

CANINE HYPOTHYROIDISM

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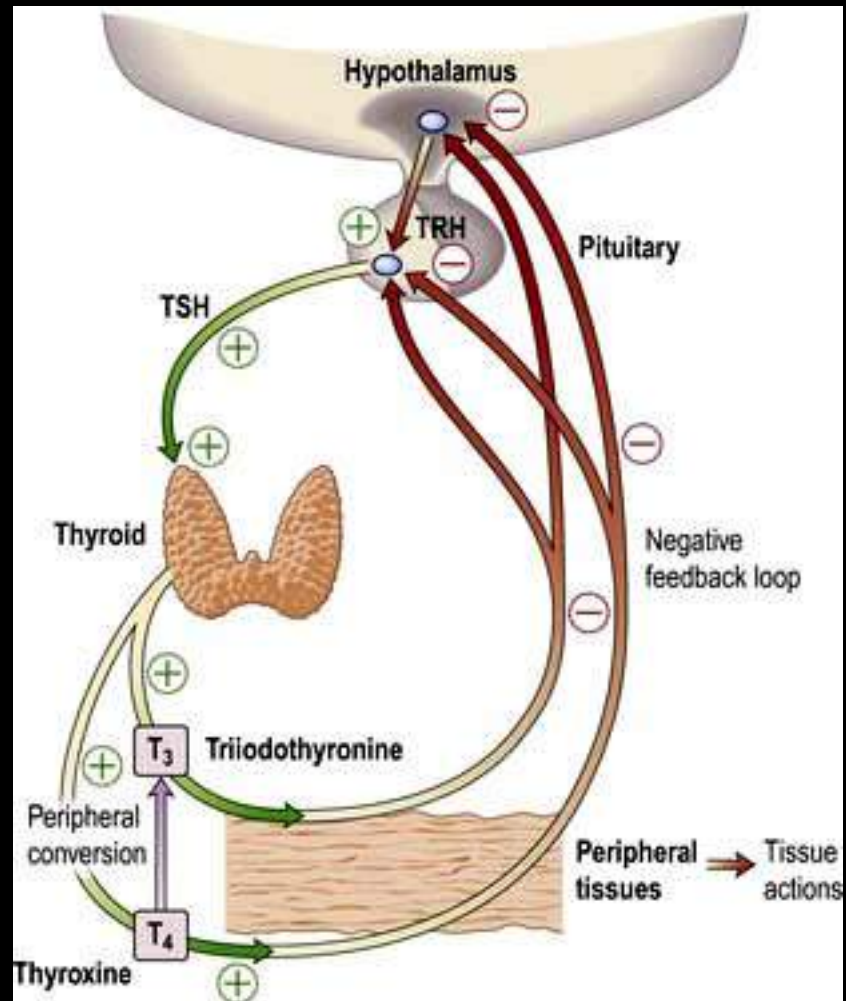
CANINE HYPOTHYROIDISM

