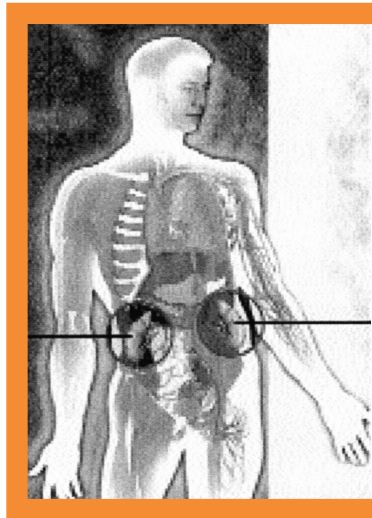


Energy In The Body



Facts

In this issue, we look at how the body produces energy to support the processes of life and maintain good health. Topics include the fundamentals of energy production; metabolic

regulation of energy; the roles of the adrenal and thyroid glands in this process; glucose metabolism; and nutrients needed by the body's organs and systems in sustaining healthy energy levels.

WHAT IS ENERGY

Funk & Wagnall's New International Dictionary defines energy as the "power by which anything acts effectively to move or change other things or accomplish any result." Put another way, it is the ability to do work or to move mass. It's an interesting observation that energy and mass can neither be destroyed nor created, but each can be converted into the other.

Energy takes many forms: potential, kinetic, radiant, physical or chemical, to name a few. Energy production in the body is a chemical process that occurs in every single cell, generated by a structure called the mitochondria. Think of it as "the little engine that could."

To accomplish this task, the cells need fuel to produce a lively and energetic feeling in the body. That fuel is glucose, a sugar extracted from foods through a chemical process called metabolism.

THAT "LOW" FEELING

Nutritional and naturopathic counselors often hear complaints from their clients about low energy levels. Clients report that their normal daily routines have become "chores," and some chores are simply avoided because they require too much effort. Yet, those very projects and deeds may be vital to that person's life or lifestyle. That's why it's important to look at energy and its role in the body.

There are, of course, many reasons why a person would experience low energy levels. Examples include physically or mentally stressful situations, poor dietary habits (like eating only fast-foods) and missing meals altogether.

Low food-intake, combined with poor nutritional habits,

may deprive the body of adequate amounts of nutrients essential for energy production.

In addition, some physical actions and stressful situations create conditions within the body that may require greater than normal amounts of nutrients. For this reason, it is essential that each of us regularly consume all the nutrients known to participate in energy production.

METABOLISM & NUTRITION

The energy-production process requires specific nutrients. One of the most crucial is **pantothenic acid**, because it is one of the catalysts of energy creation. Pantothenic acid is an element in the formation of acetyl coenzyme-A, which is a carrier molecule in the Krebs cycle. The Krebs cycle is the series of enzyme reactions that yield energy through the utilization of carbohydrates, fats and proteins to fuel cellular functions.¹ It is involved in releasing energy from carbohydrates and in gluconeogenesis, the formation of glycogen from non-carbohydrate sources such as amino acids or fatty acids.² **Pantothenic acid** also helps boost red blood cell production, which provides more oxygen for "fuel burning" and enhances the body's coenzyme-A activity for increased **ATP production**, essential to maintaining the body's energy levels.³

Several of the B-complex vitamins are essential for the energy production process: B-1, B-2 and B-12 help vital amino acids enter the Krebs cycle; Vitamin B-12 also helps the body metabolize fats, carbohydrates and proteins, and interacts in the metabolic process with folic acid, required for all cell growth and reproduction.⁴



GLANDS & ENERGY

Two key glands involved in energy's production and regulation in the body are the **adrenals** and the **thyroid**. Both are part of the **endocrine system**, the body's ductless glands that produce and secrete hormones directly into the blood or lymph, which circulates the substances to all parts of the body.⁵

ADRENALS

Adrenal glands consist of an inner section, the **medulla**, plus an outer portion, the **cortex**. Each part produces secretions that affect energy production in the body.

