Thyroid Function

What is the Thyroid?

The thyroid is a gland located at the center of your neck, below your voice box. It is shaped like a butterfly with each wing, or lobe, wrapping around the windpipe. The thyroid makes hormones that are released into the bloodstream to control metabolism – the rate at which the body uses energy. The thyroid hormones are also responsible for maintaining body temperature and controlling heart rate, appetite, and digestive tract function.

What Disorders Affect the Thyroid?

Thyroid disorders are usually the result of either hyperthyroidism, in which there is too much thyroid hormone in the bloodstream, or hypothyroidism, in which there is not enough thyroid hormone available for the body to use. The most common thyroid disorders are described below.

- **Graves' disease:** This is the most common cause of hyperthyoidism.[1] It develops when a person's natural defense (immune) system makes antibodies that bind to the surface of thyroid cells, stimulating the cells to make too much thyroid hormone.[2]
- **Hashimoto's thyroiditis:** This is the most common cause of hypothyroidism.[1] It too develops when the immune system launches an attack on thyroid tissues, but in this case the damaged thyroid becomes underactive and makes too little thyroid hormone.[3]
- **Goiter:** This is an abnormal enlargement of the thyroid gland. Goiters may be associated with hyperthyroidism, hypothyroidism, and normal thyroid hormone production. The most common causes of goiter are Hashimoto's disease, Graves' disease, or nodules[4]
- **Thyroid nodules:** A lump, or nodule, in the thyroid may be a solid mass or a fluid-filled cyst. Nodules may grow slowly or rapidly, and there may be one or more present in the thyroid. Some thyroid nodules are cancerous, but most (90%) are not.[5] If a nodule makes thyroid hormone, hyperthyroidism may develop.[5]
- **Thyroiditis:** This a general term used to describe conditions that cause thyroid tissue to become inflamed and damaged. Thyroiditis is most commonly caused by an immune system attack on thyroid tissue, but it can also be caused by infection or exposure to certain drugs or infection.[6] If the damage to thyroid cells is slow, hypothyroidism may result. If the damage occurs rapidly, that may lead to hyperthyroidism.[6] Postpartum thyroiditis affects 5-10% of women usually within a year of giving birth.[7]

Where Can I Find More Information?

You can get more information about thyroid disorders from the following source:

American Thyroid Association
1-800-THYROID (1-800-849-7643)
www.thyroid.org

References
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10. Hormone Health Network. Hypothyroidism and Heart Disease. Available at: http://www.hormone.org/questions-and-answers/2013/hypothyroidism-and-heart-disease. Accessed July 14, 2016.

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Who Should Be Tested for Thyroid Disorders?

Doctors typically order thyroid function tests for patients who have symptoms of hyperthyroidism or hypothyroidism and those who have an enlarged thyroid, masses, or lumps in the thyroid.

Some common symptoms of hyperthyroidism include the following:[1,2]

- Rapid heart rate
- Unexplained weight loss
- Increased sweating
- Anxiety and irritability
- Hand tremors
- Goiter
- Irritated eyes
- Difficulty sleeping

Some common symptoms of hypothyroidism include the following:[1,3]

- Unexplained weight gain
- Dry skin
- Constipation
- Inability to tolerate cold temperatures
- Extreme tiredness (fatigue) and forgetfulness
- Irregular menstrual periods
- Hair Loss

Thyroid function tests are also performed at regular intervals to monitor the effectiveness of treatment for thyroid disorders.

How Are Thyroid Disorders Diagnosed?

