

## Balancing Hormones through Diet

THE GLYCEMIC INDEX (GI) – is a physiologically based measure of carbohydrate *quality* – a comparison of carbohydrates (gram for gram) based on their immediate effect on blood sugar-levels (glucose):

- Carbohydrates that break down quickly during digestion have high GI values. Their blood-glucose response is fast and high
- Carbohydrates that break down slowly, releasing glucose gradually into the blood stream, have a low glycemic index

What determines the glycemic index? The primary factors are:

- 1). The structure of the simple sugars in the foods
- 2). The soluble fiber content
- 3). The fat content

How does the structure of the simple sugar that makes up a carbohydrate affect the sugar's rate of entry into the bloodstream? Regardless of the form of carbohydrate – they must be broken down into simple sugars for the body to absorb them. There are only three common sugars that comprise all edible carbohydrates, each with a different molecular structure, which ultimately determines its rate of entry into the bloodstream. Glucose is the most common, followed by fructose and galactose.

Glucose is found in grains, pasta, bread, cereal, starches like potatoes, beets, corn and other vegetables. Fructose is found primarily in fruits and galactose is found in dairy products. However, while all these simple sugars are rapidly absorbed by the liver, only glucose can be released directly into the bloodstream. This is why glucose-rich carbohydrates like bread and pasta go from the liver *directly* back into the bloodstream, while galactose and fructose containing foods must *first* be converted to glucose in the liver, allowing them to enter the bloodstream at a much slower rate. For fructose especially, this process is very slow. That's why even though they're made up primarily of simple sugars; fructose-containing carbohydrates have a very low glycemic index

compared to glucose and galactose-containing carbohydrates.

What about fiber content? Fiber is not absorbed, and therefore has no direct effect on insulin. However, it does slow the rate of entry on the absorption of other carbohydrates into the bloodstream. *The higher the fiber content of a carbohydrate, the slower the rate of entry into the bloodstream.* Remove the fiber content of a carbohydrate and the rate of entry accelerates, which is why overly processed foods like white bread, rice cakes and fast foods affect blood sugar so dramatically – they contain virtually no fiber.

Everyone knows that the foods we eat and drink have an effect on our health. Over the last 20 years, there have been many diets sold to the American public that were guaranteed to help people “lose weight and feel great.” We have devoted ourselves to Dr. Atkins’ Diet Revolution, the Pritikin Diet, Weight Watchers, Jenny Craig, Protein Power, Sugar Busters and a myriad of others. While many people have lost weight – it is almost always temporary and most people end up gaining the lost weight back plus more. Why? It is a matter of balance. With possibly the exception of Weight Watchers, each of these diets tends to stress one or two components of a balanced eating plan. Whether it’s all protein and fats, or mostly carbohydrates, each of the above diets stress one micronutrient to the exclusion of the others. The problem with eating this way is that these diets don’t take into account our internal body controls. After absorbing nutrients from the foods we consume, our bodies secrete powerful hormones to control how the nutrients are used. Any eating plan that does not take into account the hormonal effect of food can end up causing more than just unwanted weight. It can lead to immune deficiency, infertility, arthritis, severe menopause complaints and other life-threatening problems. Eating a diet that is the appropriate balance of fats, carbohydrates and protein *will* evoke the appropriate hormonal response.

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### **Endocrinology: A Brief Review**

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Let’s start with a brief review of endocrinology and several of the key hormones regulating our bodies.

Endocrinology is the study of the endocrine glands, the hormones they secrete and the effect those hormones have on the body. The endocrine system regulates the body's major continuous and prolonged processes, including reproduction, growth and development, blood sugar regulation, electrolyte balance and the mobilization of defenses against stress – both physical and mental. The endocrine system is made up of eight different glands located strategically throughout the body: ovaries, testes, adrenals, pancreatic islets, thyroid, parathyroid, pineal, pituitary and the hypothalamus (the master control).

