NatMed

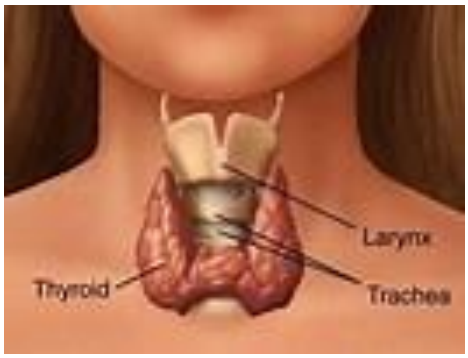
Thyroid Manual

THYROID INFORMATION HANDBOOK

Contents

The Thyroid Gland

The thyroid gland is a double lobed butterfly shaped endocrine gland located in the front of the neck just below the Adam's apple.



Production

The thyroid produces the hormones T3 (Triiodothyronine) in its biochemically active form and T4 (Thyroxine), which is converted to T3.

T3 supports your metabolism. Metabolism refers to biochemical processes that occurs within any living organism - including humans - to maintain life. These biochemical processes allow people to grow, reproduce, repair damage, and respond to their environment.

Every cell in the body depends upon thyroid hormones for regulation of their metabolism. The normal thyroid gland produces about 80% T4 and about 20% T3, however T3 possesses about four times the hormone "strength" as T4.

It also produces calcitonin, which works to reduce calcium and phosphorus levels being released into the blood.

The thyroid gland is controlled by the hypothalamus and pituitary gland, both located in the brain.

Hormone function

When levels of T3 and T4 drop, the hypothalamus produces thyroid stimulating releasing hormone (TSRH), which signals the pituitary gland to produce thyroid stimulating hormone (TSH). This then stimulates the thyroid to produce more hormones. This works on a negative feedback cycle so when adequate thyroid hormone levels are in the blood the hypothalamus TSRH down regulates and the pituitary stops producing TSH. It basically acts as the control centre to either rev up the function of the thyroid or slow it down.

T3 and T4 control how much energy our cells use. They help us to regulate body temperature, are involved in the manufacture of proteins in the body, and they also play a part in how much glucose and fat stores the body uses - therefore effecting your metabolic rate.

Hyperthyroidism

When the thyroid produces too much thyroid hormone, one will exhibit symptoms of hyperthyroidism.

Hyperthyroidism can take on three different forms:

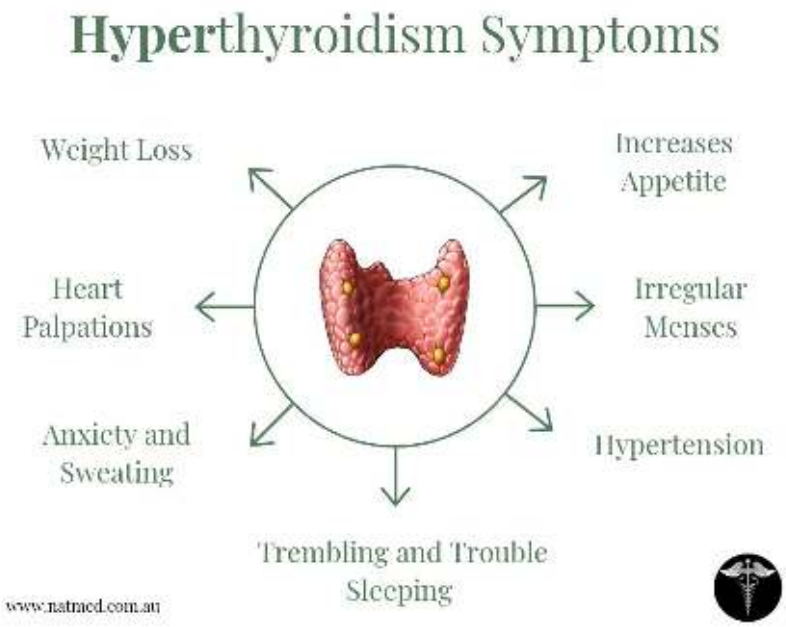
Graves' Disease

An autoimmune condition that appears with a goitre in the neck along with eye and skin changes. It stems from an antibody that stimulates the thyroid to overproduce excessive amounts of thyroid hormones. The antibody elevation overwhelms the normal amount of TSH, by then stimulating the thyroid to grow, forming a goitre.

