

HIPOTIREOIDISMO

Parte I

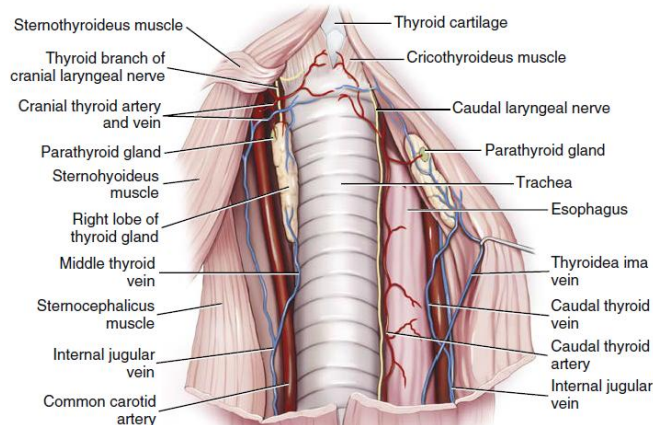
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 Coordenador do Serviço de Endocrinologia e Metabolismo, e do Programa de Ações em Endocrinologia Veterinária HCV/UFRGS.



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Anatomofisiologia

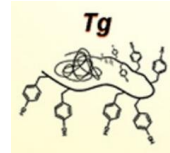
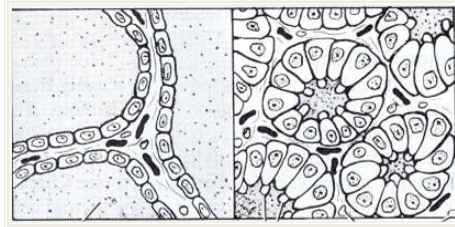
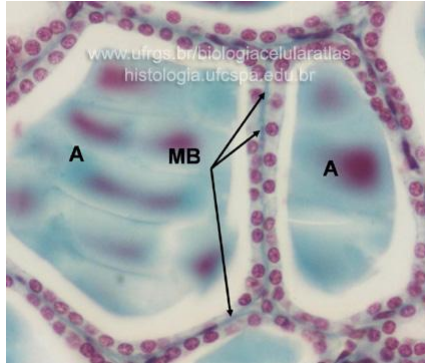


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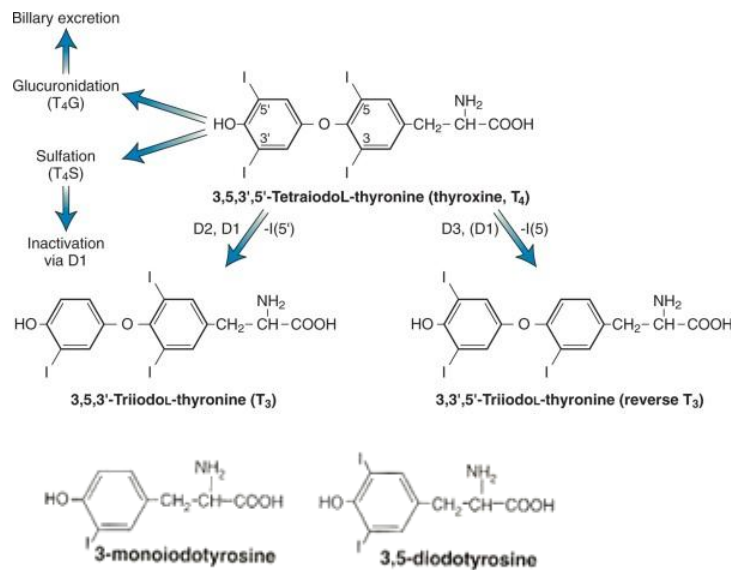
Anatomofisiologia

- Folículos armazenam coloide rico em tireoglobulina – proteína homodímera com 2678 resíduos aa em cada cadeia (total 132 resíduos de aa tirosina)

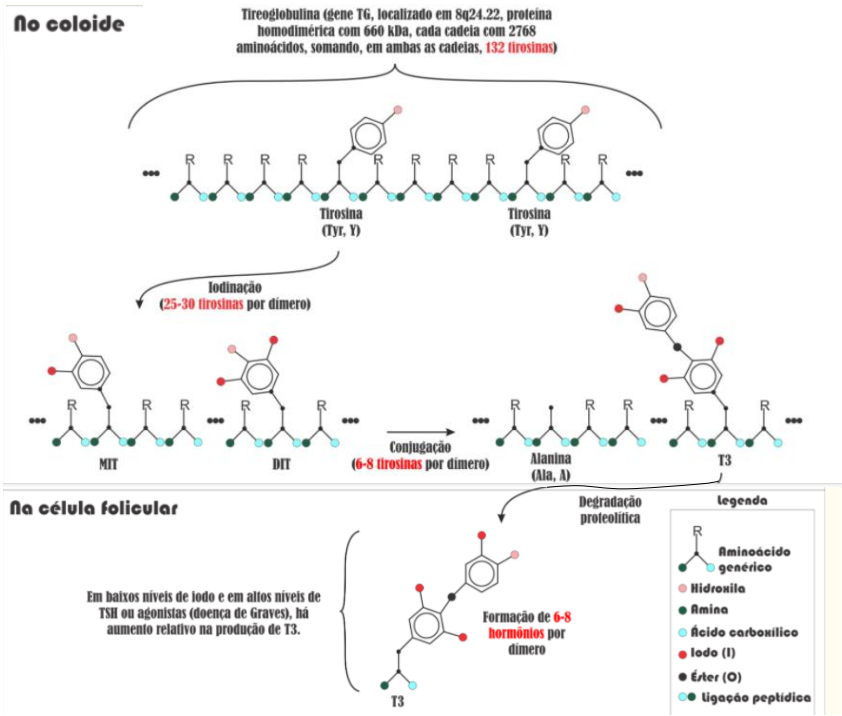


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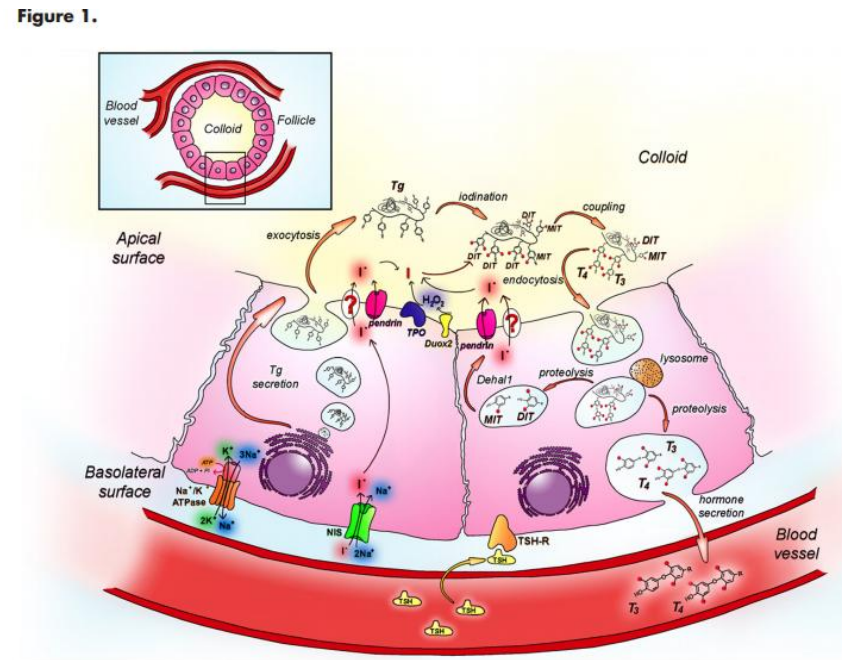
Estrutura dos Hormônios Tireoidianos



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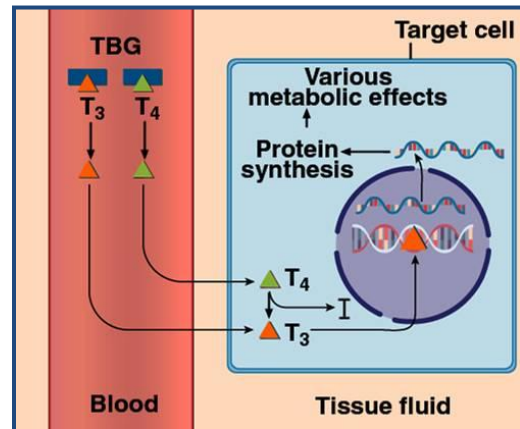
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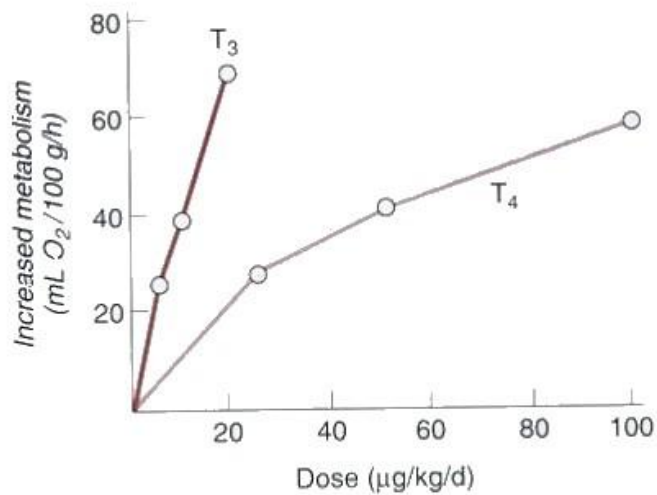
Efeitos dos Hormônios Tireoideos

- Afetam todos os tecidos
- Efeitos de início lento e duração longa
- 75-90% secreção T4
- 10-25% secreção T3
- T4 > 99% ligado a ptn
- T3 >99,9% ligado a ptn



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Efeitos dos Hormônios Tireoideos



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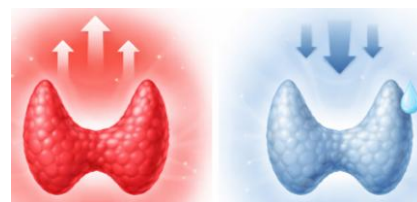
Efeitos dos Hormônios Tireoideos

❖ Taxa metabólica basal ↑ (→ demanda de oxigênio ↑)

- Aumento da atividade da **Na⁺-K⁺ ATPase**
- Aumento da expressão de **UCPs (proteínas desacopladoras)**
 - Regulam a eficiência da formação de ATP, desacoplando a fosforilação oxidativa e dissipando a energia resultante como calor

❖ Consequências:

- Aumento da necessidade energética:
 - **Apetite ↑, Motilidade TGI ↑, Absorção intestinal ↑**
 - **Apetite ↓, Motilidade TGI ↓, Absorção intestinal ↓**
- Aumento da demanda de oxigênio:
 - **Débito cardíaco ↑, Respiração ↑, Eritropoietina ↑**
 - **Débito cardíaco ↓, Respiração ↓, Eritropoietina ↓**
- Aumento da produção de calor (efeito calorígeno):
 - **Vasodilatação (pele), Temperatura corpórea ↑**
 - **Vasoconstrição (pele), Temperatura corpórea ↓**



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Efeitos dos Hormônios Tireoideos