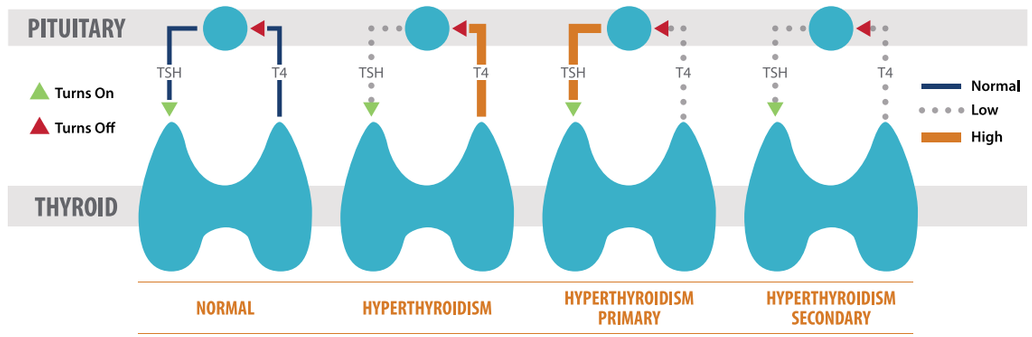
Laboratory tests to assist with the diagnosis of thyroid disorders include:

Thyroid-stimulating hormone (TSH): This is usually the first test performed to assess thyroid function. It measures the amount of TSH in a sample of your blood. TSH is made by the pituitary gland in the brain. When the pituitary senses that thyroid hormone levels in the body are getting low, it secretes TSH into the bloodstream, and the TSH triggers the thyroid to make more thyroid hormone. An abnormally low TSH level may indicate an overactive thyroid gland (hyperthyroidism). An abnormally high TSH level may indicate that the thyroid is making too little thyroid hormone (hypothyroidism).[8] When taking thyroid hormone replacement therapy, an elevated TSH level may indicate that you are receiving too little medication, while a low TSH level may indicate that you are receiving too much medication.[1,8]

T4: A T4 test is typically ordered as a follow up to an abnormal TSH test result. The unbound – or free – T4 in your blood is the active form of thyroxine that enters body tissues to control metabolism.[1] There are tests that measure total T4, which includes the bound and unbound forms, and free T4, which measure only the unbound T4. When performed in combination, TSH and free T4 (FT4) measurements give the most accurate report of your thyroid function.[1,12,13] When TSH is elevated and FT4 is low, hypothyroidism due to a diseased thyroid is the probable cause. A low TSH with a low FT4 indicates hypothyroidism due to a problem with the pituitary gland. A low TSH with an elevated FT4 indicates hyperthyroidism.[1,8]

T3: Tests to measure T3 are typically ordered to help diagnose hyperthyroidism or monitor the effectiveness of treatment.[1,12,13] People with hyperthyroidism will have an elevated T3 level. In some people with a low TSH, only the T3 is elevated and the T4 level is normal.[1,8]

Illustration of TSH and T4 activity during various thyroid conditions[8]



Thyroid antibodies: Antibody testing is mainly performed after TSH, T4, and/or T3 levels have been measured to determine whether a thyroid disorder is caused by an immune system attack on the thyroid. Antibodies can be found in people with Hashimoto's thyroiditis or Graves' disease.[1,8]

These laboratory tests may be performed in conjunction with imaging studies (such as thyroid scan and ultrasound) or biopsy (removal of a small amount of fluid or tissue from the thyroid so it can be examined under a microscope).

How Are Thyroid Disorders Treated?

The goal of therapy for thyroid disorders is to restore thyroid hormone levels to normal in order to relieve symptoms or prevent them from developing at all.

- Conditions that cause hyperthyroidism may be treated with radioactive iodine, anti-thyroid medications, and/or surgery.[9]
- Conditions that cause hypothyroidism are typically treated with hormone replacement therapy, which typically involves taking man-made (synthetic) thyroid hormone.[10]
- Thyroid nodule treatment depends on the type of thyroid nodules. Experts recommend surgical removal of cancerous or suspicious nodules. Other nodules may need to be removed when they get too big and cause problems with swallowing or breathing. Nodules that are not surgically removed should be monitored every 6 to 12 months.[5]
- Goiter treatment depends on the cause of the goiter, its size, and your symptoms. Possible treatments include observation over time, medicines, and radioactive iodine.[4]