Toxic Nodular Goitre

One or more nodules (benign tumours) appear in the thyroid and produce excess thyroid hormone.

Secondary Hyperthyroidism
The pituitary gland stimulates the thyroid to overproduce thyroid hormones.



Common Hyperthyroidism Symptoms

- Sudden weight loss
- Increased appetite
- Heart palpitations
- Anxiety and sweating
- Trembling and trouble sleeping
- Swollen, reddened and bulging eyes (exophthalmos)
- Sensitivity of the eyes
- Irregular menstrual cycle
- Hypertension

Common Triggers of Hyperthyroid Thyroid Dysfunction

- Unresolved infections
- Heavy metal toxicity – common fluoride, bromides, mercury, chlorine, lead, copper
- Endocrine disrupting chemicals – BPA, xenoestrogens, PCB's etc
- Genetic history
- Radiation exposure / post chemotherapy
- Chronic stress
- Trauma
- Pregnancy
- Menopause
- Gut dysfunction: SIBO, candida albicans, bacterial overgrowth, helicobacter pylori
- Hormonal imbalances: excess oestrogen, low progesterone, elevated SHBG, elevated prolactin
- Chronic fatigue/adrenal fatigue

Hypothyroidism

Hypothyroidism occurs when the thyroid gland produces too little thyroid hormone, when there is decreased conversion from T4 to T3, when there is an overproduction of reverse T3 or when the body is not efficiently using the thyroid hormone. A large part of the population suffers some degree of hypothyroidism, however a large portion of hypothyroid patients go undiagnosed.

Hypothyroidism can occur in both sexes at any age but is more common in middle aged women (it can be triggered by menopause with a drop or fluctuations in reproductive hormones). Untreated hypothyroidism can cause anaemia, low body temperature and heart failure.

There are many factors that influence thyroid dysfunction.

Hashimotos Thyroiditis

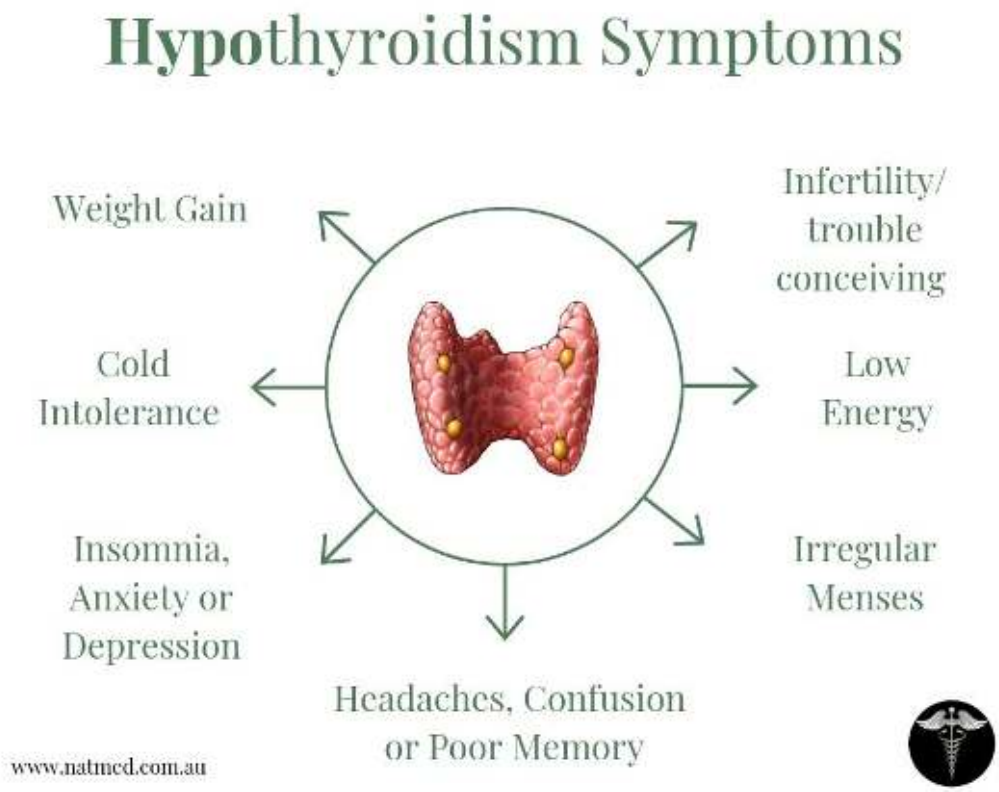
The most common type of hypothyroidism. This is an auto immune response in which antibodies in the blood destroy tissues in the thyroid gland. As a result, the thyroid decreases in size and reduces production of thyroid hormones.