Responding to impulses originating in the brain and traveling through the sympathetic nervous system, the medulla produces the hormones universally associated with the "fright, fight or flight" alarm reaction. These hormones, **adrenaline** and **noradrenaline**, are secreted directly into the blood and carried to virtually all tissues of the body.

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Circulating noradrenaline causes constriction of virtually all the body's blood vessels. Other responses include increases in heart activity, inhibition of the gastrointestinal tract, dilation of the pupils and decreases in nonessential activities.

Adrenaline's effects are similar, although epinephrine causes greater impact on cardiac activity and less constriction of the blood vessels. Adrenaline's impact on tissue metabolism is also several times greater. With a capacity for increasing each cell's metabolic rate by as much as 100% above normal, adrenaline influences other metabolic activities such as glucose production in the liver and muscle, and glucose release in the blood.⁶

The adrenal cortex produces a trio of life-essential substances, called **glucocorticoids**, that, together with other hormones, regulate metabolism and also the body's resistance to stress. They are **cortisol (hydrocortisone), corticosterone and cortisone**. Cortisol is the most abundant and is responsible for about 95% of glucocorticoid activity.⁷

Glucocorticoids' role is to make sure the body has enough ATP available. ATP, or adenosine triphosphate, is the principal energy-storing molecule in the body.⁸

Glucocorticoids increase the rate at which proteins are broken down and amino acids are removed from cells, primarily muscle fibers, and transported to the liver. Amino acids can be synthesized into new proteins, such

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as the enzymes needed for metabolic reactions. If the body's reserves of glycogen and fat are low, the liver may convert lactic acid or amino acids into glucose (gluconeogenesis). Glucocorticoids also stimulate lipolysis, the breakdown of triglycerides into fatty acids and glycerol, plus the release of fatty acids from adipose tissue.⁹

THYROID

Thyroid hormones regulate the body's oxygen use, cellular metabolism and basal metabolic rate, as well as growth and development. In regulating metabolism, the hormones stimulate protein synthesis, enhance cholesterol excretion in bile (which aids in fat digestion, thus reducing cholesterol levels), and increases the use of glucose in the production of ATP, the main energy-producing chemical in cells.¹⁰

GLUCOSE

Glucose is a simple sugar found in foods and is a major source of energy in human body fluids. Its metabolism is possible by every known living cell for the production of ATP.¹¹ Excess glucose in circulation is stored in the liver and muscles as **glycogen**, where it is converted to glucose and released as needed.

ESSENTIAL NUTRIENTS FOR ENERGY PRODUCTION

- ◆ **Glands synthesize and secrete certain fluids for use in the body. The production of such substances, like the important adrenal and thyroid hormones, always requires active work by the cells and results in an expenditure of energy.**
- ◆ **Nutrients required for proper functioning of the adrenal and thyroid glands, and for glucose metabolism include these substances:**

ADRENALS

Folic acid. A water-soluble B vitamin important in both production and synthesis of the nucleic acids RNA and DNA. Folic acid's metabolic role is interdependent with B-12, and both are required for cell growth and reproduction in the body.¹²

Pantothenic acid. Plays a key role in releasing energy from carbohydrates; in gluconeogenesis; in synthesis and degradation of fatty acids; and in the synthesis of such vital compounds as sterols and steroid hormones.¹³ Helps to boost red blood cell production providing more oxygen for "fuel burning" and enhances the body's coenzyme-A activity for increased ATP production, essential to maintaining the body's energy levels.

Vitamin B-12. Necessary for synthesis of RNA and DNA, and proper functioning of folic acid. Helps maintain the nerves' myelin-sheath coating.

Vitamin C. Occurs in large concentrations in both parts of the adrenal gland: the outer cortex and the inner medulla.¹⁴ Essential in the adrenal medulla's production of adrenalin and noradrenaline. Although adrenals are rich in vitamin C, large amounts are lost with secretion of corticosteroids.¹⁵

THYROID

Manganese. A mineral necessary for production of thyroxine, one of the thyroid hormones that must be present for the regulation of basal metabolism.

Chromium. A mineral involved in metabolism of carbohydrates, lipids (fats) and nucleic acids.

