

From a few short weeks following conception through infancy, into childhood and adolescence, during adulthood and throughout the golden years...it is the "engine" in our bodies that powers everything from body temperature, digestion, metabolism, muscle strength, skeletal growth and sexual development to the health of the heart, brain, kidneys and liver.

## The Basics

To understand the role the thyroid gland fulfills when functioning properly, it's best to start with the basics: The thyroid is a butterfly-shaped gland typically weighing less than an ounce that is located in the front of the neck just below the Adam's apple. It is wrapped around the trachea (windpipe), and its purpose is to produce, store and release into the bloodstream hormones that regulate, or in some way participate in the process of, a wide range of crucial bodily functions.

For such a tiny gland, that's a lot of responsibility. So how does the thyroid work its complex metabolic magic?

The process begins when the pituitary gland, the so-called "master gland" located at the base of the brain, produces thyroid-stimulating hormone (TSH), which acts upon the thyroid gland to produce two vital hormones, thyroxine [thigh-rahk-sun] (T4) and triiodothyronine [try-eye-oh-doe-THY-ruhneen] (T3), that influence virtually every cell in your body. Production of T3 and T4 occurs when iodine, introduced to the body via food, is synthesized. Although the thyroid produces much more T4 than T3, the T4 serves as the source of most T3, the form of thyroid hormone that actually enters the body's cells to maintain metabolic function by converting food into energy and heat.

If the amount of thyroid hormone in the body is too low, the pituitary senses it and releases TSH, which signals the thyroid to produce more. Once the thyroid produces enough hormone for the body's needs, the pituitary slows down its production of TSH back to normal.

The thyroid also produces calcitonin [kal-si-toe-nin], a substance which regulates the body's calcium levels by promoting absorption of calcium into the bones. While the importance of calcium in providing strong bones and teeth is well known, it also plays an essential role in brain function. When a chemical signal arrives at a brain cell, it's the job of calcium to deliver that signal from the outside of the cell to the inside.

## In the Womb : The Thyroid and Fetal Development

Interestingly enough, the thyroid gland is the first of the body's endocrine system glands to develop, which begins to take place approximately 24 days after conception. Human fetuses acquire the ability to synthesize thyroid hormones at roughly 12 weeks of gestation. However, the fetus remains dependent on the mother for the ingestion of iodine essential to make the thyroid hormones needed for normal brain development, as well as for many other aspects of a healthy pregnancy and fetal growth. In fact, research has shown that even mild hypothyroidism [hi-po-thigh-roy-dih-zum]—a deficiency of thyroid hormone—in a pregnant woman can result in decreased IQ or mental retardation in the child and can lead to a number of complications, including stunted growth in the baby, maternal hypertension, miscarriage and preterm delivery (see related articles on pages 12 and 16). Thus, it is extremely important for the mother-to-be to take in enough iodine to enable the thyroid gland to make enough hormone for both herself and the developing fetus.

Once a full-term baby is delivered, there is an abrupt rise in the baby's TSH within 30 minutes of delivery, although the newborn continues to be protected by its mother's thyroid hormone for a few weeks after birth. However, it is not unusual for some babies (1 out of 4,000) to suffer from what is known as congenital hypothyroidism, or an underfunctioning thyroid, which occurs because of the failure of the thyroid to develop, the inability to produce hormone normally, or iodine deficiency. If untreated for several months after birth, severe congenital hypothyroidism can lead to growth failure and permanent intellectual disability. Consequently, state-mandated programs that began in the 1970s now routinely test the blood of all newborns for evidence of thyroid dysfunction, as well as other metabolic diseases.

## Thyroid Disease and Puberty

Thyroid disease can be damaging at any stage of life. At puberty, the thyroid starts to produce more thyroid hormone, which is needed for the rapid growth and sexual development that occurs during adolescence. Thus, a low-functioning thyroid at this stage of life can delay puberty, delay development of adult teeth and wreak havoc with a teen's reproductive function. For instance, girls with thyroid problems may have an abnormally early or late onset of puberty and menstruation, a decrease or increase in menstrual flow, or there may be a shorter or longer time between periods than usual.

Although thyroid complications among teenagers are unusual, they can cause marked physical and mental health complications when they do occur, and many signs of thyroid problems are not that dissimilar to common body changes experienced as a teen. So, if you suspect your child might have a thyroid problem, it's wise to seek the services of a pediatric endocrinologist, a physician who specializes in diseases of endocrine organs such as the thyroid, pituitary, adrenal and pancreas.

## Thyroid Disease in Older Adults

Although thyroid problems are common in those over 60, in this age group its features can be subtle and few in number. Symptoms are often attributed to aging, presumed to be medication side effects or caused by cardiovascular, gastrointestinal, or nervous system diseases. This can make it very difficult to suspect that a thyroid problem is present. Seniors especially should become familiar with the symptoms and body changes of thyroid disease. Doing so can lead to prompt diagnosis and treatment—the key to preventing the short- and long-term complications of thyroid disease and increasing the chances for having truly golden years.