Post Therapeutic Hypothyroidism

Results from the treatment of hyperthyroidism with radioactive iodine or surgical removal of part of or the total thyroid gland. The treatment can leave the patient's thyroid unable to produce sufficient amounts of thyroid hormone.

Goitrous Hypothyroidism

This results in extreme shortage of iodine in the diet, producing a goitre in the neck. This condition is relatively rare in the western world due to the use of iodised salt.



Common Hypothyroid Symptoms

- Weight gain/gain weight easily
- Goitre
- Slow pulse
- Unsteady gate (bumping into things)
- Lethargy
- Sleeping more than usual
- Sluggishness
- Hoarseness/deep voice
- Slowed speech
- Puffy face and eyes
- Puffy hands and feet
- Loss of eyebrows from the outer third side
- Hair loss/brittle hair
- Drooping eyelids
- Intolerance to cold
- Constipation
- Raised, thickened skin over the shins
- Carpal tunnel syndrome
- Confusion
- Depression
- Mood changes easily
- Poor memory
- Dementia

- Headaches
- Muscle weakness/pain
- Joint pain and muscle cramps
- Irregular menses (not 28 days)
- Increased risk of miscarriage and infertility
- Low sex drive/impotence

Common Triggers of Hypothyroid Thyroid Dysfunction

- Under production of thyroid hormone
- Deficiency of thyroid hormone cofactors: Selenium, iodine, L-Tyrosine, iron, magnesium, and zinc
- Decreased conversion of T4 to T3
- High production of reverse T3 (Wilson's syndrome)
- Treatment of hyperthyroidism: radioactive iodine or partial or full removal of the thyroid gland
- Inherited enzymatic defects
- Chronic stress and adrenal insufficiency
- Toxicity (the thyroid gland is very susceptible to toxins, especially toxic metals, such as mercury)
- Changes in hormone levels
- Autoimmunity - it is common to develop other auto immune disorders once diagnosed

Reverse T3

One of the factors that can influence thyroid hormones from functioning properly in the body is reverse T3 (rT3).

T3 comes from the conversion of T4 to T3. T4 converts to rt3 to remove excess T4 from the body which is a normal process to prevent T4 levels from rising to high.

Each day the body converts a percentage of T4 to T3 and a percentage to T4 to rT3. The rT3 conversion is lower in the body then the T3 conversion unless an imbalance occurs.

For healthy metabolism the percentage of rT3 is ideally lower than T3. When factors such as stress, illness, surgery or shock occur, this ratio will change in order to conserve energy and focus on what is more important at the time.

High rT3 levels down regulate the conversion of T4 to T3 with more rt3 being produced then T3, hence a reduction in metabolism. RT3 is an inactive hormone so raised levels will reduce thyroid function.

Causes of high reverse T3 include low iron, high or low cortisol and low b12, Wilsons syndrome, chronic stress, low glutathione status, chronic inflammation, chronic illness, abnormal liver function, use of some prescription drugs, T4-only thyroid medications, and infection.

If rT3 is elevated it steals catalysts known as deiodinase enzymes from the T4 to T3 conversion which decreases its clearance from the body.

If thyroid treatment is not having the desired outcome a blood test for rT3 may be requested. From this blood test the ratio between rT3 and total T3 is determined to see if rT3 is high and is in fact the causative factor for poor thyroid response.

The equation for working out the ratio of rT3 is:

Level of T3 divided by rT3 multiplied by 100. (T3/rT3 x 100). The result should be between (1.2-2.2).
(Please note the rT3 and T3 need to be in the same unit of measurement first).

