Natural

ENDOCRINE
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The Endocrine System

Although we rarely think about the endocrine system, it influences almost every cell, organ, and function of our bodies. It works automatically to regulate our bodies. The endocrine system is instrumental in regulating mood, growth and development, tissue function, metabolism, and sexual function and reproductive processes.

In general, the endocrine system is in charge of body processes that happen slowly, such as cell growth. Faster processes like breathing and body movement are controlled by the nervous system. But even though the nervous system and endocrine system are separate systems, they often work together to help the body function properly.

The foundations of the endocrine system are the hormones and glands. As the body’s chemical messengers, hormones (pronounced: hor-moanz) transfer information and instructions from one set of cells to another. Many different hormones move through the bloodstream, but each type of hormone is designed to affect only certain cells.

A gland is a group of cells that produces and secretes, or gives off, chemicals. A gland selects and removes materials from the blood, processes them, and secretes the finished chemical product for use somewhere in the body.

Some types of glands release their secretions in specific areas.

For instance, exocrine (pronounced: ek-suh-krin) glands, such as the sweat and salivary glands, release secretions in the skin or inside the mouth.

Endocrine glands, on the other hand, release more than 20 major hormones directly into the bloodstream where they can be transported to cells all over the body to have collective actions at target cells elsewhere.

The major glands that make up the human endocrine system include the:

- hypothalamus
- pituitary gland
- thyroid
- parathyroids
- adrenal glands
- pineal body
- reproductive glands (which include the ovaries and testes)

There are endocrine functions of almost all organs to a minor degree, the gall bladder release CCK (Cholecystokinin (CCK or CCK-PZ; from Greek chole, “bile”; cysto, “sac”; kinin, “move”; hence, move the bile-sac (gallbladder)) is a peptide hormone of the gastrointestinal system-responsible for stimulating the digestion of fat and protein. Cholecystokinin, previously called pancreozymin, is synthesised by I-cells in the mucosal epithelium of the small intestine and secreted in the duodenum, the first segment of the small intestine, and causes the release of digestive enzymes and bile from the pancreas and gallbladder, respectively. It also acts as a hunger suppressant. Recent evidence has suggested that it also plays a major role in inducing...
drug tolerance to opioids like morphine and heroin, and is partly implicated in experiences of pain hypersensitivity during opioid withdrawal. There are many such examples but this book is just about the primary endocrine functions.
The Endocrine System: Hypothalamus, Pituitary, & Pineal Glands

Today, we begin our exploration of the endocrine system. In many ways, the endocrine system can be viewed as a partner, or complement, to the nervous system. Whereas the nervous system uses nerve impulses that last milliseconds to control short term events in the body, the endocrine system uses hormones that can sometimes take minutes, hours, or even days to take effect and control events. And sometimes those effects can last a lifetime.

Once you understand how important the endocrine system is in controlling every aspect of your life, from your moods to your sexuality to your energy levels to your ability to grow and be strong, you realize how important it is to keep it optimized. And yes, there are things you can do to keep it optimized.

Introduction

The endocrine system is comprised of a group of ductless glands that secrete hormones directly into the spaces surrounding their cells. From there, the bloodstream picks them up and circulates them throughout the body -- ultimately reaching the organ or cells designed to respond to a particular hormone. It is the ductless nature of the glands that defines them as part of the endocrine system. As for hormones, they are the body's chemical messengers that tell the body what to do… and when. Hormones produced by the endocrine system are necessary for normal growth and development, reproduction, and maintaining bodily functions (homeostasis). In humans, the major endocrine glands are the hypothalamus, pituitary, pineal, thyroid, parathyroids, adrenals, the islets of Langerhans in the pancreas, the ovaries, and the testes.

Secretion of hormones in the endocrine system is controlled either by regulators in a particular gland that detect high or low levels of a biochemical and inhibit or stimulate secretion or by a complex mechanism involving the brain, the hypothalamus, and the pituitary.

It should be noted again that the nervous system and the endocrine system are complementary -- both in terms of form and function. Both systems share a primary function of coordinating the activities of the body's many systems. For example, the nervous system tells muscles when to contract and relax, whereas adrenalin tells the body how to respond to stress or threats. The primary difference is that nerve impulses execute their effect in milliseconds...and the effects tend to be short-lived. The endocrine system, on the other hand, takes substantially longer for hormones to wend their way from the gland that produces them, through the bloodstream, and ultimately to the organ or cells where they take effect. In addition, the actions of hormones are much longer lasting than the milliseconds of nerve impulses. Another way of putting this is to say that the nervous system directs the body's short term responses, whereas the endocrine system directs the body's longer term responses.

One other point of note is that both systems are mutually interconnected. For example, when the nervous system needs to control things longer term, it acts through the endocrine system by stimulating the release or inhibition of hormones themselves from the endocrine organs. On the other hand, adrenalin, released by the adrenal glands, acts upon the brain to stimulate the fight or flight response.

General definitions

Before we continue, we need to lock down some important definitions.

• As mentioned above, endocrine glands (endo = "within") are glands that secrete directly into the spaces around the cells and whose products are picked up and circulated by the bloodstream.

• In contrast to the endocrine glands are the exocrine glands (exo = "out", krinein = "to secrete"). Unlike endocrine glands, exocrine glands secrete into ducts, which in turn, carry the secretions out of the glands and into the lumens (the inner cavities of a tubular organ such as blood vessels and the intestinal tract) or other body cavities or even out of the body. By an overwhelming majority, most glands in the body are exocrine glands, and most exocrine glands secrete their "products" outside of the body. These include sweat, oil, and mammary glands. (We will not be discussing the exocrine glands in this particular series of newsletters.)

• The endocrine system includes some organs that are wholly endocrine in function such as the pituitary gland, thyroid gland, parathyroid gland, adrenal glands, and pineal gland. (It is these glands in particular, along with the pancreas, that will be the focus of this series of newsletters.)

• Endocrine organs that have other functions as well as endocrine functions include the pancreas, liver, ovaries, stomach, hypothalamus of the brain, small intestine, kidneys, testes, and placenta. These are compound glands/organs. (Most of these will be covered when we explore their other functions.)

Endocrine gland locations

• The hypothalamus, pituitary gland, and pineal gland are located in the brain.

• The thyroid gland is located in the neck, with the four parathyroid glands situated behind it.
• The thymus is in the chest (will be covered when we discuss the immune system).
• The adrenal (AKA the supraneal) glands lie on top of the kidneys.
• The pancreas, stomach, ovaries, and testes are located in and beneath the abdominal cavity and have multiple functions – some of which include endocrine functions.

Hormones

As we mentioned earlier, the endocrine system releases chemical messengers called hormones (hormone = “urge on”), which act on other organs in different parts of the body. Effectively, hormones are the body’s chemical messenger system – they tell the body what to do and when. Some hormones promote or inhibit nerve impulses, while others (epinephrine and norepinephrine, for example) may act as neurotransmitters themselves in certain parts of the body. Then again, these hormones act as hormones (rather than as neurotransmitters) in other places. (This will be much easier to understand when we explore the adrenal glands in a subsequent newsletter.)

Also, as we mentioned earlier, hormones may take seconds, minutes, or hours to work their effects, and their duration of action may be short- or long-lived. How long?

Consider that once estrogen tells a fetus to become a girl, the effect lasts an entire lifetime – unless a doctor intervenes at some point. In general, though, hormones regulate growth, development, reproduction, metabolism, mood, and tissue function.

General properties of hormones

Although they may reach all the cells of the body via the bloodstream, each of the 50+ hormones in the human body affects only a tiny handful of very specific cells. This selectivity is key to the functioning of the endocrine system. How is it accomplished?

• Target cells contain highly specific receptors, which are surface glycoproteins (proteins which include a carbohydrate and a simple protein).
• The geometry of the glycoprotein molecules allows only for very specific hormones to attach to the receptor in the target cell surface. Think of it as a lock and key mechanism. Exceptions include:

Chemical mimics such as xenoestrogens (petroleum-based hormone lookalikes) and synthetic growth hormones in meat, etc. -- which can be potent in amounts as small as a billionth of a gram. These are never good.

Plant mimics such as phytoestrogens consumed in the diet or in supplements, which can fill receptor sites, making them unavailable to the stronger natural hormones (or chemical mimics for that matter) in the human body. This effect can often be used to advantage to tone down overly strong hormonal responses in the human body.

Each target cell has up to 100,000 receptors for a given hormone. When there is an excess of that hormone, the number of receptors decreases, reducing sensitivity. This reduction of sensitivity is known as "down regulation." Also, as just explained, chemical and phyto mimics can fill receptor sites on a cell making those sites unavailable to the actual hormones -- thus down regulating the cell. Or in the case of some chemical mimics, up regulating them. (Note: cells contain receptors for multiple hormones, not to mention neuropeptides produced by the brain, and other kinds of receptors too. Thus a single cell may actually have millions of receptor sites on its surface.)

If an abnormally low number of hormone molecules is circulating, the number of receptor sites on individual cells will increase to raise the level of sensitivity and thus compensate. This is known as "up regulation."

Locally acting hormones:

These hormones do not enter the general circulation. There are two types -- one of which, in particular, is of special concern to us.

• Paracrine hormones (para = “near”) act on cells next to the secreting cells without entering the bloodstream -- just passing through the interstitial fluid between cells.
• Autocrine hormones (auto = “self”) act on the cell that secreted them. These can play a critical role in terms of our health. Cancer cells use autocrine signaling to trigger growth. This means that cancer cells are autonomous. They don’t take orders from other cells in the body. They tell themselves what to do. That’s one of their features that makes them so dangerous.

Now that we have a basic understanding of what the endocrine system is, what it does, and how it works, let’s start making our way down through the body and begin by taking a look at the three endocrine glands in the human brain: the hypothalamus, the pituitary, and the pineal glands.
Hypothalamus

The hypothalamus is located below the thalamus and posterior to the optic chiasm. In humans, the hypothalamus is roughly the size of an almond. But within that small size, it contains a number of small nuclei with a variety of functions. One of the most important functions of the hypothalamus is to link the nervous system to the endocrine system via the pituitary gland. The hypothalamus actually controls the pituitary gland; and it integrates many messages from parts of the brain based on feedback from all over the body and tells the pituitary what to do.

Communication between the hypothalamus and the pituitary is effected through a portal blood capillary system, which connects the two glands over a very short distance. This provides a direct venous to venous connection. The advantage of this type of direct connection is that a portal flow allows blood-borne molecules from the hypothalamus to act on the pituitary before they are diluted with the blood in larger vessels, thus it takes very, very few molecules to direct the pituitary.

The hypothalamus synthesizes and secretes neurohormones, often called hypothalamic-releasing hormones, and these in turn stimulate or inhibit the secretion of pituitary hormones. Among other things, the hypothalamus, through its action on the pituitary, controls body temperature, hunger, thirst, fatigue, childbirth, emotions, growth, milk production, sleep, weight, and circadian cycles. It is responsive to light (the length of the day for regulating both daily circadian and seasonal rhythms). It is also responsive to olfactory stimuli (including pheromones), steroids, neurally transmitted information (from the heart, stomach, and reproductive system, stress, changes in body temperature caused by infection, and blood-borne stimuli (including leptin and ghrelin (appetite regulating hormones), angiotensin, insulin, pituitary hormones, cytokines, and glucose, etc.).

For the most part, the hypothalamus functions pretty much problem free for the vast majority of people. However, any of the following can cause it to malfunction: anorexia, bulimia, malnutrition, too much iron, bleeding, head traumas, infections, inflammation, genetic disorders, tumors, radiation, and surgery.

Pituitary gland

At one time, the pituitary gland, also called the hypophysis, was once thought to be the "master gland" that controlled all the other endocrine glands. But, as mentioned above, we have since learned that the hypothalamus actually controls the pituitary gland; and it integrates many messages from parts of the brain based on feedback from all over the body and tells the pituitary what to do. In any case, the two glands are tightly integrated. Together, they regulate all processes having to do with primitive reactions, such as stress, rage, flight, body temperature, thirst, hunger, sexual activity, and survival in general. And between them, they secrete 16 hormones.

The pituitary is about 1 cm in diameter, and it lies in the sella turcica ("Turkish saddle") at the base of the brain, directly behind the optic chiasm. It is divided into two embryologically and functionally different parts: the anterior pituitary and the posterior pituitary. Embryologically refers to what tissue the gland developed "out of" starting as an embryo. The anterior pituitary evolved anatomically up from the floor of the mouth. The posterior pituitary, on the other hand, evolved downward from the base of the brain. In fact, the two parts of the pituitary don't even talk to each other.

Anterior pituitary

The anterior pituitary gland is also called the adenohypophysis, and it makes up 75% of the pituitary gland -- the remaining 25% belonging to the posterior pituitary. Seven releasing hormones (including growth-hormone-releasing hormone and growth-hormone-inhibiting hormone) are secreted by the hypothalamus and are responsible for the release or inhibition of the anterior pituitary hormones. They are generally controlled by negative feedback mechanisms.

Once triggered by the hypothalamus, hormones released by the anterior pituitary flow into the
general circulation for action in far parts of the body. Like the hypothalamus, anterior pituitary hormones are also controlled by negative feedback from the brain and the target organ. That is, when the target organ responds to the activating hormone from the pituitary, it will release its own hormone back into the blood, which will travel back to the brain through the circulatory system, which in turn triggers the hypothalamus to turn off production of the stimulating hormone in the anterior pituitary. For example, the pituitary stimulates the thyroid to release thyroid hormones, which travel throughout the bloodstream stimulating metabolism in select parts of the body as required. Through the negative feedback loop, the brain learns that the metabolism has been activated enough (in other words, that enough thyroid hormones have been released) and tells the hypothalamus/pituitary to stop stimulating the thyroid. This completes the negative feedback loop.

**Principal anterior pituitary hormones**

- **Thyroid-stimulating hormone (TSH)** stimulates the thyroid gland to release thyroid hormones, which tend to upregulate metabolism.
- **Follicle-stimulating hormone (FSH) and luteinizing hormone (LH)** together stimulate the release of estrogen and progesterone, which cause the maturation of ova in the female and sperm cells in the male, as well as the release of testosterone.
- **Prolactin (PL)** stimulates the production of milk by the breasts. As a side note, prolactin can cross the placenta-blood barrier, causing "witch’s milk," or milk production from a baby’s nipples.
- **Adrenocorticotropic hormone (ACTH)** stimulates the release of adrenal cortical hormones by the adrenal glands.
- **Melanocyte-stimulating hormone (MSH)** causes increased skin pigmentation.
- **Human growth hormone (hGH, or somatotropin)** stimulates body growth and regulates metabolic processes. High hGH increases the growth of the skeleton during childhood, and it maintains muscle and skeletal size in the adult. Since hGH is probably the best known hormone produced by the pituitary -- and in the news constantly because of its illegal use among amateur and professional athletes looking for a competitive edge -- let’s take a look at this particular hormone in a little more detail.

**Human Growth Hormone**

The rejuvenating powers of growth hormone (GH) are no secret to the wealthy and professional athletes: for the last 30-40 years, GH has been available from doctors, requires two injections a day, and costs up to $1,800 a month. Over the last few years, however, several alternatives for the rest of us have become available. And while I could never recommend the injections (for a variety of reasons), I can endorse the alternatives. Many fantastic claims are made for the effects of growth hormone, even claims of “almost” eternal youth. Would that it were so! Although the effects are more subtle for most people, they are nevertheless wide ranging:

- Fat loss (14 percent on average after six months, without dieting)
- Elimination of cellulite
- Higher energy levels and enhanced sexual performance
- Regrowth of heart, liver, spleen, kidneys, and other organs that shrink with age
- Greater heart output and lowered blood pressure
- Improved cholesterol profile, with higher HDL ("good") cholesterol and lower LDL ("bad") cholesterol
- Superior immune function
- Increased exercise and athletic performance
- Better kidney function
- Stronger bones
- Faster wound healing and recovery from injury
- Younger, tighter skin
- Hair regrowth

The most important function of GH, however, is telling the liver to produce insulin-like growth factor 1 (IGF-1), the main key to anti-aging. Specifically, the benefits of GH can be measured in terms of how much it increases the body’s production of IGF-1 (above a 20 percent increase starts to be significant in terms of effectiveness).

There is some concern that, because it increases IGF-1 levels in the body, GH may increase the risk of prostate cancer. A simple reality check, however, calls these observations into question. First, both GH and IGF-1 levels decline as we age, yet the incidence of prostate cancer increases as these levels decline -- the exact opposite of the expressed concern. In addition, in numerous studies involving thousands of patients receiving growth hormone over many years, there were no observed increases in prostate cancer. In fact, based on real-life observation, there is evidence that growth hormone supplementation may reduce the risk of prostate cancer.
Supplementing with Growth Hormone

Most supplement formulas will increase IGF-1 levels by a minimum of 20 percent, with some even approaching 100 percent. But keep in mind that just one 30-minute aerobic session can easily increase IGF-1 levels by 100 percent, and a solid session of weight training can increase levels by an incredible 400–800 percent. Injections, on the other hand, which work directly on the liver (almost like a massive “pulse”), can increase IGF-1 production by only 20–40 percent. A downside to injections, in addition to cost, is that they can give too much GH to the body, shock the body, and can stop the pituitary from producing its own GH. This may explain why injectable GH produces more immediate results, yet ultimately plateaus in terms of effectiveness.

Incidentally, you can no longer actually buy true hGH or human growth hormone. Technically, only growth hormone actually taken from human beings can be called “human” growth hormone. Thirty years ago, the sole source of growth hormone was human cadavers, but that was abandoned when it turned out that growth hormone taken from people had a major downside (in addition to cost) — it occasionally caused the human equivalent of mad cow disease.

Fortunately, at around the same time, recombinant DNA technology came into its own and scientists learned how to alter the DNA of a single-cell yeast plant, and more recently from bacteria, so that they could produce large amounts of growth hormone (molecularly identical to real hGH), safely and inexpensively. Because this growth hormone is identical to hGH, people often use the terms growth hormone and human growth hormone interchangeably, but it should be referred to as a “plant-based growth hormone.”

Given this good, inexpensive source of growth hormone, another problem remained: the growth hormone molecule is so large (containing 191 amino acids) that it cannot be absorbed orally. That meant it could only be administered by injection, which required a doctor and was very expensive. Because of the cost, growth hormone injections became known as the secret youth formula of movie stars, athletes, and the very rich.

For most people, then, the best alternative to GH injections is the use of amino acid-based precursor formulas (also called a GH secretagogues). Typically, these formulas contain ingredients such as glutamine, tyrosine, GABA, arginine, and lysine. Although not as powerful as growth hormone injections, these formulas can be quite effective, provided your pituitary is functioning well, and they carry none of the downside of injections.

Things that sometimes go wrong with the anterior pituitary gland

Not surprisingly, since the pituitary is so involved with regulating growth, some of the key problems associated with a malfunctioning pituitary are related to growth. These include:

- Pituitary dwarfism: Low levels of hGH during the growth years causes bone-growth-plate closure before normal size is achieved. Also, many organs are smaller than normal, and the person has a childlike stature. Fortunately, injections of synthetic hGH produced by recombinant DNA technology in bacteria can prevent this if diagnosed in time.
- Pituitary gigantism: Hyposecretion of hGH during childhood causes long bones and tall stature but otherwise normal proportions.
- Acromegaly: Usually caused by functioning pituitary tumors in the already normal adult, it causes thickening of bones of the face, hands, and feet (bones can get longer after the closure of growth centers) and thickening of the tongue, eyelids, and nose. Andre the Giant, the well known wrestler and actor, was one of the world’s best known examples and was, in fact, often billed as The Eighth Wonder of the World. Another famous (possible example) might have been the biblical Goliath, who was slain by David with a slingshot. In fact, there is a very interesting theory, with real scientific basis, that proposes that Goliath’s acromegaly might actually account for how he was slain by David. According to the theory, a pituitary tumor, because of the pituitary’s placement right behind the optic chiasm, can sometimes place pressure on peripheral vision nerve fibers, resulting in tunnel vision. If Goliath had that condition, which sometimes does occur with acromegaly, he would have been blind to David, if David approached from the side, and a rock hurled from the side would hit the temple at the thinnest part of the skull, thus stunning the giant. Once stunned and on the ground, David would then be able to safely approach his now helpless victim and cut off his head. And thus the legend was born — or so the theory goes.

Posterior pituitary gland

As I mentioned earlier, the posterior pituitary gland (AKA the neurohypophysis) is anatomically derived from a down growth of the brain and is not technically a gland since it does not synthesize
hormones, but rather, stores and secretes two hormones actually made in the brain. These two hormones, oxytocin and vasopressin, are transported from the brain in small packets for storage in the posterior pituitary -- to be released as needed.

- **Oxytocin** (oxytosia = "rapid child birth"); AKA Pitocin) enhances the strength of uterine contractions and stimulates the ejection of milk after delivery. It may also foster maternal instincts and sexual pleasure during and after intercourse. Now synthesized and readily available, it is often given to women to help them have stronger contractions and expel the fetus in a more timely manner...when necessary.

- **Vasopressin** (Antidiuretic hormone, ADH) decreases urine production by increasing re-absorption by the kidneys, a useful trick when suffering from dehydration. The effect, though, is to raise blood volume and, therefore, to raise blood pressure. Alcohol inhibits ADH secretion, thus producing profuse urination after a drinking binge, which leads to severe dehydration, and the severe dehydration leads to the headache and thirst associated with a hangover.

### Pineal Gland

The pineal gland is about the size of a grain of rice, is shaped like a tiny pine cone (hence its name), and is located in the center of the brain in a tiny cave, behind and above the pituitary gland. For years, mystics considered it to be the seat of the mystical third eye, whereas the medical community considered it vestigial and, thus, pretty much non-functioning. Since then, the mystics have not necessarily been refuted, but the medical community has been. The pineal gland is now known to be the major source of melatonin production in the body. It is full size in children, a size it maintains throughout adulthood -- although its weight can drop significantly as we age. Since its discovery in 1958, melatonin has been studied extensively and shown to be widely beneficial to the body. The benefits of supplementation to compensate for abnormally low production in the body include:

- **Better Sleep** -- Lowered levels of nighttime melatonin reduce the quality of sleep, resulting in the need for more sleep. If your pineal gland does not produce adequate melatonin early enough in the evening, both the quality and quantity of your sleep may suffer. Lack of melatonin may make it difficult for you to fall asleep or may cause you to wake up too soon. Too much melatonin and you will feel exhausted or "drugged" throughout the day. By taking melatonin instead of other sleep aids, rapid eye movement (REM) sleep (dreaming) is not suppressed nor does it induce "hangover" effects when used as directed.

- **Enhanced Immune Function** -- Many people report that supplementation with melatonin has significantly reduced their incidence of colds and infections. The exact way in which melatonin affects the immune system is not known. However, since much of the activity of the immune system takes place at night, some researchers have proposed that melatonin interacts with the immune system during sleep, helping to buffer the adverse effects of stress. It has been proposed by some that the increased incidence of cancer we see today is partially due to the extended time we are exposed to artificial lighting. This is reflected in the fact that melatonin levels in breast cancer and prostate cancer patients are half of normal.

- **Powerful Antioxidant Capabilities** -- Melatonin is one of the most powerful antioxidants produced in the body. In addition, since it is both water and fat-soluble, melatonin can reach almost every cell in the body. However, since it cannot be stored in the body, it must be repleted daily.