❖ Efeitos no Metabolismo Intermediário

- **Proteínas:** síntese ↑
 - **Qdo excesso (p.ex. hipertireoidismo) proteólise (perda massa muscular)**
- ❖ **Lipídios:**
 - ❖ Supressão síntese hepática de lipídeos
 - ❖ Up regulation do receptor LDL → ↑ captação celular de LDL
 - ❖ **Hipertireoidismo:** hipocolesterolemia, lipólise periférica
 - ❖ **Hipotireoidismo:** hipercolesterolemia, dislipidemia
- ❖ **Carboidratos:** síntese de glicogênio ↑,
 - **Qdo excesso (p.ex. hipertireoidismo) glicogenólise**
- ❖ **Vitaminas:** Cofatores metabólicos (consume)
 - **Qdo excesso (p.ex. hipertireoidismo) deficiências vitamínicas são comuns**

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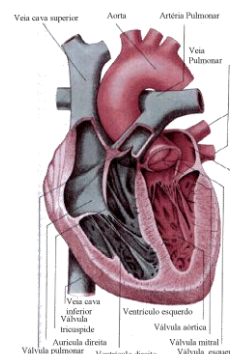
Efeitos dos Hormônios Tireoideos

❖ Reprodução (essenciais para fertilidade)

- ❖ **Hipotireoidismo**: perdas reprodutivas e redução performance em machos e fêmeas

❖ Coração

- Promove a produção da cadeia pesada de alfa-miosina
- Aumenta expressão receptores β -adrenérgicos
- ❖ **Hipertireoidismo**: força e frequência contrações $\uparrow$, tendência hipertrofia, hipertensão
- ❖ **Hipotireoidismo**: força e frequência contrações $\downarrow$, tendência dilatação



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Efeitos dos Hormônios Tireoideos

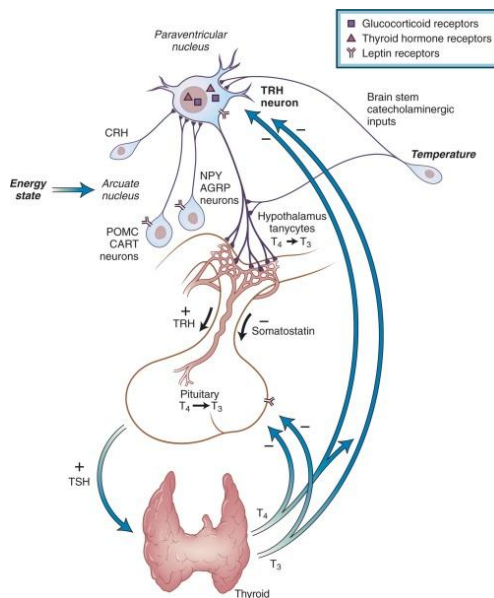
❖ Essenciais no crescimento e desenvolvimento:

- Efeitos permissivos para:
 - Secreção de GH,
 - Efeitos do GH sobre a produção de IGF-1
 - Efeitos promotores do crescimento de IGF-1
 - **Hipotireoidismo**: nanismo desproporcional e má-formações
- Essencial para o desenvolvimento cerebral do último trimestre da gestação até 3 meses após o nascimento (humanos):
 - Crescimento axonal e dendrítico
 - Formação sinapses e mielinização
 - Migração e proliferação
 - **Hipotireoidismo**: déficits cognitivos
- Estimulo funções neurais:
 - Pensamento rápido, irritabilidade, inquietação
 - Reflexos $\uparrow$
 - ❖ **Hipertireoidismo**: irritabilidade, inquietação, tremores
 - ❖ **Hipotireoidismo**: sonolência, reflexos reduzidos, "cansaço"



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Eixo Hipotálamo-Hipófise-Tireóide



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HIPOTIREOIDISMO

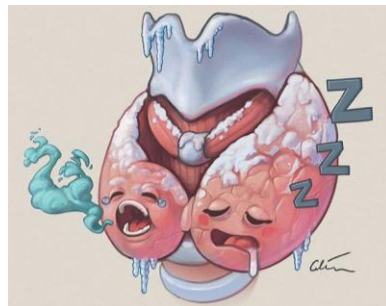
- Redução inapropriada da função tireoidiana levando um estado clínico de deficiência de hormônios tireoidianos



Article

Agreeing Language in Veterinary Endocrinology (ALIVE): Hypothyroidism, Hyperthyroidism, (Euglycaemic) Diabetic Ketosis/Ketoacidosis, and Diabetic Remission—A Modified Delphi-Method-Based System to Create Consensus Definitions

Stijn J. M. Niessen ^{1,2,3,4,*}, Robert Shiel ⁵, Astrid Wehner ⁶, Miguel Campos ⁷, Sylvie Damint ⁸, Federico Fracassi ⁹, Peter Graham ¹⁰, Jérémie Korchia ¹¹, Patty Lathan ¹², Rodolfo Oliveira Leal ¹³, Diego Daniel Miceli ¹⁴, Carmel T. Mooney ¹⁵, Maria de los Dolores Perez Alenza ¹⁶, Mark E. Peterson ^{17,18}, Johan P. Schoeman ¹⁹ and on behalf of the ESVE/SCE membership



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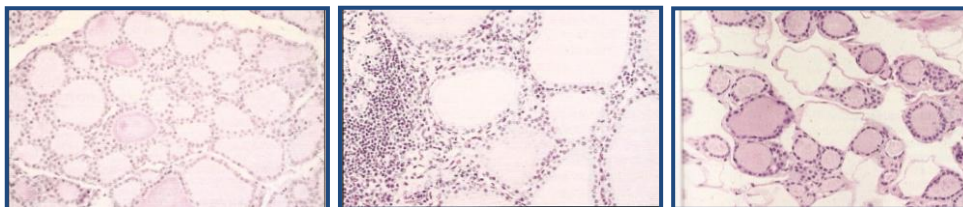
Classificação

- **Primário (95% dos casos - “não causado por deficiência de TSH ou TRH)**
 - Tireoidite linfocítica
 - Atrofia tireoide
 - Congênito, neoplasia, iatrogênico (cirurgia, radiação, tiroxina)

TABLE 3-1 PROPOSED FUNCTIONAL STAGES OF LYMPHOCYTIC THYROIDITIS IN DOGS

STAGE OF THYROIDITIS	CLINICAL SIGNS OF HYPOTHYROIDISM	SERUM THYROXINE AND FREE THYROXINE	SERUM THYROTROPIN	ANTI-THYROGLOBULIN ANTIBODY
I: Subclinical thyroiditis	Not present	Normal	Normal	Positive
II: Subclinical hypothyroidism	Not present	Normal	Increased	Positive
III: Overt hypothyroidism	Present	Decreased	Increased	Positive
IV: Noninflammatory atrophic hypothyroidism	Present	Decreased	Increased	Negative

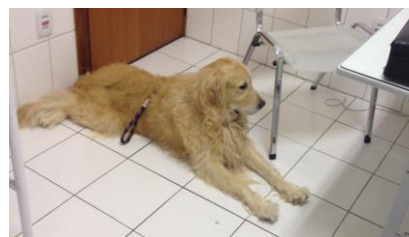
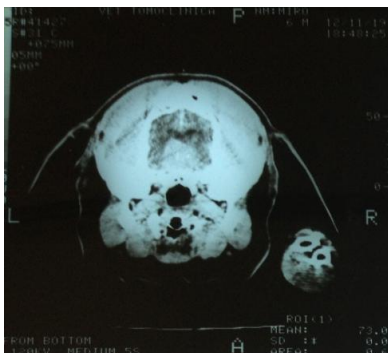
Adapted from Graham PA, et al.: Lymphocytic thyroiditis, *Vet Clin North Am Small Anim Pract* 37(4):617, 2007.



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Classificação

- **Secundário e terciário (5% dos casos):**
 - 2° = deficiência de TSH não associada a deficiência de TRH!
 - Neoplasias, hipofisite, congênito, hipofisectomia, radiação (↓ TSH e TRH)
- **Hipotireoidismo Central:**
 - Quando 2° e 3° não distinguíveis



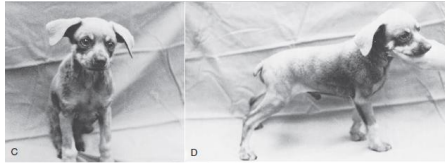
Paciente: Hró 215597 - Alan Poppi
Espécie: Canina
Sexo: Macho
Proprietário: [redacted]

Raça: Golden Retriever
Idade: 6 anos

Exames	Data	Exame	Resultado	Valores Normais
1	31/08/2012	T4 livre total	0,56 ng/dl	0,62-3,11 ng/dl (metodologia: radioimunoensaio)
2	31/08/2012	T4 total	11,8 ng/ml	Basal: 15-30 ng/ml 4-6h pós administração de levotiroxina (80): 25-45 ng/ml (metodologia: radioimunoensaio)
3	31/08/2012	TSH	0,01 ng/ml	maior: 0,05-0,30 ng/ml menor: 0,50-0,68 ng/ml (metodologia: radioimunoensaio)

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Hipotireoidismo Congênito



- ✓ Hipofunção da tireoide presente ao nascimento.
- ✓ Animais afetados podem apresentar sinais clínicos mais tardiamente (após anos)
- ✓ Resultado de desenvolvimento anormal do eixo HHT

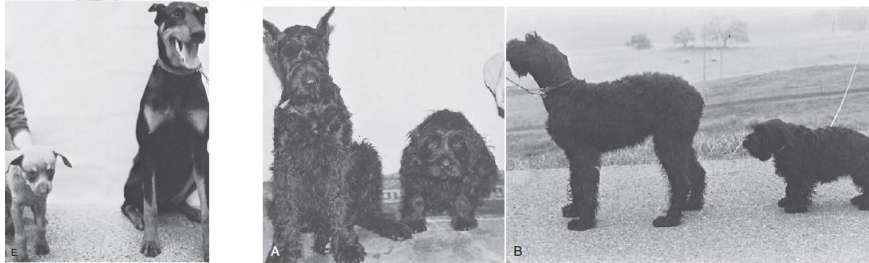


FIGURE 3-12 **A and B**, Eight-month-old female Giant Schnauzer littermates. The dog on the left is normal, whereas the smaller dog on the right has congenital hypothyroidism (cretinism). Note the small stature, disproportionate body size, large broad head, wide square trunk, and short limbs in the hypothyroid dog. **C and D**, A 3-year-old male Doberman Pinscher with congenital hypothyroidism. Note the small stature, juvenile appearance, and retention of a soft, fluffy puppy hair coat. **E**, Same dog as in **C** and **D**, shown next to his female littermate.

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Hipotireoidismo Congênito CRETINISMO



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Congenital Secondary Hypothyroidism Evidences in a Dog

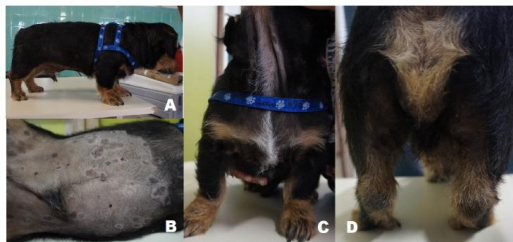
Luana da Silva Meirelles¹, Maurício Blanchini Moresco², Luciana de Jesus²,
Guilherme Luiz Carvalho de Carvalho³, Márcio Poletto Ferreira⁴ & Alan Gomes Pöppel⁴

Figure 1. A- Disproportionate dwarfism, short and thick neck, large trunk and short limbs, with hair thinning and dull hair coat; B- Epidermal crusts and collarettes secondary to pyoderma, with lesion and skin pigmentation; C- Areas of alopecia and ventral cervical alopecia; D- Areas of alopecia and hypotrichosis in the posterior surface of the pelvic limbs.