Treatment involves low dose T4 and high dose or slow release T3.

Thyroid Testing

Traditionally when a person suspects that they may have an underactive thyroid and are exhibiting multiple hypothyroid symptoms a GP will order a thyroid stimulating hormone blood test (TSH levels).

This test generally has a TSH level of 0.5-5 (depending on which clinic runs your test). However, if you fall within this level you are deemed to have a proper functioning thyroid even though you may be suffering with numerous symptoms such as fatigue, weight gain, brain fog, sore throat, anxiety etc.

According to *Wartofsky and Dickey 2005* the evidence for a narrower TSH range is compelling and previous accepted reference ranges are no longer valid as reference populations that were previously considered normal, now contain individuals with various degrees of thyroid dysfunction.

Due to this, clients with ranges of TSH of as low as 2.5 are now considered possibly hypothyroid even though it sits in the resting range of 0.5-5.

According to *Derry 2006,* to adequately test for thyroid hormone levels it needs to be done by clinical assessment - not blood tests alone.

Depending on your symptomology, we will test accordingly. Keep in mind there are many factors that affect thyroid function, including inflammation, toxicity, hormone imbalance, nutritional factors, immune dysfunction, adrenal dysfunction and gastrointestinal dysfunction.

The following blood and functional tests can be used to investigate thyroid efficiency:

- Full thyroid function test with TSH, fT4 and fT3
- Reverse T3
- Thyroglobulin Antibodies and Thyroid Peroxidase Antibodies/TPO Ab
- Red cell zinc
- Red cell selenium
- Vitamin D
- Iron studies
- Spot urinary iodine
- Fasting insulin
- Fasting Glucose
- Cholesterol panel
- Day 2-3 estradiol or day 21 E2/ P4 ratio
- Blastocytsis hominis and dientamoeba fragilis (stool test) Fecal multiplex PCR
- Functional pathology- CDSA- gastric infections are often associated with triggering auto immune thyroiditis
- Hair trace mineral analysis (HTMA) for mineral deficiencies and heavy metal toxicity
- Mold and biotoxins – high exposure to mold can trigger thyroid dysregulation
- Salivary hormone- cortisol and hormones
- Blood testing for unresolved infections
- Coeliac screening
- CRP/ESR
- Genetic testing

A GP may also order a radioactive iodine uptake and scan to measure the amount of Iodine your Thyroid absorbs and to show how much of your thyroid is working (partial or whole).

CT, MRI or Ultrasound may also be carried out of the eyes, eye sockets and muscles surrounding the eyes to ascertain the impact of Graves on the eyes and their surrounding structures.

Tests explained

TSH (Thyroid stimulating hormone) - This test lets you know how much thyroid stimulating hormone you have. TSH signals the thyroid to produce the hormones T3 (triiodothyronine) and T4 (thyroxine), which act by stimulating the metabolism of tissues in the body. TSH alone is not accurate as there are other factors which effect it.

Basal body temperature (Barne's test) - temperature is measured via the armpit upon waking for 3 consecutive days and an average is taken (not to be taken on first day of menstruation). A normal thyroid function will give a reading of 36.4-37.1 C. A temperature 36.4C or lower can indicate an underactive thyroid.

Thyroid antibody test: this test will indicate if there is an autoimmune reaction occurring against the thyroid gland. The test will give reading of raised TPO (Thyroid peroxidase antibodies) and raised TG (Thyroglobulin antibodies)

Thyroid-stimulating immunoglobulin (TSI) is a type of antibody which can be present in people with Graves' disease

T3 and T4: T3 and T4 are regulated by TSH levels. T4 (Thyroxine) is converted into T3, which is your active thyroid hormone that acts on the body's tissues to control metabolism.

Low T4 and/or elevated TSH may indicate hypothyroidism.

High T3/T4 and low TSH may indicate Graves' disease.

