HYPERTHYROIDISM

Overactive Thyroid, Hyperthyreosis

Condition that occurs due to excessive production of thyroid hormone by the thyroid gland.

Diagnosis: Male & Female

Related Diagnoses:
- Anovulation
- Thyroid disorders
- Autoimmune disorders
- Oligomenorrhea

About Hyperthyroidism

Hyperthyroidism is the condition that occurs due to excessive production of thyroid hormone by the thyroid gland. Thyrotoxicosis is the condition that occurs due to excessive thyroid hormone of any cause and therefore includes hyperthyroidism. Some, however, use the terms interchangeably. Signs and symptoms vary between people and may include irritability, muscle weakness, sleeping problems, a fast heartbeat, poor tolerance of heat, diarrhea, enlargement of the thyroid, and weight loss. Symptoms are typically less in the old and during pregnancy. The opposite is hypothyroidism, when the thyroid gland does not make enough thyroid hormone.

Hyperthyroidism is the result of several diseases that may be located in the thyroid gland (primary hyperthyroidism), as well as in other locations (secondary hyperthyroidism), or be the product of an overeating of highiodinated foods or being an undesirable effect of some drugs (amiodarone, antilussives).

Primary hyperthyroidism is the most common condition where diseases like Graves Basedow disease, toxic multinodular goiter and toxic adenoma are the most common pathologies. Although rare, also the hyperthyroidism is associated with thyroid carcinoma, extracervical ectopic thyroid tissue, mutation with activation of the TSH receptor, activating mutations of the stimulatory G protein in the McCune-Albright syndrome, Struma Ovarii and medications such as the excess of iodine intake (Jod-Basedow phenomenon).

Secondary hyperthyroidism is characterized by an increased thyroid hormone caused by extrathyroid pathologies like the TSH high secreting pituitary adenoma, thyroid hormone resistance syndrome, human chorionic gonadotropin secreting tumor. Within the thyrotoxicosis without hyperthyroidism will be the acute, subacute and silent thyroiditis and other causes such as medication with amiodarone, radiation, adenoma infarction or excessive thyroid hormone intake (factitious hyperthyroidism). These diseases will present a clinical picture similar to hyperthyroidism.

The diagnosis may be suspected based on signs and symptoms and then confirmed with blood tests. Typically blood tests show a low thyroid stimulating hormone (TSH) and raised T3 or T4. Radioiodine uptake by the thyroid, thyroid scan, and TSI antibodies may help determine the cause.

Treatment depends partly on the cause and severity of disease. There are three main treatment options: radioiodine therapy, medications, and thyroid surgery. Radioiodine therapy involves taking iodine-131 by mouth which is then concentrated in and destroys the thyroid over weeks to months. The resulting hypothyroidism is treated with synthetic thyroid hormone. Thyroid imaging and radiotracer thyroid uptake measurements, combined with serologic data, enable specific diagnosis and appropriate patient treatment. Medications such as beta blockers may control the symptoms and anti-thyroid medications such as methimazole may temporarily help people while other treatments are having effect. Surgery to remove the thyroid is another option. This may be used in those with very large thyroids or when cancer is a concern. It occurs between two and ten times more often in women. Onset is commonly between 20 and 50 years of age. Overall the disease is more common in those over the age of 60 years.
Associated diseases

- congestive heart failure
- coronary artery disease
- Sjögren syndrome
- thyroid carcinoma
- Graves Basedow disease
- toxic multinodular goiter
- rheumatoid arthritis
- arthritis psoriatica
- chronic periartthritis
- myasthenia gravis
- diabetes mellitus

Complications

- heart problems (a rapid heart rate)
- brittle bones (osteoporosis)
- eye problems (swollen eyes)
- red, swollen skin
- thyroid storm
- hypothyroidism

Thyrotoxic crisis (or thyroid storm) is a rare but severe complication of hyperthyroidism, which may occur when a thyrotoxic patient becomes very sick or physically stressed. Its symptoms can include: an increase in body temperature to over 40 degrees Celsius, tachycardia, arrhythmia, vomiting, diarrhea, dehydration, coma, and death. Thyroid storm requires prompt treatment and hospitalization. The main treatment is to decrease the circulating thyroid hormone levels and decrease their formation. Propylthiouracil and methimazole are two agents that decrease thyroid hormone synthesis and are usually prescribed in fairly high doses.

