure. The expenditure in a warm bed may become a tiny percentage of that during actively walking open air [10, 11]. This decrease in a warm, well insulated environment depends on the fact that mammals employ 70% to 90% of their energy expenditure for the maintenance of a steady body temperature.

5th Promotion of high expenditure by physical fitness, outdoor physical activity, low insulation and contagion prevention.

6th Promotion of low energy concentration of meals. The best concentration is unknown. A lower concentration than human milk (65 kcal/100 grams) may be chosen when inter-meal expenditure is low. This recommendation is convergent with the need for fiber intake to support a healthy microbiome. We suggest fiber intake from whole-grain cereals and/or leafy vegetables at every meal [1]. Addition of fruit may be useful although seemed not necessary at all meals. A healthy colon requires healthy fermentation with the entry of fibers into the colon after every meal and no entry of digestible, energy-rich nutrients. Food moves rapidly throughout the small intestine, from some minutes to half an hour in healthy conditions. This velocity together with a high absorption rate protects the small intestine from bacterial growth. Every meal must include fibers, given the rapidity of arrival of indigestible food to the colon. This recommendation is convergent with increasing the intake of the 50 indispensable principals. Leafy vegetables contain about 100 mg of Calcium per 100 grams, per 20 kcal whereas rice contains only 20 mg per 100 grams, per 350 kcal. Remember that a limit in intake is dictated by the energy amount. The promotion of a low concentration of energy contrasts with the instinctive drive to maximize energy intake. At this point, I however felt that I had to limit my prescriptions. The free food choice is a support for self-esteem against frustration. I allowed energy rich food items but an adequate volume of vegetables had to correct (balance) the energy rich items. Not-starchy vegetables acceptance by children was even considered as a test indicating low BG (unpublished findings). Fennels, zucchini, carrots, artichokes, celery, egg plants, green beans, Italian squash, cucumbers and tomatoes are now considered as equivalent to leafy vegetables. All not-starchy vegetables are recommended in an amount of between half and one kg per day after the age of eight. Curiously, we found a positive relation

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between non-starchy vegetables intake and fattening, measured as arm and skin fold thickness in infants. These fattening children were voracious and demanded their food at all meals.

Another property of non-starchy vegetables consists in their decreasing energy intake. We have found that a preprandial BG of 76.6 ± 3.7 mg/dL at recruitment is associated with insulin sensitivity and is the same level as that achieved by trained subjects during IHMP [5]. The (profuse) consumption of not starchy vegetables (NSV) helps in this preprandial achievement by cognitive containment of energy consumption at every meal. The consumption of abundant vegetables reduced energy intake in our studies [4], but by itself alone was insufficient to achieve a preprandial BG of 76.6 ± 3.7 mg/dL, the level associated with the arousal of IH. A stop in the body weight loss was observed with the maintenance of a significantly higher BG than 76.6 ± 3.7 mg/dL [4]. Recognition of current energy availability and planning intake to achieve a preprandial IH as well as the associated BG of 76.6 ± 3.7 mg/dL was instead effective. We do not want to be excessively dogmatic in asserting the best pre-meal BG. We found this figure in sedentary adults. Men engaged in heavy outdoor manual activity required intake at higher BG (Table1).

| 6 HBGa | 21 HBGb | |
|---------------------------------------|-----------------|-----------------|
| Mean blood glucose (mg/dL) | 86.4 ± 4.0 | 87.1 ± 5.3 |
| Final insulin AUC (mU L-13h-1) | 124 ± 26 | $207 \pm 99c$ |
| Final blood glucose AUC (mg dL-13h-1) | 536 ± 56 | $601 \pm 82d$ |
| Insulin sensitivity index | 11.4 ± 2.9 | $6.68 \pm 4.0e$ |
| Beta cell function index | 1.29 ± 0.66 | 1.43 ± 1.22 |

Table 1: Effects of heavy outdoor work in 6 of 27 trained subjects who remained with high BG at investigation end.

Notes: aSix HBG subjects reported doing heavy work all day in outdoor environment during cold weather while practicing “recognizing hunger”. No significant differences in the five parameters from recruitment. At recruitment, mean BG $\pm 86.9 \pm 5.3$ mg/dL in 27 HBG subjects; bThe 21 HBG subjects included 15 that were LBG after 7 weeks training (clinical assessment) and six who had higher mean BG than 100 mg/dL at recruitment; cP, 0.01; dP, 0.05; eP, 0.001.

Abbreviations: AUC, area under curve at glucose tolerance test; BG, blood glucose; HBG, high blood glucose. (Courtesy of Ciampolini [5])

The colon also needs to limit bacterial replication. Provision of slowly fermentable material daily is essential to this goal. Cellulose, hemicellulose and lignin are insoluble fiber components, and are found in whole cereals. Fruit and vegetables are rich in soluble fibers and water. We define fruit as food having less than 45 kcal/100 grams, and vegetables with less than 30 kcal/100 grams [1]. Both fibers resist small intestinal digestion and arrive at the colon. Here, insoluble components are partially (30% - 50%) fermented and soluble ones are more completely fermented (85%). One hundred trillion bacteria are involved every day in fermenting fiber. Fiber fermentation is a slow process that takes 6 - 8 hours after meals. Fermentation produces acetic, propionic and butyric acids. These short chain fatty acids flow into the blood slowly and constantly, and are metabolized like other fatty acids although more rapidly. An abundant fiber intake may deliver 600 kcal to blood, that is sufficient to cover the resting metabolic rate.