Free T3: 3.5 – 6 pmol/L ideal 5.5

Free T4: 10 – 20 pmol/L ideal 16-18
Subclinical hypothyroidism TSH: 2.5-4.0 mIIU/L (or if exhibiting multiple thyroid symptoms) idea is 1-1.5 of TSH

Reverse T3: High reverse T3 levels down regulates conversion of T4 to T3 with more rT3 being produced than T3, hence a reduction in metabolism. Reverse T3 is an inactive hormone so having high amounts of it will reduce thyroid function (note you need to find out the ratio between rT3 and Free/total T3).

Some causes of high reverse T3 include low iron, high or low cortisol and low b12.

Urinary Iodine test: checks the amount of iodine in your body. Iodine is essential for thyroid hormone production. Your naturopath can order this test to be performed.

Note that testing references differ depending on the pathology lab you are testing at.

Other applicable tests that will depend on what other factors are contributing to your thyroid disorder but can include: cortisol levels, CRP, liver function, iron, food intolerance testing, indican test, urinary organic acid testing, calcitonin levels, hormone testing, vitamin D, b12, folate, heavy metals, MTHFR, neurotransmitters and candida.

Pharmaceutical Treatments

Synthetic versions of thyroid hormone such as **thyroxine or liothyronine** are generally used. There is also an animal-derived thyroid replacement available (Armour). Key to effective treatment is calibration of the medication. Particularly in older patients, treatment should start with small doses, gradually increasing the dose until the individual's blood level of thyroid-stimulating hormone returns to normal. This may take a couple of months.

My medication isn't making me feel any better

A healthy thyroid makes 5 thyroid hormones: T1, T2, T3, T4 and calcitonin. Most synthetic hormones such as Thyroxine only supplement with T4 (remember T4 needs to convert to T3). If you only take T4 you are missing out on the other hormones that are usually present and you also need adequate cofactors for the T4 to be converted. Some issues can be seen in ongoing treatment with T4 only, including an increase in blood pressure, low mood, weight gain and raised cholesterol.

Do I need to stay on thyroid hormone for life?

There is no straight forward answer to this as it all depends on what caused the thyroid function to decline in the first place. If there was a short-term cause or nutritional imbalance thyroid hormone may be used only for a short term to correct levels. If there is an autoimmune component or you have undergone thyroid gland removal or radiation therapy, then thyroid replacement may be for life.

Below are some examples of short term and lifelong thyroid hormone treatment.

- If you have had radiation therapy or have had your thyroid gland removed, you will need to stay on thyroid hormone medication.

- If hypothyroidism was caused by Hashimotos thyroiditis, depending on the trigger to cause your immune system to destroy the thyroid gland, continuing thyroid hormone is very likely.

- If a serious illness or infection triggered your hypothyroidism, your thyroid function will most likely return to normal when you recover. Thyroid medication may be stopped for a short while to check that thyroid is now able to function on its own. There may be a brief period of time where the thyroid function will be slightly under just after medication has been stopped and monitoring must be done to ensure it returns to normal. If hormone levels remain too low, you will need to restart thyroid hormone.

- Some medicines may cause hypothyroidism. Your thyroid function may return to normal when you stop the medicines.

- If you have mild hypothyroidism, you may not need treatment but should be monitored for signs of hypothyroidism getting worse. Thyroid hormone may then be advised.

- If you have heart disease the dose of thyroid hormone will need to be watched carefully as thyroid hormone may increase chest pain or irregular heartbeat.

- If you develop hypothyroidism during pregnancy, treatment should be started immediately. If you have hypothyroidism before you become pregnant, your thyroid hormone levels need to be checked to make sure that you have the right dose of thyroid medicine. During pregnancy, your dose of medicine may need to be increased by 25% to 50%.

- If you develop hypothyroidism after pregnancy (postpartum hypothyroidism), you also may need treatment. You will be retested for hypothyroidism if you become pregnant again. In some cases, hypothyroidism will go away on its own. In other cases, it is permanent and requires lifelong treatment and you are likely to need treatment for hypothyroidism from now on.

- For some people, hypothyroidism gets worse as they age, and the dosage of thyroid medicine may have to be increased gradually as the thyroid function decreases.

- Most people treated with thyroid hormone develop symptoms again if their medicine is stopped. If this occurs, medicine needs to be restarted.