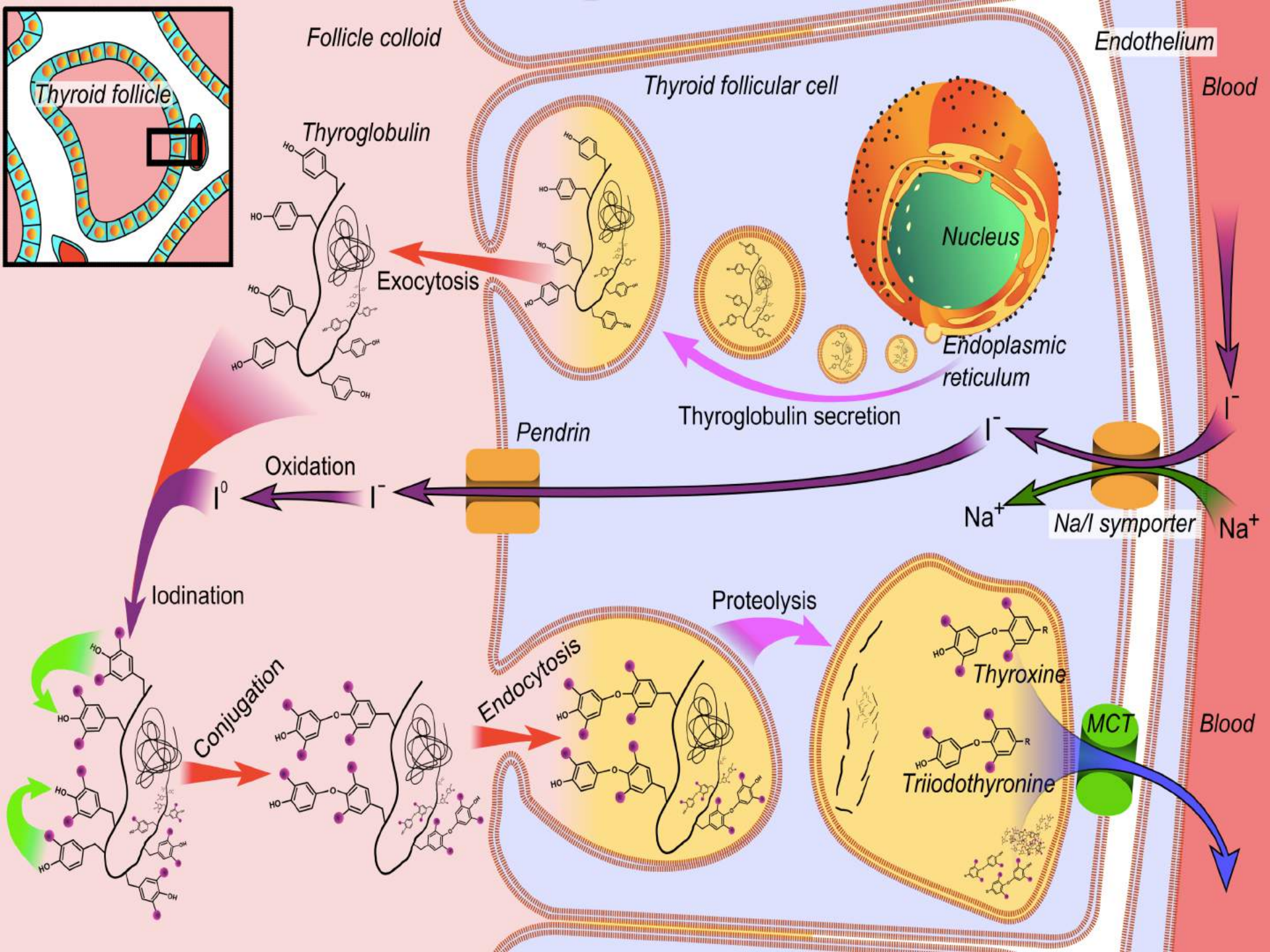
Review of normal thyroid physiology

Etiology of canine hypothyroidism

Role of thyroid function testing

Specific thyroid function tests





CANINE HYPOTHYROIDISM

Canine Thyroid Hormone Binding

T4 is bound to:

TBG	60 %
TBPA	17%
Albumin	12%
HDL ₂	11%

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Canine thyroid hormone binding

Dogs only have 15% of human TBG

Lower affinity for binding proteins

TT4 lower

fT4 higher

Plasma half-life of TT4 is 10-16 hours in dogs and 7 days in man



CANINE HYPOTHYROIDISM

Etiology of Canine Hypothyroidism

Lymphocytic thyroiditis

Idiopathic atrophy

Congenital

Neoplasia

Secondary (TSH deficiency)

Tertiary (TRH deficiency)