To inhibit thyroid hormone release from the thyroid gland, sodium iodide, potassium iodide, and/or Lugol’s solution can be given. Beta blockers such as propranolol (Inderal, Inderal LA, Innopran XL) can help to control the heart rate, and intravenous steroids may be used to help support the circulation. Earlier in the 20th century the mortality of thyroid storm approached 100%. However, now, with the use of aggressive therapy as described above, the death rate from thyroid storm is less than 20%.

Hyperthyroidism due to certain types of thyroiditis can eventually lead to hypothyroidism (a lack of thyroid hormone), as the thyroid gland is damaged. Also, radioiodine treatment of Grave’s disease often eventually leads to hypothyroidism. Such hypothyroidism may be treated by regular thyroid hormone testing and oral thyroid hormone supplementation.

Risk factors

- certain viral infections
- pregnancy
- a history of other autoimmune disorders
- age
- gender - women are more likely than men to develop hyperthyroidism
- genetic factors - a family history of toxic diffuse goiter
- other factors - start taking iodine supplements, this can increase your risk of hyperthyroidism
- thyroid surgery
- stress
- smoking
- diet

Impact on fertility

Infertility incidence is about 5-8% in women with hyperthyroidism. In women with hyperthyroidism hormonal changes effecting reproductive system may occur.

Hyperthyroidism occurs in about 0.2-0.4% of all pregnancies. Most cases are due to Graves’ disease although less common cause (e.g. toxic nodules and thyroiditis) may be seen. Uncontrolled hyperthyroidism in pregnancy is associated with an increased risk of severe pre-eclampsia and up to a four-fold increased risk of low birth weight deliveries. Some of these unfavourable outcomes are more marked in women who are diagnosed for the first time in pregnancy. A recent study has also shown that already high normal maternal FT4 levels are
associated with a decrease in child IQ and gray matter and cortex volumes, similar to the effects of hypothyroidism.

Ideally a woman who is known to have hyperthyroidism should seek pre-pregnancy advice, although as yet there is no evidence for its benefit. Appropriate education should allay fears that are commonly present in these women. She should be referred for specialist care for frequent checking of her thyroid status, thyroid antibody evaluation and close monitoring of her medication needs. Medical therapy with anti-thyroid medications is the treatment of choice for hyperthyroidism in pregnancy. Methimazole and propylthiouracil (PTU) are effective in preventing pregnancy complications by hyperthyroidism.

### Prevention

Naturally occurring hyperthyroidism cannot be prevented. Hyperthyroidism caused by taking too much thyroid drugs can be prevented. Periodically get blood tests to control thyroid levels.

### Symptoms

- coma
- psychosis
- tachycardia
- palpitations
- weight loss
- weakness
- sweating
- increased appetite
- anxiety, irritability
- emotional lability
- diaphoresis
- lighter menses, oligomenorrhea, amenorrhea

### Therapies

#### Self therapy

**Diet**

People with autoimmune hyperthyroidism should not eat foods high in iodine, such as edible seaweed and kelps.

