



# Hypothyroidism in Dogs

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This article is supervised by a Japanese professor and veterinarian. Conduct diagnosis and treatment according to the guidelines in your respective countries.

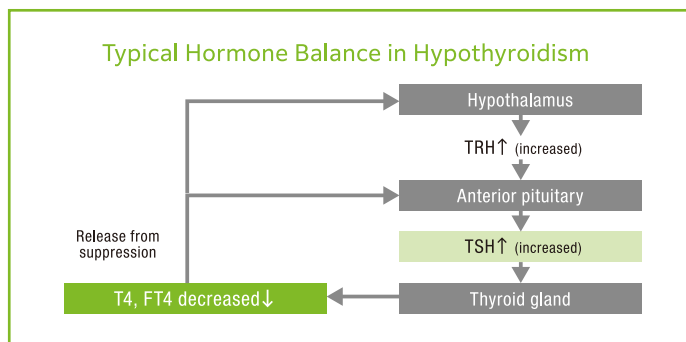
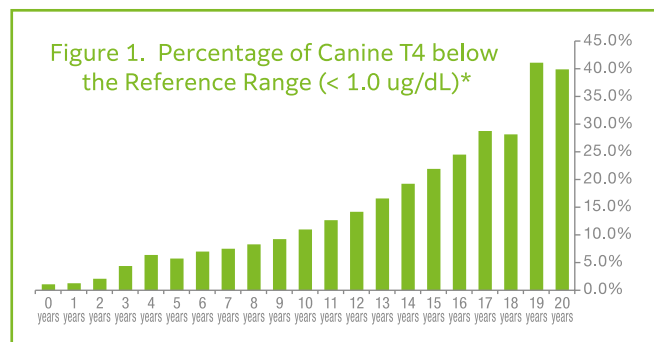
## Epidemiology/Signalment

Hypothyroidism in dogs is a disorder presenting various clinical symptoms due to the decreased secretion of the thyroid hormone secreted from the thyroid gland, such as T4 (thyroxine).

With regard to the breeds of dogs, it is observed commonly in American Cocker Spaniel, Golden Retrievers, Labrador Retrievers, Beagles, and Pomeranians.

According to the data on T4 by age group consigned to the company (FUJIFILM VET Systems Co., Ltd.) (Figure 1), levels below the reference range (< 1.0 ug/dL) was observed in 7.5% of 7-year-old dogs, 11.1% of 10-year-old dogs, and 28.8% of 17-year-old dogs, showing higher percentage with increase in age.

Based on the statistical data\*, T4 levels outside the reference range is observed in about 7.5% of the total amongst elderly dogs aged 7 years or older, suggesting that hypothyroidism is a disorder that require careful observation and detection by thyroid hormone measurement.



\*Based on the survey based on the results on the addition of optional tests in the health checkup conducted by the company from February 2021 to January 2022

With regard to the thyroid hormone, T4 and T3 are secreted in the stimulation system from hypothalamus (TRH) → anterior pituitary (TSH) → thyroid gland.

For the diagnosis of primary hypothyroidism in dogs, the presence of decreased T4 and FT4 as well as increased TSH enables diagnosis as primary hypothyroidism.

Also, the presence of decreased T4 and FT4, as well as decreased TSH, suggests secondary hypothyroidism known as "Euthyroid sick syndrome".

## Symptoms

Decrease in metabolism occurs systemically due to the decrease in thyroid hormones that activate the metabolism. Hypothyroidism is often overlooked as changes due to old age, and commonly observed or detected in the winter period when it is difficult to maintain body temperature. Changes that can be observed from the appearance include skin symptoms caused by decreased metabolism in the skin and fur; however, skin symptoms of hair loss may not be apparent for some breeds.