- **Mood Elevator** -- Nighttime melatonin levels are low in people with major depressive and panic disorders. Individuals with mood swings or who are melancholic also have lower melatonin levels. Both seasonal affective disorder (SAD) and cyclic depressions are related to the peaks and valleys of melatonin levels.

### Third Eye

While the physiological function of the pineal gland remained unknown until recently, mystical traditions and esoteric schools, have long considered the pineal gland to be the connecting link between the physical and spiritual worlds...and the seat of extrasensory perception. I am not here to argue the spiritual qualities of the pineal gland, nor talk about its extrasensory capabilities, excepting one: its sensitivity to light.

As medically theorized, the pineal gland responds to the ebbs and flow of light entering our eyes during the day. In the evening, the pineal gland reacts to the diminishing levels of daylight and starts to produce melatonin, which is then released into the blood and flows through the body.
making us drowsy. Its secretion peaks in the middle of the night during our heaviest hours of sleep. In the morning, bright light shining through the eyelids reaches the pineal gland which reacts by switching off the production of melatonin, thus removing the desire to sleep. And we wake!

But this description is incomplete in one significant aspect. As it turns out, the pineal gland can be diminished not only by light shining on the eyelids, but by light shining anywhere on the body. Literally, light striking any part of your skin can reduce production of melatonin from the pineal gland. It seems the pineal can "see without eyes." How's that for ESP? Even more interesting is the fact that in some lower vertebrates the pineal gland actually has a well-developed eye-like structure and is considered by some scientists to be the evolutionary forerunner of the modern eye. In other vertebrates, though not organized as an eye, it functions as a light receptor -- effectively a third eye.

In any case, the key when it comes to the pineal gland and melatonin is that it's important to sleep in a darkened room, with no light coming through the curtains or night lights turned on in the room. And wearing eyeshades won't help as the pineal can sense any light shining on your skin. Failure to sleep in a darkened room will inhibit melatonin production, which presents a series of health problems, not the least of which is an inability to sleep deeply. But beyond that, if continued for too long, it will literally shut down the pineal and cause it to atrophy. At that point, your only choice will be to use melatonin supplements.
The pineal gland (also called the pineal body, epiphysis cerebri, epiphysis or the "third eye") is a small endocrine gland in the vertebrate brain. It produces melatonin, a hormone that affects the modulation of wake/sleep patterns and photoperiodic (seasonal) functions.

Circadian rhythm and the Pineal

Some features of the human circadian biological clock

A circadian rhythm is an endogenously driven roughly 24-hour cycle in biochemical, physiological, or behavioural processes. Circadian rhythms have been widely observed, in plants, animals, fungi and cyanobacteria (see bacterial circadian rhythms). The term "circadian" comes from the Latin circa, meaning "around", and diem or dies, meaning "day". The formal study of biological temporal rhythms such as daily, tidal, weekly, seasonal, and annual rhythms is called chronobiology. Although circadian rhythms are endogenous ("built-in", self-sustained), they are adjusted (entrained) to the environment by external cues called zeitgebers, the primary one of which is daylight.

History

The earliest known account of a circadian process dates from the 4th century BC, when Androstenes, a ship captain serving under Alexander the Great, described diurnal leaf movements of the tamarind tree.[1]

The first recorded observation of an endogenous circadian oscillation was by the French scientist Jean-Jacques d’Ortous de Mairan in 1729. He noted that 24-hour patterns in the movement of the leaves of the plant Mimosa pudica continued even when the plants were kept in constant darkness, in the first experiment to attempt to distinguish an endogenous clock from responses to daily stimuli.[2][3]

In 1896, Patrick and Gilbert observed that during a prolonged period of sleep deprivation, sleepiness increases and decreases with a period of approximately 24 hours.[4] In 1918, J.S. Szymanski showed that animals are capable of maintaining 24-hour activity patterns in the absence of external cues such as light and changes in temperature.[5] Joseph Takahashi discovered the first mammalian ‘clock gene’ in 1994.[6][7]

The term “circadian” was coined by Franz Halberg in the late 1950s.[8]

Criteria

To be called circadian, a biological rhythm must meet these four general criteria:

1. The rhythms repeat once a day (they have a 24-hour period). In order to keep track of the time of day, a clock must be at the same point at the same time each day, i.e. repeat every 24 hours.

2. The rhythms persist in the absence of external cues (endogenous). The rhythm persists in constant conditions with a period of about 24 hours. The rationale for this criterion is to distinguish circadian rhythms from simple responses to daily external cues. A rhythm cannot be said to be endogenous unless it has been tested in conditions without external periodic input.

3. The rhythms can be adjusted to match the local time (entrainable). The rhythm can be reset by exposure to external stimuli (such as light and heat), a process called entrainment. The rationale for this criterion is to distinguish circadian rhythms from other imaginable endogenous 24-hour rhythms that are immune to resetting by external cues and, hence, do not serve the purpose of estimating the local time. Travel across time zones illustrates the ability of the human biological clock to adjust to the local time; a person will usually experience jet lag before entrainment of their circadian clock has brought it into sync with local time.

4. The rhythms maintain circadian periodicity over a range of physiological temperatures (exhibit temperature compensation). Some organisms live at a broad range of temperatures, and the...
thermal energy will affect the kinetics of all molecular processes in their cell(s). In order to keep track of time, the organism’s circadian clock must maintain a roughly 24-hour periodicity despite the changing kinetics, a property known as temperature compensation.

Origin
Photosensitive proteins and circadian rhythms are believed to have originated in the earliest cells, with the purpose of protecting the replicating of DNA from high ultraviolet radiation during the daytime. As a result, replication was relegated to the dark. The fungus Neurospora, which exists today, retains this clock-regulated mechanism.

Circadian rhythms allow organisms to anticipate and prepare for precise and regular environmental changes; they have great value in relation to the outside world. The rhythmicity appears to be as important in regulating and coordinating internal metabolic processes, as in coordinating with the environment. This is suggested by the maintenance (heritability) of circadian rhythms in fruit flies after several hundred generations in constant laboratory conditions, as well as in creatures in constant darkness in the wild, and by the experimental elimination of behavioural but not physiological circadian rhythms in quail.

The simplest known circadian clock is that of the prokaryotic cyanobacteria. Recent research has demonstrated that the circadian clock of Synchococcus elongatus can be reconstituted in vitro with just the three proteins of their central oscillator. This clock has been shown to sustain a 22-hour rhythm over several days upon the addition of ATP. Previous explanations of the prokaryotic circadian timekeeper were dependent upon a DNA transcription/translation feedback mechanism.

In 1971, Ronald J. Konopka and Seymour Benzer first identified a genetic component of the biological clock using the fruit fly as a model system. Three mutant lines of flies displayed aberrant behaviour: one had a shorter period, another had a longer one, and the third had none. All three mutations mapped to the same gene, which was named “period.” The same gene was identified to be defective in the sleep disorder FASPS (Familial advanced sleep phase syndrome) in human beings thirty years later, underscoring the conserved nature of the molecular circadian clock.

Impact of light–dark cycle
The rhythm is linked to the light–dark cycle. Animals, including humans, kept in total darkness for extended periods eventually function with afreerunning rhythm. Each “day”, their sleep cycle is pushed back or forward, depending on whether their endogenous period is shorter or longer than 24 hours. The environmental cues that reset the rhythms each day are called zeitgebers (from the German, “time-givers”). It is interesting to note that totally-blind subterranean mammals (e.g., blind mole rat Spalax sp.) are able to maintain their endogenous clocks in the apparent absence of external stimuli. Although they lack image-forming eyes, their photoreceptors (detect light) are still functional; as well, they do surface periodically.

Freerunning organisms that normally have one or two consolidated sleep episodes will still have them when in an environment shielded from external cues, but the rhythm is, of course, not entrained to the 24-hour light–dark cycle in nature. The sleep–wake rhythm may, in these circumstances, become out of phase with other circadian or ultradian rhythms such as metabolic, hormonal, CNS electrical, or neurotransmitter rhythms.

Recent research has influenced the design of spacecraft environments, as systems that mimic the light–dark cycle have been found to be highly beneficial to astronauts.

Arctic animals
Norwegian researchers at the University of Tromsø have shown that some Arctic animals (ptarmigan, reindeer) show circadian rhythms only in the parts of the year that have daily sunrises and sunsets. In one study of reindeer, animals at 70 degrees North showed circadian rhythms in the autumn, winter, and spring, but not in the summer. Reindeer at 78 degrees North showed such rhythms only autumn and spring. The researchers suspect that other Arctic animals as well may not show circadian rhythms in the constant light of summer and the constant dark of winter.

However, another study in northern Alaska found that ground squirrels and porcupines strictly maintained their circadian rhythms through 82 days and nights of sunshine. The researchers speculate that these two small mammals see that the apparent distance between the sun and the horizon is shortest once a day, and, thus, a sufficient signal to adjust by.
Butterfly migration

The navigation of the fall migration of the Eastern North American monarch butterfly (Danaus plexippus) to their overwintering grounds in central Mexico uses a time-compensated sun compass that depends upon a circadian clock in their antennae.[22][23]

In plants

Diagram showing a small portion of the transcriptional feedback loop in Arabidopsis. LHY and CCA1 are considered negative elements due to its repression against TOC1 in the morning while TOC1 is considered a positive element because it results in increased transcription of LHY and CCA1 during the evening because of its accumulation.

Plant circadian rhythms tell the plant what season it is in and when to flower for the best chance of attracting insects to pollinate them and can include leaf movement, growth, germination, stomatal/gas exchange, enzyme activity, photosynthetic activity, and fragrance emission.[24] Circadian rhythms occur as a biological rhythm with light, are endogenously generated and self-sustaining, and are relatively constant over a range of ambient temperatures. Circadian rhythms feature a transcriptional feedback loop, a presence of PAS proteins, and several photoreceptors that fine-tune the clock to different light conditions. Anticipation of changes in the environment changes the physiological state that provides plants with an adaptive advantage.[25] A better understanding of plant circadian rhythms has applications in agriculture such as helping farmers stagger crop harvests thus extending crop availability, and to secure against massive losses due to weather.

Clocks are set through signals such as light, temperature, and nutrient availability, so that the internal time matches the local time. Light is the signal and is sensed by a wide variety of photoreceptors. Red and blue light are absorbed through several phytochromes and cryptochromes. One phytochrome, phyA, is the main phytochrome in dark-grown seedlings, but rapidly degrades in light to produce Cry1. Phytochromes B–E are more stable with phyB the main phytochrome in light-grown seedlings. The cryptochrome (cry) gene is also a light-sensitive component of the circadian clock. Cryptochromes 1–2 (involved in blue–UVA) help to maintain the period length in the clock through a whole range of light conditions.[24][25]

The central oscillator generates a self-sustaining rhythm and is made of two genes: CCA1 (Circadian and Clock Associated 1) and LHY (Late Elongated Hypocotyl) that encode closely related MYB transcription factors that regulate circadian rhythms in Arabidopsis. When CCA1 and LHY are overexpressed (under constant light or dark conditions) plants become arrhythmic and mRNA signals reduce contributing to a negative feedback loop. CCA1 and LHY expression oscillates and peaks in early morning while TOC1 oscillates and peaks in early evening. From past observations and studies, it is hypothesised that these three components model a negative feedback loop in which over-expressed CCA1 and LHY repress TOC1 and over-expressed TOC1 is a positive regulator of CCA1 and LHY.[25]

Biological clock in mammals

Diagram illustrating the influence of light and darkness on circadian rhythms and related physiology and behaviour through the suprachiasmatic nucleus and the pineal in humans.

The primary circadian “clock” in mammals is located in the suprachiasmatic nucleus (or nuclei) (SCN), a pair of distinct groups of cells located in the hypothalamus. Destruction of the SCN results in the complete absence of a regular sleep–wake rhythm. The SCN receives information about illumination through the eyes. The retina of the eye contains “classical” photoreceptors (“rods” and “cones”), which are used for conventional vision. But the retina also contains specialized ganglion cells which are directly photosensitive, and project directly to the SCN where they help in the entrainment of this master circadian clock.

These cells contain the photopigment melanopsin and their signals follow a pathway called the retinohypothalamic tract, leading to the SCN. If cells from the SCN are removed and cultured, they maintain their own rhythm in the absence of external cues.

The SCN takes the information on the lengths of the day and night from the retina, interprets it, and passes it on to the pineal gland, a tiny structure shaped like a pine cone and located on the epithalamus. In response, the pineal secretes the hormone melatonin. Secretion of melatonin peaks at night and ebbs during the day and its presence provides information about night-length.

Several studies have indicated that pineal melatonin feeds back on SCN rhythmicity to modulate circadian patterns of activity and other processes. However, the nature and system-level significance of this feedback are unknown.
The circadian rhythms of humans can be entrained to slightly shorter and longer periods than the Earth’s 24 hours. Researchers at Harvard have recently shown that human subjects can at least be entrained to a 23.5-hour cycle and a 24.65-hour cycle (the latter being the natural solar day-night cycle on the planet Mars).[26]

**Determining the human circadian rhythm**

The classic phase markers for measuring the timing of a mammal’s circadian rhythm are:

- melatonin secretion by the pineal gland
- core body temperature[27]
- plasma level of cortisol.[28]

For temperature studies, subjects must remain awake but calm and semi-reclined in near darkness while their rectal temperatures are taken continuously. The average human adult’s temperature reaches its minimum at about 05:00 (5 a.m.), about two hours before habitual wake time, though variation is great among normal chronotypes.

Melatonin is absent from the system or undetectably low during daytime. Its onset in dim light, dim-light melatonin onset (DLMO), at about 21:00 (9 p.m.) can be measured in the blood or the saliva. Its major metabolite can also be measured in morning urine. Both DLMO and the midpoint (in time) of the presence of the hormone in the blood or saliva have been used as circadian markers. However, newer research indicates that the melatonin offset may be the more reliable marker. Benloucif et al. in Chicago in 2005 found that melatonin phase markers were more stable and more highly correlated with the timing of sleep than the core temperature minimum. They found that both sleep offset and melatonin offset were more strongly correlated with the various phase markers than sleep onset. In addition, the declining phase of the melatonin levels was more reliable and stable than the termination of melatonin synthesis.[27]

One method used for measuring melatonin offset is to analyse a sequence of urine samples throughout the morning for the presence of the melatonin metabolite 6-sulphatoxymelatonin (aMT6s). Laberge et al. in Quebec in 1997 used this method in a study that confirmed the frequently found delayed circadian phase in healthy adolescents.[29]

A third marker of the human pacemaker is the timing of the maximum plasma cortisol level. Klerman et al. in 2002 compared cortisol and temperature data to eight different analysis methods of plasma melatonin data, and found that "methods using plasma melatonin data may be considered more reliable than methods using CBT or cortisol data as an indicator of circadian phase in humans."[28]

Outside the "master clock"

More-or-less independent circadian rhythms are found in many organs and cells in the body outside the suprachiasmatic nuclei (SCN), the "master clock". These clocks, called peripheral oscillators, are found in the oesophagus, lungs, liver, pancreas, spleen, thymus, and the skin.[30] Though oscillators in the skin respond to light, a systemic influence has not been proven so far.[31][32] There is also some evidence that the olfactory bulb and prostate may experience oscillations when cultured, suggesting that these structures may also be weak oscillators.

Furthermore, liver cells, for example, appear to respond to feeding rather than to light. Cells from many parts of the body appear to have freerunning rhythms.

**Light and the biological clock**

Light resets the biological clock in accordance with the phase response curve (PRC). Depending on the timing, light can advance or delay the circadian rhythm. Both the PRC and the required illumination intensity vary from species to species and lower light levels are required to reset the clocks in nocturnal rodents than in humans.

Lighting levels that affect the circadian rhythm in humans are higher than the levels usually used in artificial lighting in homes. According to some researchers[33] the illumination intensity that excites the circadian system has to reach up to 1000 lux striking the retina.

In addition to light intensity, wavelength (or colour) of light is a factor in the entrainment of the body clock. Melanopsin is most efficiently excited by light from the blue part of the spectrum (420–440 nm)[34] according to some researchers while others have reported 470–485 nm. These blue wavelengths are present in virtually all light sources, therefore their elimination requires special lights or filters which appear amber.

It is thought that the direction of the light may have an effect on entraining the circadian rhythm;[33] light coming from above, resembling an image of a bright sky, has greater effect than light entering our eyes from below.

According to a 2010 study completed by the Lighting Research Center, daylight has a direct effect on circadian rhythms and, consequently, on performance and well-being. The research showed that students who experience disruption in lighting schemes in the morning consequently experience disruption in sleeping patterns. The change in sleeping patterns may lead to negatively impacted student performance and alertness. Removing circadian light in the morning delays the dim light melatonin onset by 6 minutes a day, for a total of 30 minutes for five days.[35]

**Enforced longer cycles**

Modern research under very controlled conditions has shown the human period for adults to be just slightly longer than 24 hours on average. Czeisler et al. at Harvard found the range for normal, healthy adults of all ages to be quite narrow: 24 hours and 11 minutes ± 16 minutes. The "clock" resets itself daily to the 24-hour cycle of the Earth's rotation.[36]

The 28-hour day is presented as a concept of time management.[37] It builds on the fact that the week of seven days at 24 hours and a "week" of six days at 28 hours both equal a week of 168 hours. To live on the 28-hour day and six-day week would require staying awake for 19 to 20 hours and sleeping for eight to nine hours. Each "day" on this system has a unique light/dark pattern.

Studies by Nathaniel Kleitman[38] in 1938 and by Derk-Jan Dijk and Charles Czeisler[39][40] in 1994/5 have put human subjects on enforced 28-hour sleep–wake cycles, in constant dim light and with other time cues suppressed, for over a month. Because normal people cannot entrain to a 28-hour day[41] in dim light if at all, this is referred to as a forced desynchrony protocol. Sleep and wake episodes are uncoupled from the endogenous circadian period of about 24.18 hours.
and researchers are allowed to assess the effects of circadian phase on aspects of sleep and wakefulness including sleep latency and other functions.[42]

Early research into circadian rhythms suggested that most people preferred a day closer to 25 hours when isolated from external stimuli like daylight and timekeeping. Early investigators determined the human circadian period to be 25 hours or more. They went to great lengths to shield subjects from time cues and daylight, but they were not aware of the effects of indoor electric lights.[43] The subjects were allowed to turn on light when they were awake and to turn it off when they wanted to sleep. Electric light in the evening delayed their circadian phase. These results became well-known.[44] Researchers allowed subjects to keep electric lighting on in the evening, as it was thought at that time that a couple of 60W bulbs would not have a resetting effect on the circadian rhythms of humans. More recent research has shown that adults have a built-in day, which averages just over 24 hours, that indoor lighting does affect circadian rhythms and that most people attain their best-quality sleep during their chronotype-determined sleep periods.

Human health

Timing of medical treatment in coordination with the body clock may significantly increase efficacy and reduce drug toxicity or adverse reactions. For example, appropriately timed treatment with angiotensin converting enzyme inhibitors (ACEi) may reduce nocturnal blood pressure and also benefit left ventricular (reverse) remodelling.[44]

A short nap during the day does not affect circadian rhythms.

A number of studies have concluded that a short period of sleep during the day, a power-nap, does not have any measurable effect on normal circadian rhythms, but can decrease stress and improve productivity.[45][46]

There are many health problems associated with disturbances of the human circadian rhythm, such as seasonal affective disorder (SAD), delayed sleep phase syndrome (DSPS) and other circadian rhythm disorders.[47] Circadian rhythms also play a part in the reticular activating system, which is crucial for maintaining a state of consciousness. In addition, a reversal in the sleep–wake cycle may be a sign or complication of uremia,[48] azotemia or acute renal failure.

Studies have also shown that light has a direct effect on human health because of the way it influences the circadian rhythms.[49][50][51][52]

Circadian rhythm and airline pilots

Due to the work nature of airline pilots, who often traverse multiple timezones and regions of sunlight and darkness in one day, and spend many hours awake both day and night, they are often unable to maintain sleep patterns that correspond to the natural human circadian rhythm; this situation can easily lead to fatigue. The NTSB cites this situation as a contributing factor to many accidents[53] and has conducted multiple research studies in order to find methods of combating fatigue in pilots.[54][55]

Disruption

Disruption to rhythms usually has a negative effect. Many travellers have experienced the condition known as jet lag, with its associated symptoms of fatigue, disorientation and insomnia.

A number of other disorders, for example bipolar disorder and some sleep disorders, are associated with irregular or pathological functioning of circadian rhythms. Recent research suggests that circadian rhythm disturbances found in bipolar disorder are positively influenced by lithium’s effect on clock genes.[56]

Disruption to rhythms in the longer term is believed to have significant adverse health consequences on peripheral organs outside the brain, particularly in the development or exacerbation of cardiovascular disease.[57] The suppression of melatonin production associated with the disruption of the circadian rhythm may increase the risk of developing cancer.[58]

Effect of drugs

Circadian rhythms and clock genes expressed in brain regions outside the SCN may significantly influence the effects produced by drugs such as cocaine.[59][60] Moreover, genetic manipulations of clock genes profoundly affect cocaine’s actions.[61]

The pineal gland is shaped like a tiny pine cone, hence its name.
The pineal gland is located near to the center of the brain, between the two hemispheres, tucked in a groove where the two rounded thalamic bodies join. Unlike much of the rest of the brain, the pineal gland is not isolated from the body by the blood-brain barrier system. It is reddish-gray and about the size of a pea (8 mm in humans), located just rostro-dorsal to the superior colliculus and behind and beneath the stria medullaris, between the laterally positioned thalamic bodies. It is part of the epithalamus. It is a midline structure, and is often seen in plain skull X-rays, as it is often calcified. Calcification is typically due to intake of the fluoride found in water and toothpaste. It was the last endocrine gland to have its function discovered.

**Metaphysics**

The pineal gland’s location deep in the brain seems to intimate hidden importance. In the days before its function as a physical eye that could see beyond space-time was discovered, it was considered a mystery linked to superstition and mysticism.

Today it is associated with the sixth chakra whose awakening is linked to prophecy and increased psychic awareness as consciousness ascends.

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Chakras Spiraling Wheels or Cones of Energy

12 Around Spiraling Cones of Creation

The pineal gland, or third eye, is located in the geometric center of the brain. This correlates to the location of the Great Pyramid in the center of the physical planet.

All-Seeing-Eye and Eye Symbol

This pineal gland is activated by Light, and it controls the various bio-rhythms of the body. It works in harmony with the hypothalamus gland which directs the body’s thirst, hunger, sexual desire and the biological clock that determines our aging process. When it awakens, one feels a pressure at the base of the brain.

While the physiological function of the pineal gland has been unknown until recent times, mystical traditions and esoteric schools have long known this area in the middle of the brain to be the connecting link between the physical and spiritual worlds. Considered the most powerful and highest source of ethereal energy available to humans, the pineal gland has always been important in initiating supernatural powers. Development of psychic talents has been closely associated with this organ of higher vision.

When awakened, the third acts as a ‘stargate’ that
sees beyond Space-Time into Time-Space.

To activate the 'third eye' is to raise one's frequency and moving into higher consciousness - all is a consciousness experience perceived through the Eye of Time or Third Eye. Meditation, Visualization Yoga, and all forms of Out of Body travel, open the Third Eye and allow you to 'see' beyond the physical. As you practice, you will get it faster and more frequently. Your psychic abilities will increase as well as your dream time messages. You may first begin with your eyes closed, but as you practice, you will be able to open your third eye by focusing your attention and receiving messages with your physical eyes open. Planetary vibration/frequency is accelerating exponentially, allowing souls to peer into other realms far more easily than in the past. Frequency will continue to rise until consciousness evolves out of the physical in the next few years.