CANINE HYPOTHYROIDISM

Etiology of Canine Hypothyroidism

Lymphocytic thyroiditis

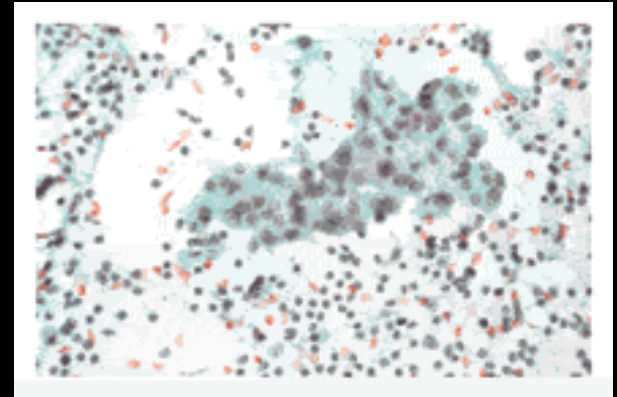
50 % of cases

Auto-immune disease

Presence of anti-thyroglobulin
AB's

Presence of anti-microsomal
AB's

T3 and T4 autoantibodies



CANINE HYPOTHYROIDISM

Etiology of Canine Hypothyroidism

Idiopathic atrophy

45 -50 % of cases

Lack of inflammatory infiltrate

Role of anti-thyroid AB' s ?

As with thyroiditis, hypothyroidism develops
slowly over time

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Etiology of Canine Hypothyroidism

Thyroid neoplasia

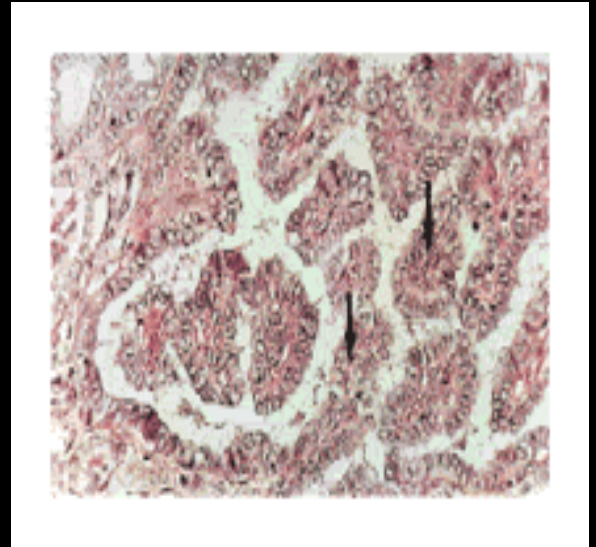
Most are euthyroid

In a retrospective study of 92
thyroid tumors:

7 % hyperthyroid

40 % hypothyroid

Based on TT4 levels alone



CANINE HYPOTHYROIDISM

Etiology of Canine Hypothyroidism

Congenital Hypothyroidism

- Very rare (<1%)

- Most are primary

 - Defective iodine intake

 - Dyshormonogenesis

- Central disease suspected in giant schnauzers

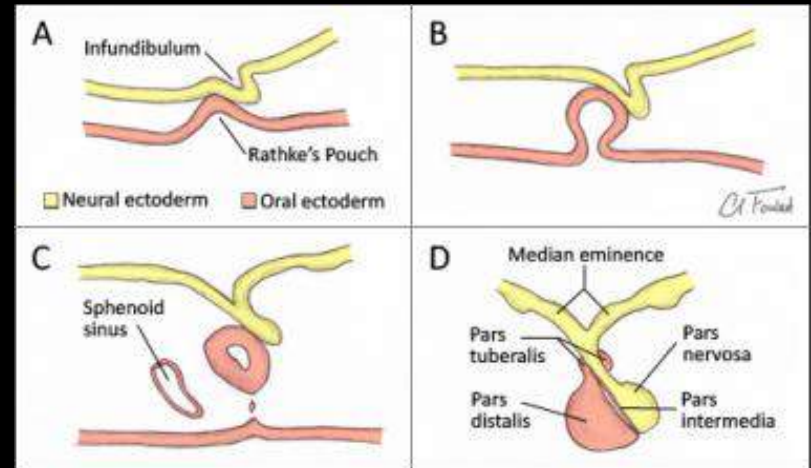
- Genetic defect in fox terriers

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Secondary Hypothyroidism

Rare (<5%)