1 Decreased metabolism	Loss of energy, bradykinesia, bradycardia, obesity, hypothermia (expressing coldness), hypoglycemia, anemia
2 Gastrointestinal/nerve suppression	Constipation, vomiting, facial palsy
3 Infections (immunosuppression)	Otitis externa, cystitis
4 Skin lesion	Hair loss, dryness, loss of gloss on the fur, pigmentation, seborrhea, acne formation, skin infection

# Test method

## Hematology/biochemistry

### Test items for suspicion of hypothyroidism

Erythrocyte system (RBC, PCV, etc.)	ALT/ALP	Blood glucose	Cholesterol	Cholesterol fraction
Decreased	Increased	Decreased	Increased	Increase in LDL fraction

Anemia, hypercholesterolemia, and increase in ALP are characteristic findings, while an increase in neutral fat and ALT or a decrease in blood glucose level may also be observed. If hypercholesterolemia and an increase in ALP are present, a close examination should not only be conducted for hypothyroidism but also hyperadrenocorticism (Cushing syndrome) and diabetes mellitus.

### Lipoprotein cholesterol fraction

Hypothyroidism and hyperadrenocorticism may involve the increase of LDL cholesterol, which is occasionally referred to as a harmful type of cholesterol. If high cholesterol level is observed, the lipoprotein cholesterol fraction should be tested. LDL cholesterol is thought to cause conditions, such as thrombosis, and treatment of hypercholesterolemia should be implemented if improvement is not observed with the treatment of hypothyroidism, or from the time of the initial consultation.

## Diagnostic imaging

Accumulation of biliary sludge can be observed. If biliary sludge is observed, a close examination should be conducted for hypothyroidism and hyperadrenocorticism. In addition, diet control must be implemented concurrently to the treatment.

## Endocrine tests

### Precautions in the measurement of T4/FT4

1	Effect of season/air temperature	Healthy dogs = high level in winter, low level in summer → Hypothyroidism = onset during winter
2	Old dogs susceptible to a decrease in level	Periodic checkup for senior dogs
3	Effect of food = Decreased after meal	Decreased 4 to 6 hours after meal → confirm low level after meal → varies depending on the type of food.
4	Changes due to amount of exercise, estrus, events/stress, disorder/wasting	

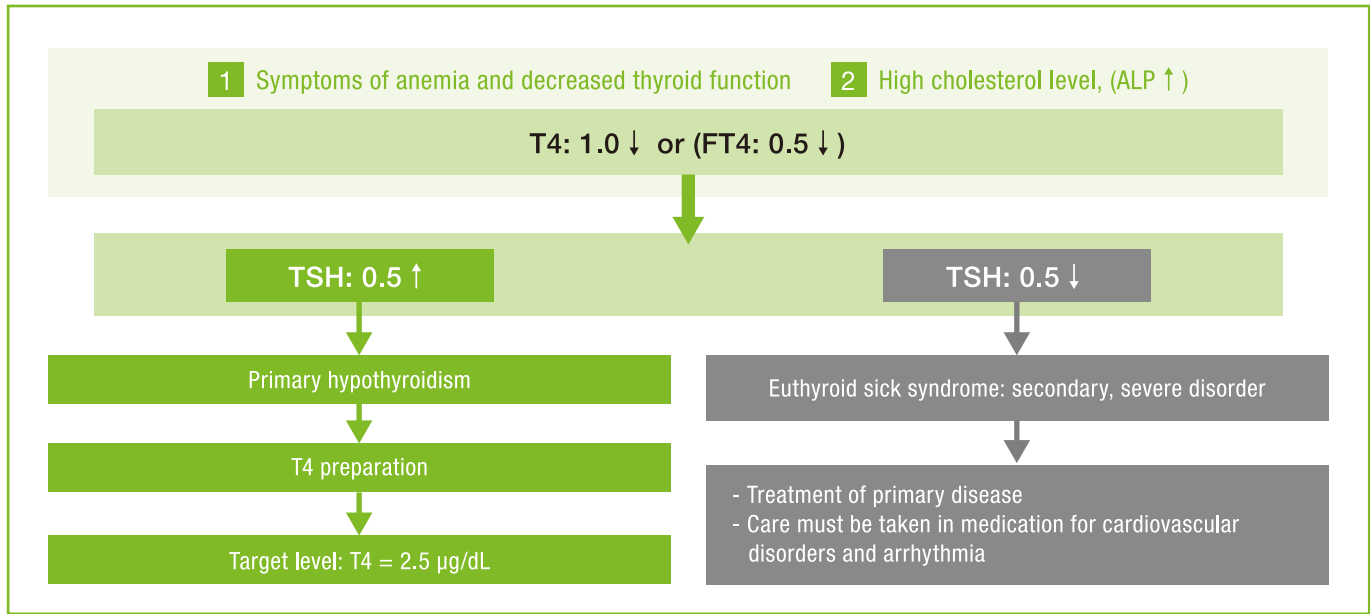
Thyroid hormone should be measured if findings of various clinical symptoms, blood abnormalities (anemia, hypercholesterolemia, increased ALP), or biliary sludge are present. Definitive diagnosis of primary hypothyroidism can be provided by the measurement of T4 (and/or FT4) and TSH, and this also allows differentiation of secondary disorder known as euthyroid sick syndrome.