The pineal gland corresponds with divine thought after being touched by the vibrating light of Kundalini. starts its ascent towards the head center after responding to the vibrations from the 'light in the head.' The light is located at the top of the sutratma, or 'soul thread', which passes down from the highest plane of our being into the physical vehicle

**Conclusion**

We’ll pause here and pick up our discussion of the endocrine system in the next newsletter with an exploration of the thyroid and parathyroid glands. One of the interesting things you’ll notice is that as we move down through the body, you’ll find that you have progressively more options for altering the behavior of your endocrine glands. That said, you can nevertheless consider using the following supplements to assist the hypothalamus, the pituitary, and the pineal glands in the optimal performance of their basic functions.

- hGH secretagogue -- available throughout the internet
- Timed release melatonin
- Hypothalamus PMG from Standard Process -- available throughout the internet
- Pituitrophin PMG from Standard Process -- available throughout the internet
Crown of head: formless supreme light
Between the eyebrows: intellect
Throat: spiritual drive
Right of the physical heart: love-compassion drive
Navel: seat of the will power
Above/behind genitals: sensual drive
Just above anus: material drive

Major Endocrine Glands:
- Pituitary gland
- Thymus
- Adrenal gland
- Pancreas
- Throat
- Heart
- Solar Plexus
- Sacral
- Ovary
- Testis

Put your body's systems back in balance.
The Endocrine System: The Pancreas & Diabetes

Several months ago, we explored the anatomy and physiology of the pancreas in terms of its role in the digestive process. But the pancreas is one of a handful of organs in the body that functions in two distinct modes. It is not only an exocrine digestive organ, but it also functions as part of the endocrine system and, to a significant degree, controls the metabolism of sugar in the body and its use as a source of energy for every single cell and organ in the body. In this newsletter, we examine the endocrine functions of the pancreas. As an endocrine organ, the pancreas produces two sugar-regulating hormones: insulin and glucagon. After reviewing the functions of insulin and glucagon and the four cell types that comprise the endocrine pancreas, we’ll examine in detail the main disease associated with the pancreas, diabetes mellitus.

The pancreas functions in two modes.

As mentioned above, the pancreas functions in two distinctly different modes. It is both an exocrine digestive organ that secretes digestive juices and enzymes into the duct of Wirsung that runs down the middle of the pancreas and empties into the duodenum at the head of the pancreas. But the pancreas is also an endocrine organ, producing insulin, glucagon, and somatostatin that flow directly into the bloodstream, eventually reaching virtually every cell in the body.

Anatomy review

We explored the anatomy and physiology of the pancreas in some detail in our newsletter focused on that topic, but a quick review would be appropriate before discussing the gland’s endocrine function.

Physically, the pancreas is located in the upper abdominal cavity, towards the back—in the C curve of the duodenum. It is about 12 inches long and tapers from right to left. (Remember, anatomically speaking, left and right are referenced from behind the body so they are actually reversed in most diagrams that view the body from the front.) The thick part, the head, comprises almost 50% of the mass of the pancreas and lies to the right, nestled in the C-curve of the duodenum. As for the body of the pancreas, it moves up and to the left, tapering into what is known as the tail of the pancreas, which terminates at the junction of the spleen.
As might be suspected for such an important organ, the pancreas is richly supplied with arteries and veins. It is served by branches from the hepatic artery, the gastroduodenal artery, the pancreaticoduodenal artery, the superior mesenteric artery, and the splenic artery.

Ninety-nine percent of the pancreas is made of acini, clusters of cells that resemble a many-lobed "berry" (acinus is Latin for berry). The acini produce exocrine digestive juices that flow out of the acini through small ducts that eventually join together and feed into the duodenum through the pancreatic duct. But today, we are not interested in that ninety-nine percent. We are interested in the one percent of the pancreas that is made up of several million cells scattered throughout the pancreas, grouped together in globules known as islets of Langerhans. It is these cells that contain the endocrine functioning of the pancreas. A healthy human pancreas contains about one million such globules, which are distributed throughout the organ like tiny islets in a vast ocean of acini -- hence their name. Their combined mass is a mere 1 to 1.5 grams.

**Physiology of the endocrine pancreas -- four cell types**

A single islet of Langerhans is actually comprised of four distinct types of cells (alpha, beta, delta, and gamma), two of which are primary: alpha and beta.

**Alpha cells**

Alpha cells constitute 20% of the islet’s cells. They secrete the hormone glucagon, a polypeptide of 29 amino acids, which raises blood sugar to maintain normal levels. For the most part, glucagon does not present the same problems as insulin and will not raise blood sugar much above normal -- 80-100 mg of sugar per 100 ccs of blood. For obvious reasons (diabetes), we don’t want blood sugar to go too high. But for the brain, we don’t want it to go too low either (hypoglycemia). The brain does not store sugar and has no reserves. If blood sugar falls too low, the brain is affected in minutes, possibly even seconds. Note: all of the islet cells are serviced by an abundant network of capillaries that carry their “products,” including glucagon, out into the bloodstream.

The production and release of glucagon in the pancreas is regulated by chemoreceptors throughout the body that constantly measure the amount of sugar in the blood. Whenever blood sugar gets too low, the chemoreceptors signal the alpha cells in the pancreas to release more glucagon. Glucagon in turn travels through the bloodstream to the liver, where it acts on hepatocytes (cells in the liver) to break down glycogen (the stored form of glucose) into glucose through a process called glycogenolysis. Also, if required, the body can convert amino acids and/or fat into intermediate metabolites that are ultimately converted into glucose through a process called gluconeogenesis. In either case, the glucose makes its way into the bloodstream where it is available to be used by cells for energy.

Correspondingly, higher-than-normal blood sugar turns off the release of glucagon. It should also be noted that stimulation of the sympathetic nervous system in preparation for stress, or flight (or in response to fright) also affects glucagon release; it increases it. This is accomplished through both neural and hormonal signals coming down into the pancreas. Hormonally, we’re talking about epinephrine and norepinephrine, which stimulate the release of glucagon, thus raising blood sugar levels.

And finally, glucagon secretion is inhibited by amylin, a peptide of 37 amino acids, which is secreted by the beta cells of the pancreas.

Injections of glucagon are sometimes given to diabetics suffering from an insulin reaction in order to speed the return of normal levels of blood sugar. All of glucagon’s actions tend to counter those of insulin, which works to reduce the level of glucose in the blood. Incidentally, glucagon, like insulin, is readily available thanks to genetically engineered bacteria and recombinant DNA technology. This is done by inserting the human gene for insulin into E. coli bacteria, which then "grow" genuine, bio-identical, human insulin in culture tanks. For those squeamish about E. coli, this process is also done by some manufacturers using yeast instead of bacteria.

**Beta cells**

Beta cells constitute approximately 80% of islet cells. They secrete insulin, which lowers blood sugar -- also in response to chemoreceptors. Higher-than-normal blood sugar stimulates beta cells to release insulin. Sustained high blood sugar is bad not only for the blood but also for organs and cells.

Beta cells have channels in their plasma membrane that serve as glucose detectors. Beta cells secrete insulin in response to a rising level of circulating glucose (i.e. "blood sugar").
Insulin is a small protein that affects virtually every single cell in the body and most organs -- primarily by regulating how every cell in the body utilizes glucose. Seventy-five percent of that glucose is ultimately used by the body to sustain brain function. The remaining 25% is divided between muscle function, red blood cell production, and powering every single cell in the body. Actually, glucose does not power those cells directly, but rather, through a process known as glycocolysis, it is used in the creation of pyruvate, which is then turned into adenosine triphosphate (ATP), the actual energy source within the cell.

Again, insulin is a primary regulator of sugar in the body. For example, it stimulates skeletal muscle fibers to take up glucose and convert it into glycogen, which is the storage form of glucose and is utilized in muscle tissue to produce ATP by the muscle itself. Insulin also works inside muscle tissue to extract amino acids from the blood and stimulate their conversion into protein, thereby causing the muscles to "grow."

Insulin also acts on liver cells, stimulating them to take up glucose from the blood and convert it into glycogen while inhibiting production of the enzymes involved in breaking glycogen back down into glucose and inhibiting the conversion of fats and proteins into glucose. In this way, insulin helps regulate the body's energy storage system. It should be noted that when the dietary intake of high glycemic carbohydrates is excessive, this leads to an excess of stored fat in the liver, which ultimately compromises liver function. This is further compounded by the fact that insulin acts on fat cells to stimulate their uptake of glucose and the synthesis of fat. In each case, insulin triggers these effects by binding to the insulin receptor -- a transmembrane protein embedded in the plasma membrane of the responding cells.

Taken together, all of these insulin actions result in the storage of the soluble nutrients absorbed from the intestine into insoluble, energy-rich products (glycogen, protein, fat) and a drop in the level of blood sugar. Specifically, insulin is glucagon’s opposite and acts on the cells of the body to:

- Increase the speed and ability of glucose to diffuse into cells -- especially the skeletal muscles and heart muscles for the restoration and recovery of those muscles.
- Accelerate the conversion of glucose into its storage form, glycogen.
- Increase the synthesis of proteins from amino acids.
- Increase the synthesis of fatty acids -- especially in the liver. This is the mechanism animals in the wild use to store energy for hibernation or just to survive harsh winters. Unfortunately, it causes problems for modern man as we no longer face such extreme conditions -- thus leading to an excess of fat storage.
- It decreases the rate of glycogenolysis (breakdown of glycogen into glucose) and gluconeogenesis (conversion of fats and proteins into glucose). The net effect is to lower glucose levels. Lower-than-normal blood glucose turns off the output of insulin. But there are other factors that also affect insulin release. The parasympathetic nervous system can stimulate insulin release to aid in recovery and rest. Glucagon itself causes insulin release to balance its effect in a negative feedback loop. And finally, gastric inhibitory peptide (GIP) from the enteroendocrine cells of the small intestine responds to glucose in the lumen of the gut, thereby signaling the "preparatory" release of glucose-dependent insulin from pancreatic beta cells. It should be noted that the effect of GIP on the pancreas is diminished by Type 2 diabetes.

And finally, beta cells also produce insulin-like growth factors (specifically, IGF-2), which is found in many body tissues at concentrations far higher than insulin itself. It shares the molecular structure and shape of insulin and is involved in growth. As a side note, IGF-1 (produced in the liver) and IGF-2 are used by cancer cells to stimulate growth.

Delta cells

Delta cells constitute less than 1% of pancreatic islets. They secrete somatostatin, the same growth-hormone-inhibiting hormone secreted by the hypothalamus. This hormone inhibits insulin release and slows absorption of nutrients from the GI tract.

Gamma cells (F cells)

Gamma cells also constitute less than 1% of pancreatic islets. They secrete a pancreatic polypeptide that inhibits the release of somatostatin. In other words, Delta cells and Gamma cells work to regulate each other.

Diabetes mellitus ("sweet urine")

Diabetes mellitus is actually not one disease, but a group of disorders in which glucose levels are elevated in the blood. It is called a protean (widespread) disease because it affects every system in the body. (For more on this concept, check out Diabetes -- The Echo Effect -- highly recommended.) By itself, it ranks somewhere between fourth and sixth as a leading cause of death in the US -- and climbing the charts throughout the rest of the world. But when considered as a major factor in cardiovascular disease and kidney failure, its true impact is probably much higher. Its name, sweet urine, comes from the fact that it was originally diagnosed by tasting (not testing) the patient’s urine. The word “mellitus” is Latin for honey-sweet. Elevated glucose levels make the urine sweet. Back then, doctors truly earned their fees.
Doctors often refer to the clinical manifestations of diabetes as the "three polys":

- **Polyphagia**: excessive eating. Patients with diabetes are actually starving because they’re not getting sugar into their cells where it is needed -- so they are driven to eat excessively, in an attempt to compensate.
- **Polydipsia**: excessive thirst and drinking of water -- caused by the polyuria.
- **Polyuria**: copious amounts of urine.

There are two main types of diabetes. Type I is insulin-dependent diabetes mellitus and Type II is non-insulin-dependent diabetes, formerly known as maturity-onset or adult onset diabetes. There is also a third, less common, type of diabetes that results from mutant genes inherited from one or both parents. We will discuss all three types.

**Type I diabetes**

Type I represents about 10-20% of all diabetes cases. It is suspected that it is an autoimmune disease in which the body becomes allergic to its own beta cells and destroys them. What triggers this attack is still unknown, although a prior viral infection may be the culprit. In any case, the net result is that there are simply too few beta cells left to make enough insulin to fulfill the body's needs, and the patient ends up with an absolute deficiency in the quantity of insulin available. Type I diabetes is also known as juvenile-onset diabetes because it often appears in childhood.

Standard "medical" treatment is daily insulin injections to give patients the insulin their bodies are not providing. Unfortunately, because insulin demands fluctuate so frequently during the day, it is very hard to regulate "external" insulin in a way that keeps sugar and insulin levels consistently balanced in the body. For example, injections after vigorous exercise or long after a meal may drive the blood sugar level down to a dangerously low value causing an insulin reaction. The patient becomes irritable, fatigued, and may lose consciousness. In response, doctors have developed experimental treatments such as inhalable insulin, pancreatic transplants, islet cell transplants, immune suppression, and insulin pumps. To this point, none of these alternatives is without significant problems. On the other hand, although it cannot be controlled with diet and exercise, there are indeed alternative options that can prove helpful. We’ll talk about those a little later.

In addition to the immediate problems associated with excess blood sugar, diabetes also presents other problems. For example, patients are in a chronic state of starvation, unable to use nutrients without injections of insulin. In addition, cataracts of the lens of the eye and diabetic retinopathy are related to high blood sugar. The excess sugar diffuses into the eye and forms a cloudy glycoprotein with the lens. Another problem associated with diabetes is if the body is unable to utilize blood sugar as energy for the cells of the body, it will try and convert as much of the excess glucose as possible into fat to store the energy. This not only leads to fatty livers, but to an excess of fat in the blood. High levels of fat in the blood, over long periods, leads to atherosclerosis. Other physical problems related to high blood lipids and blood vessel damage (also caused by blood sugar) include strokes, heart attacks, kidney failure, peripheral vascular disease, and increased rates of infection -- not to mention, a high rate of amputation. (Again, check out Diabetes -- The Echo Effect.)

There is another problem associated with Type I diabetes. Since diabetics cannot use glucose for energy effectively, their bodies shift to using fatty acids to produce cellular energy. This results in an excess of fatty acid wastes called ketones. Ketones are very, very acidic, and they cause a shift to acidity in the blood. This condition is called ketoacidosis. You can smell acetone on the breath of a diabetic suffering from ketoacidosis. Uncorrected, ketoacidosis is rapidly fatal.

It’s probably worth mentioning that low-carb diets work by turning dieters into “controlled” diabetics so that their bodies can shift from sugar burning to fat burning. Effectively, low-carb diets interrupt the Krebs cycle by denying the body the 100 grams of glucose it needs to prime the pump for sugar burning. As I mentioned, this process essentially turns dieters into controlled low-level diabetics and produces a mild form of ketoacidosis. As a side note, if a dieter eats protein and fat, then triggers the Krebs cycle, all excess material will be turned into fat anyway -- so ultimately, little is gained unless one chooses to remain permanently a low level diabetic.

For more on low-carb diets, check out my series of newsletters on the subject, Low Carb Craziness.

**Type II diabetes**

At one time, Type II diabetes was known as adult onset diabetes because almost all its victims tended to be over 40 years of age. But those days are long gone, and now, thanks to catastrophic dietary changes in the developed world (and with developing countries struggling to imitate us) Type II diabetes is now appearing in many children. So it has been renamed. It is now called non-insulin-dependent diabetes and accounts for some 90% of all diabetes cases. In fact, children now account for 20% of all newly-diagnosed cases of Type II diabetes and, like their adult counterparts, are usually overweight. Sadly, it is almost always a self-inflicted disease -- most often triggered by high glycemic diets and excessive weight. Fortunately, because it is self-inflicted, it is usually much milder than Type I diabetes (at least if caught in the early stages) and is much easier to control. In fact, many patients have normal insulin levels. The problem is that because the body has had to pump out so much insulin over time to combat the high glycemic foods dominating so many diets, the cells of the body have become progressively less sensitive to the action of insulin. They have, to use the common term, become insulin resistant.

Although virtually every single cell in the body survives by converting glucose to energy, skeletal
muscle is the major "sink" for removing excess glucose from the blood and converting it into glycogen). But in a Type II diabetic, the ability of skeletal muscle to remove glucose from the blood and convert it into glycogen may be only 20% of normal. This, again, is called insulin resistance. Fortunately, vigorous exercise increases the ability of skeletal muscle to transport glucose across its cellular membrane, thus reducing the effect of insulin resistance. Or to put it another way, people who lead sedentary lives are more likely to develop Type II diabetes.

Symptoms of Type II diabetes are similar to that found in Type I and include the three polys mentioned above.

Treatment options include:

- For most patients -- diet, weight loss, and exercise.
- For some patients -- pharmaceutical drugs.
- For a few patients -- insulin injections.

On the other hand, if patients are lax and do not control their disease early on, symptoms become more severe over time. It is as though after years of pumping out insulin in an effort to overcome the patient's insulin resistance, the beta cells become exhausted.

Note: there is a close relative of Type II diabetes called gestational diabetes. It usually results from transient elevations in blood glucose during pregnancy. It causes the same problems as Type II diabetes for the fetus.

Inherited Forms of Diabetes Mellitus

A very small number of cases of diabetes result from mutant genes inherited from one or both parents. These genes can cause diabetes in several different ways.

- Some mutant genes prevent the body from actually manufacturing insulin.
- Other genes cause insulin receptor sites on cells to malfunction.
- Still another mutation prevents the body from manufacturing glucokinase, an enzyme essential for glycolysis, the first step in converting glucose into ATP, which energizes every single cell in the body.
- And yet another mutation messes up the sodium-potassium pump mechanism (used to transport large molecules into and out of cells) in the beta cells of the pancreas so that the insulin they create can never leave the cell and make its way into the bloodstream. In other words, the insulin is there, but unusable.

While the symptoms of inherited diabetes usually appear in childhood or adolescence, patients with inherited diabetes differ from most children with Type 2 diabetes in that their families have a history of similar problems and they are not necessarily obese. But again, inherited diabetes represents only a small percentage of diabetic patients.

Natural treatments for diabetes

Ultimately, Type I and Type II diabetics end up at the same place even though they arrive there through very different means. In Type I diabetes, you end up with high blood sugar because your body can’t produce enough insulin to drive the sugar into cells where it can be used for energy production. In Type II diabetes, your body can produce more than enough insulin (at least in the beginning), but because cells become resistant to the effects of that insulin, sugar stays in the blood because it can’t get transported into the cells of the body. Thus, the alternative methods for dealing with both types of diabetes are similar -- with a couple of additions for Type I diabetes to deal with the autoimmune factor.

Natural protocol for dealing with diabetes

Beyond modifying your diet and exercising, you might want to inhibit absorption of high glycemic foods, without creating unwelcome responses in the intestinal tract, such as those experienced using metformin. This drastically reduces the amount of insulin your body requires and minimizes the chances of having both sugar and insulin spikes. It can be accomplished with the following herbs:

- Nopal cactus
- Gymnema sylvestre

Naturally reverse insulin resistance so less insulin is required. Again, the benefits for both Type I and Type II diabetes are obvious:

- Konjac mannan
- Cinnulin PF
- Chromium GTF
- Omega-3 fatty acids

Repair beta cells in the islets of Langerhans in the pancreas to optimize insulin production reserves as opposed to forcing the cells to dramatically overproduce as with glyburide, which leads to inevitable burn out. This is a "sine qua non" for Type I diabetes and is essential if you want to prevent prolonged Type II diabetes from "burning out" the beta cells through forced overproduction of insulin.

- Gymnema sylvestre
- Alpha lipoic acid or R lipoic acid

Lower blood sugar levels through proper diet and herbal supplementation:

- Fenugreek extract
- Momordica charantia
- Corosolic acid
- Mulberry

Reduce stress. Remember, adrenaline suppresses the release of insulin.

Specific for Type I diabetes

Since it is strongly suspected that Type I diabetes results from an out of control immune system that attacks and destroys the beta cells in the islets of Langerhans, it is essential that you try and modulate your immune system to minimize, or even eliminate, this factor.
Immunomodulators

Natural immunomodulators retrain your immune system to not overreact -- and without deadly side effects.

- L-carnosine
- Cetylmyristoleate (CMO)
- Transfer Factor found in bovine colostrums
- Ginseng

Taking on viruses

There is steadily mounting evidence that a virus may be responsible for triggering the autoimmune response that causes Type I diabetes. If so, then you will want to use antipathogens to help reduce or eliminate that viral load.

- Garlic
- Olive leaf
- Zinc
- Grapefruit seed extract
- Wild mountain oil of oregano

Additional steps

If you clicked the link to Diabetes: the Echo Effect, you know that diabetes potentially affects almost every organ in the body -- many of which, as they degrade, can exacerbate the original diabetic problem. Therefore, anyone suffering from diabetes will want to do whatever is necessary to protect those organs.

Protect organs and proteins from damage caused by higher than normal levels of sugar through a mixture of antioxidants and nutraceuticals such as:

- L-Carnosine
- Acetyl-l-carnitine
- DMAE
- CoQ10
- Alpha lipoic acid or R lipoic acid
- Benfotiamine

Protect organs from damage caused by higher than normal insulin levels by cleaning the blood by using:

- A blood cleansing formula
- Proteolytic enzymes
- Omega-3 fatty acids

And that concludes our exploration of the endocrine functions of the pancreas. In our next newsletter, we will conclude our exploration of the endocrine system by examining the adrenal glands.

The Endocrine System: Thyroid and Parathyroid Glands

In our last newsletter, we began an exploration of the endocrine system by examining the three endocrine glands in the brain: the hypothalamus, the pituitary, and the pineal gland. In this issue, we move down the body to examine the five endocrine glands found in the neck: the thyroid and the four parathyroid glands. The thyroid gland regulates the rate and intensity of the body’s chemical/metabolic reactions, and the parathyroid glands regulate the amount of calcium and phosphorus in the blood. As it turns out, malfunctions in these glands are not that uncommon, can produce serious problems such as over excitation of the muscle and nervous systems, bony demineralization, high calcium levels, duodenal ulcers, kidney stones, and behavioral disorders. And if left unchecked, they can kill you. Fortunately, there are things you can do to minimize the chances of these problems occurring in the first place, or relieving them through alternative means if you get them.

With that in mind, let’s begin by looking at the thyroid gland.

Thyroid overview

In essence, the thyroid gland is the thermostat of the body. It regulates both the rate and intensity of chemical/metabolic processes. It is one of the largest endocrine glands in the body and specifically controls how quickly the body uses energy, how it makes proteins, and the body’s sensitivity to other hormones. The function of the thyroid gland is to take iodine and convert it into thyroid hormones -- primarily, thyroxine (T4) and triiodothyronine (T3). Normal thyroid cells accumulate and retain iodidefar, far more efficiently than do any other cells in the body. Most cells don’t absorb iodine at all, but some, including thyroid cancer cells and breast epithelial cells, can to a limited degree. Thyroid cells combine iodine and the amino acid tyrosine (as bound to thyroglobulin) to make T3 and T4. (We will cover this process in more detail a little later.) T3 and T4
are then released into the bloodstream and transported throughout the body, where they control metabolism (i.e., the conversion of oxygen and calories to energy). Every cell in the body depends upon thyroid hormones for regulation of their metabolism.