Figure 4. A- Excellent hair coat quality recovery, disproportionate dwarfism body conformation sustained; B- Complete hair coat coverage of ventral abdomen, remission of skin pigmentation and recovery from pyoderma lesions; C- Total hair coat coverage of ventral cervical region; D- Total hair coat coverage of posterior surface of the pelvic limbs.



Figure 3. A- Radiolunar x-ray of the left forelimb after eight weeks of treatment with generic levothyroxine. Non-closure of epiphyseal plates is observed. B- Radiolunar x-ray after six months of treatment with brand-name levothyroxine approved for use in dogs. Complete epiphyseal closure.

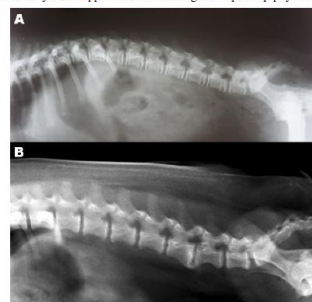
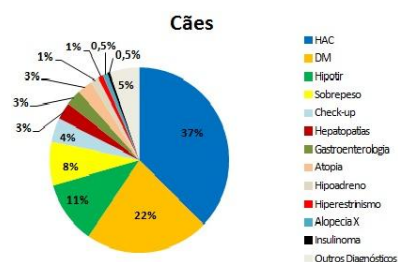


Figure 2. A- Thoracolumbar spine at 18 months of age: non-closure of growth plates in vertebral bodies. B- Thoracolumbar spine at 3 years old after six months of supplementation with sodium levothyroxine: proper closure of growth plates and articular-surface irregularities in vertebral bodies, associated with ventral spondylosis, more prominent between L5-L6.

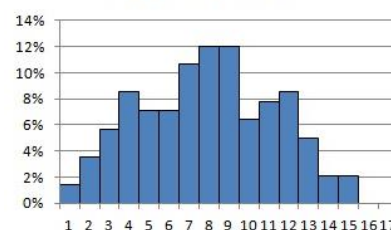
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Epidemiologia

- Já **foi** considerada Dç Endócrina mais comum em cães, raríssimo em gatos...
- >60% afetados são fêmeas,
- Castração > risco
- Meia-idade a idosos > chance
- Mais comum em raças porte médio a grande
- Retrievers (Lab/Gold), Rott, Cocker, Beagle, Doberman, Dálmatas, Pittbull, Dashchund, Schnauzer, etc...



Hipotireoidismo



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RESEARCH ARTICLE

Open Access



Gonadectomy effects on the risk of immune disorders in the dog: a retrospective study

Crystal R. Sundburg¹, Janelle M. Belanger¹, Danika L. Bannasch², Thomas R. Famula¹ and Anita M. Oberbauer^{1*}

Abstract

Background: Gonadectomy is one of the most common procedures performed on dogs in the United States. Neutering has been shown to reduce the risk for some diseases although recent reports suggest increased prevalence for structural disorders and some neoplasias. The relation between neuter status and autoimmune diseases has not been explored. This study evaluated the prevalence and risk of atopic dermatitis (ATOP), autoimmune hemolytic anemia (AIHA), canine myasthenia gravis (CMG), colitis (COL), hypoadrenocorticism (ADD), hypothyroidism (HYPO), immune-mediated polyarthritis (IMPA), immune-mediated thrombocytopenia (ITP), inflammatory bowel disease (IBD), lupus erythematosus (LUP), and pemphigus complex (PEMC), for intact females, intact males, neutered females, and neutered males. Pyometra (PYO) was evaluated as a control condition.

Results: Patient records (90,090) from the William R. Pritchard Veterinary Medical Teaching Hospital at the University of California, Davis from 1995 to 2010 were analyzed in order to determine the risk of immune-mediated disease relative to neuter status in dogs. Neutered dogs had a significantly greater risk of ATOP, AIHA, ADD, HYPO, ITP, and IBD than intact dogs with neutered females being at greater risk than neutered males for all but AIHA and ADD. Neutered females, but not males, had a significantly greater risk of LUP than intact females. Pyometra was a greater risk for intact females.

Conclusions: The data underscore the importance of sex steroids on immune function emphasizing a role of these hormones on tissue self-recognition. Neutering is critically important for population control, reduction of reproductive disorders, and offers convenience for owners. Despite these advantages, the analyses of the present study suggest that neutering is associated with increased risk for certain autoimmune disorders and underscore the need for owners to consult with their veterinary practitioner prior to neutering to evaluate possible benefits and risks associated with such a procedure.

Keywords: Neuter, Dog, Immune function, Gonadectomy

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A.G. Pöppl, I.C. Coelho, C.A. Silveira, M.B. Moresco & G.L.C. Carvalho. 2016. Frequency of Endocrinopathies and Characteristics of Affected Dogs and Cats in Southern Brazil (2004-2014). *Acta Scientiae Veterinariae*, 44: 1379.

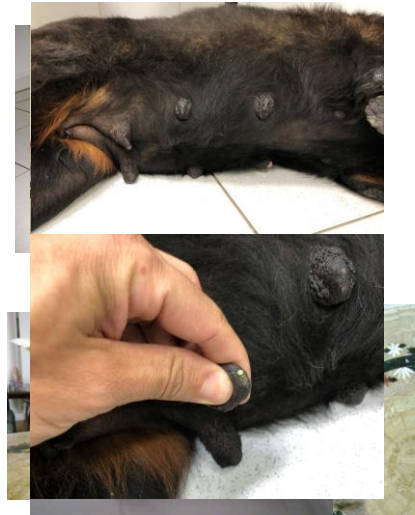
Table 3. Frequency of breed distribution of dogs diagnosed with hypothyroidism at the Division of Endocrinology between 2004 and 2014.

Breed	N	(%)
Mixed breed	39	24.4
Beagle	20	12.5
Dachshund	18	11.3
Labrador Retriever	11	6.9
Schnauzer	10	6.3
Poodle	9	5.6
Cocker Spaniel	6	3.8
Rottweiler	5	3.1
Lhasa Apso	4	2.5
Bichon Frise, Golden Retriever, Maltese, Pug	3 (each)	1.9
Boxer, Doberman, Fila Brasileiro, American Pit Bull Terrier, Weimaraner, Yorkshire Terrier	2 (each)	1.3
Akita, American Staffordshire Terrier, Basset-Hound, Border Collie, Chow-Chow, Dalmatian, Doberman Pinscher, English Bulldog, French Bulldog, Fox Terrier, German Shepherd Dog, Shiba Inu, Scottish Terrier, Shih Tzu	1 (each)	0.6
Total	160	100

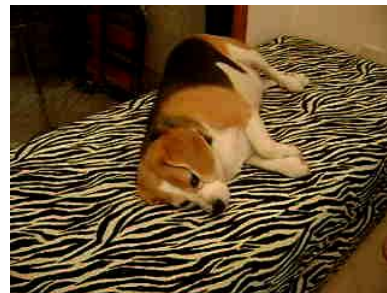
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Sinais Clínicos Metabólicos

- Letargia
- Ganho de peso
- Intolerância à exercícios
- Embotamento mental
- Bradicardia
- Fraqueza
- Intolerância ao frio (Baixa TR°)
- Galactorréia



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STANDARD ARTICLE

Journal of Veterinary Internal Medicine ACVIM
Official Journal of the American College of Veterinary Internal Medicine

Electrocardiographic and echocardiographic evaluation in dogs with hypothyroidism before and after levothyroxine supplementation: A prospective controlled study

Carlo Guglielmini¹ | Michele Berlanda¹ | Federico Fracassi² | Helen Poser¹ | Shani Koren² | Marco Baron Toaldo²

TABLE 3 Electrocardiographic and echocardiographic variables from 30 dogs with hypothyroidism before (hypothyroid T0) and after treatment with levothyroxine (hypothyroid T60)

Variable	Hypothyroid T0	Hypothyroid T60	P value
Electrocardiography			
HR (bpm)	80 (50–160)	120 (67–180)	<.001
P-wave amplitude (mV)	0.15 (0.05–0.35)	0.20 (0.10–0.45)	.004
P-wave duration (ms)	40 (30–50)	40 (0.15–50)	.09
PQ (ms)	100 (80–140)	98 (30–160)	.06
QRS (ms)	63 (30–100)	65 (40–90)	.67
R-wave amplitude (mV)	1.04 ± 0.48	1.13 ± 0.51	.33
MEA QRS (°)	60 (–99–90)	63 (–99–90)	.93
QTc (ms)	204 ± 19	204 ± 16	.98

Variable	Hypothyroid T0	Hypothyroid T60	P value
Echocardiography			
LA/Ao	1.3 (1–2.6)	1.22 (0.9–1.8)	.15
LVDDn	1.5 ± 0.1	1.5 ± 0.2	.72
LVDSn	1.0 (0.6–1.6)	1.0 (0.6–1.3)	.03
FS (%)	27 ± 9	30 ± 7	.002
EPSSn	1.92 (0.47–7.1)	1.3 (0.41–2.32)	.001
E-wave velocity (cm/s)	59 ± 15	66 ± 13	.009
A-wave velocity (cm/s)	47 ± 14	54 ± 13	.002
MPI	0.56 ± 0.24	0.55 ± 0.16	.82
EDVi (mL/m ²)	62 (28–101)	60 (32–87)	.026
ESVi (mL/m ²)	34 ± 12	29 ± 10	.10
EF (%)	48 ± 11	51 ± 10	.35

Normally and nonnormally distributed data are expressed as mean ± standard deviation and median and range (minimum–maximum), respectively. Values with statistically significant difference are indicated in bold.

Abbreviations: EDVi, end diastolic volume indexed to body surface area; EF, ejection fraction; EPSSn, E-point-to-septal separation normalized to body weight; ESVi, end systolic volume indexed to body surface area; FS, fractional shortening; HR, heart rate; LVDDn, left ventricular diastolic diameter normalized to body weight; LVDSn, left ventricular systolic diameter normalized to body weight; MEA, mean electrical axis; MPI, myocardial performance index; QTc, QT corrected for heart rate; LA/Ao, left atrial to aortic root ratio.

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Sinais Clínicos Dermatológicos

- Alopecia / rarefação e afinamento da pelagem
- Pêlos fracos, secos e quebradiços
- Cauda de rato
- Hiperpigmentação
- Discromia
- Pioderma
- Seborréias
- Hiperqueratose
- Mixedema



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Recurrent pyoderma and its underlying primary diseases: a retrospective evaluation of 157 dogs

Florian Seckerdieck, Ralf S Mueller

- Tiroxina exerce forte efeito de aumento do número e tamanho dos folículos pilosos.
- A melhora da pelagem 2ª a tto com tiroxina não significa que o paciente tinha hipotireoidismo.

TABLE 3: Primary diseases identified as responsible for recurrent pyoderma (n=107 dogs)

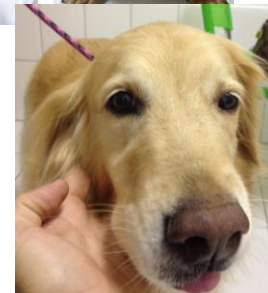
Primary disease	Dogs (n)	%
Environmentally induced atopic dermatitis	45	42
Adverse food reaction	24	22
Juvenile demodicosis*	16	15
Hypothyroidism	12	11
flea bite hypersensitivity	6	6
Hyperadrenocorticism	6	6
Leishmaniosis	4	4
Adult-onset demodicosis*	3	3
Pemphigus foliaceus	2	2
Sarcoptic mange	2	2
Juvenile cellulitis	1	1
Lupus erythematosus	1	1
Ichthyosis	1	1
Intertrigo	1	1
Portosystemic shunt	1	1

*Age at onset of clinical signs: juvenile demodicosis up to 24 months; adult-onset demodicosis more than 24 months.