While T4 and FT4 are measured generally, the measurement involves variation factors and precautions shown in the table above. Decrease in T4 ( $< 1.0 \mu\text{g/dL}$ ) represents a state of decreased thyroid hormone; however, some symptomatic cases may be observed to have  $1.0 \mu\text{g/dL}$  or higher. FT4 should be measured as supplementary measurement.

Measurement of TSH is important for a definitive diagnosis. TSH of  $0.5 \text{ ng/dL}$  or higher is diagnosed as primary hypothyroidism. In addition, even if T4 and FT4 are at the lower limit of the reference range when TSH is high, it is likely to indicate primary hypothyroidism. It is not an exaggeration to say that the diagnosis of primary hypothyroidism is centered around the measurement of TSH.

# Treatment

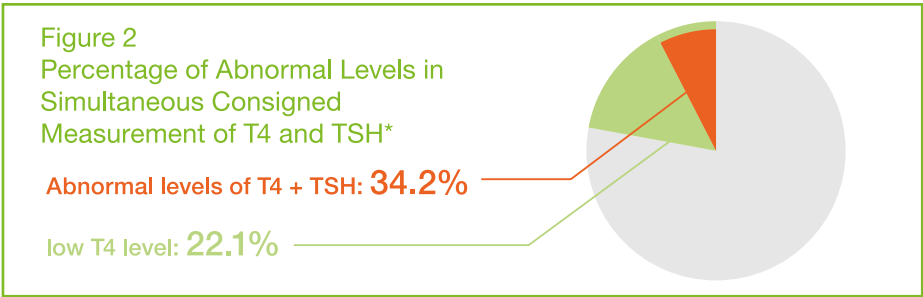
## Diagnosis and Treatment of Hypothyroidism



For treatment, T4 replacement is performed with levothyroxine preparation (T4 preparation). Replacement therapy with T4 preparation is indicated for TSH of 0.5 ng/dL and higher. If T4 is low and TSH is within the reference range, this is diagnosed as “Euthyroid sick syndrome”, and the identification and treatment of comorbidities should be prioritized. If T4 preparation is used, this should be started from a low dose. The blood half-life of T4 preparation is as long as 7 days in humans; however, this is short for dogs at 14 hours. The treatment must therefore be conducted with compliance to the dosage and administration. Alternatively, the level is maintained high during the morning when the symptoms commonly occur, then the dose is reduced in the night to reduce the symptoms of excessive efficacy. Also, the drug may be administered once in the morning. Although hypothyroidism is diagnosed with T4 level of 1.0 µg/dL or lower, many cases that achieved 1.0 µg/dL or higher with T4 preparations do not show improvement in symptoms until the T4 value reaches 2.0 µg/dL. Efficacy of treatment is determined with reference to the improvement in the clinical symptoms and T4 level at 4 to 6 hours after administration (maximum after administration), as well as T4 level in the non-dosing period (measurement on the morning following after non-dosing in the night before, fasting and non-dosing in the morning for health checkups), and the dose is adjusted accordingly. T4 should be measured every month after administration; however, confirmation should be made in the winter, summer, and at the change of seasons because the dose is dependent on the environmental temperature. In addition, the amount necessary for replacement increases with age, and the dose should be determined with confirmation of this point.

## Monitoring

According to the data on the simultaneous consigned measurement of T4 and TSH for health checkups at the company, low T4 level was observed in 22.1%, and from this group, 34.2% of these results also showed abnormal TSH levels. (Figure 2)



\*Based on the survey based on the results on the addition of optional tests in the health checkup conducted by the company from February 2021 to January 2022