#### Conventional medicine

**Pharmacotherapy**

**Antithyroid drugs**

Thyrostatics (antithyroid drugs) are drugs that inhibit the production of thyroid hormones, such as carbimazole and methimazole, and propylthiouracil. Thyrostatics are believed to work by inhibiting the iodination of thyroglobulin by thyroperoxidase, and, thus, the formation of tetra-iodothyronine (T4). Propylthiouracil also works outside the thyroid gland, preventing conversion of (mostly inactive) T4 to the active form T3. Because thyroid tissue usually contains a substantial reserve of thyroid hormone, thyrostatics can take weeks to become effective, and the dose often needs to be carefully titrated over a period of months, with regular doctor visits and blood tests to monitor results. A very high dose is often needed early in treatment, but, if too high a dose is used persistently, patients can develop symptoms of hypothyroidism.
Many of the common symptoms of hyperthyroidism such as palpitations, trembling, and anxiety are mediated by increases in beta adrenergic receptors on cell surfaces. Beta blockers, typically used to treat high blood pressure, are a class of drugs that offset this effect, reducing rapid pulse associated with the sensation of palpitations, and decreasing tremor and anxiety. Thus, a patient suffering from hyperthyroidism can often obtain immediate temporary relief until the hyperthyroidism can be characterized with the Radioiodine test (noted below in “Other therapies” section) and more permanent treatment take place. Note that these drugs do not treat hyperthyroidism or any of its long-term effects if left untreated, but, rather, they treat or reduce only symptoms of the condition. Some minimal effect on thyroid hormone production however also comes with Propranolol - which has two roles in the treatment of hyperthyroidism, determined by the different isomers of propranolol. L-propranolol causes beta-blockade, thus treating the symptoms associated with hyperthyroidism such as tremor, palpitations, anxiety, and heat intolerance. D-propranolol inhibits thyroxine deiodinase, thereby blocking the conversion of T4 to T3, providing some though minimal therapeutic effect. Other beta blockers are used to treat only the symptoms associated with hyperthyroidism.

**Surgical therapy**

Surgery (thyroidectomy to remove the whole thyroid or a part of it) is not extensively used because most common forms of hyperthyroidism are quite effectively treated by the radioactive iodine method, and because there is a risk of also removing the parathyroid glands, and of cutting the recurrent laryngeal nerve, making swallowing difficult, and even simply generalized staphylococcal infection as with any major surgery. Some people with Graves’ may opt for surgical intervention. This includes those that cannot tolerate medicines for one reason or another, people that are allergic to iodine, or people that refuse radioiodine.

If people have toxic nodules treatments typically include either removal or injection of the nodule with alkolol.

**Other therapies**

**Radioiodine**

Radioactive iodine-131 is given orally (either by pill or liquid) on a one-time basis, to severely restrict, or altogether destroy the function of a hyperactive thyroid gland. This isotope of radioactive iodine used for ablative treatment is more potent than diagnostic radioiodine (usually iodine-123 or a very low amount of iodine-131), which has a biological half life from 8–13 hours. Patients not responding sufficiently to the first dose are sometimes given an additional radioiodine treatment, at a larger dose. Iodine-131 in this treatment is picked up by the active cells in the thyroid and destroys them, rendering the thyroid gland mostly or completely inactive.

Since iodine is picked up more readily (though not exclusively) by thyroid cells, and (more important) is picked up even more readily by over-active thyroid cells, the destruction is local, and there are no widespread side-effects with this therapy. Radioiodine ablation has been used for over 50 years, and the only major reasons for not using it are pregnancy and breast-feeding (breast tissue also picks up and concentrates iodine). Once the thyroid function is reduced, replacement hormone therapy taken orally each day may easily provide the required amount of thyroid hormone the body needs. There is extensive experience, over many years, of the use of radio-iodine in the treatment of thyroid overactivity and this experience does not indicate any increased risk of thyroid cancer following treatment.

The principal advantage of radioiodine treatment for hyperthyroidism is that it tends to have a much higher success rate than medications. A major expected side-effect of radioiodine in patients with Graves’ disease is the development of lifelong hypothyroidism, requiring daily treatment with thyroid hormone. Also, there are some indications that patients suffering from related eye disease experience a worsening of this condition, and for this reason some patients elect to have a surgical solution. On occasion, some patients may require more than one radioactive treatment, depending on the type of disease present, the size of the thyroid, and the initial dose administered. Many patients are initially unhappy at the thought of having to take a thyroid hormone pill for the rest of their lives. Nevertheless, as thyroid hormone is safe, inexpensive, and easy to take, and is identical to the thyroid hormone normally made by the thyroid. This therapy is, in general, extremely safe and very well tolerated by the vast majority of patients.
Assisted reproduction