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Sinais Clínicos Neuromusculares

- Polineuropatias
- Lesão NM Inferior
- Doença Vestibular
- Paralisia de Nervo Facial
- Sinais SNC / Epilepsia 2ª
- Fraqueza
- Déficits proprioceptivos
- Miosites
- Megaesôfago
- Transito intestinal lento
- Agressividade/mau humor



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Doença vestibular central por infarto isquêmico secundário a hipotireoidismo em cão

Central Vestibular Disease Due to Ischemic Stroke Secondary to Hypothyroidism in a Dog

Rafael Oliveira Chaves¹, Marcelo Luis Schwab², Angel Ripplinger³, Bruna Copat¹, Graciano Aiello²,
Denis Antonio Ferrarini², Mariana Martins Flores⁴, Rafael Figuera⁴ & Alexandre Mazzanti¹

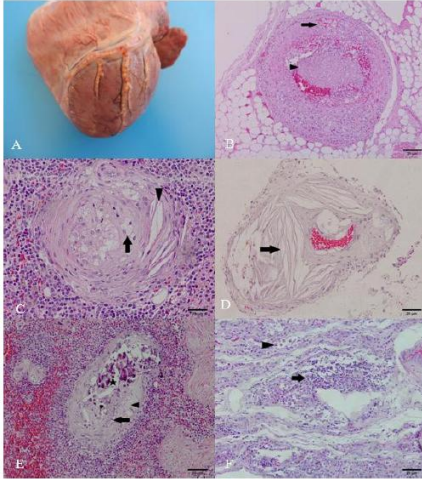


Figura 1. A- Imagem fotográfica do coração de um cão com doença vestibular central por infarto isquêmico secundário a hipotireoidismo. Notam-se as artérias coronárias esbranquiçadas, acentuadamente espessadas e com superfície externa irregular. B- Artéria coronária. Espessamento acentuado da parede caracterizado principalmente pelo acúmulo de macrófagos espumosos repletos de gotículas de lipídios (seta). Observa-se um trombo aderido à superfície endotelial (cabeça da seta), ocluindo o lúmen vascular [HE Obj. 20x]. C- Arteríola esplênica. Presença de macrófagos espumosos (seta) e fendas de colesterol (cabeça da seta) causando espessamento da parede e oclusão do lúmen [HE Obj. 40x]. D- Artéria das leptomeninges. Espessamento da parede com áreas dissecadas predominantemente pela formação de fendas de colesterol (seta) [HE Obj. 40x]. E- Arteríola esplênica. Lúmen vascular ocluído (seta) por acúmulo de macrófagos espumosos (cabeça da seta) e formação fendas de colesterol (estrela) focalmente mineralizadas [HE Obj. 20x]. F- Tireoide. Presença de acentuado infiltrado inflamatório linfocítico (seta) com raras células do epitélio folicular remanescentes (cabeça da seta), caracterizando uma tireoidite linfocitária [HE Obj. 10x].

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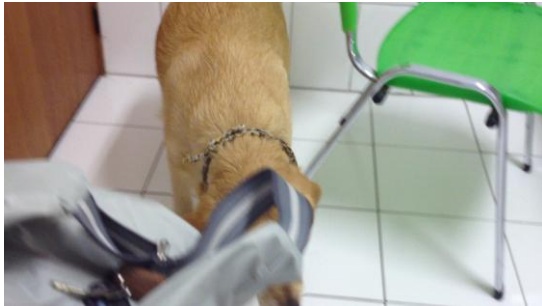
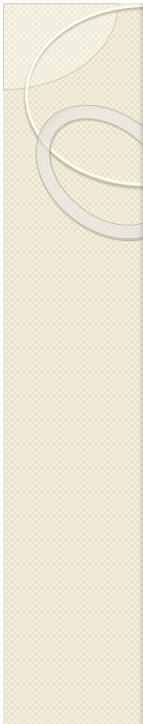
Sinais Clínicos Neuromusculares

TABLE 3-4 INCIDENCE OF CLINICAL SIGNS IN 162 ADULT DOGS WITH HYPOTHYROIDISM	
CLINICAL SIGN	PERCENT OF DOGS
Dermatologic	88
Obesity	49
Lethargy	48
Weakness	12
Neurologic	
Facial nerve paralysis	4
Peripheral vestibular	3
Polyneuropathy	2
Reproductive	< 2
Cardiovascular (bradycardia)	10

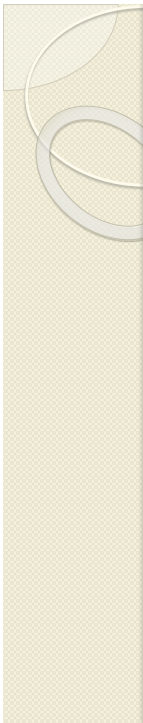
Adapted from Panciera DL: Conditions associated with canine hypothyroidism, *Vet Clin North Am* 31:935, 2001.

- Cerca de 70% dos pacientes com hipotireoidismo que fazem sinais vestibulares ou convulsões não apresentam outros sinais clínicos de HipoT.
- Investigar Ht, Colesterol total e HTs

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Journal of Veterinary Internal Medicine ACVIM
Official Journal of the American College of Veterinary Internal Medicine

STANDARD ARTICLE

Behavior in dogs with spontaneous hypothyroidism during treatment with levothyroxine

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Background: Thyroid hormone supplementation anecdotally has been described as a valid treatment option for dogs with aggression-related problems. However, prospective, controlled, and blinded trials evaluating behavior and neurohormonal status in hypothyroid dogs during treatment with levothyroxine are lacking.

Objective: Levothyroxine supplementation will have a significant influence on the behavior and neurohormonal status of dogs with spontaneous hypothyroidism.

Animals: Twenty client-owned dogs diagnosed with spontaneous hypothyroidism.

Methods: This prospective study was to evaluate the behavior of dogs, which was screened at initial presentation, and after 6 weeks, and 6 months of treatment with levothyroxine (starting dosage 10 µg/kg PO q12h) using the standardized Canine Behavioral Assessment and Research Questionnaire (C-BARQ). At each time period, circulating serotonin and prolactin (PRL) concentrations were evaluated using a commercially validated ELISA kit and heterologous radioimmunoassay, respectively.

Results: After 6 weeks of thyroid hormone supplementation, C-BARQ scores demonstrated a significant increase in activity of hypothyroid dogs ($P < .01$). No significant change in any of the behavioral signs was observed after 6 months of treatment. No significant difference in circulating concentrations of serotonin ($P = .99$ and $P = .46$) and PRL ($P = .99$ and $P = .37$) were noted between the 6-week and 6-month period compared with baseline.

Conclusions and Clinical Importance: The results of this study indicate increased activity of hypothyroid dogs after 6 weeks of thyroid hormone supplementation. None of the hypothyroid dogs in this cohort showed a significant change in any of the evaluated behavioral signs and neurohormonal status after 6 months of thyroid hormone supplementation.

KEYWORDS

carine, prolactin, serotonin, thyroid supplementation

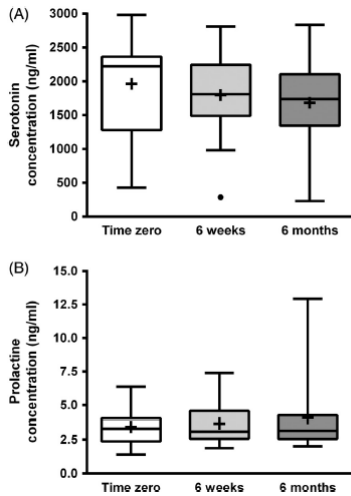


TABLE 1 Analysis of the C-BARQ of dogs diagnosed with primary hypothyroidism before the treatment with levothyroxine (T_0 ; $N = 20$), 6 weeks (T_1 ; $N = 19$) and 6 months (T_2 ; $N = 17$) after initiation of treatment^a

Behavioral category	T_0 and T_1			T_0 and T_2			T_1 and T_2		
	Mean	95% CI	P	Mean	95% CI	P	Mean	95% CI	P
Training	-0.15	-0.27 to 0.06	.20	-0.09	-0.27 to 0.10	.33	0.04	-0.14 to 0.21	.66
Aggression	-0.23	-0.46 to -0.01	.04	-0.18	-0.40 to 0.04	.10	0.05	-0.14 to 0.24	.57
Fear	-0.22	-0.59 to 0.16	.24	0.02	-0.17 to 0.21	.81	0.21	-0.15 to 0.58	.23
Separation-related anxiety	0.01	-0.19 to 0.20	.95	0.01	-0.23 to 0.25	.95	0.02	-0.18 to 0.24	.80
Excitement	-0.35	-0.69 to -0.2	.04	-0.20	-0.57 to 0.18	.28	0.14	-0.18 to 0.47	.37
Attachment and attention seeking	-0.04	-0.40 to 0.32	.82	0.11	-0.29 to 0.51	.57	0.14	-0.16 to 0.43	.34
Activity level	-0.79	-1.38 to -0.20	.01*	-0.44	-1.35 to 0.47	.32	0.37	-0.42 to 1.17	.33

^a Differences in behavior between T_0 , T_1 , and T_2 are expressed as mean and 95% confidence interval (CI).

* Significant difference ($P < 0.01$).

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Outros Sinais Clínicos

- Lipidose corneana
- Ceratoconjuntivite seca
- Redução na função do miocárdio
- Anormalidades reprodutivas
- Outras endocrinopatias autoimunes...



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Australian VETERINARY JOURNAL THE JOURNAL OF THE AUSTRALIAN VETERINARY ASSOCIATION LTD SMALL ANIMALS

CASE REPORT AND CLINICAL REVIEW

Hypothyroidism associated with acromegaly and insulin-resistant diabetes mellitus in a Samoyed

T Johnstone,^{1*} E Terzo² and CT Mooney³

Transdiferenciação tireotrofos em somatotrofos com resposta de GH ao TRH....

Figure 1. Face and mouth of the 4-year-old Samoyed dog at initial presentation, showing marked interdental spacing.

Figure 2. Results of thyrotropin-releasing hormone (TRH) stimulation test. GH, growth hormone; TRH, thyrotropin-releasing hormone.

Time (min)	GH concentration (ng/L)	TRH concentration (pg/mL)
-15 min	1.8	6.1
0 min	1.7	6.9
10 min	1.8	5.6
30 min	1.9	8.2

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OPEN ACCESS

Citation: Aicher KM, Cullen JM, Seiler GS, Lunn KF, Mathews KG, Gookin JL (2019) Investigation of adrenal and thyroid gland dysfunction in dogs with ultrasonographic diagnosis of gallbladder mucocele formation. PLoS ONE 14(2): e0212638. <https://doi.org/10.1371/journal.pone.0212638>

RESEARCH ARTICLE

Investigation of adrenal and thyroid gland dysfunction in dogs with ultrasonographic diagnosis of gallbladder mucocele formation

Kathleen M. Aicher^{1*}, John M. Cullen², Gabriela S. Seiler³, Katharine F. Lunn¹, Kyle G. Mathews¹, Jody L. Gookin^{1,4}

- 23% pacientes com mucocele atenderam a critério para Hipotir, maioria sem maiores sinais clínicos
- Aparente ruptura metabolismo HTs nesses pacientes (menor captação iodo?)