Expanding pituitary tumor
Cystic Rathke's pouch
Isolated TSH deficiency



CANINE HYPOTHYROIDISM

Tertiary Hypothyroidism

TRH deficiency

Trauma

Neoplasia/infiltrative disease

Biochemical defect

Occurrence in dogs

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Epidemiology of Canine Hypothyroidism

True incidence is unknown

Referral hospital data

Severity of illness

Pure breed dogs

Unusual cases

Diagnostic criteria

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Epidemiology of Canine Hypothyroidism

Age at diagnosis

46 % were 1 – 3 years of age

29% were 4 – 6 years of age

Breeds at risk develop the disease at an earlier age

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Epidemiology of Canine Hypothyroidism

Gender Predisposition (63,184 dogs)

2.5: 1 ratio female to male

Higher risk in spayed vs intact females

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Breed Predispositions

Golden Retrievers

Doberman pinchers

Dachshunds

Shetland sheepdogs

Irish setters

Airedales

Cocker spaniels

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Clinical Signs of Hypothyroidism

Dermatologic

Reproductive

Reprod Domest Anim 2:211-3, 2009.

Thyroid function and infertility in the dog: a survey in five breeds.

Hematologic

Cardiovascular

Neurologic

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Role of Thyroid Function Testing

- Confirm a clinical suspicion

- Establish cellular thyroid status

- Distinguish hypothyroid from “sick euthyroid”

- Predict and monitor response to therapy

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Role of Thyroid Function Testing

Total T4

Diagnostic if normal (> 1.5 ug/dl)

Low values can be seen with:

- Non-thyroidal illness

- Time of day

- Medications

CANINE HYPOTHYROIDISM

Role of Thyroid Function Testing

Total T4

Time of day

50-60 % of normal dogs have concentrations below the reference range at some time during the day

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Role of Thyroid Function Testing

Total T4

Effect of age

TT4 two to 5 times higher in first 3 months

Age dependent decline in resting and post TSH

TT4

Decline in TSH response to TRH in aged dogs

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Role of Thyroid Function Testing

Total T4

Breed related normal range

Greyhounds, sight hounds, basenji's

TT4 about 50% of normal

fT4 also lower

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Role of Thyroid Function Testing

Assessment of criteria used by veterinary practitioners to diagnose hypothyroidism in sighthounds and investigation of serum thyroid hormone concentrations in healthy Salukis. J Am Vet Med Assoc. 2010 Feb 1;236(3):302-8.

76.1 % diagnosed with hypothyroidism based on low TT4

7.5 % diagnosed with hypothyroidism with normal results

83.6 % incorrectly diagnosed

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Role of Thyroid Function Testing

Total T4

Non-thyroidal illness

Euthyroid sick syndrome

Low T3 syndrome

Low T4 state of medical illness

Predictor of mortality in man and cats

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Role of Thyroid Function Testing

Total T4

Non-thyroidal illness

- Hyperadrenocorticism

- Diabetes mellitus

- Hypoadrenocorticism

- Chronic renal failure

- Hepatic disease

- Intensive care

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TT4 and Medications

Lowering TT4

Steroids (↓ in TT4, ↓ or = fT4ED, = or (↓) TSH)

Phenobarbital (= or ↓ TT4 and fT4ED, = or ↑ TSH)

Sulfonamides (↓ TT4 and fT4ED, ↑ TSH)

Rimadyl (↓ TT4, = or (↓) fT4ED, ↓ TSH)

Clomipramine (↓ TT4 and fT4ED)

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TT4 (low TT4)

Sensitivity	89 – 100 %
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Specificity	75 – 82 %
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Accuracy	85 %
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T3AA, T4AA and TgAA Antibodies

50 – 60 % hypothyroid dogs + TgAA

20 % TgAA + dogs progress in one year

T3AA + 33 %

T4 AA + 15 %

Marker of thyroiditis

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Free Thyroid Hormone Measurement

Free Hormone Hypothesis (Mendel)