Anatomically speaking, the thyroid is a butterfly shaped gland (two larger lobes connected by a narrower isthmus) located between the Adam’s apple and the clavicle. When viewed from the front of the body, the thyroid totally covers the trachea. Nevertheless, a normal thyroid gland cannot be felt externally. If a doctor can “see” it or “feel” it when touching the neck with his fingers, it’s enlarged. Under normal circumstances, it’s soft and flat.

Not surprisingly for such an important organ, it is richly serviced by multiple arteries and veins, which makes surgery on the thyroid that much more difficult. In addition, surgeons face further complications since the nerves that service the vocal cords run right next to the arteries that provide blood to the thyroid. Bottom line is that the thyroid with radioactive iodine rather than remove it surgically (a procedure we will talk more about later).

At the micro level, the thyroid is primarily comprised of spheres called follicles. The follicles themselves are primarily composed of two types of cells:

1. On the outside circumference of the follicles are the cuboidal follicular cells. The follicular cells produce two iodine based compounds, thyroxine (tetraiodothyronine, also known as T4) and triiodothyronine (also known as T3). On the inside circumference, or lumen of the follicle, is a brush border composed of hairlike extensions (not visible in the slide below). This allows for the easy deposit and removal of key hormonal components into the follicular lumen (see slide below) as required for production of T3 and T4.

2. The parafollicular cells (C cells) sit scattered about the outer edge of the follicles on top of the follicular cells and produce calcitonin, a minor regulator of calcium in the body.

Thyroid hormones

When talking about thyroid hormones, we’re actually talking about four bio-chemicals:

- Thyroglobulin is a protein (not a hormone) produced by the thyroid. It is synthesized from amino acids and iodide and stored in the follicular lumen as colloid and used entirely within the thyroid gland in the production of the thyroid hormones.
- T3 (triiodothyronine) affects almost every physiological process in the body, including growth and development, metabolism, body temperature, and heart rate. Production of T3 and its prohormone, T4 (T3 is actually produced by the breakdown/conversion of T4), is activated by thyroid-stimulating hormone (TSH), which is released from the pituitary gland. As a side note, the 3 in its name refers to the fact that it contains 3 iodine atoms.
- T4 (thyroxine, AKA tetraiodothyronine) is the prohormone from which the body extracts T3. It is synthesized from residues of the amino acid tyrosine, found in thyroglobulin. Every cell in the body depends upon the thyroid hormones T3 and T4 for regulation of their metabolism. The normal thyroid gland produces about 80% T4 and about 20% T3. However, T3 is about
four times “stronger” than T4. T4 is converted to T3 in body cells. This allows the body to fine tune the metabolic regulating capabilities of T3 and T4. As with T3, the 4 in T4’s name refers to the fact that T4 contains 4 iodine atoms.

- Calcitonin is produced in the parafollicular cells and regulates calcium levels in the blood (to a minor degree), along with the parathyroid glands (the main regulator). It lowers blood calcium and phosphorus by decreasing the rate of re-absorption of these minerals from bone.

As we discussed previously, thyroid chemistry is an iodine-based chemistry; iodine must be ingested because it can’t be manufactured in the body; it is an element, not a compound. In fact, follicular cells actively trap virtually all iodine/iodide molecules in the body. Any iodine you ingest is trapped exclusively by cells in the thyroid to be used for manufacturing thyroglobulin and, ultimately, T3 and T4. This fact is exploited by endocrinologists when it comes to treating several thyroid disorders. (We will talk more about this later.) If iodine is not present in sufficient amounts, the body will develop a benign goiter (enlargement of the thyroid) over time. It is common in areas where iodine does not naturally occur in food.

In the early 1900’s, Western countries began adding iodine to salt to combat this problem. And it worked, in the sense that goiters are now uncommon in the Western world. But using iodized salt presents its own problems. Surprisingly, a number of “older” societies recognized the connection between iodine and goiters. The ancient Greeks, for example, consumed iodine-rich seaweed to successfully combat goiters -- without the problems associated with iodized salt. Sometimes grandma really does know best.

As seen in the slide above, the thyroid stores something called colloid (which is manufactured in the follicular cells) in the center (lumen) of the follicles in large quantities. Although colloid contains some T3 and T4, it is primarily comprised of thyroglobulin, which is converted to T3 and T4 and released into the body when triggered by thyroid stimulating hormone (TSH), released by the pituitary. In fact, a healthy thyroid stores about a three-month supply of thyroglobulin at any given moment in time.

As we touched on in our last newsletter, thyroid-stimulating hormone (TSH) from the anterior pituitary regulates the processes via a negative feedback loop. That is to say, thyroid releasing hormone (TRH) from the hypothalamus stimulates the pituitary to release TSH into the bloodstream, which stimulates thyroid follicular cells to add iodine to the amino-acid (tyrosine) component of thyroglobulin (which, once again, is stored as colloid within the lumen of the thyroid follicles). Once converted, the T3 and T4 hormones are released into the bloodstream. This arrangement essentially works as a reserve system for thyroid hormones, allowing it to release active hormones into the body on an as needed basis. As more thyroid hormones are produced, blood levels of T3 and T4 rise. Ultimately, these hormones make their way through the bloodstream back to the hypothalamus, telling the hypothalamus that enough is enough and to stop releasing TRH, which stops the pituitary from releasing TSH – shutting down the cycle.

It should be noted that the thyroid hormones are slow acting. Unlike adrenalin, for example, it takes awhile for anything to happen with thyroid hormones.

Thyroid hormone functions

Thyroid hormones regulate the following activities:

- Oxygen uptake (they up regulate it).
- Gross basal metabolic rate (they up regulate it).
- Maintenance of body temperature.
- Intracellular metabolism (microscopic protein synthesis, lipid breakdown, and cholesterol breakdown.) Patients who are hypothyroid, for example, will have higher levels of cholesterol in the blood because of reduced thyroid up regulation. Patients who are hyperthyroid will often be thin and have lower levels because of too much up regulation.
- Growth and development; that is, body growth rate and nervous system development.
- Thyroid hormones also enhance the effects of catecholamines, accounting for high blood pressure, nervousness, sweating, and fast heart rate in hyperthyroid patients.

Iodine uptake and control

Iodide (I-) ions circulating in the blood are actively taken into follicular cells through capillaries and become trapped in the endoplasmic reticulum inside the follicular cells. Once iodine is present, the follicles begin synthesizing thyroglobulin. Vesicles (small transport membranes) transport some of the iodide further into the follicles, where it is combined with thyroglobulin to produce the amino acid tyrosine. This combination of thyroglobulin and tyrosine is bound into colloid, which can be transformed into T3 and T4 as needed.
Incidentally, the thyroid’s ability to trap iodine can be used clinically.

- Low levels of radioactive iodine (I-131), combined with x-ray exposure, can map thyroid function.
- Higher levels of I-131 will irradiate and destroy thyroid tissue, when needed, without damaging surrounding cells. This can be used to kill off some of the thyroid to down regulate its function, or kill the whole organ. When Kristen was diagnosed with Graves’ disease many years ago, this was the first thing they wanted to do to her. She chose to go an alternative route. A quarter of a century later, she still has her thyroid, and it functions perfectly. (At some point, I will get her to tell her complete story in a newsletter – when she can find the time.)

Theoretically, if doctors give a hypothyroid patient some synthetic thyroid hormones, they’re not too concerned if they give a little too much, since the negative feedback loop will pick up the extra hormone in the blood and stop the pituitary from releasing more TSH. If they give too little, the functioning cells in the thyroid will be stimulated to release enough to “top” levels off. But that assumes that there’s still some functioning thyroid cells in the neck to respond to stimulation if necessary. If the thyroid has been surgically removed or killed off by I-131 irradiation, then there is no self-regulatory mechanism. Trying to mechanically balance thyroid levels with pharmaceuticals at that point is almost impossible, and people are forced to live the rest of their lives in a borderline psychotic state. It was for that reason that Kristen chose a natural solution.

- Cancerous cells will not trap iodine when normal thyroid tissue is present. Tumors must be surgically removed or thyroid tissue must be destroyed with higher levels of I-131, before I-131 can be re-administered to destroy cancerous thyroid cells.

**Thyroid dysfunction**

The two main types of thyroid disease fall into hyperthyroidism (Graves’ disease), and hypothyroidism (Hashimoto’s thyroiditis).

**Hyperthyroidism**

Hyperthyroidism causes increased heart rate, increased blood pressure, high body temperature and sweating, nervousness, diarrhea, heat intolerance, and weight loss despite high caloric intake.

In other words, the metabolic processes are up regulated to dangerous levels. Also, it can lead to severe neurotic behavior. Graves’ disease, a specific form of hyperthyroidism, is an autoimmune disorder in which antibodies mimic the effects of TSH but are not constrained by the negative feedback system for turn-off and control; thus, they continue to drive the thyroid to release stimulating T3 and T4 hormones without letup. This disease causes goiter, enlargement of the thyroid, and exophthalmos (bulging eyeballs caused by the build-up of fat behind the eye). Curing the diseases (often involving the destruction or removal of the thyroid followed by the lifelong administration of synthetic hormones) may not cure exophthalmos, which may leave the eyes open to injury. When talking about Graves’ disease and bulging eyes, the late actor, Marty Feldman almost immediately comes to mind.

**Hypothyroidism**

Hypothyroidism is a condition in which the thyroid gland does not make enough thyroid hormone. Early symptoms include:

- Being more sensitive to cold
- Constipation
- Depression
- Fatigue or feeling slowed down
- Heavier menstrual periods
- Joint or muscle pain
- Paleness or dry skin
- Thin, brittle hair or fingernails
- Weakness
- Weight gain (unintentional)

There are two fairly common causes of hypothyroidism. The first is a result of inflammation of the thyroid gland which leaves a large percentage of the cells of the thyroid damaged (or dead) and incapable of producing sufficient hormone. The most common cause of thyroid gland failure, however, is called autoimmune thyroiditis (aka Hashimoto’s thyroiditis), a form of thyroid inflammation caused by the patient’s own immune system. (Think of it as the flip side of Graves’ disease.)

Dr. Lee covers hypothyroidism in What Your Doctor May Not Tell You about Menopause. First, he points out that thyroid problems are far more common in women than in men – a strong indicator that we’re dealing with an estrogen issue. Then he points out that for most women, when they start using progesterone crème, their need for thyroid supplements is greatly reduced – and often even eliminated. Note: just because it is more common in women, does not mean that men cannot have estrogen problems also -- caused by exposure to chemical estrogens.

If you suffer from hypothyroidism, removing your thyroid or blasting it with radiation or trying to balance it out with synthetic medication are not your only options. There are natural progesterone crèmes (for both men and women), which easily can be found by searching the net. Also, immunomodulators such as cetyl-myristoleate and L-carnosine might make sense in case the problem is associated with an autoimmune disorder. And finally, thyroid extracts such as Standard Process’ Thytophin PMG can be helpful in rebuilding lost thyroid function.
Cretinism

Hypothyroidism during fetal development totally disrupts normal development patterns, leading to dwarfism, mental retardation, and physical deformities. (Now usually called "thyroid dwarfism.")

Thyroid cancer

Cancerous thyroid tumors (nodules) are most often associated with patients who have had their faces irradiated (at one time this was done to treat acne—really), but these cancers are easily curable by simply removing the cancerous nodules. Other risk factors include:

Natural Hashimoto’s Treatment - Your Iodine Supplements May Be Making You Worse

A Voice Of Caution When Treating Hashimoto’s Naturally With Iodine:

When a patient is diagnosed with low thyroid production, medically referred to as hypothyroidism, one of the first things commonly prescribed is iodine supplementation. This is logical and valid on the surface. Iodine is a component in thyroid hormone production. Worldwide iodine deficiency is a widespread problem. In areas of the world where iodine is deficient in the food supply, including the United States, iodine is not usually the cause of low thyroid.

In areas of the world with adequate iodine in food, or where salt is iodized, the most common cause of low thyroid is Hashimoto’s Autoimmune Thyroid. It is estimated that up to 90 percent of cases of hypothyroidism in the United States is from this autoimmune mechanism.

Autoimmune thyroid is not primary hypothyroidism; instead it is a form of hypothyroidism that is caused by immune destruction. The amount of iodine that is contained is iodine supplements and thyroid natural support products act like gas on a burning fire.

In a 2004 article in the journal Thyroid, the author stated “...the explosive mix of iodine, TPO Ab, and H202 necessary for thyroid hormone synthesis, inadvertently provide the trigger for the autoimmune thyroid response.” It is this misguided inclination to give every hypothyroidism patient high doses of supplemental iodine that leads to increased thyroid gland destruction, and more suffering on the patient’s part. Most natural healthcare practitioners possess a very limited understanding of autoimmune physiology and continue giving iodine supplements for all cases of hypothyroidism, in the same way as the medical community uses thyroid replacement hormones as a “blanket” treatment for all low thyroid conditions.

If you have been diagnosed with Hashimoto’s disease then you need to take an inventory of your supplements. Remove supplements that contain iodine, as it is most likely aggravating your condition, and is most likely one of many things working against you as you try to properly treat and manage your condition. We get plenty of iodine from the iodination of salt and from a normal balanced diet.

3 Herbs for Hyperthyroidism You Might Want To Consider Taking

Many people with hyperthyroidism look to take nutritional supplements and herbs to help manage their symptoms naturally and/or restore their health back to normal. The truth is that curing hyperthyroidism involves more than just taking supplements and herbs, as there are many other components to consider. I’m talking from self experience, as I personally was diagnosed with Graves’ Disease in the past, which is an autoimmune hyperthyroid condition. While most endocrinologists label Graves’ Disease as being incurable, I successfully restored my health back to normal by following a natural hyperthyroid treatment protocol.

Part of this natural hyperthyroid treatment protocol did involve taking nutritional supplements and herbs. I’m not going to discuss all of the different supplements and herbs I took when I followed such a protocol, but I am going to focus on three herbs which can play an important role in natural symptom management, which is important when trying to restore the health of any person who has hyperthyroidism. I personally took two of the following herbs. Some people with hyperthyroidism might only need to take one of them, while others might need to take all three. In order to figure out exactly which of these herbs you should take and the specific dosage you need, it’s best to consult with a competent natural endocrine doctor.

Anyway, let’s take a look at the following three herbs:

Bugleweed. When I was diagnosed with Graves’ Disease, Bugleweed was one of the primary herbs responsible for my recovery. Obviously I took numerous nutritional supplements and herbs beside this one, and these others were all beneficial. However, Bugleweed is a great herb that is specific for hyperthyroidism, and it did a wonderful job of managing my symptoms naturally. Without this herb, I’m pretty certain I would have needed to take anti-thyroid drugs to help with the symptoms I was experiencing.

Of course this doesn’t mean that this herb should always be used as a replacement for anti-thyroid drugs. It really does depend on the severity of the symptoms, as while I had a high pulse rate and heart palpitations, I didn’t consider my symptoms to be life threatening. On the other hand, it
still was a risk for me to not manage the symptoms using prescription drugs, and this is the main reason why I can’t recommend for anyone with hyperthyroidism or Graves’ Disease to not take anti-thyroid drugs. This is only a decision you can make on your own, although it is wise to consult with your endocrinologist, as well as a competent natural endocrine doctor for some guidance.

Motherwort. This is another supplement which can help people with hyperthyroidism. I didn’t begin taking this herb immediately, as I started by taking Bugleweed (along with some other supplements and herbs). And while the Bugleweed did help a great deal with the symptoms, I still was having some noticeable heart palpitations, and so I began taking both the Bugleweed and the Motherwort together. Taking both of these herbstogether did a great job of managing the symptoms. Of course the main concern I had was weaning off of these herbs, as I was worried that the symptoms would return. And if all I did was take Bugleweed and Motherwort, then the symptoms probably would have returned. But using these two herbs in combination with other supplements and herbs, along with modifying other lifestyle factors, allowed me to restore my health back to normal.

Just as is the case with any herb you take, I would recommend advising with a competent natural endocrine doctor before taking the ones I have mentioned. And chances are they will recommend you beginning with either Bugleweed or Motherwort, and then if the symptoms persist they probably will recommend another herb. Of course if you have very severe symptoms and if you don’t want to take prescription drugs temporarily then they might recommend you taking both Bugleweed and Motherwort from the start. Once again, it all depends on your unique situation.

Lemon Balm. This is an herb I didn’t personally take when I was diagnosed with Graves’ Disease, but many people with hyperthyroidism and Graves’ Disease do benefit from it. It’s primary function is as a calming agent, but it also directly impacts the binding of TSH levels, which is how it helps with hyperthyroidism. Although this herb can be beneficial, I personally would recommend using Bugleweed and/or Motherwort first, but obviously the holistic doctor you consult with will advise you as to which herbs to take, as well as the dosage.

In summary, these are three herbs which can effectively manage the symptoms of hyperthyroidism and Graves’ Disease. Just remember that taking these herbs alone won’t do much more than provide symptom management, but when combined with a natural hyperthyroid treatment protocol they have the potential to restore your health back to normal. To determine which of these herbs you should take, and at what dosage, I highly recommend consulting with a competent natural endocrine doctor, rather than trying to self-treat the condition on your own.

The parathyroid glands

The four parathyroid ("beside the thyroid") glands are located on both sides of the thyroid but have functions totally unrelated to the thyroid. This physical relationship of the parathyroids to the thyroid is typical of the endocrine system. Last issue we saw that the pituitary, although extremely small, is comprised of two parts -- anterior and posterior -- that have totally unrelated functions, that develop out of entirely different parts of the body despite their close proximity, and that are for all intents and purposes entirely separate glands. When we explore the adrenals, we will see the same disparate relationship between the adrenal cortex and the adrenal medulla. The bottom line is that the only connection the parathyroids have with the thyroid is their physical location.

Specifically, the parathyroid glands are located behind the thyroid, and they are intimately connected to the covering of the thyroid gland. There are two on each side. They are supplied by the same blood vessels that supply the thyroid. Each parathyroid is about the size of a large kernel of rice. They can be extremely difficult for surgeons to locate and identify. And something that can make the job even harder is that the parathyroid glands sometimes “disengage” from the thyroid gland and migrate down into the chest cavity, making them difficult to find and remove.

So what do the parathyroids do? The chief cells (principal cells) produce parathormone (PTH, parathyroid hormone). The oxyphil cells produce...??? In fact, the function of the oxyphil cells is as yet unknown.

Parathormone, PTH, parathyroid hormone

PTH has one simple function. It regulates the levels of calcium and phosphorus in the blood. It accomplishes this by increasing the cells of the bone (osteoclasts), which reabsorb calcium. It also increases urinary re-absorption of calcium by the kidneys. In addition, it causes the kidneys to form calcitrol, a hormone made from vitamin D that increases absorption of calcium from the GI tract.

And finally, it increases excretion of phosphorus by the kidneys (which, in turn increases calcium levels). Calcium and phosphorus always go in opposite directions -- in a defined relationship called the solubility constant. Bottom line: parathormone increases calcium levels.

Note: Calcitonin (from the thyroid gland) participates in the negative feedback system that regulates the parathyroids by forcing calcium back into the bones.

Pathology of parathyroid dysfunction

Hyperparathyroidism refers to increased PTH production, usually because of a benign tumor of one or more of the parathyroid glands (parathyroid adenoma). If PTH is produced in excess, calcium is reabsorbed from the kidneys, bones, and stomach back into the blood. This leads to a condition that many endocrinologists call "Stones, bones, groans, and moans." This terminology refers to the classic set of four symptoms associated with hyperparathyroidism: kidney stones, de-mineralized bones (osteoporosis), groans of pain from intestinal distress (including duodenal ulcers), and themoans of psychosis.

Hyperparathyroidism is almost always caused by parathyroid adenoma. Removing a parathyroid adenoma, a fairly simple surgery, can cause an immediate and drastic return to normal function and the disappearance of all symptoms.

Another form of hyperparathyroidism is called parathyroid hyperpiesia, in which all four parathyroid glands overproduce PTH for no obvious reason. In other words, there is no adenoma causing the problem. Surgeons usually attempt to fix the problem by removing most of the parathyroid glands.

On the other hand, if the surgeon makes a mistake and removes too much (or all) of the parathyroid tissue by accident, you can end up with hypoparathyroidism. Hypoparathyroidism leads to
low serum calcium levels and an elevated state of excitement for nerves and muscles, resulting in twitching and over-activity of the muscular and nervous systems. In the extreme, this can lead to convulsions and death. Again, it is caused primarily by inadvertent surgical removal. This is an extremely difficult condition to live with, as it is almost impossible to self regulate. Fortunately, there is one medical alternative that works in some cases...if the surgeon recognizes the error in time. Removed parathyroid glands can be chopped up and implanted into muscle tissue in other areas of the body (such as the forearm), where sometimes, they will survive and start producing PTH again. If that doesn't work, hypoparathyroid patients require lifelong calcium and vitamin D injections, which are almost impossible to manage accurately.

**Conclusion**

When it comes to maintaining the health of the thyroid and parathyroid glands, you want to address several key issues.

- **Autoimmune problems**
- **By using immunomodulators such as L-carnosine, Cetyl-myristoleate (CMO), and the Transfer Factor found in bovine colostrum, you can retrain the immune system to not overreact -- which, as we’ve seen is one of the biggest factors associated with the onset of thyroid problems.**
- **Estrogen dominance**
- **Constant exposure to chemical estrogens in our food, water, and environment creates a condition called estrogen dominance in both men and women. (Consider the fact that the average man by the age of 65 contains more estrogen than the average woman of the same age -- the reason so many men develop breasts as they age.) In any case, the regular use of a men’s or women’s progesterone creme is advisable -- not to mention their value in minimizing serious prostate, breast, and uterine problems.**
- **Nutrition**
  - **Iodine: Again, if you’re not using iodized salt (and there are good reasons not to), you need to make sure you’re getting iodine in your food, or you’re using a supplement that contains your daily requirement for iodine (about 150 mcg a day). Seaweed, kelp, shrimp, lobster, and other shellfish are all good sources of iodine. Cod, sole, haddock, and ocean perch are also decent choices, and they are relatively low in mercury. Yogurt, cow’s milk, eggs, and many cheeses may also contain reasonable amounts of iodine -- depending on whether or not the feed the cows lived on was grown in soil that contained iodine. Strict vegetarians may need to rely on supplemental sources, unless the produce they eat is grown in iodine rich soil.**
  - **Thyroid gland extracts**
    Extracts derived from bovine thyroid glands can provide critical cell factors that help re-establish normal cell function. Check out Standard Process’ Thytrophin PMG.
- **Body pH**

- **Proper pH is required for the thyroid to access and utilize iodine. In fact, the higher the pH, the more iodine that accumulates in the thyroid, as the thyroid uses the iodine, as part of an exchange mechanism to regulate thyroid pH. pH can be raised using alkaline teas, potassium based water drops, and water ionizers.**

In our next issue, we’ll move on down the body into the pancreas. In our previous newsletters on the digestive system, we explored the pancreas’ production of digestive enzymes. But the pancreas has two distinct functions in the body. In addition to producing digestive juices, it also is part of the endocrine system and produces several key hormones, most notably insulin and ghrelin (the appetite hormone).
Endocrine Society Releases Statement on Chemicals That Affect our Thyroid, Hormones and Endocrine System

By Mary Shomon, About.com Guide June 10, 2009

98% Thyroid Disease Cured
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www.greenlife-herbal.com

Thyroid Support Vitamins
Natural blends of iodine, zinc, and B-vitamins for thyroid health
www.BotanicChoice.com

Chemical Engineering
Online and print solutions for pros in CPI and related industries
www.chemical.com

The Endocrine Society -- conducting its annual meeting in Washington, DC this week -- has just released a 50+ page detailed Scientific Statement on Endocrine-Disrupting Chemicals.

