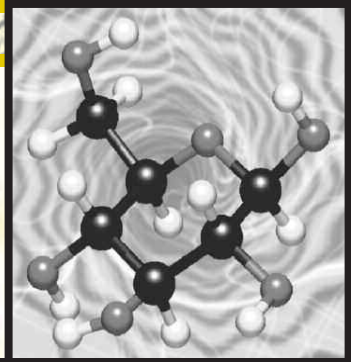


Glucose/Sugar Metabolism



Whatever level of health that you are at presently, know that your body is seeking balance and harmony within. What you feed it is all that it has to maintain balance/harmony. A healthy diet complemented by nutritional supplementation and exercise goes a long way in helping the body in its creation of energy and in repairing and restoring.

The diets of the industrial countries contain high levels of carbohydrates, the food group that includes sugars and comprises the main source of energy for the body. Too much sugar and simple carbohydrates can eventually lead to excess weight gain and a variety of related health conditions. In this issue, we examine how the body metabolizes sugar and regulates blood sugar, or glucose, levels in the body, including the nutrients that support that process. The concern related to blood sugar balance is not just an issue with adults. It is so important to consider our lifestyles as they relate to our entire families.

CARBOHYDRATE METABOLISM

Carbohydrate is the name given to a large group of sugars, starches, celluloses and gums. Carbohydrates are the main source of energy for all body functions and are needed to process other nutrients. Carbohydrate metabolism mainly involves fructose, galactose and glucose:

- **Fructose**, found in fruits, is a sugar that is sweeter than sucrose. It is the sugar in sugar cane.
- **Galactose** is the sugar found in lactose (milk sugar), sugar beets and seaweed.
- **Glucose**, another simple sugar found in foods, is a major source of energy in human body fluids. When eaten, glucose is taken into the blood from the intestinal tract. Excess glucose in circulation is stored in the liver and muscles as glycogen then converted to glucose and released as needed.
- **Insulin**, has many functions, it stimulates the uptake of glucose into cells so that it can be used as fuel for metabolic processes. It also stimulates liver and muscle cells to form glycogen and fat cells to make fat out of glucose molecules. In these functions, insulin acts as an anabolic agent because it stimulates the formation of larger glycogen and fat molecules from glucose molecules.

The higher the level of blood sugar, the greater the demand for insulin.

BLOOD PRESSURE

Blood pressure may also be affected by metabolism. There are many considerations for maintaining proper blood pressure and blood sugar levels. Exercise, proper diet, and supplementation are beneficial.

INSULIN

Insulin is made in the pancreas, a gland that lies behind the stomach. It is a naturally occurring hormone released in response to increased levels of sugar (glucose) in the blood. In their studies, published nearly 60 years ago, Schwarz and Mertz first documented that mammals exhibited glucose intolerance when fed diets deficient in chromium.¹ Insulin production also requires the mineral zinc.

THE PANCREAS AND GLUCOSE (SUGAR) METABOLISM

As the pancreas performs its vital role in both digestion and glucose metabolism, it becomes a key link in helping the body maintain homeostasis, or a state of internal balance and harmony.

Pancreatic juices (including digestive enzymes) provide for the homeostasis of digestive function, and the secretion of glucagon and insulin aid in the homeostasis of glucose metabolism, the manufacturing of the body's food source. **Insulin and glucagon, the two hormones produced by the pancreas, play a key role in glucose metabolism.**

Insulin Accelerates:

- Uptake of glucose from the blood into the cells
- Formation of glycogen from glucose molecules
- Entry of amino acids into cells and the synthesis of proteins
- Conversion of nutrients into fatty acids

Glucagon:

The hormone glucagon has functions that are opposite to those of insulin

- **Accelerates** the breakdown of glycogen into glucose
- **Promotes** formation of glucose from lactic acid and certain amino acids
- **Enhances** release of glucose into the bloodstream
- **Causes** the breakdown of fat into free fatty acids

The interchange of the two hormones works like this:

Increased blood levels of glucose stimulate the pancreas to release insulin, as do certain hormones and amino acids. When the blood level of glucose decreases, the pancreas releases glucagon, which inhibits the flow of insulin and raises the blood glucose level by stimulating the breakdown of glycogen and stimulating glucose release by the liver.² Thus, the secretions of both insulin and glucagon are essential to the body's homeostasis. Also important in the control of blood glucose levels are the liver and the adrenal glands.

DIETARY CONSIDERATIONS

- Consume a diet with plenty of fiber from fruits, vegetables and whole grains.
- Avoid tobacco, caffeine, soda, white flour and salt.
- Avoid foods with artificial sweeteners, simple sugars and hydrogenated fats.

Glucose/Sugar Metabolism

NUTRIENTS IMPORTANT IN SUPPORTING GLUCOSE/SUGAR METABOLISM

Chromium

This so-called "trace" mineral has been shown to influence carbohydrate metabolism, lipid (fat) metabolism, and protein absorption and metabolism. It is also a potentiator of insulin action.

Essential fatty acids (unsaturated fatty acids, UFAs)

They are needed to form cell structures, particularly cell membranes, and for proper absorption of fat-soluble vitamins (A, D, E and K). UFA's play an essential role in normal function of all tissues, in normal brain development and function and in the regulation and function of the immune system.