When treating infertility caused by thyroid disease, fertility treatment may be an effective option. This can be in the form of intra-uterine insemination (IUI) or in-vitro fertilisation (IVF) depending on your conditions. IVF and related ART techniques generally start with stimulating the ovaries to increase egg production. Most fertility medications are agents that stimulate the development of follicles in the ovary. Examples are gonadotropins and gonadotropin releasing hormone. After stimulation, the physician surgically extracts one or more eggs from the ovary, and unites them with sperm in a laboratory setting, with the intent of producing one or more embryos. Fertilization takes place outside the body, and the fertilized egg is reinserted into the woman’s reproductive tract, in a procedure called embryo transfer.

The rate of success for IVF is correlated with a woman’s age. More than 40 percent of women under 35 succeed in giving birth following IVF, but the rate drops to a little over 10 percent in women over 40.

Find more about related issues

Diagnoses

Anovulation
Failure of the ovaries to release an oocyte over a period of time generally exceeding 3 months.
Learn more at: www.fertilitypedia.org/therapy/diag/anovulation

Thyroid disorders
A medical condition impairing the function of the thyroid.
Learn more at: www.fertilitypedia.org/therapy/diag/thyroid-disorders

Autoimmune disorders
A condition arising from an abnormal immune response to a normal body part.
Learn more at: www.fertilitypedia.org/therapy/diag/autoimmune-disorders-1

Oligomenorrhea
Light or infrequent menstrual flow at intervals of 39 days to 6 months or 5–7 cycles in a year.
Learn more at: www.fertilitypedia.org/therapy/diag/oligomenorrhea

Organs

Thyroid gland
One of the largest endocrine glands in the body, controls rate of use of energy sources, protein synthesis, and body's sensitivity to other hormones.
Learn more at: www.fertilitypedia.org/edu/organs/thyroid-gland

Biological control

Thyroid hormones
Tyrosine-based hormones produced by thyroid gland and that regulate metabolism, heat production, protein synthesis, and many other body functions.
Learn more at: www.fertilitypedia.org/edu/biological-control/thyroid-hormones

Thyroid-stimulating hormone
A hormone that stimulates the thyroid gland to produce thyroxine, and then triiodothyronine, which stimulates the metabolism of tissue in the body.
Learn more at: www.fertilitypedia.org/edu/biological-control/thyroid-stimulating-hormone

Risk factors
Diabetes mellitus
A condition in which the body either does not produce enough, or does not properly respond to insulin, a hormone produced in the pancreas.
Learn more at: www.fertilitypedia.org/therapy/rfc diabetes-mellitus

Emotional stress
Learn more at: www.fertilitypedia.org/therapy/rfc/emotional-stress

High level of T3
The excess of thyroid hormone triiodothyronine (T3) causing multi-system effect on the body for example an abnormal sperm and irregular period.
Learn more at: www.fertilitypedia.org/therapy/rfc/high-level-of-t3

Smoking
Long-lasting inhalation of the smoke of burning tobacco.
Learn more at: www.fertilitypedia.org/therapy/rfc/smoking-1

Thyroid surgery
An operation that involves the surgical removal of all or part of the thyroid gland.
Learn more at: www.fertilitypedia.org/therapy/rfc/thyroid-surgery

Symptoms

Absence of menstrual periods
The absence of a menstrual period in a woman of reproductive age.
Learn more at: www.fertilitypedia.org/edu/symptoms/absence-of-menstrual-periods-1

Anxiety
The emotional state characterized by unpleasant feelings such as uneasiness, worry, apprehension and dread.
Learn more at: www.fertilitypedia.org/edu/symptoms/anxiety

Excessive sweating
Abnormally increased sweating.
Learn more at: www.fertilitypedia.org/edu/symptoms/excessive-sweating