Linear correlation of fT4 and metabolic rate

Inversely correlated with the log of TSH

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Free Thyroid Hormone Measurement

Direct Dialysis (EqD)

Nichols Institute
Antech Diagnostics

CANINE HYPOTHYROIDISM

fT4ED (low fT4ED)

Sensitivity	98 %
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Specificity	94%
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Accuracy	95 %
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Canine cTSH Assays

History

Experimental models

TRH testing

Supplementation

Real world

25% of confirmed hypothyroid dogs have normal
cTSH

CANINE HYPOTHYROIDISM

Canine cTSH Assays (high cTSH)

Sensitivity	76 – 87 %
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Specificity	82 – 93 %
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Accuracy	84 %
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CANINE HYPOTHYROIDISM

•Low fT4ED/High cTSH

•Sensitivity 74 – 80%

•Specificity* 97 – 98%

•Accuracy 86 %

Low fT4ED

80 – 98 %

93 – 94 %

95 %*

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Can We Evaluate Thyroid Function
in Sick Dogs ??

In the sick dogs, serum TT4 and fT4 concentrations are less than reference range values in (80%) and (32%) dogs, respectively

J Am Vet Med Assoc 2001;219:765–769

J Am Vet Med Assoc 2003;222:1079–1085

J Vet Emerg Crit Care 2014; May-Jun;24(3):264-71.

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Replacement Therapy

Dose: 20 ug/kg (0.1 mg/10#)

Once daily dosing

Clinical evaluation of a novel liquid formulation of L-thyroxine for once daily treatment of dogs with hypothyroidism. J Vet Intern Med. Jan-Feb;23(1):43-9, 2009.

Pharmacokinetics of total thyroxine after repeated oral administration of levothyroxine solution and its clinical efficacy in hypothyroid dogs. J Vet Intern Med. Jul-Aug;28(4):1229-34, 2014.

Name brand vs generic

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The FDA announced on Jan. 29, 2016 that it sent warning letters to Merck Animal Health, Neogen Corporation, Virbac Animal Health, Quality Animal Care Manufacturing, Dechra Veterinary Products and Diamond Animal Health, notifying the companies that their levothyroxine products are not in compliance with the Federal Food, Drug, and Cosmetic Act of 1938 and "are not generally recognized among experts qualified by scientific training and experience to evaluate the safety and effectiveness of animal drugs, as safe and effective for use under the conditions prescribed, recommended, or suggested in the labeling."

The affected products are Leventa, Levocrine, Soloxine, Thyroid Chewable Tablets, Thyrokare, Thyromed, Thyrosyn, ThyroVet and Thyroxine L.

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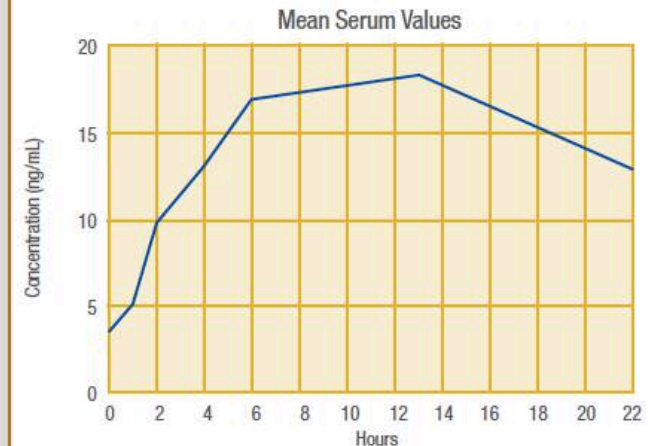
Only approved formulation is:

Thyro-Tabs Canine made by
Lloyd Inc.



Efficacy proven in
clinical studies

CANINE T4 BIOAVAILABILITY STUDY



Blood serum thyroxine (T4) concentration in four thyroidectomized dogs given a single Thyro-Tabs® dose of 20 µg per kilogram body weight.

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Monitoring Therapy

Why

Pre vs Post Pill

Monitor cTSH, TT4, fT4ED