According to the EPA, endocrine disruptors are chemicals that mimic a natural hormone, fool the body into over-responding to the stimulus (e.g., thyroid hormone that results in hyperthyroidism), or respond at inappropriate times (e.g., producing thyroid hormone when it is not needed). Other endocrine disrupting chemicals block the effects of a hormone from certain receptors (e.g. thyroid hormones required for normal development). Still others directly stimulate or inhibit the endocrine system and cause overproduction or underproduction of hormones (e.g. an over or underactive thyroid). Certain drugs are used to intentionally cause some of these effects, such as birth control pills. In many situations involving environmental chemicals, however, an endocrine effect is not desirable.

Endocrine Disruptors

1. What is the endocrine system?

The endocrine system is a complex network of glands and hormones that regulates many of the body’s functions, including growth, development and maturation, as well as the way various organs operate. The endocrine glands -- including the pituitary, thyroid, adrenal, thymus, pancreas, ovaries, and testes -- release carefully-measured amounts of hormones into the bloodstream that act as natural chemical messengers, traveling to different parts of the body in order to control and adjust many life functions.

2. What is an endocrine disruptor?

An endocrine disruptor is a synthetic chemical that when absorbed into the body either mimics or blocks hormones and disrupts the body’s normal functions. This disruption can happen through altering normal hormone levels, halting or stimulating the production of hormones, or changing the way hormones travel through the body, thus affecting the functions that these hormones control. Chemicals that are known human endocrine disruptors include diethylstilbesterol (the drug DES), dioxin, PCBs, DDT, and some other pesticides. Many chemicals, particularly pesticides and plasticizers, are suspected endocrine disruptors based on limited animal studies.

3. What are some likely routes of exposure to endocrine disruptors?

Exposure to endocrine disruptors can occur through direct contact with pesticides and other chemicals or through ingestion of contaminated water, food, or air. Chemicals suspected of acting as endocrine disruptors are found in insecticides, herbicides, fumigants and fungicides that are used in agriculture as well as in the home. Industrial workers can be exposed to chemicals such as detergents, resins, and plasticizers with endocrine disrupting properties. Endocrine disruptors enter the air or water as a byproduct of many chemical and manufacturing processes and when plastics and other materials are burned. Further, studies have found that endocrine disruptors can leach out of plastics, including the type of plastic used to make hospital intravenous bags. Many endocrine disruptors are persistent in the environment and accumulate in fat, so the greatest exposures come from eating fatty foods and fish from contaminated water.

4. How do we know that endocrine disruptors are dangerous?

Many plant and animal species are showing signs of ill health due to exposure to endocrine disrupting chemicals. For example, fish in the Great Lakes, which are contaminated with polychlorinated biphenyls (PCBs) and other man-made chemicals, have numerous reproductive problems as well as abnormal swelling of the thyroid glands. Fish-eating birds in the Great Lakes area, such as eagles, terns, and gulls, have shown similar dysfunctions.

Scientists have also pointed to endocrine disruptors as the cause of a declining alligator population in Lake Apopka, Florida. The alligators in this area have diminished reproductive organs that prevent successful reproduction. These problems were connected to a large pesticide spill several years earlier, and the alligators were found to have endocrine disrupting chemicals in their bodies and eggs.

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5. Should humans be concerned for their health based on evidence that fish, birds and alligators have been affected?
Yes. All vertebrates (fish, amphibians, reptiles, birds, and mammals, including humans) are fundamentally similar during early embryonic development. Scientists can therefore use the evidence acquired on other species to make predictions about endocrine disrupting effects on humans.

6. Is there direct evidence that humans are susceptible to endocrine disruption?
Yes. In the 1950s and 1960s pregnant women were prescribed diethylstilbestrol (DES), a synthetic estrogen, to prevent miscarriages. Not only did DES fail to prevent miscarriages, but it also caused health problems for many of these women’s children. In 1971, doctors began reporting high rates of unusual vaginal cancers in teenage girls. Investigations of the girls’ environmental exposures traced the problem to their mothers’ use of DES. The girls also suffered birth defects of the uterus and ovaries, and immune system suppression.

7. Are children at greater risk from endocrine disruptor exposure?
Yes. Because endocrine disruptors affect the development of the body’s vital organs and hormonal systems, infants, children and developing fetuses are more vulnerable to exposure. And as was the case with DES, parents’ exposure to certain chemicals may produce unexpected -- and tragic -- effects in their children, even decades later.

8. These days don’t chemicals have to be safe to be allowed on the market?
No. The majority of the more than 2,000 chemicals that come onto the market every year do not go through even the simplest tests to determine toxicity. Even when some tests are carried out, they do not assess whether or not a chemical has endocrine interfering properties.

9. What can I do to reduce my risk of exposure?
- Educate yourself about endocrine disruptors, and educate your family and friends.
- Buy organic food whenever possible.
- Avoid using pesticides in your home or yard, or on your pet -- use baits or traps instead, keep your home especially clean to prevent ant or roach infestations.
- Find out if pesticides are used in your child’s school or day care center and campaign for non-toxic alternatives.
- Avoid fatty foods such as cheese and meat whenever possible.
- Avoid heating food in plastic containers, or storing fatty foods in plastic containers or plastic wrap.
- Do not give young children soft plastic teetherers or toys, since these leech potential endocrine disrupting chemicals.
- Support efforts to get strong government regulation of and increased research on endocrine disrupting chemicals.

Kroni insert the adrenal foods book.
When you get the flu the virus or other pathogen can weaken your adrenal. Fighting the stress, the infection, the toxicity and the pathogens takes it out of you. Adrenalin is the great anti-inflammatory. When you have inflammation adrenalin fights it. This is needed when flu, asthma, or any infection threatens life.

When your adrenal gets weak you make less adrenalin and adrenalin makes your body fluids like mucous thin. So when flu makes your mucous thick it is because of accompanying adrenal insufficiency. Adrenal insufficiency other symptoms include: weakness, lack of libido, allergies, dark circles under the eyes, muscle and joint pain, dizziness, low blood pressure, low blood sugar, food and salt cravings, poor sleep, dry skin, cystic breasts, lines of dark pigment in nails, difficulty recuperating from stresses like colds or jet lag, no stamina for confrontation, tendency to startle easily, lowered immune function, anxiety, depression, and premature aging. Some of these symptoms are similar to those of low thyroid.
If low-thyroid people with these symptoms are put on thyroid hormone alone, they sometimes respond negatively. These people may have coexistent, but hidden, low adrenal. If they take thyroid hormone by itself, the resultant increased metabolism may accelerate the low adrenal problem.

The addition of thyroid hormone in this situation unmasks the also disturbing low adrenal situation. The proper approach in this case is to treat the patient with thyroid and adrenal support simultaneously.

Adrenal insufficiency, especially when unmasked by the addition of thyroid hormone, is unpleasant and uncomfortable. To compound the problem, the doctor and patient then may wrongly assume that thyroid replacement has been a mistake. A tremendous opportunity for better health has now been missed.

Do you feel tired all the time? Maybe you get plenty of sleep and just don’t feel rested. Or maybe you have trouble sleeping. Low energy? Difficulty thinking or focusing? These are all symptoms of adrenal fatigue. This article explores the adrenals and the causes of adrenal fatigue. Included is a simplified explanation of how diet affects the adrenals and some suggestions for what you can do to restore them, and you to health.

The 30 symptoms include, but are not limited to:

1. Excessive fatigue and exhaustion, chronic fatigue
2. Non-refreshing sleep
3. Sleep disturbance, insomnia
4. Feeling overwhelmed or unable to cope
5. Craving salty and/or sweet foods
6. Sensitivity to light
7. Low stamina and slow to recover from exercise
8. Slow to recover from injury or illness
9. Difficulty concentrating, brain fog
10. Poor digestion
11. Irritable bowel syndrome, IBS
12. Low immune function
13. Premenstrual syndrome
14. Menopause symptoms
15. Low blood pressure
16. Sensitivity to cold
17. Fearfulness
18. Allergies,
19. Frequent influenza
20. Arthritis
21. Anxiety
22. Irritability
23. Depression
24. Reduced memory
25. Low libido, sexual drive or interest
26. Lack of lust for life and/or food
27. Excess hunger
28. Low appetite
29. Panic/anxiety attacks
30. Irritability, impatience, quick to anger.

If quick to anger, the person will often tend to back down quickly if confronted.

Epinephrine (also referred to as Adrenaline) is a hormone and neurotransmitter. When produced in the body it increases heart rate, contracts blood vessels and dilates air passages and participates in the “fight or flight” response of the sympathetic nervous system. It is a catecholamine, a sympathomimetic monoamine produced only by the adrenal glands from the amino acids phenylalanine and tyrosine.
The term adrenaline is derived from the Latin roots ad- and renes and literally means on the kidney, in reference to the adrenal gland’s anatomic location on the kidney. The Greek roots epi- and nephros have similar meanings, and give rise to epinephrine. The term epinephrine is often shortened to epi in medical jargon.

Many of these symptoms have other causes, so just because you have one or more symptoms doesn’t necessarily mean that you have adrenal fatigue. On the other hand, adrenal fatigue is so prevalent that if you have even one of these symptoms, it is likely that you are at least a bit run down.

Almost every client I have ever seen has come to me because of one or more of these symptoms. Stress is a major contributor to adrenal fatigue. We live in a busy world that offers little relief from stresses of life. Toxicity contributes to adrenal fatigue as well. But by far, adrenal fatigue is caused by a diet high in sugar and processed foods. And, the same dietary factors that contribute to adrenal fatigue are at the root of most of our major health issues today. Most major diseases start with the same factors as adrenal fatigue, and adrenal fatigue can lead to many serious conditions.

What are the adrenals?

The adrenals are two walnut sized glands that sit on top of the kidneys. They produce three different classes of hormones at the rate of about a quart (liter) a day. One class is stress hormones like adrenalin and cortisol also called hydrocortisone. Another class of adrenal hormones affect mineral metabolism especially the sodium/potassium balance. And, they produce sex hormones and their precursors. These hormones are some of the ones that make us feel good. They give us energy and a lust for life — and sex.

A simple test for adrenal fatigue

There are many tests for adrenal fatigue. Lab tests are expensive and take time for the results. However, there is a simple self-test that can be done with a flashlight and a mirror. Start in a darkened room so that your pupils dilate but have it light enough so that you can see your eyes in a mirror. Allow enough time in the dim room so that the pupils dilate fully, about ten minutes. Next, shine the flashlight into one of your eyes from the side so that the light causes the pupil to shrink down to a pin point. Do this in such a way that you can still watch the pupil as it reduces in size. If your adrenals are strong, the pupil will most likely shrink down immediately. If there is any hesitation before they react, then your adrenals are probably fatigued. I use the qualifier probably here because there are other reasons eyes may not react like this though they are not common.

Dietary causes of adrenal fatigue

As mentioned earlier, dextrose sugar and refined carbohydrates are the main cause of adrenal fatigue. Dextrose Sugar includes honey, maple syrup, fructose, dried grapes and dates. Fructose has to be taken in very large concentrations for disturbance. Refined carbohydrates are grains that have been ground up or have had the bran removed. This includes products like bread even whole wheat bread, noodles, corn chips, white rice and pretty much anything that comes in a package.
Refined foods are broken down by grinding and concentration. Refined grains have more surface area exposed to digestion, so they digest more quickly. They release their sugars quickly into the blood stream causing blood sugar to go up too high too fast.

The body responds to high blood sugar by releasing insulin. Insulin is a hormone that causes sugar to move into the liver, muscles and fat tissues. The problem is that the body evolutionarily isn’t designed to deal with the large amounts of sugar in the blood that are caused by sugar and refined foods. Evolution has designed us to eat animal protein, whole grains (not chopped up), vegetables and fruits. So, the body tends to overreact to this fast sugar by releasing too much insulin. This article is about the adrenals, but high blood sugar, high levels of insulin and constant exposure to stress hormones cause their own problems that will be covered in the future.

The release of too much insulin causes the blood sugar to go down too far. Most everyone has experienced getting sleepy after a large meal of pasta, rice or some other carbohydrate. Or, the drop in energy that follows a candy high. That’s what happens after the large release of insulin. The blood sugar goes down too far. The brain eats mostly sugar, so it gets sleepy from lack.

Now we get into the adrenal involvement. One of the stress hormones they release is cortisol. In ancient times stress meant that we had to fight or run away, the fight/flight response. The muscles that move quickly use sugar, and cortisol causes blood sugar to increase. There is also a cortisol release anytime there is low blood sugar. You know how you can be really hungry, then after awhile you aren’t so hungry anymore? That’s cortisol doing it’s job. The same thing happens when low blood sugar happens because of an over-release of insulin.

The adrenals are constantly being assailed by the above reactions. Processed foods and snacks are available all the time, and they are hard to resist. Our ancestors survived because they had a sweet tooth. They craved the sweet fruits that were available at the end of winter. Insulin caused that extra sugar to be stored as fat for the lean times of winter. The ones that didn’t desire sweet fruits didn’t survive, so we inherited that craving for sweets and other foods that turn into sugar. The problem is that we eat as though it is the end of summer all the time!

The adrenals are constantly being called on to produce more and more cortisol in response to the stress caused by sugar and processed food. Eventually they become exhausted. And, so does the indulger.

What you can do

The obvious thing to do is to stop eating sugar and refined foods. A lot of people will do great just by modifying their diet alone. There are lots of products on the market for treating the adrenals, but which ones really work? This is very individual, but I will give you some suggestions in part two.

Be well, and remember: the body wants to heal, all it needs is the opportunity.
Information on Tyrosine Food Sources

There is a wide variety of tyrosine foods that are good sources of the amino acid called tyrosine. Now that we have mentioned it, you might probably know that tyrosine is one of the important amino acids that are used in protein synthesis.

What is tyrosine?

As mentioned, tyrosine is an amino acid that has an important role in the structure of almost all the protein found in your body. It is also the precursor of other substances, such as epinephrine, norepinephrine and dopamine. The function of tyrosine amino acid is closely-knit with neurotransmitters and hormones in the body and is essential for normal mental functions. It is also used to create melanin, which is the dark pigmentation that helps shield your skin from the harmful rays of the sun.

Who do we need tyrosine foods?

Tyrosine is technically a non-essential amino acid, since the body is able to produce it through another amino acid called phenylalanine. Incidentally though, phenylalanine is considered to be an essential amino acid so they have to be taken in through food sources. Following this line of reasoning, you can conclude that adequate amounts of tyrosine is best taken through foods rich in tyrosine amino acids.

Other Tyrosine Benefits

Aside from the fact that it is important to normalize body and brain functions, tyrosine has been seen to provide various health benefits. Studies have revealed that tyrosine can help fight the symptoms of Parkinson's disease, to alleviate emotional and environmental stress, and to combat depression. Those that take tyrosine supplements claim that it tyrosine helps calm their bodies, increase their energy levels and enhance their libido. Supplements have also been used in the treatment of conditions such as Alzheimer’s disease, schizophrenia, ADD, ADHD and dementia.

tyrosine (tīˑ·r·sēn),

-n, an amino acid involved in the synthesis of neurotransmitters; has other functions. Has been used to treat sleep disorders, enhance cognitive function, and alleviate symptoms of ADD. No known precautions. Also called L-tyrosine.
Chemical structure of tyrosine.

Foods High in Tyrosine

Fortunately, there are many natural food sources of tyrosine. It is found in most animal and vegetable sources. Foods high in tyrosine include the following:

- Meat sources including fish, chicken, and pork
- Whole unprocessed brown grains, wheat, and oats
- Dairy products such as milk, cheese and yogurt
- Fruits such as avocados, berries and bananas
- Legumes, beans and nuts such as almond, lima beans, sesame seeds and pumpkin seeds
- Bean and grain sprouts

Tyrosine Deficiency

Even if tyrosine is non-essential and that tyrosine is largely available through tyrosine foods, some people have increased needs of tyrosine due to one or several factors, while other suffer from tyrosine deficiency. For example, people going through depression reportedly have low tyrosine levels, as with those who suffer from phenylketonuria (marked by an inability to properly utilize phenylalanine). If you have extremely low levels of tyrosine, you will suffer from a variety of conditions, such as muscle weakness, muscle loss, mood disorders, low protein level and liver damage.

If you are one of those who have increased tyrosine level need or suffer from deficiency of the amino acid, taking in tyrosine through natural tyrosine foods is not enough. You would need actual tyrosine supplementation through tyrosine tablets or tyrosine powder forms. They are now being sold as individual supplements and sometimes in combination with other amino acids.

Cures and Remedies for Adrenal Fatigue:

As I said above, adrenal fatigue is complicated and not an easy problem to correct. It may take one to two years to cure. Many times there are underlying health problems that are causing adrenal fatigue. In this case you need to find out what the cause is. It could be an ongoing infection or inflammation. It can be candida overgrowth, irritable bowel syndrome, or any of a number of health problems that cause ongoing stress to the adrenals. The underlying cause needs to be addressed as well or you will never be able to heal your adrenal glands.

Below are some supplements, herbs, hormonals and some advice to help you with adrenal fatigue.

Supplements That Help Adrenal Fatigue

- **Vitamin C** (500-1,500 mg/day sustained release) -- best taken with bioflavonoids.
- **Vitamin E** w/mixed tocopherols (400 IU/day)
- **Vitamin B100 Complex**
- **Niacin** (50-75 mg/day) -- as inositol hexaniacinate.
- **Pyridoxine B6** (50 mg/day)
- **Pantothenic Acid B5** (500-1500 mg/day)
- **Magnesium Citrate** (100-400 mg) -- I like this best in the powdered form with a touch of calcium. This form of magnesium makes sure it is absorbed.
- **Liquid Trace Minerals** -- they have a calming effect
- **Free-Form Amino Acids and Fatty Acids**
- **Iodine Deficiency** -- Using prescribed medications is usually wrong in treating thyroid and adrenal glands as the real cause is most likely an iodine deficiency. Use kelp. Sea salt, fucus or iodine homeopathics.
- **Proline** (100 mg daily) -- Proline is helpful in rebuilding connective tissues. Weak adrenals are often associated with poor quality connective tissues and whatever helps connective tissues seems to help adrenals as well.
- **Adrenal Glandular** -- or desiccated adrenal gland is extremely important in the initial phases of adrenal repair since it provides raw materials to support adrenal function. It also contains some important adrenal hormones.

Herbs That Help Adrenal Fatigue

- **Rhodiola Rosea** -- It enhances memory and concentration. It has been shown to reduce stress-induced fatigue and improve mental performance.
- **Ashwagandha** -- It has been shown to have a sedating effect on the body and helps to rebuild the digestive and nervous system.
- **Eleuthero Root or Siberian Ginseng** -- It has been used traditionally to stimulate and nourish the adrenal glands and increases mental alertness. Eleuthero is considered an “adaptogen” which means it
can help the body adapt to stress.

- **Cordyceps** — This is a Chinese mushroom used for supporting the adrenal gland and can also normalize immune function and support kidney, lung, liver, nervous system and cardiovascular function.
- **Mahung** — Oriental herb containing ephedra natural adrenalin, banned for how well it worked and for its use in illegal drugs.
- **Ginko Bilboa** — for memory and mental functioning
- **Goto Kola** used for energy
- **Liquorice herb** (Glycyrrhiza Glabra), is possibly the most important herb for helping the adrenal glands to produce natural steroids and also to help balance the immune system in cases of auto-immune disorders as well as reduce inflammation via these two routes.

**How Does Liquorice Achieve its Action?**

Liquorice contains Glycosides called glycyrrhizin and glycyrrhizinic acid; these have a structure similar to the natural steroids in the body and tend to rapidly restore natural steroid production from the adrenal glands. In addition, the direct action of these glycosides, along with other ingredients in the liquorice seem to have an almost magical effect in reducing inflammation and the entire auto-immune mal-response. Personally, taking Sterols and Sterolins from the product Naturleaf produced general health benefits and improved energy, it did not prevent the re-occurrence of asthma. Taking Liquorice had an obvious effect within hours of the first dose and repeatedly I found that it would turn off the initial stages on asthma like a switch. Note: if you have asthma, or bronchitis the formulation of Liquorice root, slippery elm and Lobelia (Asthma and Bronchitis Formula) has a very high success rate (according to Gerald Green) of almost 100% in babies and children and 80% in adults; irrespective of how serious the condition. Gerald has used liquorice extensively for many different auto-immune conditions, with good success as part of the a herbal programme. We supply Liquorice Concentrate capsules and also Kalawalla with Liquorice in a combination capsule called Immuno-calm.

Liquorice is the well known component of Liquorice sweets, is surprisingly one of the most important medicinal herbs on the planet. It has been used extensively in Chinese herbal medicine for thousands of years, in approximately half of their formulas. The reason given is that it tends to improve the action of all the other herbs and ‘harmonise’ the action of the herbal formula.

The cautions and side effects of regular Liquorice consumption for a very small percentage of the population: details are given in the full Liquorice article: Liquorice herb.

Personally I have found liquorice to be more effective and totally harmless in its ability to help the body produce the correct type and amount of natural steroids, whereas drug based steroids, in my experience are less effective and will in time seriously disrupt the body’s homeostasis and render it susceptible to Candida Albicans infection and other health problems. Glycyrrhizin has a similar chemical structure to corticosteroids released by the adrenals, and further studies have suggested that it could be used as an aid in helping to reduce withdrawal symptoms from dependency on some corticosteroid hormones.
Wild Yam and the Adrenals

In our modern, stressful world, our fight or flight mechanism is over-stimulated and subsequently the adrenals become over-worked and insufficient DHEA is produced. DHEA, is a precursor hormone to oestrogen, progesterone, and testosterone, and is necessary to balance the hormones in your body. Insufficient DHEA can cause fatigue, bone loss, loss of muscle mass, depression, aching joints, decreased sex drive, and impaired immune function. Wild Yam helps to maintain a balance of hormones in the body for women & men. The essence of the action of yam appears to be in facilitating the production of DHEA, ‘the mother of hormones’.

DHEA is also referred to as ‘the anti-aging hormone’: its widespread effects are due to its role of ‘mothering’ the production of over 50 other hormones. Researchers now believe that adequate DHEA production may help modulate the following: fatigue, depression, stress, memory problems, obesity, tumor growth, viral and bacterial infections, high blood pressure, collagen and skin integrity problems, osteoporosis, immune responses.

Further evidence suggests that Wild Yam consumption can help to normalise the production of the adrenal cortex hormones. The anti-stress and anti-inflammatory hormones (natural steroidal hormones) help prevent inflammation and maintain joint and general structural integrity. This would explain the anti-arthritis (especially relating to rheumatoid arthritis) and anti-rheumatic effects observed traditionally. The tendency to strains, sprains and back problems (so-called slipped disc) are in part due to poor adrenal gland function. Also the tendency to pain in the body is modulated by adrenal hormones. We cannot feel or become strong without adequate adrenal hormones. Aldosterone is an important adrenal hormone that helps the body to maintain the balance of mineral salts to water - a most important aspect of optimum well-being.

The adrenals are also involved in regulating salt balance in the body in conjunction with the hypothalamus. In some people, it seems this regulation does not work properly and too much salt is lost from the urine. In these cases the need for supplemental salt in the form of either Ionic Minerals or Celtic Sea Salt is increased.