Hypomenorrhea
Short or scanty periods with extremely light menstrual blood flow.
Learn more at: www.fertilitypedia.org/edu/symptoms/hypomenorrhea

Infrequent menstruation
The medical term for infrequent, often light menstrual periods (intervals exceeding 35 days).
Learn more at: www.fertilitypedia.org/edu/symptoms/infrequent-menstruation-1

Irritability
A cognitive effect which results in one experiencing heightened feelings of annoyance, stress, irritability and a tendency towards violent behaviour.
Learn more at: www.fertilitypedia.org/edu/symptoms/irritability

Tachycardia
A heart rate that exceeds the normal resting rate.
Learn more at: www.fertilitypedia.org/edu/symptoms/tachycardia
**Underweight**
A term describing a person whose body weight is considered too low to be healthy.
Learn more at: [www.fertilitypedia.org/edu/symptoms/underweight](http://www.fertilitypedia.org/edu/symptoms/underweight)

**Weakness**
A decrease in the strength in one or more muscles.
Learn more at: [www.fertilitypedia.org/edu/symptoms/weakness](http://www.fertilitypedia.org/edu/symptoms/weakness)

## Therapies

**Egg donation**
Process by which a woman donates eggs for purposes of assisted reproduction or biomedical research.
Learn more at: [www.fertilitypedia.org/edu/therapies/egg-donation](http://www.fertilitypedia.org/edu/therapies/egg-donation)

**ICSI**
A micromanipulative fertilization technique in which a single sperm is injected directly into an egg.
Learn more at: [www.fertilitypedia.org/edu/therapies/icsi](http://www.fertilitypedia.org/edu/therapies/icsi)

**Intrauterine insemination**
A process of injecting of washed sperm into the uterus with a catheter for treatment of infertility.
Learn more at: [www.fertilitypedia.org/edu/therapies/intrauterine-insemination](http://www.fertilitypedia.org/edu/therapies/intrauterine-insemination)

**Pharmacotherapy of hyperthyroidism**
It is a therapy by thyrostatics (antithyroid drugs) drugs that inhibit the production of thyroid hormones.
Learn more at: [www.fertilitypedia.org/edu/therapies/pharmacotherapy-of-hyperthyroidism](http://www.fertilitypedia.org/edu/therapies/pharmacotherapy-of-hyperthyroidism)

**Radioiodine therapy of hyperthyroidism**
The administration of radioactive isotope of iodine used in treatment of hyperthyroidism.
Learn more at: [www.fertilitypedia.org/edu/therapies/radioiodine-therapy-of-hyperthyroidism-1](http://www.fertilitypedia.org/edu/therapies/radioiodine-therapy-of-hyperthyroidism-1)

**Sperm donation**
The procedure in which a man (sperm donor) provides his sperm for fertility treatment.
Learn more at: [www.fertilitypedia.org/edu/therapies/sperm-donation](http://www.fertilitypedia.org/edu/therapies/sperm-donation)

**Standard IVF**
A process in which an egg is fertilised by sperm outside the body; in vitro. Own or donated gametes may be used.
Learn more at: [www.fertilitypedia.org/edu/therapies/standard-ivf](http://www.fertilitypedia.org/edu/therapies/standard-ivf)

**Surgical therapy of hyperthyroidism**
Thyroidectomy is a surgical method by which the whole thyroid or a part of is removed.
Learn more at: [www.fertilitypedia.org/edu/therapies/surgical-therapy-of-hyperthyroidism](http://www.fertilitypedia.org/edu/therapies/surgical-therapy-of-hyperthyroidism)

**Treatment of hyperthyroidism with diet**
A diet that consist of foods that may help ease hyperthyroidism symptoms.
Learn more at: [www.fertilitypedia.org/edu/therapies/treatment-of-hyperthyroidism-with-diet](http://www.fertilitypedia.org/edu/therapies/treatment-of-hyperthyroidism-with-diet)
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