

SECTION 2 | explaining the science of hyperthyroidism

What is hyperthyroidism?

Hyperthyroidism is the medical term for a situation where there are excessive blood levels of **thyroid** hormones. Some clinicians call this condition thyrotoxicosis. **Thyroid** hormones are produced by the **thyroid** gland. There are two **thyroid** hormones – **T3** (triiodothyronine) and **T4** (thyroxine).

What effect do thyroid hormones have on the body?

Thyroid hormones act on most body cells and in general their effects are to:

- increase the metabolic rate
- increase the heart rate (number of heart beats per minute) and the force of each heart beat
- increase blood pressure
- increase gastrointestinal (bowel) movement which can cause diarrhoea and/ vomiting
- increase activity levels – affected cats can be very restless and hyperactive
- reduce bodyweight (i.e. cause weight loss)

- reduce the amount of time the cat spends asleep
- aid in control of body temperature (thermoregulation)

What is the thyroid gland and what does a healthy thyroid gland do?

The **thyroid** gland is normally located in the cat's neck, just below the larynx (voice box). The **thyroid** gland is made up of two lobes – one on each side of the body. Some cats also have 'ectopic' (sometimes clinicians use the term 'accessory') **thyroid** tissue. **Ectopic** is the medical term for tissue at an unusual location. **Ectopic thyroid** tissue can be found under the tongue, in the neck and, most commonly, in the chest cavity.

Iodine present in the diet is absorbed into the circulation where it is taken to the **thyroid** gland. Iodine is actively concentrated in the **thyroid** where it is used to make the **thyroid** hormones, **T3** and **T4**. Both of these hormones are released into the circulation from where they can act on all of the cells of the body. **Thyroid** hormones are required to regulate the body's metabolism. Production and release of **thyroid** hormones is under tight control in healthy cats. The hormone TRH (thyrotropin releasing hormone, produced in a part of the brain called the hypothalamus) stimulates production of TSH (thyrotropin or **thyroid** stimulating hormone, produced in a part of the brain called the pituitary) which in turn stimulates production and release of the **thyroid** hormones. Presence of **T4** and **T3** inhibits production of TRH and TSH so that levels

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of these **thyroid** hormones remain within a healthy balance. In hyperthyroid cats, the **thyroid** gland 'ignores' TSH and works autonomously (under its own control). The end result of this is abnormally high blood levels of **thyroid** hormones which causes a range of problems, as discussed later.

What causes hyperthyroidism?

There is still much not known about the cause of **hyperthyroidism**. This is a relatively new illness (first diagnosed in the United States in 1979) which varies in frequency around the world and even within individual countries. These findings have led to theories that genetic, dietary and/or environmental factors might be to blame for the disease. The belief that feline genetics may play a role in the development of **hyperthyroidism** is supported by the fact that one study showed that Siamese and Himalayan breed cats were ten times *less* likely to suffer from **hyperthyroidism** than the rest of the cat population.

Several studies have been done to try and identify common environmental factors which may be involved in causing **hyperthyroidism**. A recent publication looked at brominated flame retardants (PBDEs: commonly used in soft furnishings and electronic equipment) as these substances have been reported to alter **thyroid** function in other species. Although older cats tended to have higher levels of these substances than younger cats, no significant association was found between **hyperthyroidism** and levels of PBDEs. Other studies have looked at nutritional factors such as the iodine content of diets and



Siamese cats are believed to be less vulnerable to developing **hyperthyroidism** than other cats.

tried to assess whether this is a factor in development of the disease. 'Risk factors' – factors increasing the chance that a cat will suffer from **hyperthyroidism** – have been identified in some studies although much of this data is controversial. For example some studies have shown that eating a wet diet (for example canned foods), having an indoor lifestyle and regular use of flea sprays increases the risk of **hyperthyroidism**. However, some of these factors are probably more associated with increasing life length of the cat (and hence increasing its chances of developing an illness common in older cats) rather than specific causes

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of **hyperthyroidism**. At this stage no specific cause has been identified and concerns over **hyperthyroidism** would not be a good reason to change from a wet to a dry catfood for example.

In the majority of cases, estimated to be 98% or more, **hyperthyroidism** is caused by a benign overgrowth of the **thyroid** tissue. This is sometimes referred to as a **thyroid** adenoma or adenomatous hyperplasia. In less than 2% of cases, **hyperthyroidism** is caused by a malignant growth (**cancer**) called a **thyroid carcinoma** or adenocarcinoma. **Thyroid carcinomas** are much more serious and need very different treatment from 'routine' hyperthyroid cases. **Thyroid carcinomas** are discussed in more detail on [page 55](#).

In most cats (estimated >70%), **hyperthyroidism** is a **bilateral** condition – in other words, both lobes of the **thyroid** are affected by the disease. In the remainder of cats, the **hyperthyroidism** only affects one lobe and so is called **unilateral**. Some of these cases go on to develop **bilateral** disease at a later stage in their life.

Which cats most commonly suffer from hyperthyroidism?

Hyperthyroidism is most common in older cats – the most common age group being diagnosed are 10 to 13 years. It is unusual to diagnose **hyperthyroidism** in cats under seven years of age – less than 5% of cases are diagnosed in this age group. However, this condition has been reported in a few very young

cats (the youngest being eight months) although this is very rare. Male and female cats appear to be affected with equal frequency.

Can hyperthyroidism be prevented?

Since the cause of **hyperthyroidism** has not been identified, at the moment there is little that can be done to prevent this condition. Until we understand the cause of this illness there is no prevention programme that can be recommended.

What are the signs of hyperthyroidism?

The **clinical signs** of **hyperthyroidism** vary in severity. **Clinical signs** are most severe in those cats that have been suffering with the illness for longer and in those that have additional (also referred to as 'concurrent') illnesses. **Chronic kidney disease** is one of the most common **concurrent** illnesses and this results in a worsening of many of the **clinical signs**.

Clinical signs of **hyperthyroidism** that an owner may notice commonly include:

- Weight loss
- An increased hunger and often insatiable appetite (referred to as **polyphagia**)
- Hyperactivity, anxiety/nervousness and restlessness

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Weight loss is a common clinical sign associated with **hyperthyroidism** and can be dramatic.

- An increased thirst (**polydipsia**) and increased amount of urine produced (**polyuria**)
- Diarrhoea and/or vomiting
- Poor coat and skin condition, for example matted, greasy and generally unkempt

Less common **clinical signs** of **hyperthyroidism** include:

- Laboured breathing, breathlessness and panting (breathing with the mouth open)



A small number of hyperthyroid cats are breathless and/or breathe with their mouth open. Many of these cats are suffering from heart disease as a consequence of their **hyperthyroidism**.

- Weakness, depression and lethargy
- Voice changes
- Reduced or variable appetite
- Heat intolerance – seeking out cool places to sleep

Cats showing depression, lethargy and reduced appetite are often referred to as '**apathetic**' hyperthyroid cases. Some of these cats are even overweight rather than thin. **Apathetic** means that the cat appears indifferent, showing no emotion or animation.