Peruvian Maca -- This herb can also help the adrenals generally, Maca root contains natural substances that stimulate the pituitary and hypothalamus. These master glands of the body in turn trigger the ovaries, adrenals, testes, thyroid, and pancreas to return to healthy functioning, thus producing normal amounts of hormones.

Hormones That Help Adrenal Fatigue

As for hormones, it is a good idea to be tested and find out what your hormone levels are before supplementing them. This way you’ll know exactly what hormones are deficient. The three hormones below are most often supplemented when dealing with adrenal fatigue.

- **DHEA** - This is a basic adrenal hormone that the adrenals will convert into other hormones. If someone is very deficient in this hormone they may only be able to tolerate a small amount such as 5 mg. The average adult dose ranges 10 mg. DHEA will also go on to become sex hormones such as testosterone and estrogen.

- **Pregnenolone** - This is a precursor to many of the hormones produced by the adrenal glands. It is a raw material that supports basic adrenal function. Pregnenolone is best taken towards
the evening but may be taken earlier if it interferes with sleep. The usual dose is 10 mg.

- **Progesterone Cream** - Progesterone is the building block for many other major hormones such as cortisol, DHEA, testosterone and estrogen. If you are under a lot of stress and your adrenals are pumping out cortisol, your body will use available progesterone. If too much progesterone is used to produce cortisol, like with adrenal fatigue, not enough is produced to make testosterone which is needed for a woman's healthy libido. I recommend progesterone in the form of a skin cream. Always make sure that it says progesterone USP so you know its real progesterone. Progesterone in men will decrease sexual urge and even destroy male sex glands.

**Life Style Changes That Help Adrenal Fatigue**

- Removal of the stressors. This is the most important step. Emotional stressors such as marital, family, relationship or financial problems needs to be dealt with and normalized. Don't get upset at the little stuff. And it is all little stuff.
- Rest and sleep are extremely important. You will need nine hours of sleep and maybe more for a very long time. Also rest after meals, at midmorning and mid-afternoon if possible.
- Gentle walking is beneficial but vigorous exercise depletes the adrenals. Deep breathing and stretching is also beneficial. You should exercise to relax rather than to build muscles or lose weight.
- Replace toxic cleaning products used around the house with natural products. There are natural alternatives available for cleaning. Hair dyes, shampoos, makeup and skin care products need to be replaced with natural versions. Adrenals are stressed by chemicals and so this is very important.
- Detoxification sauna therapy using an infrared sauna will greatly speed up recovery. If you are in adrenal burnout, use the sauna daily for no more than 30 minutes. Once or twice a week is excellent for prevention.
- Potassium deficiency can also produce a problem. Potassium makes food orange. Eat orange foods such as orange, pumpkin, squash, paprika, carrot, yam, peppers, grapefruit. Avoid salt and sodium.
- Avoid bad sugars (dextrose) and bad oils (cooked, animal and transfatty acids), eat good sugars (fructose) and healthy cold processed uncooked plant oils.

**Adrenal Fatigue Diet**

It may benefit you to add sea salt to your diet, if your potassium is adequate. Acetic acid from vinegar like in pickles can help the acetyl choline form and balance energy.

**Nutritional Considerations in Chronic Fatigue Syndrome**

When the adrenal glands are fatigued they do not produce enough aldosterone. Aldosterone regulates the amount of sodium and potassium in the body. When aldosterone becomes deficient not enough salt is retained in the body. If you have been craving salt, this is probably the reason. Use natural potassium salts or magnesium salts to balance and not upset the mineral balance with too much sodium. You might stimulate the adrenals but generate another problem with the heart.

**Adrenal Fatigue Article**

Instead of eating three meals a day, eat five or six small meals or snacks a day to keep your blood sugar balanced. If you have adrenal fatigue it causes low blood sugar problems. Eating more often can help keep your blood sugar stable. Eat every 3 to 4 hours, nothing in the middle.

Always eat protein with every meal and snack – eggs, beef, pork and poultry are the best sources of protein. Nuts and seeds are other good sources. Absolutely avoid vegetarian diets as they will further stress your adrenals. Most vegetarians never recover from adrenal fatigue.

Complex carbohydrates are good but you may want to avoid wheat as you may be allergic. If you know of any other food allergies, you should avoid them as well. Root vegetables such as turnips, parsnips, rutabaga, carrots, onions, garlic and potatoes are good. All vegetables are good for you and should be eaten several times throughout the day. Other good complex carbs are corn, brown rice and quinoa. Organic corn chips or brown rice cakes are also good.

Avoid isolated soy protein as it is of poor quality and contains many anti-nutrients. Actually avoid all soy products as well. Do not eat any sugar and only eat fruit in small portions. Don't drink fruit juices. Use only healthy oils such as olive oil, flaxseed oil, coconut oil and butter. Use sea salt rather than table salt.

It's really beneficial to drink green drinks like barley grass or various mixed green drinks that also have vegetable extracts. Don't drink tap water but drink filtered or spring water. Absolutely avoid caffeine or any stimulants as these are very stressful to the adrenals.

Restriction or dieting is not a good idea. Follow good eating habits with regular meals and snacks.
The conventional medical evaluation for adrenal function includes measurements of ACTH (adrenocorticotropic hormone) from the pituitary, as well as cortisol (hydrocortisone) from the adrenal glands themselves. Both of these are simple blood tests. In addition, doctors will sometimes obtain a 24-hour urine sample for cortisol and related cortex hormones. This involves having patients collect urine in the same large container every time they empty their bladder for an entire 24-hour period. One drawback with this measurement is that it is not illustrative of variations within the 24-hour period, because the whole day’s worth of urine is mixed together in one bottle. The level of adrenal hormone is naturally high in the morning, progressively diminishing through the afternoon, reaching its lowest levels in the evening. In the case of the 24-hour urine sample, the doctor can determine if the total amount of hormone is high or low for the whole day, but will not know at what time of day major variations occurred.

Also, a normal level for 24 hours might mask very high levels at one point in the day, with very low levels at another part of the day. The total for 24 hours would be normal, but the patient may go through half the day with excessively high levels, and the other half excessively low. Complicating this test is the fact that the blood cortisol level is dependent on the protein molecule that carries it around in the bloodstream. The amount of this molecule can change for a variety of reasons, which changes the level that is measured.

Complicating this test is the fact that the blood cortisol level is dependent on the protein molecule that carries it around in the bloodstream. The amount of this molecule can change for a variety of reasons, which changes the level that is measured.

Liver trouble can lower the amount of this carrier protein, which will alter your test result. Abnormal estrogen levels will also alter the amount of this protein. In addition to all this, one’s level of activity can change the result of the test.

The person’s stress level has a significant impact too. Someone may have rushed to get to the lab or come from a stressful meeting at work. That would yield a different level than a patient who was calmly sitting in the waiting room for half an hour before the test. In addition, the conventional tests have a normal range that is very wide, so that only the most severe, out-of-range abnormalities qualify as being diagnostic of abnormal adrenal function (sound familiar?). For these reasons, many doctors do not order adrenal tests at all. If they do, they generally focus not on cortisol, but on evaluating adrenaline levels. You should tell your doctor that you would like the cortisol testing, and that you want both a “free” and a “total” cortisol level. The free fraction is available in more recently-developed tests, and has more revealing information for thyroid sufferers.

It is true that conventional medicine’s evaluation of mild adrenal insufficiency is stymied by the adrenal system’s subtleties. What do the alternative practitioners have to offer? They have chosen laboratories that try to assess adrenal function somewhat differently. A number of labs will do urinary measurements as described above, but instead of using 24-hours’ worth of urine, they
use four separate samples collected at 8 A.M., noon, 4 P.M., and midnight. Testing four different samples taken throughout the day is an attempt to obtain a more complete adrenal profile than one sample would provide. This allows a more detailed picture of the patient’s daily cyclic adrenal function, and better distinguishes between alarm and exhaustion phases.

In addition to increased determinations per day, the new test measures more than cortisol levels. Also commonly tested is DHEA, a precursor to almost all the other adrenal hormones. (A precursor is a chemical that is not as far along on the chemical pathway chain as the final product.) The resulting set of numbers, which some labs call the Adrenal Stress Index or ASI, can be then be used to initiate and monitor therapy.

Saliva measurement is another type of test not yet considered part of a conventional adrenal workup. The determination of hormonal levels in saliva is, however, being researched for its effectiveness in assessing glandular health and balance. One such saliva test is similar to the urinary ASI above. It tests four saliva samples, collected at four specific times of day (8 A.M., noon, 4 P.M., and midnight). Like the urinary tests just mentioned, more than cortisol levels are measured. Some saliva labs will check cortisol, DHEA, and pregnenolone. Pregnenolone, like DHEA, is a chemical precursor to many of the important adrenal hormones. The saliva measurement is a good choice because of its ease of collection and affordability, but its degree of reliability remains to be fully evaluated. Some alternative practitioners are claiming improved success with salivary testing.

**Adrenal Fatigue**

by Vicki Wade, Pharm. D. January 2005
Adrenal fatigue is a condition in which the adrenal glands function at a sub-optimal level when patients are at rest, under stress, or in response to consistent, intermittent, or sporadic demands. The adrenal glands are two small glands that sit over the kidneys and are responsible for secreting over 50 different hormones—including epinephrine, cortisol, progesterone, DHEA, estrogen, and testosterone. Over the past century, adrenal fatigue has been recognized as Non-Addison’s hypoadrenia, subclinical hypoadrenia, neurasthenia, adrenal neurasthenia, and adrenal apathy.

Generally patients who present with adrenal fatigue can often be heard saying, “After______, I was never the same.” The onset of adrenal fatigue often occurs because of financial pressures, infections, emotional stress, smoking, drugs, poor eating habits, sugar and white flour products, unemployment and several other stressors. After experiencing many of these events over a long period of time, the adrenal glands tend to produce less cortisol, the body’s master stress hormone. Cortisol’s main role in the body is to enable us to handle stress and maintain our immune systems. The adrenal gland’s struggle to meet the high demands of cortisol production eventually leads to adrenal fatigue.

Patients with adrenal fatigue have a distinct energy pattern. They are usually very fatigued in the morning, not really waking up until 10 AM, and will not usually feel fully awake until after a noon meal. They experience a diurnal lull in their cortisol (the stress hormone produced by the adrenal gland) and as a result, they feel low during the afternoon, generally around 2-4 PM. Patients generally begin to feel better after 6 PM; however, they are usually tired after 9 and in bed by 11 PM. These patients find that they work best late at night or early in the morning.

Some key signs and symptoms of adrenal fatigue include:
- Increased blood sugar under stress
- Increased PMS, perimenopausal, or menopausal symptoms under stress
- Mild depression
- Lack of energy
- Decreased ability to handle stress
- Muscle weakness
- Absent mindedness
- Decreased sex drive
- Mild constipation alternating with diarrhea
- As well as many others.

Although there are no specific tests that will provide a true diagnosis of adrenal fatigue, there are tests that may contribute to an assessment, such as a postural hypotension test, an AM cortisol test, or an ACTH stimulation test. It is customary for a physician to assess the adrenals together with thyroid tests to rule out insufficiency, which sometimes occurs in long-standing hypothyroidism.

A single determination of plasma cortisol or 24-hour urinary free cortisol excretion is not useful and may be misleading in diagnosing adrenal insufficiency. However, if the patient is severely stressed or in shock, a single depressed plasma cortisol determination is highly suggestive. An elevated plasma ACTH level in association with a low plasma cortisol level is diagnostic.

Treatment for adrenal fatigue is relatively simple. Lifestyle modifications can be initiated to treat this condition. Simple changes such as more laughter (increases the parasympathetic supply to the adrenals), small breaks to lie down, increased relaxation, regular meals, exercise (avoiding any highly competitive events), early bedtimes and sleeping until at least 9 AM whenever possible can all benefit those experiencing adrenal fatigue.

A diet that would be conducive to treating adrenal fatigue includes one that combines unrefined carbohydrates (whole grains) with protein and oils (nuts and seeds) at most meals—olive, walnut, fiber, flax and high-quality fish oil. It is also important for patients to eat regular meals, chew food well, and eat by 10 AM and again for lunch. Patients should look to avoid any hydrogenated fats, caffeine, chocolate, white carbohydrates, and junk foods. Diets should have a heavy emphasis on vegetables. It may be of additional benefit that patients add salt to their diet, especially upon rising and at least a half-hour before their lowest energy point of the day. (Preferably, 1/8 to 1/2 teaspoonful of sea salt, Celtic salt, or sea salt w/kelp powder added to an 8 oz glass of water). In adrenal fatigue, one should not follow the USDA’s Food Guide Pyramid, as these patients tolerate fewer carbohydrates and need more protein.

The addition of nutritional supplements may also offer additional benefits to patients experiencing adrenal fatigue. They should consider the addition of:
- Vitamin C 2,000-4,000 mg/day Sustained Release
- Vitamin E w/mixed tocopherols 800 IU/day
- Vitamin B complex
- Niacin (125-150 mg/day) – as inositol hexaniacinate
- B-6 (150 mg/day)
- Pantothentic acid (1200-1500 mg/day)
- Magnesium citrate (400-1200 mg)
- Liquid trace minerals (zinc, manganese, selenium, chromium, molybdenum, copper, iodine)—calming effect
- If depression is present – Add SAM.e 200 mg bid; DL-Phenylalanine (DLPA) 500 mg bid

Some herbal remedies that have been noted as possible therapies include Licorice, Ashwagandha, Maca, Siberian Ginseng, Korean Ginseng. Note: Licorice can and, if taken over time, does have a propensity to elevate blood pressure. It should not be used in persons with a history of hypertension, renal failure, or who currently use digitalis preparations such as digoxin.

Under the supervision of a physician hormone supplementation with DHEA, Pregnenolone, and Progesterone may also offer some benefits. There are several glandular extracts on the market that contain adrenal, hypothalamus, pituitary, thyroid, and gonadal that are also often recommended.
Sometimes the initiation of hydrocortisone (Cortef®) may be necessary as a replacement hormone when cortisol is not being produced by the adrenals. While the initiation of corticosteroids, such as hydrocortisone may have quick and dramatic results, they can sometimes make the adrenals weaker rather than stronger. As a result, the initiation of hydrocortisone is usually a last resort. It is important to note that patients may have to undergo treatment for 6 months to 2 years.

While a cortisol measurement may be helpful to confirm any thoughts or ideas that a patient may have decreased adrenal function, typically blood cortisol levels would be tested along with blood levels of potassium, and sodium. If the pituitary gland is the cause of adrenal failure electrolyte levels are usually normal. Practitioners usually pay attention to extremely low cortisol levels, which generally diagnoses Addison’s disease—a condition in which the adrenal glands are completely depleted, also considered a medical emergency.

Natural Cures and Remedies for Hypothyroidism

The thyroid gland, located in the front of the neck just above the collar bone, produces thyroid hormones. These hormones are released into the bloodstream and circulated throughout the body to produce metabolic energy. To find out more about metabolic energy click on the links below:

Metabolic Therapy Overview
(there is a lot of information here)

Regaining Control of Your Metabolism

There are two thyroid hormones, thyroxine or T4 and triiodothyronine or T3, that are released into the blood stream. T3 speeds up the body’s metabolism. Most of the T3 in the blood is converted from T4. The production of T3 and T4 is regulated by another hormone called TSH (thyroid stimulating hormone) or thyrotropin. This hormone is produced in the pituitary gland. If TSH is normal, it is a possible indicator that the thyroid is working properly.

You need to have a blood test to see what your hormone levels are. You should also be working with your doctor as this can be a very serious health problem. He may have you go on a hormone replacement therapy. If he does, make sure that he puts you on a natural form of the thyroid hormone or glandular such as Armour thyroid.

The symptoms of hypothyroidism may not be detected right away as it can develop slowly. You may also experience some symptoms before your thyroid hormone levels drop below normal.

Here is a list of symptoms that might be caused by low thyroid:

- Dry, thick skin
- Hair thinning
- Painful muscles and joints
- Depression
- Memory problems
- Constipation
- Heavy, irregular or prolonged menstrual periods
- Low body temperature (below 97.8°F first thing in the morning)
- Low blood pressure
- Puffy eyes and face
- Slow pulse
- Reduced libido
- Poor memory
- Fatigue
- Chronic sinus infections
- Headaches
- Sweating abnormalities
- Migraines
- Heat and/or cold intolerance
- Irritability
- Fluid retention
- Anxiety
- Panic attacks
- Frequent colds and sore throats
- Lightheadedness
- Ringing in the ears
- Decreased concentration
- Slow wound healing
- Easy bruising
- Unhealthy nails
- Acid Indigestion
- Cold hands or feet
- Inappropriate weight gain
- Hypoglycemia
- Falling asleep during the day
- Itching
- High cholesterol
- Loss of outside portion of eyebrows

It is possible that there is an underlying cause that is the reason for your hypothyroidism. Some possible causes are heavy metal poisoning (especially mercury), adrenal fatigue, food allergies and celiac disease. It might be wise to also check into what may be causing your thyroid problem and deal with it also in order to get well.

There are actually some foods that can cause low thyroid levels. They are called goitrogenic foods and include Brussels sprouts, rutabaga, turnips, cabbage, radishes, broccoli, cauliflower, millet, kale, and soy. Goitrogens are naturally occurring thyroid inhibiting substances found in these
foods. The thyroid inhibiting effect of these foods are thought to be largely inactivated by cooking. So if you eat any of these foods, be sure to cook them. I would recommend that you not eat any of these foods in large quantity even when cooked and don’t eat them at all raw.

Natural Remedies for Hypothyroidism

Below are some supplements that might help improve your thyroid health. Always remember to also include a good multivitamin supplement to make sure you are not deficient in any vitamins.

Iodine -- You can increase your iodine intake through diet and kelp supplementation. Kelp is rich in iodine and is very affordable. I buy it in tablet form with 225 mcg. of iodine per tablet. I had low levels of iodine because I didn’t like to salt my food. Now I use natural sea salt that doesn’t have iodine in it and I supplement with kelp tablets. There used to be plenty of iodine in vegetables and fruits but the soil is very iodine depleted in most areas today. Foods that contain iodine are yogurt, eggs, meat, fish and other seafood, radish, parsley, potatoes, oatmeal and bananas.

Selenium -- Many people diagnosed with hypothyroidism were found to be selenium deficient. Selenium is required to convert the T4 thyroid hormone to the active T3 form. As an example, the selenium containing enzyme type-I-iodothyronine-deiodinase is important for the conversion of T4 to T3. So selenium deficiency can reduce the activity of the thyroid hormones.

Tyrosine -- Tyrosine is an amino acid needed by the body to manufacture thyroid hormones from iodine. And so the use of tyrosine as a dietary supplement increases production of thyroid hormones.

Thyroid Glandular -- Thyroid glandular supplements have been used since the beginning of thyroid treatment. Usually it is only sold through your practitioner or by prescription (like Armour) but there are some over-the-counter thyroid glandular supplements available.

Bladderwrack -- Bladderwrack is a seaweed that is a rich source of iodine. Traditionally it has been used for weight loss and hypothyroidism. The low incidence of goiter in maritime people has been attributed to the iodine in bladderwrack. It also contains the minerals potassium, magnesium, calcium, iron, zinc, etc. Bladderwrack is thought to stimulate the thyroid gland increasing metabolism.

Coconut Oil -- Below are two articles about coconut oil and how it benefits the thyroid. They also talk about why coconut oil helps you lose weight as well.

Coconut Oil and Thyroid Functioning

Thyroid Health and the Coconut Diet
Foods and Meals, Tips and Tricks...

Kiwifruit

This tiny, nutrient-dense fruit packs an amazing amount of vitamin C (double the amount found in oranges), has more fiber than apples, and beats bananas as a high-potassium food. The unique blend of phytonutrients, vitamins, and minerals found in kiwifruit helps protect against heart disease, stroke, cancer, and respiratory disease. Kiwifruit’s natural blood-thinning properties work without the side effects of aspirin and support vascular health by reducing the formation of spontaneous blood clots, lowering LDL cholesterol, and reducing blood pressure. Multiple studies have shown that kiwifruit not only reduce oxidative stress and damage to DNA but also prompt damaged cells to repair themselves. Kiwifruit are often prescribed as part of a dietary regimen to battle cancer and heart disease, and in Chinese medicine they are used to accelerate the healing of wounds and sores.

How much: Aim to eat one to two kiwifruit a day while they’re in season, for the best taste and nutrition. California-grown kiwifruit are in season from October through May, and New Zealand kiwifruit are available between April and November.

Tips: Kiwifruit contain enzymes that activate once you cut the fruit, causing the flesh to tenderize. So if you’re making a fruit salad, cut the kiwifruit last. The riper the kiwifruit, the greater the antioxidant power, so let them ripen before you dig in.

Cherries

Cherries boast a laundry list of healing powers. For starters, they pack a powerful nutritional punch for a relatively low calorie count. They’re also packed with substances that help fight inflammation and cancer. As if that weren’t enough, in lab studies, quercetin and ellagic acid, two compounds contained in cherries, have been shown to inhibit the growth of tumors and even cause cancer cells to commit suicide—without damaging healthy cells. Cherries also have antiviral and antibacterial properties.

Anthocyanin, another compound in cherries, is credited with lowering the uric acid levels in the blood, thereby reducing a common cause of gout. Researchers believe anthocyanins may also reduce your risk of colon cancer. Further, these compounds work like a natural form of ibuprofen, reducing inflammation and curbing pain. Regular consumption may help lower risk of heart attack and stroke.

In Chinese medicine, cherries are routinely used as a remedy for gout, arthritis, and rheumatism (as well as anemia, due to their high iron content). Plus they’re delicious.

How much: Aim for a daily serving while they’re in season locally. And keep a bag of frozen cherries in your freezer the rest of the year; frozen cherries retain 100 percent of their nutritional value and make a great addition to smoothies, yogurt, and oatmeal.

Tip: Buy organic, since conventionally grown cherries can be high in pesticides.

Guavas

Guavas are a small tropical fruit that can be round, oval, or pear-shaped. They’re not all that common, so they might be hard to find, depending on where you live. But if you can track them down, it’s more than worth it. Guavas contain more of the cancer-fighting antioxidant lycopene than any other fruit or vegetable, and nearly 20 percent more than tomatoes. Our bodies can’t process much of the lycopene in tomatoes until they’re cooked; the processing helps break down tough cell walls. However, guavas’ cell structure allows the antioxidant to be absorbed whether the fruit is raw or cooked, and the whole fruit offers the nutrition without the added sodium of processed tomato products.

Lycopene protects our healthy cells from free radicals that can cause all kinds of damage, including blocked arteries, joint degeneration, nervous system problems, and even cancer. Lycopene consumption is associated with significantly lower rates of prostate cancer; in addition, men with prostate tumors who consumed lycopene supplements showed significant improvements, such as smaller tumors and decreased malignancy. Lycopene has also been found to inhibit the growth of breast cancer cells, and research suggests that this antioxidant may also help protect against coronary heart disease.

This strange-looking little fruit is also packed with vitamin C and other antioxidants. Serving for serving, guava offers more than 60 percent more potassium than a banana, which can help protect against heart disease and stroke. In fact, the nutrients found in guavas have been shown to lower LDL and boost HDL cholesterol, reduce triglycerides, and lower blood pressure.

How much: Aim to eat fresh guavas as often as you can when you can find them in stores. They’re not commonly available in the freezer section; and most guava juices are processed and
sweetened, so they don’t provide the same superior nutrition that the whole, fresh fruit does. One to two guavas a day is a good goal.

Tip: Opt for the red-fleshed variety if you can; both are loaded with antioxidants, but the red type has more than the white-fleshed apple guava.