Tyrosine. An amino acid necessary to the manufacturing of the thyroid hormones, as well as to the adrenal glands and pituitary.

Irish moss. Rich in iodine.

GLUCOSE/SUGAR METABOLISM

Chromium. Involved in metabolism of carbohydrates, lipids (fats) and nucleic acid. A potentiator of insulin action.

Insulin. A naturally occurring hormone released by the pancreas in response to increased levels of sugar (glucose) in the blood.

Iodine. An essential part of the hormones thyroxine and triiodothyronine.

Manganese. Promotes enzyme activation.

Niacin. A B-complex nutrient. Aids in metabolism of fats, carbohydrates and proteins.

Pantothenic acid. Necessary for growth. Contributes extensively to energy functions.

Potassium (amino acid complex). Stored almost entirely within lean tissues, where it serves as predominant positively charged ion in the cells.

Unsaturated fatty acids. Essential for growth. Not all of them can be synthesized in the body.

Vitamin B-1. Needed for carbohydrate metabolism.

Vitamin B-6 (pyridoxine). Necessary for the metabolism of fats, carbohydrates and proteins.

Zinc. Involved with carbohydrate digestion. Important to function of cell membranes.



GLUCOSE METABOLISM

The hormone **insulin** serves as the catalyst for the process of metabolizing glucose. Insulin is manufactured in the pancreas and requires the mineral **zinc** for its production. Other nutrients important in the process of metabolism include **vitamin B-1, niacin, iodine** and **chromium**.

ABOUT MICHAEL'S® PRODUCTS

MICHAEL'S® NATUROPATHIC PROGRAMS combine the basics and the newest developments along with the finest ingredients and the most effective formulations for your total healthcare. Each program is designed to produce physical results you can feel, owing to innovative nutritional supplementation with specific, targeted **FACTORS OF LIFE®** products. **MICHAEL'S® FACTORS OF LIFE®** formulas are synergistically complete. Each contains combinations of nutrients that work together to increase assimilation and reduce the amount of binders and fillers. Our products are hypoallergenic with no artificial colors or flavors. The formulas contain cold-pressed or organically grown herbs, when available, to ensure the highest quality. Additionally there is no sugar, dairy, wheat, gluten or sodium in any of our supplements. These high-potency, all-natural products are manufactured with food-grade fillers, binders and enteric coatings. Most are suitable for vegetarians and those who follow a kosher diet. Michael personally guarantees purity and specified content. Every product includes an expiration date to ensure freshness and is double safety-sealed with an outer shrink-wrap and inner-bottle freshness seal. As is normal with all-natural products, some color and texture variations may occur but this does not affect product purity, potency or assimilation.

■ **ADRENAL FACTORS™** contains vitamins C, B-12 and folic acid along with pantothenic acid, complemented by the herbs eleuthero root and licorice root, known for their energizing properties.

■ **ADRENAL XTRA™** is formulated to enhance the body's endurance and speed its return to normal energy levels. **ADRENAL XTRA™** derives its name and potency from the addition of three times the amount of energy-enhancing pantothenic acid found in **ADRENAL FACTORS™** and also from *Rhodiola rosea*, used for centuries to combat fatigue, support physical strength and enhance mental stamina.

■ **GLUCOSE/SUGAR METABOLISM FACTORS™ ORIGINAL & ADVANCED** formulas support sugar metabolism and the production of insulin by the pancreas. They provide ingredients that protect the cardiovascular system and the liver and nourish the pancreas. They also provide support for the thyroid and adrenal glands.

Glucose/Sugar Metabolism Factors™ contains chromium, zinc and niacin complemented with other vital nutrients for glucose metabolism and the herbs cedar berries, blueberry leaf and golden seal root.

In addition **Glucose/Sugar Metabolism Factors™ Advanced Formula** contains:

Bitter melon & Gymnema - two Asian herbs used for support of glucose/sugar metabolism.
Milk thistle - supports liver health.