While there are many hormones the body produces, let's focus on those that are directly affected by diet and stress:

Gland	Hormone	Action
Adrenal Cortex	Adrenal steroids – pregnenolone, DHEA and cortisol  Sex steroids –testosterone, estrogen and progesterone	Electrolyte balance, protein synthesis, immune modulation, response to stress, mental focus, clarity
Pancreas (Islets of Langerhans)	Insulin and Glucagon	Regulation of blood sugar

As stated earlier, eating various foods evokes a hormonal response. Carbohydrates secrete insulin, protein stimulates glucagon production and certain fats provide the building blocks for eicosanoids (regulates inflammation).

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### **Pancreas (Islets of Langerhans)**

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While the adrenal cortex is critical to modulating our response to stress, the pancreas is critical to the regulation and maintenance of blood sugar control through two powerful hormones: insulin and glucagon.

Our bodies use glucose, also referred to as blood sugar, to fuel many of the biochemical processes that keep us alive. The most important role glucose has is in keeping the brain functioning, as glucose is its primary energy source, the amino acid L-glutamine is its secondary source. Ever

wonder why when you're feeling tired or lacking mental clarity, you reach for a cookie, candy bar or even pretzels – anything in the carbohydrate family? It's to give you a shot of glucose! However, when circulating glucose is not used immediately by the body, it is converted to glycogen (a long string of glucose molecules linked together) and stored in the liver and muscles with the aid of the powerful hormone insulin. Only the glycogen stored in the liver can be broken down and sent back to the bloodstream to maintain adequate glucose levels for proper brain function. And since the storage capacity of glucose in the liver is quite limited, only 60 - 90 grams, it should be clear how quickly the reserves fill -- this amount is equivalent to about *2 cups of cooked pasta!* Once glycogen levels are filled in both the liver and muscles, all excess carbohydrates have one fate: to be converted to fat and stored for later use. Worse yet, any meal or snack high in carbohydrates will generate a rapid rise in blood glucose. To adjust for this rapid rise, the pancreas secretes insulin into the bloodstream, which aggressively promotes the accumulation of body fat if the carbohydrates are not used quickly enough.

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### Insulin

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Insulin is the key hormone that controls blood sugar levels after eating carbohydrates. First, insulin helps store blood sugar in the liver and muscle tissue as glycogen and then any excess beyond the storage capacity will be converted to body fat. Eating a balance of carbohydrates, fat and protein at each meal will increase the glucagon levels relative to insulin, as will exercise. Bear in mind **all** carbohydrates our bodies consume are converted to blood sugar, even from the least sugary foods (think broccoli).

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### Glucagon

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The protein hormone glucagon works in opposition to insulin. What insulin puts into storage, glucagon puts back into use. The two hormones do not conflict with one another in the bloodstream, because when insulin levels are high, glucagon levels are low and vice versa.

When blood sugar levels drop, the pancreas secretes glucagon. It is believed that both eating

protein-rich foods and exercise will also induce this process. Glucagon causes the stored glycogen to be released back into the bloodstream to restore the blood sugar levels. In addition to releasing glycogen, glucagon releases fat from stored in adipose tissue to be released for fuel.

The different roles of insulin and glucagon can be summed up as follows:

<b>Insulin</b>	<b>Glucagon</b>
Lowers blood sugar levels	Raises blood sugar levels
Stores fat	Mobilizes fat from storage
Triggered by carbohydrates	Triggered by proteins

Basically, the body needs certain kinds of carbohydrates, fats and proteins to function optimally. Interestingly, highly processed carbohydrates such as white flour pasta, bagels and white flour breads and highly refined cereals raise blood sugar levels more than sugar itself. Eating a balance of slow-acting or low-glycemic complex carbohydrates, high quality low-fat proteins and dietary fat is crucial because they slow down the entry of carbohydrates into the system, allowing for longer hunger satisfaction. Dietary fat and fiber are the best blood sugar stabilizers, whereas protein is considered neutral. Finally, a balanced diet will not leave us craving a particular food type. When body chemistry is balanced through hormonally balanced meals, cravings are eliminated.