**Beans**

Beans are a miracle food. They lower cholesterol, regulate blood sugar and insulin production, promote digestive health, and protect against cancer. If you think of fiber, protein, and antioxidants and immediately think whole grains, meat, and fruit, think again—beans offer all three in a single package.

An assortment of phytochemicals found in beans has been shown to protect cells from cancerous activity by inhibiting cancer cells from reproducing, slowing tumor growth. Researchers at the Harvard School of Public Health reported that women who consumed beans at least twice a week were 24 percent less likely to develop breast cancer, and multiple studies have tied beans to a reduced risk of heart disease, type 2 diabetes, high blood pressure, and breast and colon cancers.

Beans deliver a whopping amount of antioxidants, which help prevent and fight oxidative damage. In fact, the USDA’s ranking of foods by antioxidant capacity places three varieties of beans (red beans, red kidney beans, and pinto beans) in the top four—and that’s among all food groups.

Beans are a great source of dietary fiber, protein, and iron. They also contain the amino acid tryptophan; foods with high amounts of tryptophan can help regulate your appetite, aid in sleep, and improve your mood. Many are also rich in folate, which plays a significant role in heart health.

And depending on the type of bean you choose, you’ll also get decent amounts of potassium, magnesium, vitamin B1 and B2, and vitamin K. Soybeans are a great source of omega-3 fatty acids.

In Chinese medicine, various types of beans have been used to treat alcoholism, food poisoning, edema (particularly in the legs), high blood pressure, diarrhea, laryngitis, kidney stones, rheumatism, and dozens of other conditions.

How much: Aim for a minimum of two servings of beans per week.

Tip: Adzuki and mung beans are among the most easily digested; pinto, kidney, navy, garbanzo, lima, and black beans are more difficult to digest.

**Watercress**

Not only is watercress extremely nutritious, it’s about as close as you can get to a calorie-free food. Calorie for calorie, it provides four times the calcium of 2 percent milk. Ounce for ounce, it offers as much vitamin C as an orange and more iron than spinach. It’s packed with vitamin A and has lots of vitamin K, along with multiple antioxidant carotenoids and protective phytochemicals.

The nutrients in watercress protect against cancer and macular degeneration, help build the immune system, and support bone health. The iron helps red blood cells carry oxygen to your body’s tissues for energy. The phytochemicals in watercress battle cancer in three ways: killing cancer cells, blocking carcinogens, and protecting healthy cells from carcinogens. They’ve also been shown to help prevent lung and esophageal cancer and can help lower your risk for other cancers.

In Chinese medicine, watercress is thought to help reduce tumors, improve night vision, and stimulate bile production (improving digestion and settling intestinal gas). It’s used as a remedy for jaundice, urinary difficulty, sore throat, mumps, and bad breath.

How much: Eat watercress daily if you can. In some regions, it’s more widely available during the spring and summer, when it’s cultivated outdoors. But since it can also be grown hydroponically in greenhouses, you can find it year-round in many grocery stores and at your local farmers market.

Tips: You can cook it, but watercress is better for you when you eat it raw. Tuck it into a sandwich in place of lettuce.

Toss it with your favorite vegetables and eat it in a salad. Watercress is great in pesto—just replace the basil with watercress—and soups. Use watercress as a wonderfully detoxifying ingredient in juice or smoothies.

**Spinach**

You already knew spinach was good for you, but did you know just how good? Spinach protects against eye disease and vision loss; it’s good for brain function; it guards against colon, prostate, and breast cancers; it protects against heart disease, stroke, and dementia; it lowers blood pressure; it’s anti-inflammatory; and
it’s great for bone health. Spinach has an amazing array of nutrients, including high amounts of vitamin K, calcium, vitamin A, vitamin C, folate, magnesium, and iron.

A carotenoid found in spinach not only kills prostate cancer cells, it also prevents them from multiplying. Folate promotes vascular health by lowering homocysteine, an amino acid that, at high levels, raises the risk of dementia and cardiovascular disease, including heart disease and stroke. Folate has also been shown to reduce the risk of developing colorectal, ovarian, and breast cancers and to help stop uncontrolled cell growth, one of the primary characteristics of all cancers. The vitamin C and beta-carotene in spinach protect against colon cancer in addition to fighting inflammation, making them key components of brain health, particularly in older adults.

Spinach is loaded with vitamin K (one cup of cooked spinach provides 1,111 percent of the recommended daily amount!), which builds strong bones by helping calcium adhere to the bone. Spinach is also rich in lutein, which protects against age-related macular degeneration, and it may help prevent heart attacks by keeping artery walls clear of cholesterol buildup.

How much: Fresh spinach should be a daily staple in your diet. It’s available in practically every grocery store, no matter where you live, it’s easy to find year-round, and you’d be hard pressed to find a more nutritionally sound, versatile green. So do yourself a healthy favor and aim for a few ounces, raw or lightly steamed, every day.

Tips: Add a handful of fresh spinach to your next fruit smoothie. It’ll change the color but not the taste.

Conventionally grown spinach is susceptible to pesticide residue; stick to organic.

Onions

Onions get a bad rap for their effect on the breath, but that’s not the only part of the body where they pack a wallop. Onions contain potent cancer-fighting enzymes; onion consumption has been shown to help lower the risk of prostate and esophageal cancers and has also been linked to reduced mortality from coronary heart disease. Research suggests that they may help protect against stomach cancer. Onions contain sulfides that help lower blood pressure and cholesterol, as well as a peptide that may help prevent bone loss by inhibiting the loss of calcium and other bone minerals.

Onions have super antioxidant power. They contain quercetin, a natural antihistamine that reduces airway inflammation and helps relieve symptoms of allergies and hay fever. Onions also boast high levels of vitamin C, which, along with the quercetin, battles cold and flu symptoms. Onions’ anti-inflammatory properties help fight the pain and swelling...
associated with osteo- and rheumatoid arthritis. Onions are also extremely rich in sulfur and they have antibiotic and antiviral properties, making them excellent for people who consume a diet high in protein, fat, or sugar, as they help cleanse the arteries and impede the growth of viruses, yeasts, and other disease-causing agents, which can build up in an imbalanced diet.

**How much:** For all the health benefits onions provide, it would be ideal to eat one a day. However, if that’s not doable for you, add a few onions to your weekly grocery list and try to eat a little bit every day. All varieties are extremely good for you, but shallots and yellow onions lead the pack in antioxidant activity. Raw onions provide the best nutrition, but they’re still great for you when they’re lightly cooked. And cooking meat at high temperatures (such as on a grill) with onions can help reduce or counteract carcinogens produced by the meat.

**Tip:** Onions should be stored at room temperature, but if they bother your eyes when you cut them, try refrigerating them for an hour beforehand.

### Carrots

Carrots are a great source of the potent antioxidants known as carotenoids. Diets high in carotenoids have been tied to a decreased risk in postmenopausal breast cancer as well as cancers of the bladder, cervix, prostate, colon, larynx, and esophagus. Conversely, diets low in carotenoids have been associated with chronic disease, including heart disease and various cancers. Research suggests that just one carrot per day could reduce your risk of lung cancer by half. Carrots may also reduce your risk of kidney and ovarian cancers. In addition to fighting cancer, the nutrients in carrots inhibit cardiovascular disease, stimulate the immune system, promote colon health, and support ear and eye health.

Carrots contain calcium, potassium, magnesium, phosphorus, fiber, vitamin C, and an incredible amount of vitamin A. The alpha-carotene in carrots has shown promise in inhibiting tumor growth. Carrots also contain the carotenoids lutein and zeaxanthin, which work together to promote eye health and prevent macular degeneration and cataracts. In Chinese medicine, carrots are used to treat rheumatism, kidney stones, tumors, indigestion, diarrhea, night blindness, ear infections, earaches, deafness, skin lesions, urinary tract infections, coughs, and constipation.

**How much:** Eat a serving of carrots each day if you can, and enjoy them year-round. Carrots are good for you whether they’re raw or lightly cooked; cooking helps break down the tough fiber, making some of the nutrients more easily absorbed. For the best nutrition, go for whole carrots that are firm and fresh-looking. Precut baby carrots are made from whole carrots and, although they’re convenient, they tend to lose important nutrients during processing.

**Tips:** Remove carrot tops before storing them in the fridge, as the tops drain moisture from the roots and will cause the carrots to wilt.

Buy organic; conventionally grown carrots frequently show high pesticide residues.

### Cabbage

Cabbage is a powerhouse source of vitamins K and C. Just one cup supplies 91 percent of the recommended daily amount for vitamin K, 50 percent of vitamin C, good amounts of fiber, and decent scores of manganese, vitamin B6, folate, and more—and it’ll only cost you about 33 calories. Calorie for calorie, cabbage offers 11 percent more vitamin C than oranges.

Cabbage contains high levels of antioxidant sulforaphanes that not only fight free radicals before they damage DNA but also stimulate enzymes that detoxify carcinogens in the body. Researchers believe this one-two approach may contribute to the apparent ability of cruciferous vegetables to reduce the risk of cancer more effectively than any other plant food group.

Numerous studies point to a strong association between diets high in cruciferous vegetables and a low incidence of lung, colon, breast, ovarian, and bladder cancers.

Cabbage builds strong bones, dampens allergic reactions, reduces inflammation, and promotes gastrointestinal health. Cabbage is routinely juiced as a natural remedy for healing peptic ulcers due to its high glutamine content. It also provides significant cardiovascular benefit by preventing plaque formation in the blood vessels. In Chinese medicine, cabbage is used to treat constipation, the common cold, whooping cough, depression and irritability, and stomach ulcers. When eaten and used as a poultice, as a dual treatment, cabbage is helpful for healing bruises, varicose veins, and arthritis.

**How much:** The more cabbage you can include in your diet, the better. A study of Polish women found that those who ate at least four servings of cabbage per week as adolescents were 72 percent less likely to develop breast cancer later in life than their peers who consumed only one weekly serving or less.

**Tips:** Try raw sauerkraut. It has all the health properties of cabbage, plus some potent probiotics, which are excellent for digestive health.

Use the whole cabbage; the outer leaves contain a third more calcium than the inner leaves.

Both are nutritional stars, but red cabbages are far superior to the white variety, with about seven times more vitamin C and more than four times the polyphenols, which protect cells from oxidative stress and cancer.
Broccoli

You’ll find it difficult to locate another single food source with as much naturally occurring health-promoting properties as broccoli. A single cup of steamed broccoli provides more than 200 percent of the RDA for vitamin C (again, more than oranges), nearly as much of vitamin K, and about half of the daily allowance for vitamin A, along with plentiful folate, fiber, sulfur, iron, B vitamins, and a whole host of other important nutrients. Calorie for calorie, broccoli contains about twice the amount of protein as steak—and a lot more protective phytonutrients.

Broccoli’s phytochemicals fight cancer by neutralizing carcinogens and accelerating their elimination from the body, in addition to inhibiting tumors caused by chemical carcinogens. Studies show evidence that these substances help prevent lung and esophageal cancers and may play a role in lowering the risk of other cancers, including gastrointestinal cancer. Phytonutrients called indoles found in broccoli help protect against prostate, gastric, skin, breast, and cervical cancers. Some research suggests that indoles also protect the structure of DNA and may reduce the risk of prostate cancer. Extensive studies have linked broccoli to a 20 percent reduction in heart disease risk. In Chinese medicine, broccoli is used to treat eye inflammation.

How much: If you can eat a little broccoli every day, your body will thank you for it. If you can’t swing it, aim for eating it as regularly as possible. Like many other vegetables, broccoli provides fantastic nutrition both in its raw form and when it’s properly cooked. Cooking reduces some of broccoli’s anticancer components, but lightly steaming it will preserve most of the nutrients. Broccoli is available fresh year-round in most areas, but if you can’t find it where you live, frozen broccoli is a good substitute.

Tip: Steaming or cooking broccoli lightly releases the maximum amount of the antioxidant sulforaphane.

Kale

Kale is highly nutritious, has powerful antioxidant properties, and is anti-inflammatory. One cup of cooked kale contains an astounding 1,328 percent of the RDA for vitamin K, 192 percent of the RDA for vitamin A, and 89 percent of the RDA for vitamin C. It’s also a good source of calcium and iron.

Kale is in the same plant family as broccoli and cabbage, and, like its cruciferous cousins, it contains high levels of the cancer-fighting compound sulforaphane, which guards against prostate, gastric, skin, and breast cancers by boosting the body’s detoxification enzymes and fighting free radicals in the body. The indoles in kale have been shown to protect against breast, cervical, and colon cancers. The vitamin K in kale promotes blood clotting, protects the heart, and helps build strong bones by anchoring calcium to the bone. It also has more antioxidant power than spinach, protecting against free-radical damage. Kale is extra rich in beta-carotene (containing seven times as much as does broccoli), lutein, and zeaxanthin (10 times the amount in broccoli). In Chinese medicine, kale is used to help ease lung congestion.

How much: Like cabbage, the more kale you can eat, the better. A daily serving is ideal. Eat it as much as you can, as long as you can find it fresh at your local grocery or farmers market. In some areas, it’s available all year; in others, it only makes an appearance during summer and fall.

Tips: Kale’s growing season extends nearly year-round; the only time it’s out of season is summer, when plenty of other leafy greens are abundant.

Steam or sauté kale on its own, or add it to soups and stews. Cooking helps tenderize the leaves Kale is also a great addition when it’s blended in fruit smoothies or juiced with other vegetables.

Dandelion

The same pesky weed known for ruining lawns has a long history of being used as a healing herb in cultures around the globe. One cup of raw dandelion greens provides 535 percent of the RDA of vitamin K and 112 percent of the RDA for vitamin A. Dandelion greens are also a good source of vitamin C, calcium, iron, fiber, and potassium. Among all foods, it’s one of the richest sources of vitamin A; among all green vegetables, it’s one of the best sources of beta-carotene.

Dandelion has been used for centuries to treat hepatitis, kidney, and liver disorders such as kidney stones, jaundice, and cirrhosis. It’s routinely prescribed as a natural treatment for hepatitis C, anemia, and liver detoxification (poor liver function has been linked to numerous conditions, from indigestion and hepatitis to irritability and depression). As a natural diuretic, dandelion supports the entire digestive system and increases urine output, helping flush toxins and excess salt from the kidneys. The naturally occurring potassium in dandelions helps prevent the loss of potassium that can occur with pharmaceutical diuretics.

Dandelion promotes digestive health by stimulating bile production, resulting in a gentle laxative effect. Inulin, a naturally occurring soluble fiber in dandelion, further aids digestion by feeding the
healthy probiotic bacteria in the intestines; it also increases calcium absorption and has a beneficial effect on blood sugar levels, therefore being useful in treating diabetes. Both the dandelion leaves and root are used to treat heartburn and indigestion. The pectin in dandelion relieves constipation and, in combination with vitamin C, reduces cholesterol. Dandelion is excellent for reducing edema, bloating, and water retention; it can also help reduce high blood pressure. On top of all that, dandelion contains multiple antidiarrheal and antibacterial properties.

In Chinese medicine, dandelion is used in combination with other herbs to treat hepatitis and upper respiratory tract infections such as bronchitis and pneumonia. The sap from the stem and root is a topical remedy for warts. Imagine—all this from a lowly weed!

**How much:** How much dandelion to incorporate into your diet boils down to two factors: availability and personal preference. Dandelion greens are considered a specialty item in some areas and therefore can be difficult to find. They also have a pungent taste, and people tend to love or hate the flavor. If you can find fresh dandelion greens and you enjoy the taste, make them a regular part of your diet.

**Tips:** Use the root in soups or sauté it on its own. If the raw leaves are too bitter for you, try them lightly steamed or sautéed.

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**Nuts and seeds**

Nuts and seeds are nutrient-dense foods packed with high-quality protein and healthy omega-3 fats. Depending on the type you choose, you’ll also get decent amounts of manganese; magnesium; phosphorus; iron; copper; riboflavin; vitamins B1, B2, B5, and B6; and tryptophan -- all of which are involved in the production of energy.

**Why they work:** Pumpkin seeds, almonds, cashews, and hazelnuts are all good sources of magnesium, which helps fight muscle fatigue. The tryptophan found in sesame seeds, sunflower seeds, pumpkin seeds, cashews, walnuts, and almonds battles emotional fatigue and promotes sleep, which can ease physical weariness. And all nuts and seeds are excellent sources of high-
Iron plays a direct and important role in fighting fatigue. It’s a known energy booster, helping the body produce energy by delivering oxygen to the cells and enabling them to perform optimally. Without sufficient oxygen, our cells slow down and can even shut down altogether. Low iron levels can cause both physical and mental fatigue, as well as anemia. Symptoms of anemia include tiredness, lack of energy, weakness, trouble concentrating, apathy, insomnia, and loss of appetite. Spinach and other leafy greens offer a high rate of iron for an extremely low caloric intake. Spinach also happens to be an excellent source of vitamin C, which boosts iron absorption. Magnesium is another mineral that plays a vital role in the production of energy. In fact, it’s involved in hundreds of enzymatic reactions throughout the body and directly affects our cardiovascular, digestive, and nervous systems; muscles; kidneys; liver; and brain.

Magnesium is necessary for the production of energy, proper digestion, and the regulation of nerve and muscle tone. It’s no wonder that a lack of magnesium can cause our brains and bodies to slow. Unfortunately, magnesium deficiency is one of the most common nutrient deficiencies in the U.S. Even a slight deficiency can result in reduced energy levels, which causes your body to work harder and can lead to exhaustion. Symptoms of magnesium deficiency include imbalanced blood sugar levels, depression, muscle weakness, muscle cramps, muscle spasms, muscle soreness, body tension, low energy, fatigue, difficulty sleeping, confusion, and lack of appetite.

Like magnesium, potassium also helps muscles and nerves function properly. Physical overexertion is a common cause of potassium deficiency, but it can also occur if you become dehydrated due to illness or for any other reason. Symptoms of potassium deficiency include imbalanced blood sugar levels, depression, muscle weakness, muscle cramps, muscle spasms, muscle soreness, body tension, low energy, fatigue, difficulty sleeping, confusion, and lack of appetite.

When to eat it: For the amount -- and array -- of nutrients packed into these leafy greens, we’d all be better off if spinach made an appearance at every meal, every day. But let’s be practical. Incorporate spinach into your diet as much as you can, as often as possible. Try steamed spinach and organic, farm-fresh eggs for breakfast; tuck spinach into your sandwich at lunch; layer it in your lasagna at dinner. You get the idea.

How to enjoy it: You don’t have to resort to a spinach salad or side dish at every meal. Spinach is so mild you can add it to just about anything -- soups, stews, casseroles, dips, smoothies, and stir-fries.

Extra credit: Fold pureed spinach into baked goods. No one but you will be the wiser, and everyone will be a little healthier for it.

**Probiotic Yogurt**

Probiotic Yogurt is so creamy and flavorful, it can seem like a dessert masquerading as a health food. But the truth is, it’s really good for you, thanks to a power play of protein and gut-healthy probiotics.

**Why it works:** Because it’s soft, your body processes yogurt more quickly than a solid food, making it a great source of quick energy. But while you get a rapid result, it’s also long-lasting, thanks to a good ratio of protein to carbohydrates. Protein stays in the stomach longer than carbohydrates, which translates into a steady source of energy.
Yogurt also contains probiotics, beneficial bacteria that help maintain a healthy gut ecosystem by protecting against pathogens and helping your body eliminate harmful bacteria. Like fiber, probiotics are a powerful digestive aid. Recent research from the University of Toronto suggests that probiotics can help ease symptoms of chronic fatigue syndrome; in the study, probiotic supplementation appeared to boost levels of the amino acid tryptophan in the brain. Tryptophan is famously known as the component in turkey that makes you sleepy, but it’s also a precursor of serotonin, a neurotransmitter that helps induce sleep and promote feelings of calm and tranquility, helping to combat both physical and emotional fatigue.

**When to eat it:** Absolutely any time. Aside from its health benefits, one of the best things about yogurt is its versatility. It’s a great afternoon or preworkout snack because it will give you a quick hit of energy. But you can also add healthy toppings like oats, ground flaxseed, nuts, and fruit to make a hearty breakfast. The plain variety works well at the dinner table in place of sour cream or as a salad dressing base, and you can doctor it up with frozen berries for dessert.

**How to enjoy it:** Go for the Greek. Greek yogurt contains about twice the amount of protein as the regular kind, and it has a richer, creamier consistency, which makes it seems like an indulgence. Choose organic whenever possible.

**Extra credit:** Make yogurt your go-to breakfast at least three times a week for great digestive results. Bonus points if you choose low-fat, plain yogurt and add your own healthy toppings — try honey and golden raisins for a sweet snack.

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**Oatmeal**

Oatmeal isn’t particularly low on the glycemic index, it outranks almost every other breakfast cereal and most whole-grain breakfast products. Oatmeal is also regarded as a super food when it comes to supporting digestive health. For those reasons, many medical practitioners and nutritionists not only allow their diabetic patients to eat oatmeal but actually encourage it, especially since oatmeal helps maintain normal blood sugar levels.

**Why it works:** Carbohydrates spend the least amount of time in the stomach, which means you get a quick boost of energy. But unlike processed, sugary cereals, whole oats don’t result in a sugar crash. The high dietary fiber content in oats helps you feel full longer, preventing overeating throughout the day, which can lead to weight gain, sluggishness, and fatigue. Fiber is also crucial to healthy digestion; the soluble fiber in oats feeds the beneficial bacteria in your digestive tract and prevents energy-draining constipation.

In addition to its high fiber content, oatmeal provides magnesium, protein, and phosphorus, three nutrients that significantly and directly affect energy levels, making it an ideal food for fighting fatigue. It’s also a good source of vitamin B1 (thiamin), which is crucial for producing energy.

**When to eat it:** Eat oatmeal first thing in the morning for instant energy. Breakfast is especially important because it replenishes energy reserves and sets the tone for your day.

**How to enjoy it:** Go for old-fashioned, minimally processed organic oats, and avoid the instant and flavored varieties. Hint: Look for oats labeled “Scottish,” “Irish,” “steel-cut,” “thick cut,” or “Old-fashioned,” and you’ll be on the right track.

**Extra credit:** Sprinkle protein-rich flaxseed or nuts on top of your oatmeal for longer-lasting energy.
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7 Foods Every Woman and Man Must Eat For energy and health

Berries

Why: Ounce for ounce, berries have more protective plant antioxidants than almost any other food. “These compounds not only lower your disease risks, they help prevent memory loss,” says Somer.

How Much: Aim for a cup of berries—any berries, fresh or frozen—at least three times a week (berry researchers say eat a cup daily). Since berries are high in fill-you-up fiber, they may also help curb weight gain.

How:
- Toss them in salads.
- Snack on them one by one, like healthy potato chips.
- Add them to yogurt, cereal, and smoothies.
- Stir them into anything you bake.

Mixed Greens with Berries and Honey-Glazed Hazelnuts

For a sophisticated starter, try this colorful salad, which marries fresh berries, caramelized nuts and tangy feta cheese. Pureed berries form the base of the dressing, giving it a velvety texture and rich flavor.