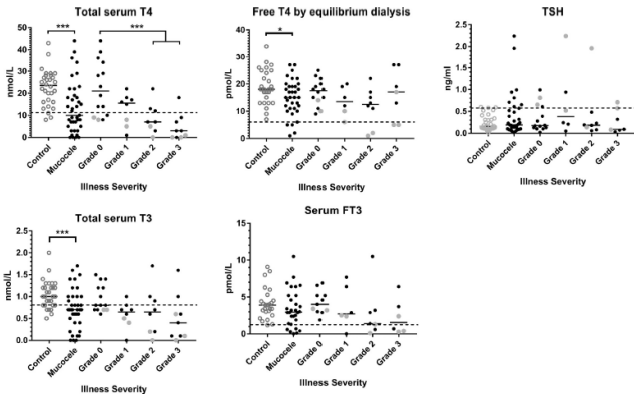


Fig 4. Thyroid hormone assay results obtained from control dogs and dogs diagnosed with gallbladder mucocele formation. For dogs with gallbladder mucocele formation, values are shown subdivided by non-thyroidal illness severity score. The horizontal dashed line designates lower limit of the laboratory reference range (total T4, FT4, total T3, and FT3) and upper limit of the laboratory reference range (TSH). Among dogs with gallbladder mucocele formation, solid gray data points represent dogs meeting proposed criteria for diagnosis of hypothyroidism. Bar = median; * $p < 0.05$ and ** $p < 0.001$ Kruskal-Wallis One Way ANOVA on Ranks (Benjamini-Hochberg FDR ≤ 0.15). Significant differences between illness severity groups, if present, determined by post-hoc Dunn's test.





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Diagnóstico

- Evidências Clínicas da Doença
- Podem ser um a poucos até quase a totalidade das anormalidades aqui descritas;
- Depende do tempo de evolução da doença e grau de comprometimento da função glandular.
- Experimentalmente leva 12-18 meses após radioterapia para o início de sinais clínicos...

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Avaliação Laboratorial

- Hemograma**

Anemia normocítica-normocrômica ~30/40% casos

- Bioquímica**

Hipercolesterolemia (> 200 mg/dL) ~85% casos

Hipertrigliceridemia (baixa magnitude)

↑ Frutossamina, ~30% dos casos

↑ CK, LDH, AST ~30% casos

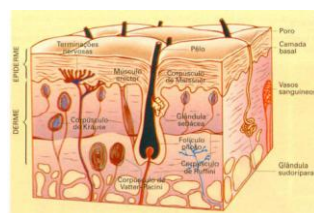
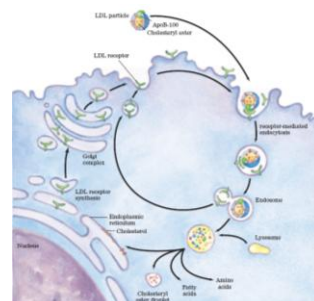
↑ ALT/FA discreto a normais

↑ Creatinina/SDMA discretas

- Cuidado com diagnóstico por Biópsia de pele**

-hipertrofia músculo pilo-erector

-degeneração gordurosa músculo



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BSAVA

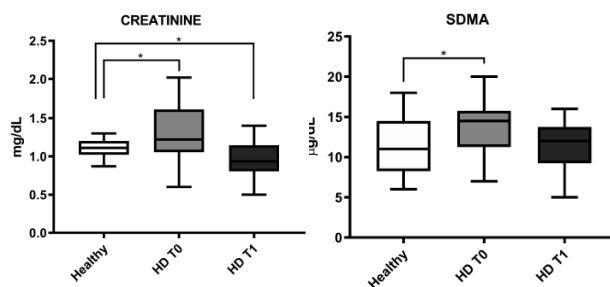
PAPER

Symmetric dimethylarginine concentrations in dogs with hypothyroidism before and after treatment with levothyroxine

A. Di Paola*, G. Carotenuto*, E. Dondi*, A. Corsini*, S. Corradini* and F. Fracassi*

CLINICAL SIGNIFICANCE: The SDMA and serum creatinine concentrations were higher in hypothyroid dogs at diagnosis as compared to healthy dogs. Serum creatinine concentrations were increased in one-third of the hypothyroid dogs and in the majority of cases normalised after levothyroxine supplementation. SDMA concentrations were rarely above the upper limit of the RI when the highest (<18 µg/dL) cut-off was employed. The diagnostic accuracy of SDMA in dogs with thyroid dysfunction requires additional evaluation.

Journal of Small Animal Practice (2020), 1–8
DOI: 10.1111/jsap.13212



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Obrigado pela
Atenção!



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HIPOTIREOIDISMO

Parte II

Prof. Dr. Álan Gomes Pöppl

Médico Veterinário - UFRGS
 Residência em Clínica e Cirurgia de Pequenos Animais - HCV/UFRGS
 Mestrado em Fisiologia - Laboratório de Metabolismo e Endocrinologia Comparada ICBS/UFRGS
 Doutorado em Ciências Veterinárias - PPGCV/UFRGS
 Atuações na Society for Comparative Endocrinology (SCE) e European Society of Veterinary Endocrinology (ESVE)
 Sócio Fundador e Diretor Executivo da Associação Brasileira de Endocrinologia Veterinária - ABEV
 Fundador e Consultor da Equipe PetEndocrine
 Professor Adjunto, Departamento de Medicina Animal, UFRGS
 Professor do Programa de Pós-Graduação em Ciências Veterinárias FcVet/UFRGS
 Coordenador do Serviço de Endocrinologia e Metabolologia, e do Programa de Ações em Endocrinologia Veterinária HCV/UFRGS.



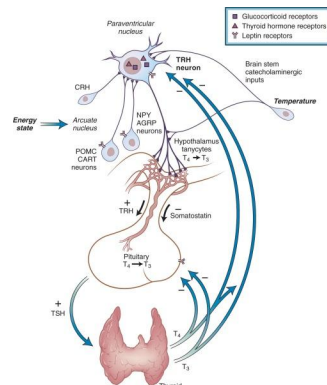
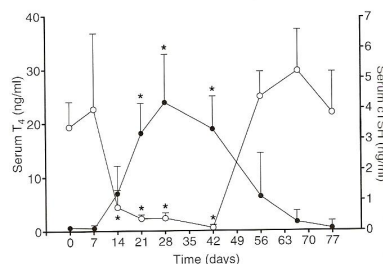
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Avaliação Laboratorial – MENSURAÇÕES HORMONAIS

• Avaliação hormonal clássica:

- T4 e T3 ↓

- TSH ↑



DOENÇA DE DIFÍCIL DIAGNÓSTICO, PORÉM FÁCIL TRATAMENTO!!!

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Síndrome Doença Não-Tireoidiana Non-Thyroid Illness Syndrome “Síndrome do Eutireoideo Enfermo”

Escore Doenças Não-Tireoidianas:

- 0) ausência sinais clínicos de doenças
- 1) **Leve** – sinais de doenças clínicas tratáveis em casa
- 2) **Moderado** – doença importante com possível indicação de internamento ou terapia intensiva
- 3) **Grave** – doenças graves com necessidade de terapia intensiva ou avançadas

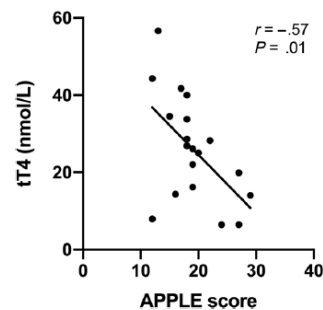
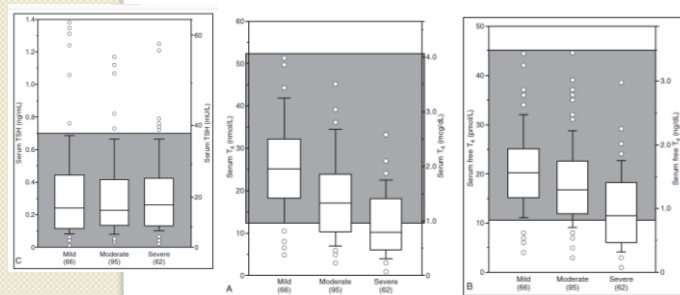
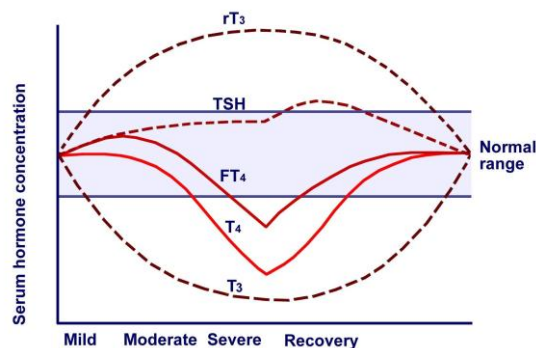
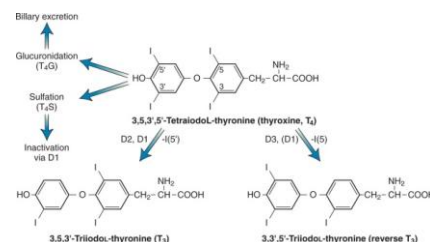


FIGURE 2 Correlation between serum total thyroxine (tT4) concentrations and Acute Patient Physiologic and Laboratory Evaluation (APPLE) fast score at the time of hospitalization (T0).

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Mecanismos envolvidos

- Menor Conversão T4 → T3
- **Maior Conversão T4 → T3 reverso**
- Supressão Eixo HHT
- Redução Síntese Ptns Transportadoras de HTs
- Redução expressão receptores de T3



Serhat Aytug, Euthyroid Sick Syndrome, Medscape (2024)



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Síndrome Eutireoideo Doente

Principais Doenças Associadas

- Diabetes Mellitus
- Hiperadrenocorticism
- Piodermite crônica
- Dermatite atópica
- DRC / Hepatopatias
- Politraumatismos / DDIV
- Efeito de Fármacos

✓ **T4 LIVRE POR DIÁLISE**

MENOS SENSÍVEL A INTERFERÊNCIAS EXTRA-TIREOIDIANAS

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DOI: 10.1111/jvim.17099

STANDARD ARTICLE

Journal of Veterinary Internal Medicine
Open Access
American College of
Veterinary Internal Medicine

Total thyroxine, triiodothyronine, and thyrotropin concentrations during acute nonthyroidal illness and recovery in dogs

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Serena Ribichini¹ | Massimo Giunti¹ | Francesca Fidanzi² | Federico Fracassi¹

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Funding information
ECVIM-CA Clinical Studies Fund, Grant/Award
Number: 2020_Parina_02

Abstract

Background: Acute illness can result in changes in serum total thyroxine (tT4), total triiodothyronine (tT3), and thyrotropin (TSH) concentrations in euthyroid dogs defined as nonthyroidal illness syndrome, but longitudinal evaluation of these hormones during the recovery phase is lacking.