Abundant intake of not-starchy vegetables converges on another regard in overweight subjects who are not diabetic. These overweight people are poorly able at planning intake and show a fear for the emergence of weakness, abrupt hunger and fading later during the day. Half - one kg of vegetables per day prevented events of low BG (Table2).

| After meal containing: | No F-Veget 1 | Fruit-Veg 2 | X ² | Fruit-Veg < 0.5 kg 3 | F-Veg > 0.5 kg 4 | X ² |
|------------------------|--------------|-------------|----------------|----------------------|------------------|----------------|
| Infants (<3y) | 9/174 (1) | 49/1170 (2) | 0.4 | 11/305 (3) | 47/1039 (4) | 0.5 |
| NW > 3y) | 11/516 | 23/2058 | 3.3 | 12/934 | 22/1640 | 0.01 |
| OW > 3y | 4/183 (5) | 3/559 | 4.0 | 5/331 | 2/411 | 2.0 |
| NW adults | 5/573 | 4/820 | 0.8 | 6/800 | 3/593 | 0.3 |
| OW adults | 24/1084 | 20/1724 | 4.8 | 30/1431 | 14/1377 | 5.3 |
| totals | 53/2530 | 99/6331 | 3 | 64/3801 | 88/5060 | 0.04 |
| Analysed meals (6) | | | | 8861 (6) | 8861 | |

Table 2: Slightly depressed blood glucose events (SDBG, <60 mg/dL) before meals following null, < 0.5 kg and > 0.5 kg fruit & vegetables content in the previous meal during Initial Hunger Meal Pattern.

Notes: 8861 pre-meal BG measurements were analyzed twice after different division on the consumption of fruit & vegetables in the previous meal. In the 2nd and 3rd column, a comparison between after either no intake or intake of fruit & vegetables. In the 5th and 6th columns, a comparison between either less or more than half kg of fruit/vegetables. Fruit was suggested before breakfast, vegetables before lunch and dinner.

1. = 9 SDBGs before 174 meals when the previous meal had no fruit & vegetables.
2. = 49 SDBGs before 1170 meals when the previous meal had a variable amount of fruit & vegetables.
3. = 11 SDBGs before 305 meals when the previous meal had less than 100g of fruit & vegetables. 200g was the suggested amount for two years of age. After 8 y, the suggested half fruit & vegetables was 150g and the suggested full amount was 300g [1].
4. = 47 SDBGs before 1039 meals when the previous meal had more than 100g of fruit & vegetables. See (3).
5. Bold, underlined numbers = significant comparisons. See (3) for the suggested amounts.
6. Total number of analyzed meals in the five groups, two times by two different divisions, either null vs. variable amount or half suggested amount vs. more than half.

X² indicates significance of differences in the comparisons (P = 0.05 =X² of 3.8).

Fat content

Fats are displaced from blood several times more slowly than glucose and proteins [27-30] and contribute to current energy availability in blood. These two events prevent inter-meal BG decline and is an equivalent of an increase in insulin resistance. The margins in meal energy intake (before arriving to the arousal of untoward feedbacks) become small. Fat intake must be limited in dependence on the latitude. In tropical humid countries, no more than 20% of all energy intake, whereas 30% - 40% may be tolerated in polar countries. Insulation and home heating subvert these suggestions. Fatty acids and fats with different fatty acids content are not equally displaced from blood stream. Oleic acid is rapidly displaced, whereas linolenic acid is displaced very slowly. This is in contrast to the usefulness of linolenic acid and its high solubility in water and blood. The usefulness as omega 3 of linolenic acid is not great because 95% is burnt out. Yet cell and canaliculi membranes are made by fats. Those made by saturated fats are more rigid and cells that use membranes for phagocytosis or pinocytosis are disadvantaged by saturated and “trans” fats in the diet.

Harmful food?

Saturated and trans fats are harmful? Bedouins eat mainly cheese and full strength milk, yet have no vascular problems. I consider food items approved by Food and Drug Administration as healthy. Yet saturated fat delays the IH arousal, this delay depends on the on the amount consumed. On the contrary vegetables may anticipate IH arousal. At all meals, people must maintain awareness on the conflictual nature of energy absorption and consume food in relation to the energy expenditure.

Conclusion

We extend the view about rotten food. Bacteria double every quarter of an hour in the warm-humid environment of the small intestine and food becomes rotten and harmful within an hour or two. Moments of depressed energy metabolism and of high blood glucose prepare and produce the rotten material. The immune system provides a defense [24] that is not infinite. We have to abandon the instinctive drive for maximal amount and concentration of meal energy. We have to take care of the expected inter-meal energy expenditure and to exhaust previously consumed energy. A lot of information is necessary for eating. Learning seems the destiny of our species.

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