(Per serving)
- Calories: 232
- Total Fat: 17g
- Saturated Fat: 4g
- Cholesterol: 17mg
- Sodium: 349mg
- Total Carbohydrate: 16g
- Dietary Fiber: --
- Sugars: --
- Protein: 7g
- Calcium: --

Ingredients

Nuts:
- 1 teaspoon(s) extra-virgin olive oil
- 1/4 cup(s) chopped hazelnuts
- 1 teaspoon(s) honey

Dressing:
- 1/3 cup(s) raspberries
- 2 tablespoon(s) extra-virgin olive oil
- 1 tablespoon(s) balsamic vinegar
- 1 tablespoon(s) water
- 1 teaspoon(s) Dijon mustard
- 1 clove(s) garlic
- 1/2 teaspoon(s) honey
- 1/8 teaspoon(s) salt
- Freshly ground pepper
- 2 tablespoon(s) finely chopped shallots

Salad
- 10 cup(s) mesclun salad greens
- 1 cup(s) blackberries, raspberries and/or blueberries
- 1/2 cup(s) crumbled feta or goat cheese

Directions

1. To prepare nuts: Preheat oven to 350 degrees F. Coat a small baking dish with cooking spray. Combine oil and honey in a small bowl. Add nuts and toss to coat. Transfer to the prepared baking dish and bake, stirring from time to time, until golden, 10 to 14 minutes. Let cool completely.

2. To prepare dressing: Combine berries, oil, vinegar, water, mustard, garlic, honey, salt and pepper in a blender or food processor. Blend until smooth. Transfer to a small bowl and stir in shallots.

3. To prepare salad: Just before serving, place greens in a large bowl. Drizzle the dressing over the greens and toss to coat. Divide the salad among 4 plates. Scatter berries, cheese and the glazed nuts over each salad; serve immediately.
Blueberry-Banana Smoothie

Refreshing and colorful fruit smoothies called batidos are served at Cuban snack bars all over Florida.

(per serving)
- Calories: 243
- Total Fat: 3g
- Saturated Fat: 2g
- Cholesterol: 10mg
- Sodium: 261mg
- Total Carbohydrate: 48g
- Dietary Fiber: --
- Sugars: --
- Protein: 10g
- Calcium: --

Ingredients
- 1 ripe banana, peeled and cut into chunks
- 1/2 cup(s) frozen blueberries
- 1 tablespoon(s) sugar
- 4 ice cubes
- 1 cup(s) buttermilk

Directions
Combine banana, blueberries, sugar, ice cubes and buttermilk in a blender and blend until smooth.

Salmon

Why: Sure, salmon is a prime source of omega-3s, the healthy fats that fend off heart disease and maybe more, but are you aware that a mere 3 ounces of the fish serves up 170 percent of your daily vitamin B12 and more than 80 percent of your D?

How Much: Aim for two servings a week (and if you substitute tuna for one serving, that’s OK).

How:
- Broil, bake, or poach it with dill.
- Toss it into pasta dishes and salads.

If you’re vegetarian or just not a fish eater, get the key omega-3 fat called DHA in:
- Silk Plus Omega-3 DHA Soymilk
- Horizon Organic Milk Plus DHA
- Oh Mama! Nutrition Bars
- Gold Circle Farm Eggs
- Rachel’s Wickedly Delicious Yoghurts

Spicy Grilled Salmon with Garlicky Greens

(per serving)
- Calories: 348
- Total Fat: 22g
- Saturated Fat: 3g
- Cholesterol: 70mg
- Sodium: 380mg
- Total Carbohydrate: 70g
- Dietary Fiber: --
- Sugars: --
- Protein: 29g
- Calcium: --

Ingredients
- 4 piece(s) (4 oz. each) salmon fillets
- salt and pepper , to taste
- 4 tablespoon(s) olive oil
- 2 tablespoon(s) red currant jelly
- 1 tablespoon(s) (prepared) mustard
- 1 teaspoon(s) (ground ) black pepper
• 1/8 teaspoon(s) (ground) cloves
• 1/8 teaspoon(s) cayenne pepper
• 2 clove(s) garlic, minced
• 1 pound(s) baby spinach, washed and dried
• 2 whole(s) green onions, finely chopped

Directions
1. Sprinkle salmon with salt and pepper.
2. Combine 2 Tbsp. olive oil, red currant jelly, mustard, black pepper, cloves and cayenne in a small bowl. Brush mixture onto salmon.
3. Mist a grill pan with cooking spray and warm over medium-high heat. Place salmon in pan; grill for 10 to 12 minutes, turning once. (May also be baked in a 400°F oven on a lightly greased baking pan for 10 to 12 minutes. If using oven method, do not turn.)
4. In large skillet over medium heat, cook garlic in remaining 2 Tbsp. oil for 1 minute. Add spinach; cover and cook 8 minutes, stirring once. Season with salt and pepper, to taste.
5. To serve, divide spinach onto four plates. Top with salmon and sprinkle with green onions.

Pan-Grilled Salmon Fillets with Tomato and Tarragon
(per serving)
• Calories: 248
• Total Fat: 13g
• Saturated Fat: 3g
• Cholesterol: 69mg
• Sodium: 216mg
• Total Carbohydrate: 2g
• Dietary Fiber: --
• Sugars: --
• Protein: 23g
• Calcium: --

Ingredients
• 1 1/8 pound(s) salmon fillet, skin on (scaling is not necessary), pin bones removed
• Salt and freshly ground pepper, to taste
• 1/2 cup(s) dry white wine
• 1/3 cup(s) very finely chopped fresh chives
• 3 sprig(s) fresh tarragon
• 1 teaspoon(s) butter
• 2 ripe plum tomatoes, seeded and finely chopped
• Fresh chives, for garnish

Directions
1. Preheat a 12-inch ovenproof skillet (cast iron is fine) for 3 or 4 minutes over medium-high heat. Preheat the broiler, positioning the top rack about 4 inches from the heat.
2. Place salmon fillets in the skillet, skin-side down, leaving the heat on medium-high. Sprinkle with pepper and cook, undisturbed, for about 6 minutes, or until the salmon flesh turns opaque about halfway up the fish.
3. Transfer the skillet to the broiler and leave it there for 2 or 3 minutes, just until the salmon browns on top. The salmon should still be moist in the middle.
4. Meanwhile, in a small saucepan, heat wine over medium heat. Let it simmer for about 1 minute. Add chives, tarragon and butter and stir. When the butter has melted, add tomatoes and cook another 30 seconds. Adjust seasonings with salt and pepper. Remove and discard the tarragon. Spoon the sauce over the salmon. Garnish with chives.

Leafy Greens
Why: It’s almost impossible to meet your nutritional needs without eating dark leafy greens, from spinach and romaine to collard greens and chard. They’re huge sources of fiber; vitamins C and K; folic acid (a B vitamin that guards the heart and memory and fights birth defects); lutein, a vision protector; and four essential minerals: calcium, magnesium, iron, and potassium.

How Much: Two servings a day—and the darker, the better.

How:
• Add arugula to your sandwich.
• Layer chard into lasagna.
• Fold spinach into omelets.
• Add any green to stir-fries, pasta dishes, and soup.

**Basic Greens with Garlic, Oil and Hot Pepper**

Greens—beet greens, collards, kale, mustard greens, spinach, Swiss chard—make a delicious side dish for many winter meals.

*(per serving)*

- Calories: 48
- Total Fat: 3g
- Saturated Fat: --
- Cholesterol: --
- Sodium: 359mg
- Total Carbohydrate: 6g
- Dietary Fiber: --
- Sugars: --
- Protein: 2g
- Calcium: --

**Ingredients**

- Greens:
- Olive oil
- Garlic, thinly sliced
- Crushed red pepper
- Optional: lemon juice, cider vinegar, wine vinegar, balsamic vinegar
- Salt, to taste
- Pepper, to taste

**Directions**

To make a simple side dish of greens, cook a pound of greens (beet greens, collards, kale, mustard greens, spinach, Swiss chard) in lightly salted water just until wilted, 5 to 10 minutes. Drain; press with the back of a spoon to release excess moisture. Heat some olive oil and thinly sliced garlic in a skillet over low heat until the garlic begins to sizzle. Add a pinch of crushed red pepper and cook,
stirring, until the garlic is tender and light golden, 1 to 2 minutes. Add greens and toss with the hot oil until heated through, 1 to 2 minutes. Season with a splash of lemon juice or vinegar (cider vinegar, wine vinegar or balsamic), and salt and pepper to taste.

**Beets and Greens Salad with Cannellini Beans**

Sometimes beets in the market have beautiful, unblemished, tender greens attached. When that happens, blanch the greens and toss with beans and vinaigrette, using some of the beets to garnish the salad, as in this recipe. Use the leftover cooked beets for other dishes. If you buy beet greens on their own, you can make the salad just with them. Either way is delicious.

**(per serving)**
- Calories: 302
- Total Fat: 19g
- Saturated Fat: 3g
- Cholesterol: --
- Sodium: 869mg
- Total Carbohydrate: 28g
- Dietary Fiber: 8g
- Sugars: --
- Protein: 7g
- Calcium: --

**Ingredients**
- 2 beets with unblemished greens or 8 cups lightly packed beet greens
- 2 clove(s) garlic, crushed and peeled
- 1/2 teaspoon(s) salt
- 3 tablespoon(s) red-wine vinegar
- 1/3 cup(s) extra-virgin olive oil
- 1 teaspoon(s) dried oregano or 2 teaspoons fresh oregano leaves, minced
- Freshly ground pepper to taste
- 1 can(s) (15-ounce or 19-ounce) cannellini beans, rinsed
- 1/4 cup(s) (1/2 small onion) thinly slivered red onion

**Directions**

1. If using beets, preheat oven to 400 degrees. Cut greens from beets, leaving about 1 inch of stem attached; reserve about 8 cups greens, lightly packed. Wash and dry the beets. Wrap in foil and roast until tender, 1 1/4 to 1 1/2 hours, depending on the size. (Alternatively, place beets in a microwave-safe dish, add 1/4 cup water, cover and microwave on high for 20 to 25 minutes.) When the beets are cool enough to handle, peel 4 of them and cut into 1/2-inch wedges. You should have about 2 cups. Place in a medium bowl.

2. Using a mortar and pestle or the side of a chef's knife, mash garlic and salt into a paste. Transfer to a large bowl. Add vinegar and whisk to blend. Add oil, oregano and pepper, whisking until blended. Measure out 1 tablespoon and add to the beet wedges; toss to coat. Add beans to the remaining dressing and toss to coat. Let marinate at room temperature until ready to use.

3. Place onion in a small bowl, cover with cold water and add a handful of ice cubes; let stand for 10 minutes, or until ready to use.

4. Meanwhile, bring 2 cups lightly salted water to a boil in a large wide pan. Wash beet greens in several changes of water; trim the stems. Add the greens to boiling water, cover and cook until tender, about 5 minutes. Drain well, pressing on the greens with the back of a spoon to remove excess moisture. Cut into 1-inch pieces.

5. Drain the onion. Add to the beans along with greens; toss to coat. Spoon the salad onto a serving platter or individual plates and garnish with the beets, if using. Serve immediately.

**Tips & Techniques**

Soaking the onion in ice water for 10 minutes or more renders it less pungent and more crisp.

Carb Servings: 1 starch, 2 1/2 vegetable, 1/2 lean meat, 3 1/2 fat
Carbohydrate Servings: 1 Nutrition Bonus: Vitamin A (90% daily value), Vitamin C (30% dv), Potassium (23% dv), Folate & Iron (20% dv), Calcium & Magnesium (15% dv).

**Whole Grains**

**Why:** They have up to 96 percent more fiber, magnesium, zinc, chromium, and vitamins E and B6 than refined grains. This nutritional powerhouse helps prevent the same health problems that refined grains help cause: heart disease, cancer, diabetes, hypertension, and even obesity.

**How Much:** Ideally, all of the six daily grain servings you need should be whole, unrefined grains, but aim for at least three.

**How:**
- Start your day with oatmeal or whole-grain cold cereal.
• Use 100 percent whole-wheat bread for toast and sandwiches.
• Switch to whole-wheat couscous and pasta.
• Opt for brown rice (instant is fine), whole-grain pretzels, even whole-wheat tortillas.

Whole-Wheat Couscous with Parmesan and Peas

Couscous, which is actually a type of tiny pasta, makes an almost-instant side dish. Happily, the whole-wheat variety is just as fast to prepare as regular couscous. Lemon zest is a delicious accent to nutty Parmesan in this Italian-inspired couscous.

(per serving)
• Calories: 208
• Total Fat: 4g
• Saturated Fat: 1g
• Cholesterol: 6mg
• Sodium: 186mg
• Total Carbohydrate: 35g
• Dietary Fiber: --
• Protein: 10g

Ingredients
• 1 cup(s) reduced-sodium chicken broth, or vegetable broth
• 1/4 cup(s) water
• 2 teaspoon(s) extra-virgin olive oil
• 1 cup(s) whole-wheat couscous
• 1 1/2 cup(s) frozen peas
• 2 tablespoon(s) chopped fresh dill
• 1 teaspoon(s) freshly grated lemon zest
• Salt & freshly ground pepper, to taste
• 1/2 cup(s) freshly grated Parmesan cheese

Directions
1. Combine broth, water and oil in a large saucepan; bring to a boil. Stir in couscous and remove from heat. Cover and let plump for 5 minutes.
2. Meanwhile, cook peas on the stovetop or in the microwave according to package directions.
3. Add the peas, dill, lemon zest, salt and pepper to the couscous; mix gently and fluff with a fork. Serve hot, sprinkled with cheese.

Nuts

**Why:** They’re excellent sources of protein, magnesium, and B and E vitamins—trusty fighters in the war against heart disease and cancer. Yes, nuts are high in fat calories, but their fat is the heart-healthy kind. Replace junky snacks with them and you won’t gain an ounce.

**How Much:** Up to five small fistfuls a week (roughly a quarter cup or about 15–20 almonds, cashews, walnuts, or pecans).

**How:**
- Sprinkle plain or toasted nuts instead of croutons on salads.
- Mix them into cooked couscous and brown rice.
- Stir them into cereal and yogurt.
- Use them to garnish a stir-fry just before serving.

Tamari Walnuts

Keep these nuts on hand for stir-fries, salads or snacking.

(Per serving)
- Calories: 50
- Total Fat: 5g
- Saturated Fat: --
- Cholesterol: --
- Sodium: 45mg
- Total Carbohydrate: --
- Dietary Fiber: --
- Sugars: --
- Protein: 1g
- Calcium: --

**Ingredients**
- 1/2 cup(s) coarsely chopped walnuts
- 2 teaspoon(s) tamari or reduced-sodium soy sauce

**Directions**

Place walnuts in a small skillet; heat over medium heat until hot. Drizzle with tamari (or soy sauce) and stir until the nuts are coated and the pan is dry, about 1 minute. Transfer to a bowl to cool.

Couscous and Walnut Salad

This colorful couscous salad is easy to prepare and ideal for a summer lunch.

**Ingredients**
- 2 cup(s) instant couscous
- 6 tablespoon(s) olive oil
- 3 cup(s) boiling water
- 1/2 cup(s) walnuts, chopped
- 2 carrots, finely chopped
- 1 teaspoon(s) garlic, chopped
- 1 tablespoon(s) red wine vinegar
- 2 teaspoon(s) salt
- 1 teaspoon(s) ground white pepper

**Directions**

1. Place the couscous and 3 tablespoons of olive oil in a large bowl. Mix well with a fork.
2. Add the boiling water, mix well, and set aside for 25 minutes.
3. Fluff the couscous with a fork and add the walnuts, carrots, parsley, garlic, vinegar, salt, pepper, and remaining olive oil.
4. Mix well and set aside for 2 hours in the refrigerator, or transfer to an airtight container for storage for up to 24 hours.
5. When it is chilled, stir the salad, transfer to serving dishes, and serve at room temperature.

Orange and Almond Green Beans

Our simple Orange and Almond Green Beans make an elegant side dish to accompany anything from tarragon chicken to marinated, grilled pork tenderloin.
Ingredients
- 3/4 cup(s) sliced almonds
- 3 pound(s) green beans, trimmed
- 3 tablespoon(s) butter or margarine
- 3/4 teaspoon(s) grated orange rind

Directions
1. Heat oven to 325 degrees F. Bake almonds on baking sheet 7 minutes until golden brown.
2. Cook green beans in simmering salted water until just cooked, 6 to 9 minutes. Drain well; toss with butter, orange rind, and toasted almonds.

Golden Veggies
Why: Just one serving of fiber-filled, deep-yellow-orange vegetables supplies five times the beta carotene you need daily to lower your cancer risk, defend against colds and other infections, and protect your skin from sun damage. The potassium in these veggies also keeps your heartbeat in sync and your blood pressure down.

How Much: Aim for two half-cup servings a day, the equivalent of one sweet potato, 12 canned apricot halves, or a cup of butternut squash or carrots.

How: Try this sweet potato quickie from Somer’s The Food & Mood Cookbook:
Cajun Sweet Potatoes

- Preheat oven to 375 degrees Fahrenheit.
- Cut sweet potatoes into 1-inch thick slices, and toss with olive oil, Cajun seasoning, and freshly ground pepper.
- Bake for 25 minutes or until lightly brown and cooked through, but still slightly crunchy.

Yukon Gold and Sweet Potato Mash

The addition of delicious sweet potatoes gives a nutrient boost to mashed potatoes. Double it. Cook the potatoes in a Dutch oven rather than a large saucepan.

(per serving)

- Calories: 151
- Total Fat: 4g
- Saturated Fat: 3g
- Cholesterol: 11mg
- Sodium: 321mg
- Total Carbohydrate: 26g
- Dietary Fiber: --
- Sugars: --
- Protein: 3g
- Calcium: --

Ingredients

- 1 pound(s) Yukon Gold potatoes, peeled and cut into 1 1/2-inch chunks
- 1 pound(s) sweet potatoes, peeled and cut into 1 1/2-inch chunks
- 1/2 cup(s) low-fat milk
- 2 tablespoon(s) butter
- 1 teaspoon(s) brown sugar
- 3/4 teaspoon(s) salt
- 1/4 teaspoon(s) freshly ground pepper

Directions

1. Place potatoes and sweet potatoes in a large saucepan and add enough water to cover. Bring to a boil over high heat and cook until very tender when pierced with a fork, 20 to 25 minutes.

2. Drain the potatoes, then mash them in the pot to the desired consistency. Place milk and butter in a small bowl and microwave on High until the butter is mostly melted and the milk is warm, 30 to 40 seconds. (Alternatively, place in a small saucepan and heat over medium until the milk is warm.) Stir the milk mixture, sugar, salt and pepper into the mashed potatoes until combined.

Roasted Sweet Potato Wedges

Peach preserves and cinnamon make a simple glaze for roasted sweet potatoes.

(per serving)

- Calories: 160
- Total Fat: 2g
- Saturated Fat: --
- Cholesterol: --
- Sodium: 165mg
- Total Carbohydrate: 34g
- Dietary Fiber: 3g
- Sugars: --
- Protein: 2g
- Calcium: --

Ingredients

- 5 pound(s) (about 7 medium) sweet potatoes, peeled and each cut crosswise in half, then lengthwise into 1-inch wedges
- 2 tablespoon(s) olive oil
- 1 teaspoon(s) salt
- 1/2 teaspoon(s) coarsely ground black pepper
- 2/3 cup(s) peach preserves
- 1/2 teaspoon(s) ground cinnamon

Directions

1. Preheat oven to 450 degrees F. In large bowl, combine potatoes, oil, salt, and pepper; toss to
coat well. Arrange potatoes in single layer on 2 large cookie sheets or 2 jelly-roll pans.

2. Roast potatoes on 2 oven racks 30 minutes or until tender, rotating pans between upper and lower racks halfway through cooking.

3. Meanwhile, in small bowl, with wire whisk or fork, mix peach preserves and cinnamon until blended.

4. When potatoes are tender, spoon equal amounts of preserve mixture over potatoes in each pan; toss to coat. Roast 5 minutes longer or until glaze is hot and bubbly.

**Carrot-Cumin Salad**

Grated carrots are anything but plain when tossed with parsley, lemon juice and cumin.

- Calories: 115
- Total Fat: 7g
- Saturated Fat: 1g
- Cholesterol: --
- Sodium: 228mg
- Total Carbohydrate: 12g
- Dietary Fiber: 4g
- Sugars: --
- Protein: 1g
- Calcium: --

**Ingredients**

- 6 carrots, coarsely grated
- 1/2 cup(s) chopped fresh parsley
- 1 tablespoon(s) lemon juice
- 1 tablespoon(s) extra-virgin olive oil
- 1 clove(s) garlic, finely chopped
- 1 teaspoon(s) ground cumin
- Salt and freshly ground pepper to taste

**Directions**

Combine carrots, parsley, lemon juice, oil, garlic and cumin in a medium bowl. Season to taste with salt and freshly ground pepper.

**Tips & Techniques**

Carb Servings: 2 vegetable, 1 fat Carbohydrate Servings: 1/2

**Yogurt**

Why: Low- or no-fat plain yogurt is a terrific source of B vitamins, protein, calcium and—if it has active cultures—the healthy bacteria known as probiotics, which crowd out disease-causing germs.

How Much: Four or more cups a week, if this is your main dairy source.

How: Cut back on sugar and calories by choosing plain yogurt and adding some granola. Or be more inventive:

- Mix a dash of vanilla and chopped mint into yogurt and dollop on fruit.
- Use yogurt instead of sour cream for dips, sauces, and salad dressings.
- Top baked potatoes with yogurt and chives.
- Thicken sauces and make soups “creamy” with yogurt.

The payback part? As one of the Harvard researchers would likely tell you, eating a diverse diet that is low in calories and high in nutrients can make your Real Age as much as four years younger.

**Romaine with Creamy Yogurt Dressing**

Romaine lettuce holds up particularly well to a light dressing that substitutes plain, nonfat yogurt for most of the oil. Cool and tangy, the yogurt gives the dressing a creamy consistency and a refreshingly sour taste the makes it a good accompaniment for spicy chili.

**Ingredients**

- 1 tablespoon(s) white wine vinegar
- 1/4 teaspoon(s) salt
- 1/4 teaspoon(s) freshly ground black pepper
- 3 tablespoon(s) nonfat plain yogurt
- 1 tablespoon(s) virgin olive oil
- 10 ounce(s) romaine lettuce, ribs cut in half and leaves torn into 1 1/2- to 2-inch pieces
- 1 tablespoon(s) chopped fresh herb mixture (tarragon, chives, basil, and chervil)

**Directions**

1. In a bowl large enough to hold the lettuce, whisk together the vinegar, salt, pepper, and yogurt.
Whisk in the oil.

2. Wash the lettuce pieces well in cold water and spin them dry in a salad spinner.

3. Add the lettuce to the dressing in the bowl, and toss it until coated with the dressing. Sprinkle on the fresh herbs, and serve immediately.

Piña Colada Yogurt Parfait

Take a trip to the tropics with our piña colada-inspired parfait. It even makes a great breakfast when you need a sunny start to your day.

(per serving)

- Calories: 155
- Total Fat: 3g
- Saturated Fat: 3g
- Cholesterol: 4mg
- Sodium: 57mg
- Total Carbohydrate: 28g
- Dietary Fiber: --
- Sugars: --
- Protein: 5g
- Calcium: --

Ingredients

- 1/3 cup(s) reduced-fat vanilla yogurt
- 1/2 cup(s) crushed canned pineapple, or canned mandarin oranges
- 1 tablespoon(s) toasted coconut (see Tips & Techniques)

Directions

Top yogurt with pineapple (or canned mandarin oranges) and coconut.

Tips & Techniques

To toast coconut: Place coconut in a small dry skillet and cook, stirring often, until golden, about 5 minutes or spread in a shallow baking dish and bake at 350°F until light golden and fragrant, 5 to 10 minutes.
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Notes


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