## What Causes Thyroid Problems?

Diseases of the thyroid can occur at any stage in life and are primarily classified into problems involving a.) the function of the thyroid gland (either overactive or underactive) or b.) the structure of the thyroid gland (changes in size or the development of nodules). Structural problems can include an enlarged thyroid gland (also known as a goiter [goy-ter]), a small thyroid gland (atrophic) or the development of either single nodules (solitary thyroid nodule) or multiple thyroid nodules (multinodular gland). Functional problems of the thyroid are initially evaluated with blood tests which are used to determine if the thyroid is functioning normally, or is overactive or underactive. The evaluation of structural problems of the thyroid is usually done with a thyroid ultrasound. Because a thyroid gland can often have both a structural problem and a functional problem simultaneously, the proper evaluation of a thyroid condition includes careful examination of both the structure and function of the thyroid gland.

## Too Little Thyroid Hormone



Among the more common thyroid conditions is hypothyroidism (mentioned above), which can occur as a result of iodine deficiency; an autoimmune disorder, such as Hashimoto's thyroiditis [hah-shemoe-toes thy-roy-dye-tiss], where the body attacks the thyroid gland as if it were foreign tissue; surgical removal of the thyroid to treat severe hyperthyroidism or thyroid cancer; and radiation therapy for treatment of cancers in the region of the head and neck.

Typical symptoms of hypothyroidism are abnormal weight gain, fatigue, hair loss, intolerance to cold, impaired memory ("brain fog"), constipation and a slow heart rate. Hypothyroidism is typically treated with a daily dosage of a synthetic hormone replacement drug, such as levothyroxine, which is usually required for the rest of the patient's life.

Hypothyroidism affects women more than men and is especially common in females older than age 60.

However, infants, children, teens and adults of all ages can also develop the condition.

## Too Much Thyroid Hormone

When your thyroid gland is overactive, the result is a condition called hyperthyroidism [hi-per-thigh-roydih- zum], which increases a person's metabolic rate. Hyperthyroidism is the result of overproduction of T3 and T4 by the body and is most commonly caused by Graves' disease, in which the body produces antibodies that stimulate the thyroid to secrete excessive quantities of thyroid hormones. It can also be caused by a toxic multinodular goiter, a condition that occurs when a hyperfunctioning nodule develops within a longstanding goiter (abnormal enlargement of the thyroid gland).

Symptoms of hyperthyroidism can include prominent eyes, heart palpitations, excessive sweating, weight loss, diarrhea, muscle weakness and a heightened sensitivity to heat. (NOTE: While Graves' causes protruding eyes, hyperthyroidism of all types causes wide-open eyes, which create the illusion of protrusion). Approximately 15 percent of all patients diagnosed with hyperthyroidism are over the age of 60.

There are several options for treating hyperthyroidism. Anti-thyroid medications are often used to slow down the production of thyroid hormones. Alternatively, the gland may be partially or entirely removed surgically or radioactive iodine may be given. If the entire thyroid gland is removed, and usually after taking radioactive iodine, patients become hypothyroid and must remain on thyroid medication for life.

## Thyroid Growths

Thyroid nodules—a collection of cells within the thyroid that grow and produce a lump—are relatively common and sometimes are discovered by physical examination of the thyroid gland, but often are detected incidentally during a radiology test such as an ultrasound or CT scan being performed for an unrelated reason. People can develop thyroid nodules at any age, but they occur most commonly in older adults. Thyroid nodules are more common in women than in men.

Fortunately, 90 to 95 percent of thyroid nodules are benign (not cancerous). Several features do make it more likely for a thyroid nodule to be cancerous: a rapid increase in the size of the nodule, difficulty swallowing, changes in the voice, difficulty breathing, a family history of thyroid cancer, or prior history of radiation exposure during childhood.

The type of cancer determines the treatment plan and the prognosis. With the less aggressive forms of thyroid cancer, treatment typically is surgery to remove the cancerous nodule (and any enlarged lymph nodes) from your neck. This is sometimes followed several weeks later by the administration of radioactive iodine to destroy any remaining thyroid tissue in the body. After surgical removal of the thyroid gland, patients must take synthetic thyroid hormone daily for the rest of their lives.

Until recently, patients had to temporarily stop their thyroid hormone therapy to receive radioactive iodine (RAI) treatment or undergo monitoring tests for possible cancer recurrence. This was to allow the patient's thyroid-stimulating hormone (TSH) level to rise and stimulate cancer cells to absorb iodine. Thanks to development of a synthetic product called recombinant human TSH, today's thyroid cancer patients can undergo RAI and monitoring using recombinant human TSH without temporarily discontinuing their thyroid hormone therapy.

Patients whose thyroid nodule has been identified by a primary care physician are often referred to an endocrinologist for further evaluation or are referred directly to surgeons who specialize in thyroid surgery.

You can perform a simple Neck Check self-exam to help assist with finding nodules or enlargements in the neck that may point to a thyroid condition. A step-by-step guide is offered online at: <http://thyroidawareness.com/neck-check>.

Surprisingly, thyroid disease is more common than diabetes or heart disease and is a fact of life for as many as 30 million Americans. Women are at greater risk than men, and being 50 or older poses the highest risk of developing a thyroid condition. Also surprising are estimates suggesting that more than half of those with thyroid disease remain undiagnosed. For that reason, the American Association of Clinical Endocrinologists (AACE) and the American College of Endocrinology (ACE) are promoting thyroid awareness through The Thy Life educational campaign, with a mission to enlighten people at all stages of life about how maintaining good thyroid health is vital to a healthy life.