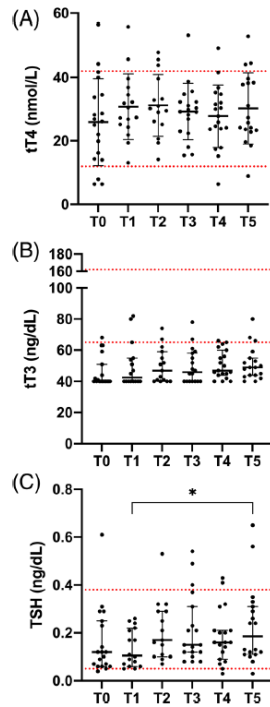
Objectives: To longitudinally evaluate serum tT4, tT3, and TSH concentrations during the acute phase and recovery from acute illness in dogs.

Animals: Nineteen euthyroid client-owned dogs hospitalized for acute illness at a veterinary teaching hospital.

Methods: Prospective longitudinal study. Serum tT4, tT3, and TSH concentrations were measured at the admission (T0), at last day of hospitalization (T1), and during the recovery phase at 3, 7, 14, and 21 days after the discharge (T2, T3, T4, and T5), respectively.

Results: tT4 and tT3 were below the reference interval (RI) at T0 in 3 (16%) and 18 (95%) dogs, respectively; tT4 normalized in all dogs early in the recovery phase, while low tT3 persisted at the end of the study in 16 (83%) dogs. Median TSH concentrations were increased at T5 compared with T1 (0.19 ng/mL [range 0.03–0.65] vs 0.11 ng/mL [range 0.05–0.26]), mean difference = 0.09 ng/mL; $P = .03$. Five (26%) dogs had TSH above the RI at least at 1 time point during the recovery phase. None of the dogs had concurrent low tT4 and high TSH during the study.

Conclusions and Clinical Relevance: In euthyroid dogs acute illness can interfere with evaluation of thyroid function up to 21 days during the recovery phase. Thyroid testing should be avoided or postponed in these dogs.



Efeitos de Diferentes Drogas sobre os Testes de Função Tireoidiana

Droga	Efeito
Glicocorticóides	Redução no tT4, fT4 e TSH em decorrência da inibição da secreção de TSH pelo glicocorticóide além de menor conversão de T4 a T3, e menor ligação destes a proteínas de transporte
Antiinflamatórios não esteroidais (AINEs)	Redução no tT4 em decorrência dos AINEs estimularem a separação do T4 das proteínas, levando a valores maiores de fT4 que inibem a secreção do TSH levando a valores de tT4 baixos
Sulfonamidas	Redução no tT4 e aumento do TSH em decorrência da interferência da droga com a síntese dos HT
Barbitúricos	Redução no tT4 e fT4 em decorrência da maior metabolização hepática secundária a indução do sistema microsomal hepático. Em longo prazo pode haver aumento do TSH
Tiroxina ou triiodotironina sintéticas	Redução no TSH em decorrência da retroalimentação negativa sobre hipófise, com conseqüente inibição da função da tireóide

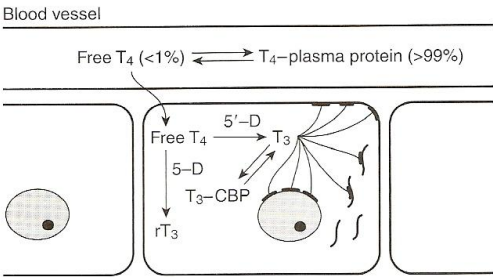
Influence of medications on thyroid function in dogs: An update

Timothy A. Bolton | David L. Panciera

Drug	Dose administered	Treatment duration	TT4	TT3	FT4	TSH
Prednisone (anti-inflammatory) ³⁵⁻³⁸	1.0-1.1 mg/kg/day	3 ^{36,38} or 5 ^{35,37} weeks	= or ↓*	↓	=	=*
Prednisone (immunosuppressive) ^{36,39-42}	2.2-4.0 mg/kg/day	1 ³⁹ or 3 ^{36,40-42} weeks	↓	↓	↓	=
Dexamethasone (anti-inflammatory) ⁴³	0.1 mg/kg q24h	3 weeks	↓	Not studied	Not ED	=
Dexamethasone (immunosuppressive) ⁴⁴	0.5-0.66 mg/kg/day	1 day	=	↓	Not studied	Not studied
Phenobarbital (short-term) ⁴⁵	3.6-9.0 mg/kg/day	3 weeks	=	Not studied	=	=
Phenobarbital (long-term) ⁴⁵⁻⁵⁰	1.0-16.4 mg/kg/day	18 ⁵⁰ 27-29 ^{45,47,48} or 52-54 ^{46,49} weeks	↓	=	↓ or =	↑ or =
Potassium bromide ^{45,51}	30 mg/kg q24h ⁵¹	6 ⁵¹ or 14 ⁴⁵ months	=	=	=	=
Zonisamide ⁵²	10 mg/kg q12h	8 weeks	=	Not studied	=*	=*
Imepitoin ⁵³	30 mg/kg q12h	18 weeks	=	=	=	=
Aspirin ^{53,54}	50 ⁵⁴ or 75 ⁵³ mg/kg/day	1 ⁵⁴ or 4 ⁵³ weeks	↓	↓	↓ or =	=
Carprofen ^{55,56}	3.4-6.6 mg/kg/day	5 ⁵⁵ or 8 ⁵⁶ weeks	↓ or =	Not studied	=	↓ or =
Sulfonamides (low dose) ^{57,58}	Approximately 15 mg/kg q12h	3 ⁵⁷ or 4 ⁵⁸ weeks	↓ or =	=	↓ or =	↑
Sulfonamides (high dose) ^{59,60}	Approximately 30 mg/kg q12h	6 weeks	↓	=	Not studied	↑
Inhalant anesthetics ⁶¹⁻⁶³		1 ⁶² 2 ⁶³ or 14 ⁶¹ days	↓	↓ or =	↑ or =	=
Propranolol ⁶⁴	60-120 mg/day	4 weeks	=	=	Not studied	Not studied
Clomipramine ⁶⁵	3 mg/kg q12h	112 days	↓	↑	↓	=
Toceranib ^{66,67}	1.5-3.0 mg/kg q48h	12 weeks	=	=	↓*	↑
Trilostane ⁶⁸		6 months	=	Not studied	↓	↑
Amiodarone ^{69,70}	3.9-36.4 mg/kg/day	28 ⁶⁹ or 75-84 ⁷⁰ days	↑ or =	=	Not studied	=

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Avaliação da Função Tireoidiana



IDEAL:
T4 Ipd + TSH + T4t

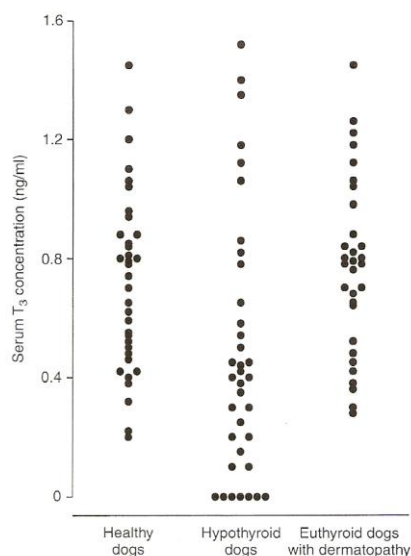
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Pq Não usar T3?

- T3 total
- (1 -2 ng/mL)

**NÃO DISCRIMINA PACIENTES
HipoT de PACIENTES
Eutiroides**

**Aumento expressão e função
deiodinases mantém T3 normal
em muitos pacientes
hipotireoideos...**



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Pq não usar T4 isoladamente??

- T4 total
- T4 livre

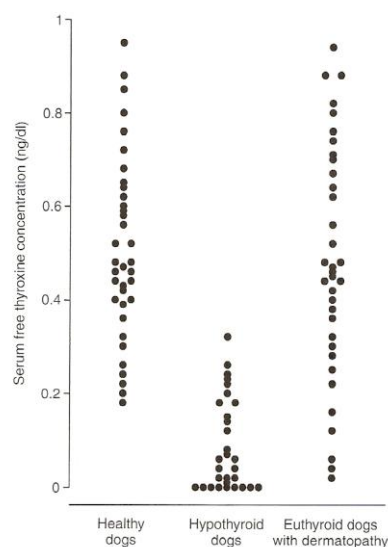
T4t (RIE) → 15 – 30 ng/mL

T4t (Quimi) → 1 – 4 mcg/dL

Fácil ter Falsos-Positivos

SERUM THYROXINE CONCENTRATION (μg/dL)	SERUM FREE THYROXINE CONCENTRATION (ng/dL)	PROBABILITY OF HYPOTHYROIDISM
> 2.0 μg/dL	> 2.0 ng/dL	Very unlikely
1.5 to 2.0 μg/dL	1.5 to 2.0 ng/dL	Unlikely
1.0 to 1.5 μg/dL	0.8 to 1.5 ng/dL	Unknown
0.5 to 1.0 μg/dL	0.5 to 0.8 ng/dL	Possible
< 0.5 μg/dL	< 0.5 ng/dL	Very likely*

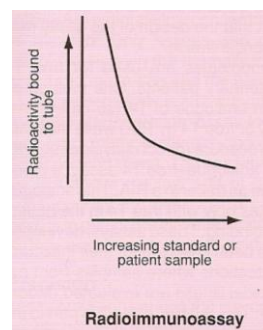
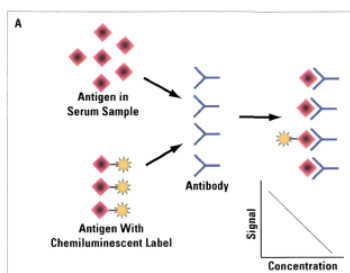
*Assuming that a severe systemic illness is not present.



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Pq não usar T4 isoladamente??

- TIREOIDITE LINFOCÍTICA e formação de anticorpos anti-HT...
- A presença destes anticorpos interfere na leitura das amostras no RIA, podendo-se obter valores de T4 total normais ou superiores ao valor de referência

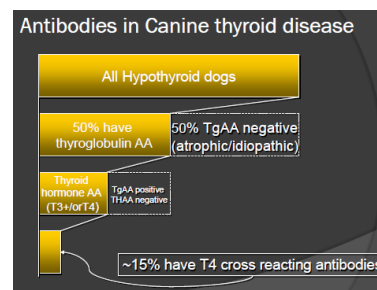


Até 15% de Falsos-Negativos

55

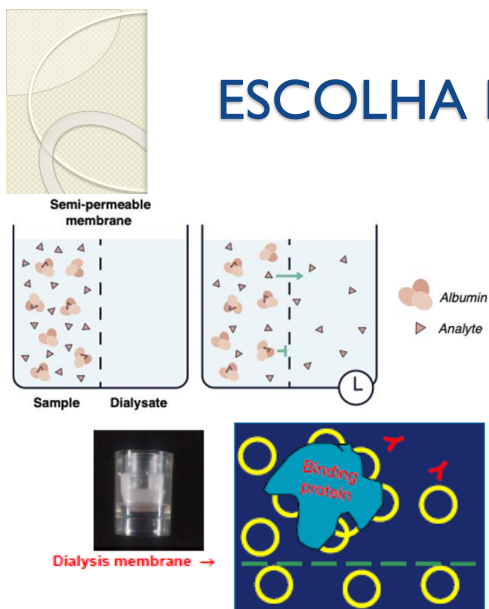
Anticorpos Anti-T4 (T4AA)