- Thyroid hormone replacement for a limited time may occur in subacute thyroiditis. whereby there is a temporary breakdown of thyroid cells and the release of thyroid

hormone from the thyroid. As the condition improves the thyroid again makes and stores thyroid hormone and thyroid hormone is no longer necessary.

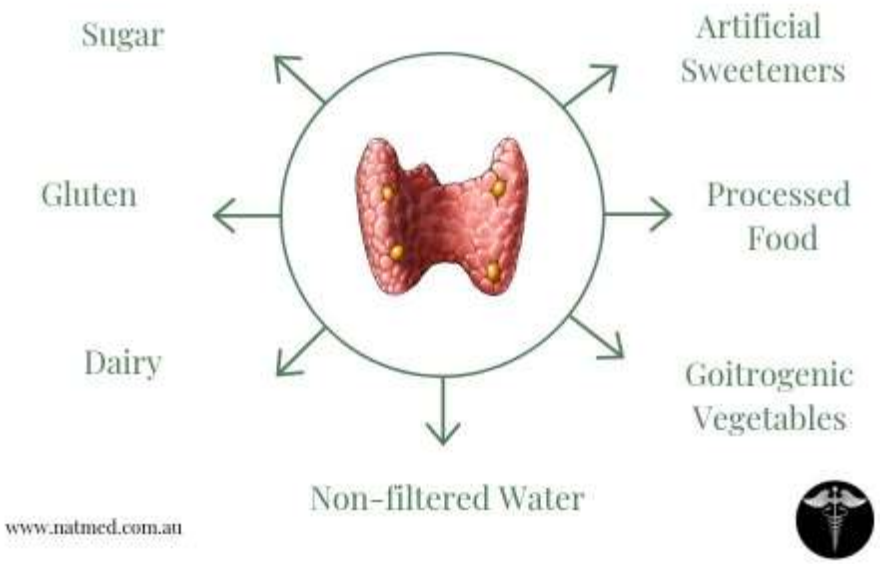
- Pregnancy and post-partum thyroid imbalances are common due to changes in hormone levels and also tend to rebalance after taking thyroid hormone for small durations on time.

- Other causes of thyroid imbalance include immune imbalance, adrenal imbalance, low iron, infection and hormone imbalance. The thyroid may again rebalance after treating these causes.

Diet and Lifestyle

Food That Aggravates Thyroid Function

- Gluten – There is higher prevalence of coeliac disease in hypothyroidism and Auto immune thyroiditis. A meta-analysis identified that approximately 1-62 patients with auto immune thyroiditis have biopsy verified CD.
- Dairy (casein and whey)
- Sugar
- Raw goitrogenic vegetables: broccoli, cauliflower, Brussel sprouts, cabbage, kale. Cooking these helps to deactivate the goitrogenic property.
- Non-genetically modified soy products
- Non-filtered water – tap water is high in bromide, fluoride, and chlorine which binds dietary iodine and lowers thyroid function
- Artificial sweeteners – aspartame, sucralose
- Sprayed vegetables and fruit
- Heavily processed foods
- Pharmaceutical medications may interfere with thyroid function
- Excessive iodine intake or food rich in iodine can also be like fuelling the fire to the thyroid gland. Correct testing is essential to ensure the exact dosage is prescribed for the individual.



Lifestyle tips

- Reduce exposure to heavy metal toxicity
- Reduce toxins in the body (carry out a detoxification program if needed)
- Remove food intolerances from the diet which can trigger immune responses
- Remove/lower thyroid suppressing foods: broccoli, cabbage, brussel sprouts, cauliflower, kale, spinach, turnips, soy, beans, and mustard greens. These vegetables contain isothiocyanates which may block iodine utilisation
  N.B studies have showed this to be the case with high amounts of raw Goitrogens e.g. a head of raw broccoli a day.
- Small servings of cooked goitrogenic foods are tolerated.
- Small amounts of soy product have been deemed safe if iodine levels are satisfactory.
- Follow an anti-inflammatory diet
- Follow a low GI diet
- Manage stress
- Exercise
- Supplementation: provide thyroid cofactors such as iodine, tyrosine and selenium. Support nutrients which when low can interfere with proper thyroid function such as iron, D3 and B12. Support other organs, glands and body function needed for proper

thyroid function such as balancing cortisol.

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