■ **THYROID FACTORS™** contains iodine, manganese and tyrosine, complemented with the herbs Irish moss, gentian root and bladder wrack.

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For Life – Naturally!**



SINCE 1984

Energy In The Body

MICHAEL'S® NUTRITIONAL SUPPORT PRODUCT FORMULAS

ADRENAL FACTORS™

Supplement Facts

Serving Size: Three (3) Tablets

Amount Per Serving	% Daily Value	
Vitamin C (as Calcium Ascorbate)	750 mg	1000%
Vitamin B-12 (as Cobalamin)	900 mcg	15000%
Pantothenic Acid (as Calcium Pantothenate)	450 mg	4500%
Folic Acid (as Folicin)	600 mcg	150%

Proprietary Blend 1.8 g (1800 mg)*
 Eleuthero Root (Eleutherococcus senticosus), Ashwagandha Root (Withania somnifera), Turmeric Root (Curcuma longa), Juniper Berry (Juniperus communis) & Licorice Root (Glycyrrhiza glabra)

*Daily Value not established.

OTHER INGREDIENTS: Dicalcium Phosphate, Microcrystalline Cellulose, Stearic Acid, Vegetable Stearate, Modified Cellulose Gum & Silicon Dioxide.

Energy In The Body

ADRENAL XTRA™

Supplement Facts

Serving Size: Three (3) Tablets

Amount Per Serving	% Daily Value	
Vitamin C (as Calcium Ascorbate)	500 mg	667%
Folic Acid (as Folicin)	600 mcg	150%
Vitamin B-12 (as Cobalamin)	500 mcg	8,333%
Pantothenic Acid (as Calcium Pantothenate)	1500 mg	15,000%

Proprietary Blend 650 mg*
 Ashwagandha Root (Withania somnifera), Rhodiola Rosea Root Extract (3% rosavins), Rhodiola Rosea Root, Licorice Root (Glycyrrhiza glabra)

*Daily Value not established.

OTHER INGREDIENTS: Dicalcium Phosphate, Microcrystalline Cellulose, Stearic Acid, Vegetable Stearate, Modified Cellulose Gum & Silicon Dioxide.

Adrenal Xtra™ is also available in a 15-tablet Traveler Tube



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**)	90 mg	600%
Manganese (as Manganese Amino Acid Chelate)	15mg	750%
Chromium (as Chromium Polynicotinate**)	450 mcg	375%

Proprietary Blend 3.37g (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.

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GLUCOSE/SUGAR METABOLISM FACTORS™

ADVANCED FORMULA SMALL TABS

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	75%
Zinc (as Zinc Monomethionine**)	90 mg	600%
Manganese (as Manganese Amino Acid Chelate)	15 mg	750%
Chromium (as Chromium Polynicotinate**)	450 mcg	375%

Proprietary Blend 3.8 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, 240 mg), Blueberry Leaf (Vaccinium myrtillus), Bitter Melon Seed (Momordica charantia), Ginger Root (Zingiber officinale) & Vanadium (Vanadyl Sulfate)

*Daily Value not established.

OTHER INGREDIENTS: Dicalcium Phosphate, Calcium Sulfate, Microcrystalline Cellulose, Stearic Acid, Modified Cellulose Gum & Silicon Dioxide.

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THYROID FACTORS™

Supplement Facts

Serving Size: Three (3) Capsules

Amount Per Serving	% Daily Value	
Vitamin B-6 (as Pyridoxine)	75 mg	3750%
Iodine (from Kelp)	450 mcg	300%
Chromium (as Chromium Polynicotinate**)	300 mcg	250%
Manganese (as Manganese Amino Acid Chelate)	30 mg	1500%

Proprietary Blend 675 mg*
 Gentian Root (Gentiana lutea), Irish Moss (Whole Plant) (Chondrus crispus), Bladderwrack (Whole Plant) (Fucus vesiculosus) & Tyrosine (as L-Tyrosine)

*Daily Value not established.

OTHER INGREDIENTS: Dicalcium Phosphate, Maltodextrin, Cellulose, Vegetable Stearate and Stearic Acid.

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