- Dixon & Mooney 1999
- N = 16.250 perfis tireoidianos K9 (T4lpd+T4t+ TSH)
- 1.093 hipotireoideos
- 14,5% tinham T4AA
- 8,8% tiveram T4t dentro faixa referência
- 1,2 % tiveram T4t elevado (**fácil assumir artefato por T4AA**)
- **Perderia 10% dos diagnósticos se avaliasse somente T4t**



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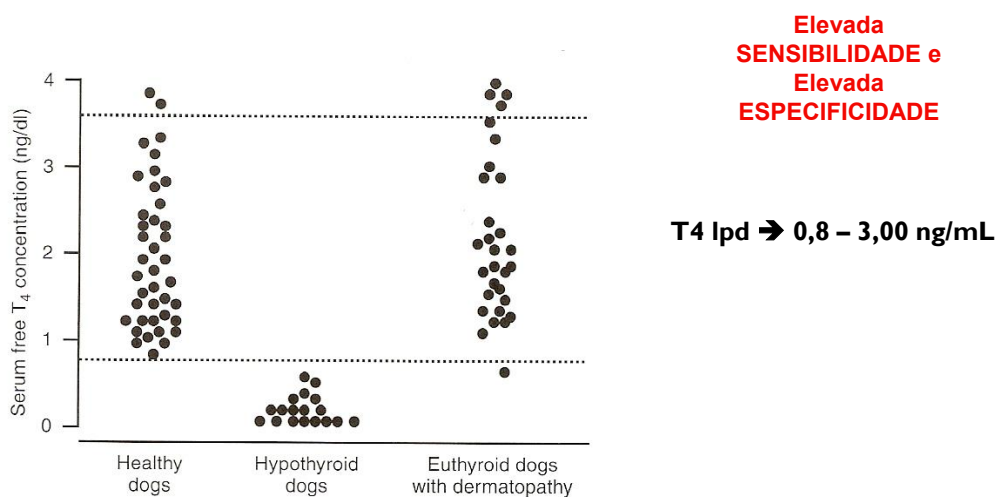
ESCOLHA DO MÉTODO t_4 LIVRE



- ❑ **Usar método T4 LIVRE POR DIÁLISE (T4 lpd)**
- ❑ Cuidado com termos como “análogo”, “direto”, “veterinário” ao solicitar T4 livre
- ❑ Métodos não-diálise geralmente mimetizam resultados do T4 total
- ❑ Técnica menos afetada por doenças não tireoidianas (falsas reduções, não afetada por proteínas ligadoras e anticorpos)

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T4 livre por diálise

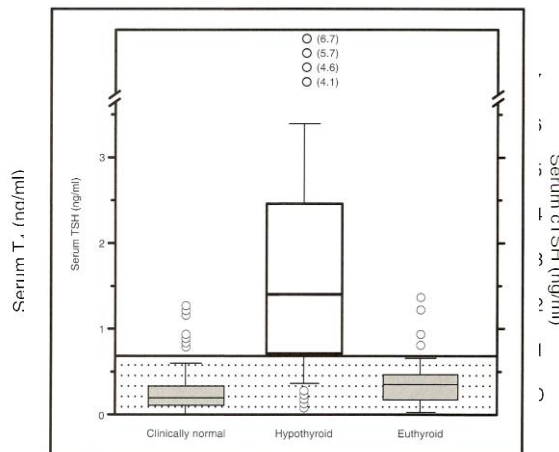


58

Qual a importância do TSH associado e Pq não usa-lo sozinho?

- TSH então professor ?

TSH → normal
0,05 – 0,5ng/mL



Normal em ~20% dos casos (40% se ensaio for para TSH humano)

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Available online at www.sciencedirect.com

ScienceDirect

Domestic Animal Endocrinology 35 (2008) 98–111

DOMESTIC
ANIMAL
ENDOCRINOLOGY

www.journals.elsevierhealth.com/periodicals/dae

Functional and morphological changes in the adenohypophysis of dogs with induced primary hypothyroidism: Loss of TSH hypersecretion, hypersomatotropism, hypoprolactinemia, and pituitary enlargement with transdifferentiation

M.M. Diaz-Espíñeira^a, J.A. Mol^a, T.S.G.A.M. van den Ingh^b,
R.H. van der Vlugt-Meijer^c, A. Rijnberk^a, H.S. Kooistra^{a,*}

M.M. Diaz-Espíñeira et al. / Domestic Animal Endocrinology 35 (2008) 98–111

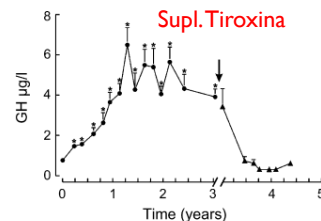
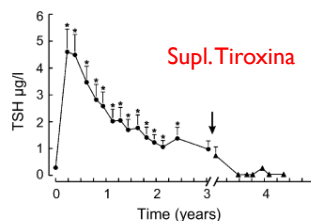
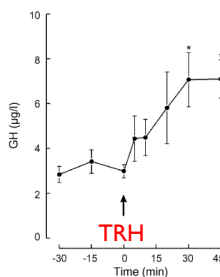
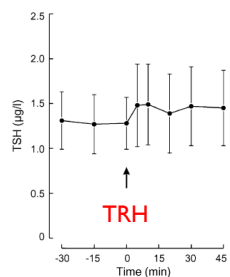
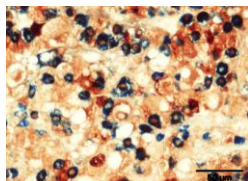


Fig. 1. (Left) 5-year-old beagle with features of hypothyroidism: tragic facial expression and dorsal nasal alopecia with pigmentation. This beagle also developed maxillary prognathia with widening of the interdental spaces (right).

M.M. Diaz-Espíñeira et al. / Domestic Animal Endocrinology 35 (2008) 98–111

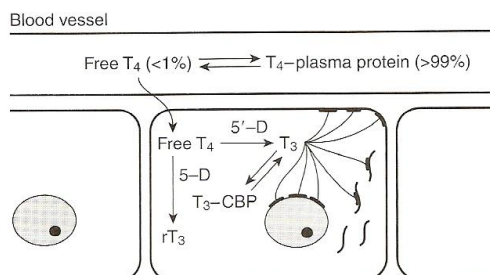


- Tireotrofos transdiferenciados com marcação para TSH (Laranja) e GH (Azul), várias células marcadas para ambos



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Avaliação da Função Tireoidiana AVALIAR NO PACIENTE “ESTÁVEL”



IDEAL:
T4 lpd + TSH + T4t

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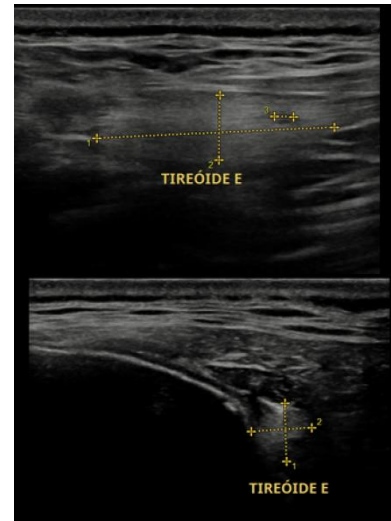
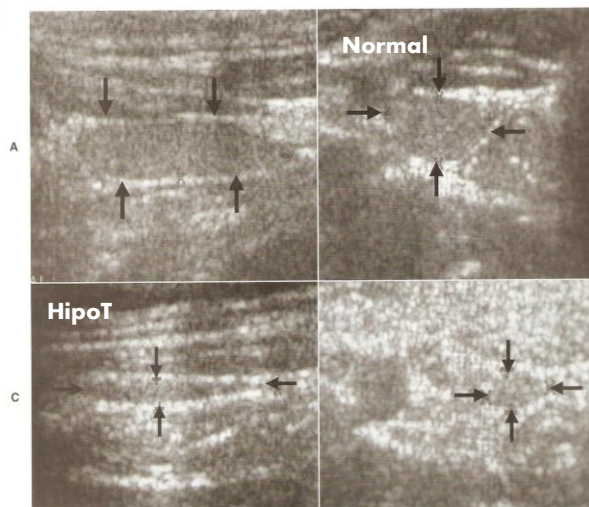
Interpretação dos Testes Tireoidianos

- ✓ T4 lpd ↓ + T4 t ↓ + TSH ↑ → Hipotireoidismo 1° confirmado
- ✓ T4 lpd ↓ + T4 t ↓ + TSH ↓ → Hipotireoidismo 2°
- ✓ T4 lpd ↓ + T4 t normal ou ↑ + TSH ↑ → Hipotir 1° com AA anti-T4
- ✓ T4 lpd ↓ + T4 t ↓ + TSH normal → Possível Hipotir 1° (Eutireoideo Doente?)
- ✓ T4 lpd normal + T4 t ↓ + TSH normal → Provável Eutireoideo Doente
- ✓ T4 lpd e T4 t normais + TSH ↑↑ → Hipotir Subclínico Inicial (Tireoidite x Ca)
- ✓ **T4 lpd + T4 t + TSH normais → Descartado o Hipotireoidismo**

- ☐ Use um bom Lab. Hormonal ou verifique se o seu Lab. usa métodos e kits validados
- ☐ Atenção se os valores de referência apresentados são para cães
- ☐ Avalie os exames hormonais à luz da clínica do paciente (histórico, exames e US cervical)

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Ultrassom de Tireoides



63

Campana, Beagle, 5 anos...



- Exames gerais s/a
- **Colesterol 289 mg/dL**

64



- Citologia: compatível com CA Tireoide

Exames				
	Data	Exame	Resultado	Valores Hormonais Normais
1	22/05/2015	T4 livre por diálise	0,68 ng/dl	0,80-3,00 ng/dl (metodologia: radioimunoensaio)
2	22/05/2015	T4 total	13,2 ng/ml	Basal: 15-30 ng/ml 4-6h pós administração de levotiroxina (BID): 25-45ng/ml (metodologia: radioimunoensaio)
3	22/05/2015	TSH	3,80 ng/ml	Normal: 0,05-0,50 ng/ml Limite: 0,50-0,68 ng/ml (metodologia: radioimunoensaio)



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Donna, Rottweiler, 5 Anos

be+ Laboratories Resultado de Exame Hormonal 30/12/2020

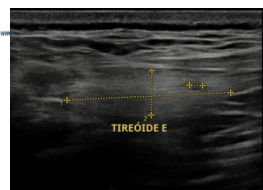
Requisição: 205182 Data Req.: 28/12/2020
 Cliente: 274 - Pet Lab Laboratório Veterinário de Análises Clínicas CNPJ: 03.843.779/0001-03
 Veterinário: Altan Pöpl
 Usuário: PetLab Laboratório Veterinário
 Endereço: Rua São Mateus, 135 Bom Jesus - Porto Alegre - Rio Grande do Sul - Brasil
 Tel/Fax: 55 51 3019-2501 Telefone: 55 51 3061-0364
 Paciente: Dona 442342
 Espécie: Canina
 Sexo: Fêmea
 Proprietário: Gabriela Oliveira da Silva
 Raça: Rottweiler
 Idade: 5 anos

Exames	Data	Exame	Resultado	Valores Hormonais Normais
1	30/12/2020	T4 livre por diálise	0,03 ng/dl	0,80-3,00 ng/dl (metodologia: radioimunoensaio)
2	30/12/2020	TSH	0,21 ng/ml	Normal: 0,05-0,50 ng/ml (metodologia: imunoluminescência)

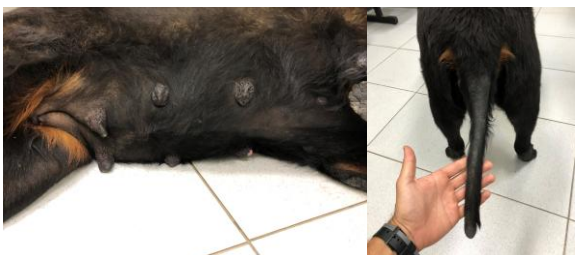
T4 TOTAL Unidade: ng/dl Data de Coleta: 29/12/2020 09:45
 Valores de Referência: 1,4 - 3,8 ug/dL

Resultado: 0,9 ug/mL
 Material: Soro
 Catalyst (IDEXX)

Conferido e Assinado Eletronicamente



Lobos de tireoide com bordos regulares, parênquima hiperecogênico homogêneo com o volume levemente reduzido. O lobo direito mediu aproximadamente 2,70 cm x 0,65 cm x 0,76 cm (0,69 cm³) e o lobo esquerdo 2,47 cm x 0,67 cm x 0,64 cm (0,55 cm³). Imagem sugere discreta assimetria e aumento de ecogenicidade (inflamação crônica?). Paratireoide esquerda caudal evidenciada sem alterações (0,20 cm). Demais paratireoides não evidenciadas, compatível com normalidade.



