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## Thyroid gland

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### Summary

- The thyroid gland regulates many metabolic processes, including growth and energy expenditure.
  - Around one in 20 people will experience some form of thyroid dysfunction in their lifetime.
  - Common problems include overactivity and underactivity of the thyroid gland.
  - Most thyroid conditions are caused by autoimmunity. These conditions have a genetic link. People with a family history of thyroid conditions have a higher risk of also having a thyroid condition and other autoimmune conditions.
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Some of the more common hormonal disorders are associated with the thyroid gland, which is part of the endocrine system. This system is a collection of glands that secrete chemicals called hormones directly into the bloodstream. Together with the nervous system and the immune system, the endocrine system helps the body to cope with different events and stresses.

The thyroid gland is situated at the front of the throat, below the larynx (Adam's apple), and comprises two lobes that lie on either side of the windpipe. The thyroid gland secretes hormones to regulate many metabolic processes, including growth and energy expenditure. If the thyroid gland is overactive or sluggish, the metabolism will be affected, leading to a variety of symptoms that are easily misdiagnosed. Around one in 20 people will experience some form of thyroid dysfunction in their lifetime. Women are more susceptible than men.

### Iodine for hormone production

The thyroid gland produces two primary hormones - thyroxine (also referred to as T4) and tri-iodothyronine (also referred to as T3). The numbers 3 and 4 refer to the number of atoms of iodine in the hormones. Iodine is essential for the production of thyroid hormones and humans need about 150 mcg (millionths of a gram) each day. Iodine is found in most foods, especially seafood. The soils in Tasmania and along the Great Dividing Range are low in iodine, so the food from these areas can contain insufficient iodine. Iodised salt is the best way to supplement dietary iodine, but taking too much iodine can also be a problem.

Of the two hormones produced, T3 is more active than T4, but is produced in much smaller quantities. T4 has a lesser effect, but most is converted to T3 by enzymes that remove one iodine atom. The greater the amount of T3 and T4 circulating in the blood, the faster the metabolism. Lower amounts of T3 and T4 result in a reduced metabolism.

### The pituitary gland

The thyroid gland is controlled by the pituitary, which is considered the 'master gland' of the endocrine system. The pituitary is located at the base of the brain. Its principal function is to monitor and regulate the activity of the other glands. The pituitary affects the thyroid gland by producing a hormone called thyroid-stimulating hormone (TSH), which prompts the thyroid to release more T4 and T3. If there is too much T4 circulating in the blood, the pituitary reduces the amount of TSH produced, which then causes thyroid activity to slow. If there is too little T4, the pituitary increases the amount of TSH. In this way, T4 and T3 levels in the blood are kept relatively constant. The pituitary gland, in turn, is overseen by a part of the brain called the hypothalamus.

### Goitre

An enlargement of the thyroid gland is called a 'goitre'. A shortage of iodine in the diet is a common cause of goitre, especially in areas where the soil has little iodine. If a person's diet is too low in iodine, the pituitary keeps sending chemical messages to the thyroid, but without effect. In attempting to make more thyroid hormone, the gland gets larger and larger. This is also common with underactive thyroids, as the pituitary attempts to speed them up. Overactive thyroids can also produce goitres because their overactivity is often due to overstimulation. Goitres indicate a problem with the thyroid or iodine intake.

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## Overactive thyroid (hyperthyroidism)

An overactive thyroid releases too much T4 and T3 into the bloodstream, causing the metabolism to speed up too much. The most common cause is Graves' disease. This is an autoimmune condition in which antibodies behave like TSH and stimulate the thyroid uncontrollably. Complications of untreated hyperthyroidism include liver damage and heart failure, which can lead to death. Symptoms of an overactive thyroid include:

- Rapid pulse
- Tremor (shaking) of the hands
- Sweating and sensitivity to heat
- Weight loss (despite an increased appetite)
- Nervousness, agitation and anxiety
- Fatigue
- Diarrhoea
- Bulging eyes
- Goitre.

## Underactive thyroid (hypothyroidism)

An underactive thyroid releases too little T4 and T3 into the bloodstream, causing the metabolism to slow down too much. The most common cause is Hashimoto's disease. This is an autoimmune condition in which white blood cells and antibodies attack the thyroid gland. If not treated, the metabolism will continue to slow and will ultimately (in 10 to 15 years) lead to death. Symptoms include:

- Lethargy and fatigue
- Feeling cold (even on warm days)
- Unusual weight gain
- Depression
- Reduced concentration (brain fog)
- Puffiness of the face
- Hair loss
- Dry skin
- Constipation
- Goitre.

When these symptoms increase, the condition may be called myxoedema.

Congenital hypothyroidism must be urgently treated to avoid serious brain damage. All newborn babies are now screened for this condition.

## Other thyroid gland disorders

Other disorders of the thyroid gland include:

- **Nodules** - lumps in the thyroid. Some are groups of uncontrollably overactive thyroid cells. These are called 'hot' nodules and cause hyperthyroidism. Other nodules are 'cold'. These are generally harmless, but about 20 per cent will be cancerous.
- **Cancer** - thyroid cancer is uncommon and is readily treatable, especially if detected early.

## Treatment for thyroid gland disorders

Problems with thyroid hormone levels can be diagnosed with a simple blood test. The presence of antibodies in the blood will confirm Graves' or Hashimoto's disease. Underactivity is treated by taking thyroxine tablets - a form of hormone replacement. Overactivity is treated with drugs that slow the activity of the thyroid gland. If these do not work, part or all of the thyroid can be removed surgically, or some or all of the active thyroid cells can be killed with radioactive iodine.

Nodules and cancers are diagnosed with a variety of different tests, including ultrasound, special x-rays and fine needle biopsies. Hot nodules will generally be removed surgically or destroyed with radioactive iodine. Cold nodules are frequently left alone and simply kept under observation. Cancer is treated by surgically removing the thyroid gland, followed by treatment with radioactive iodine to destroy any cells which may have spread.

Taking iodine supplements can be dangerous for patients with Graves' disease or hot nodules.

### Where to get help

- Your doctor

### Things to remember

- The thyroid gland regulates many metabolic processes, including growth and energy expenditure.
- Around one in 20 people will experience some form of thyroid dysfunction in their lifetime.
- Common problems include overactivity and underactivity of the thyroid gland.
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