Iodine

An essential part of thyroxine and triiodothyronine, the thyroid hormones which help maintain the basal metabolic rate.

Manganese

Promotes enzyme activation in the mitochondria, the energy centers of the cells.

Niacin

A B-complex nutrient that aids in the metabolism of fats, carbohydrates and proteins.

Pantothenic acid

Necessary for growth, and the skin. It contributes extensively to energy functions as part of the Coenzyme A molecule.

Thiamin (also known as Vitamin B-1)

Needed for carbohydrate metabolism. Essential for digestion and for heart function.

Zinc

One of the most important roles this mineral plays in the body is in the production of insulin. It also aids in the digestion of protein and in the metabolism of phosphorus. Necessary for burn and wound healing, prostate gland function and carbohydrate digestion. A critical function of zinc is its role in the structure and function of bio-membranes.

REFERENCES

- Schwarz, K. and W. Mertz. (1959) "Chromium (III) and the glucose tolerance factor." Archives of Biochemistry and Biophysics. 85:292-295.
- Eckert, Roger (1983) Animal Physiology: Mechanisms and Adaptations. New York: W H Freeman & Co.



Glucose Sugar Metabolism Factors™

ADVANCED FORMULA Smaller Tablets

Supplement Facts	
Serving Size: Nine (9) Tablets	
Amount Per Serving	% Daily Value
Vitamin C (as Calcium Ascorbate)	300 mg 400%
Thiamin	300 mg 20,000%
Niacin (as Niacinamide and 20% as Nicotinic Acid)	300 mg 1500%
Pantothenic Acid (as Calcium Pantothenate)	210 mg 2100%
Calcium (as Calcium Amino Acid Chelate)	150 mg 15%
Iodine (from Kelp)	675 mcg 450%
Magnesium (as Magnesium Amino Acid Chelate)	300 mg 100%
Zinc (as Zinc Monomethionine**)	30 mg 200%
Manganese (as Manganese Amino Acid Chelate)	15 mg 750%
Chromium (as Chromium Polynicotinate**)	450 mcg 375%
Proprietary Blend	3.83 g (3825 mg)*
Essential Fatty Acids (from Flax Seed) (7% gamma Linolenic Acid, 64% Linoleic Acid), Nopales (Cactus) (Opuntia), Cedar Berry (Thuja occidentalis), Glutamine (as L-Glutamine), Golden Seal Root (Hydrastis canadensis), Gymnema Sylvestre Leaf, Milk Thistle Extract (Seed) (Silybum marianum) (80% Silymarin), Blueberry Leaf (Vaccinium myrtillus), Bitter Melon Seed (Momordica charantia), Ginger Root (Zingiber officinale) & Vanadium (Vanadyl Sulfate)	
*Daily Value not established.	
OTHER INGREDIENTS: Dicalcium Phosphate, Terra Alba (Calcium Sulfate), Microcrystalline Cellulose, Stearic Acid, Modified Cellulose Gum & Silicon Dioxide.	
Made in a GMP facility that processes egg, fish, milk, shellfish, soy, tree nut & wheat products.	
**OptiZinc® and ChromeMate® are Trademarks of InterHealth Nutraceuticals Inc.	
CAUTION: Not to be taken by pregnant or lactating women. Keep out of reach of children.	

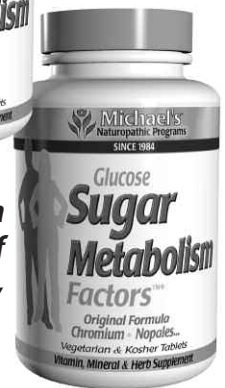
Glucose Sugar Metabolism Factors™

ORIGINAL FORMULA

Supplement Facts	
Serving Size: Three (3) Tablets	
Amount Per Serving	% Daily Value
Thiamin	300 mg 20,000%
Niacin (as Niacinamide and 17% Nicotinic Acid)	360 mg 1800%
Pantothenic Acid (as Calcium Pantothenate)	210 mg 2100%
Iodine (from Kelp)	675 mcg 450%
Zinc (as Zinc Monomethionine**)	30 mg 200%
Manganese (as Manganese Amino Acid Chelate)	15 mg 750%
Chromium (as Chromium Polynicotinate**)	450 mcg 375%
Proprietary Blend	3.38 g (3375 mg)*
Essential Fatty Acids (from Flax Seed) (7% gamma Linolenic Acid, 64% Linoleic Acid), Nopales (Cactus) (Opuntia), Cedar Berry (Thuja occidentalis), Glutamine (as L-Glutamine), Golden Seal Root (Hydrastis canadensis), Dandelion Root (Taraxacum officinale), Blueberry Leaf (Vaccinium myrtillus), Ginger Root (Zingiber officinale) & Vanadium (Vanadyl Sulfate)	
*Daily Value not established.	
OTHER INGREDIENTS: Dicalcium Phosphate, Microcrystalline Cellulose, Stearic Acid, Vegetable Stearate, Modified Cellulose Gum & Silicon Dioxide.	
Made in a GMP facility that processes egg, fish, milk, shellfish, soy, tree nut & wheat products.	
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