Eri 5,5 x10⁶
 Ht 34%
 Hb 11 g/dL
 Colesterol 864 mg/dL
 Triglicerídeos 193 mg/dL
 Creatinina 0,9 mg/dL
 SDMA 15 mcg/dL
 ALT/AST/FA/CPK s/a

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Tratamento

- Resposta terapêutica confirma o diagnóstico!!
- Levotiroxina sódica (T4 sintético) = 15 - 22µg/kg **SID** (bid cf necessidade)
- Má absorção hormônios humanos; *preferência por Synthroid ou Euthyrox humano ou tiroxina veterinária*
- JEJUM – mínimo 40 min. após para comer...
- Introdução gradual...



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J Vet Intern Med 2014;28:1229–1234

Pharmacokinetics of Total Thyroxine after Repeated Oral Administration of Levothyroxine Solution and its Clinical Efficacy in Hypothyroid Dogs

I.C. van Dijk, G. Le Traon, B.D.A.M. van de Meulengraaf, S. Burgaud, L.J.I. Horspool, and H.S. Kooistra

Background: Oral levothyroxine (L-T₄) supplementation is commonly used to treat hypothyroid dogs.

Objectives: Investigate the plasma profile and pharmacokinetics of total thyroxine (tT₄) after PO administration of a L-T₄ solution and its clinical efficacy in hypothyroid dogs.

Animals: Ten dogs with naturally occurring hypothyroidism.

Methods: After hypothyroidism diagnosis and supplementation with L-T₄ solution PO q24h at 20 µg/kg BW for minimum 4 weeks, the plasma profile and pharmacokinetics of tT₄ were determined over 34 hours and the clinical condition of the dogs was evaluated.

Results: Before dosing for pharmacokinetic evaluation, mean tT₄ concentration was 23 ± 9 nmol/L. L-T₄ was absorbed rapidly (t_{max}, 5 hours), reaching a mean maximal tT₄ concentration of 56 ± 11 nmol/L. The apparent terminal half-life was 11.8 hours. Clinical signs of hypothyroidism improved or resolved in all dogs after 4 weeks of treatment. The dosage of 20 µg/kg PO q24h was judged appropriate in 5 dogs, and 4 dogs required slight increases (9–16%). Twice daily treatment, with a 30% increase in dosage, was necessary for 1 dog.

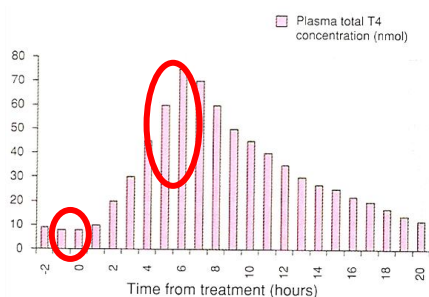
Conclusions and Clinical Importance: The pharmacokinetics of L-T₄ in hypothyroid dogs was similar to that reported in healthy euthyroid dogs. Clinical and hormonal responses to L-T₄ solution were rapid in all dogs. The starting dosage of 20 µg/kg PO q24h was suitable for maintenance supplementation in 50% of the dogs, minor dosage modification was required in 4 other dogs, and treatment q12h was required in 1 dog.

Key words: Canine; Hypothyroidism; Plasma profile; Thyroid hormone supplementation.

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Monitoramento da terapêutica

- Resolução dos sinais clínicos
- Ausência de sinais de tireotoxicose
- T4 total (25-45 ng/mL) ou T4 lpd (0,8-3 ng/mL) 4-6 horas após medicação e normalização TSH (0,05-0,5 ng/mL)
- T4 pré-tiroxina?
- Anormalidades Laboratoriais normalizam em 1 a 4 meses



Antes de ajustar terapia para BID verificar:

- Esta recebendo uma “boa” tiroxina?
- Esta respeitando jejum pós-pill?
- Realmente tem hipotireoidismo?
- Trate o paciente, não os exames!!!

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Xandão...



600 mcg Puram T4 SID
26/07/2017
T4t pós-tiroxina = 28 ng/mL
TSH = 0,16 ng/mL



600 mcg Tyrox SID
04/10/2017
T4t pós-tiroxina = 20,9 ng/mL
TSH = 0,20 ng/mL

70

Como confirmar um diagnóstico “suspeito” em um paciente já em tratamento?

Journal of Veterinary Internal Medicine

ACVIM

Open Access

Standard Article

J Vet Intern Med 2017;31:705-710

Effects of Levothyroxine Administration and Withdrawal on the Hypothalamic-Pituitary-Thyroid Axis in Euthyroid Dogs

V. Ziglioli, D.L. Panciera, G.C. Troy, W.E. Monroe, K.M. Boes, and K.R. Refsal

Background: Chronic supplementation can suppress the hypothalamic-pituitary-thyroid axis (HPTA) and make it difficult to assess thyroid function after withdrawal of levothyroxine.

Objectives: To determine whether the HPTA is suppressed after levothyroxine administration in euthyroid dogs and the time required for resolution of any suppression.

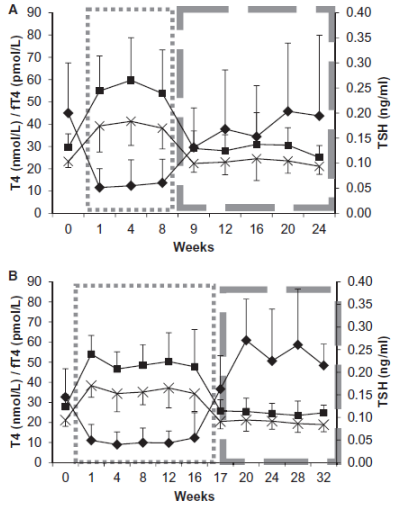
Animals: Twenty-eight healthy euthyroid dogs.

Methods: A prospective, randomized study administering levothyroxine to euthyroid dogs for 8 weeks (group 1) or 16 weeks (group 2). Serum concentrations of total thyroxine (T_4), free thyroxine (fT_4) by equilibrium dialysis, thyroid stimulating hormone; thyrotropin (TSH), and 3,5,3'-triiodothyronine (T_3) were measured every 4 weeks during supplementation and for 16 weeks after levothyroxine was discontinued.

Results: Mean serum concentrations of T_4 and fT_4 were significantly higher ($P < .0001$) and TSH was lower ($P < .0001$) in all dogs during levothyroxine administration compared to baseline. Mean serum concentrations of T_4 , fT_4 , and TSH in both groups, beginning 1 week after levothyroxine was discontinued, were significantly different ($P < .01$) compared to values during levothyroxine administration but not compared to baseline values ($P > .3$).

Conclusions and Clinical Importance: Assessing thyroid function tests 1 week after cessation of levothyroxine at 26 $\mu\text{g}/\text{kg}$ once a day for up to 16 weeks will provide an accurate assessment of thyroid function in healthy euthyroid dogs.

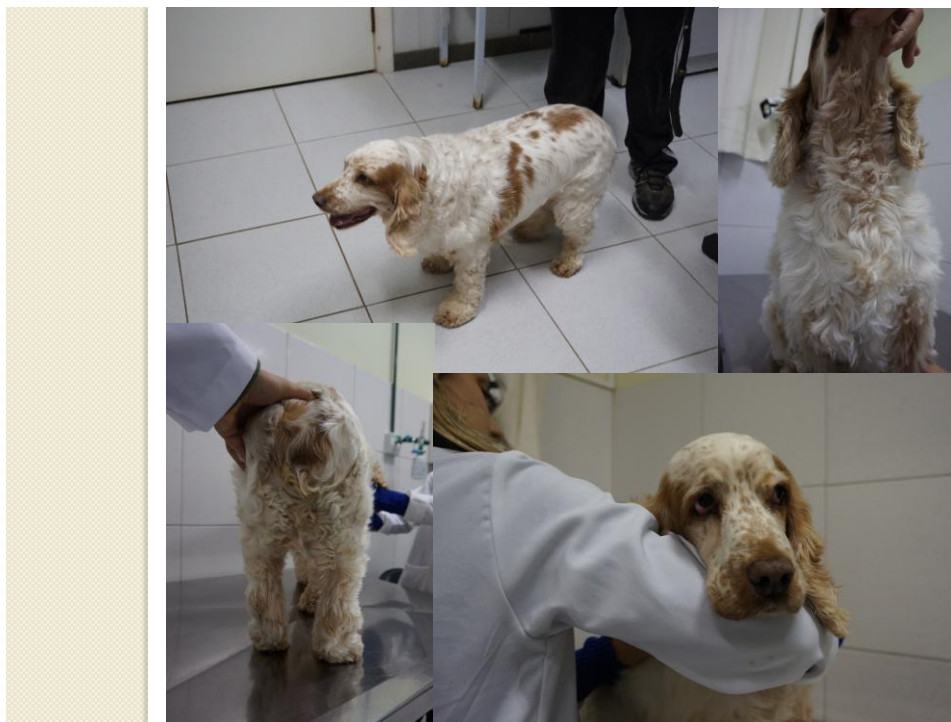
Key words: Canine; Endocrinology; Hypothyroidism; Thyroid function tests.



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**Lilica,
Cocker, 9
anos –
88682, Abr
2016**

73

PONTOS-CHAVE !

1. O hipotireoidismo é uma doença pouco frequente, porém de sinais insidiosos que se confundem com outras doenças neurológicas, dermatológicas e distúrbios comportamentais, e vale a pena sempre mantê-lo em mente como um diagnóstico diferencial
2. Jamais solicitar mensuração de hormônios tireoidianos em pacientes clinicamente descompensados de qualquer doença, ou sob terapia com diversas medicações devido ao elevado risco de falsos-positivos (síndrome do eutireoideo doente).
3. Quanto mais evidências da doença presentes (clínica, patologia clínica, ultrassonografia, exames hormonais compatíveis) menor o risco de erro de diagnóstico
4. A adequada resposta terapêutica é fundamental para confirmação do diagnóstico! Antes de julgar o diagnóstico, verificar se o tutor esta usando uma boa tiroxina e administrando em jejum.

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Obrigado pela Atenção!

