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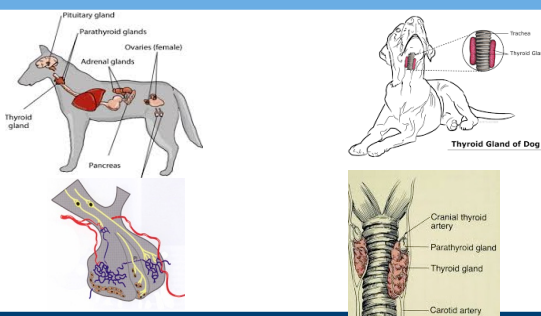
THYROID DISEASE

Michael E. Herrtage

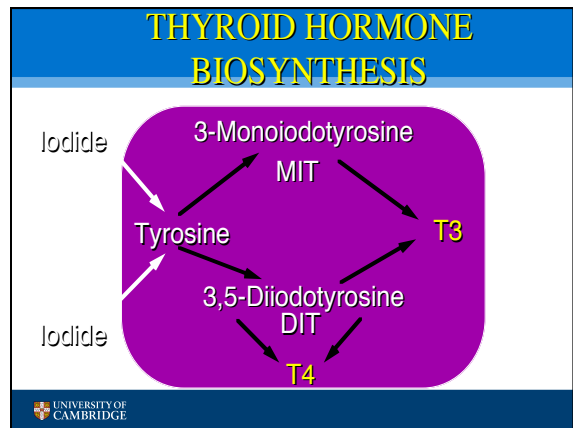
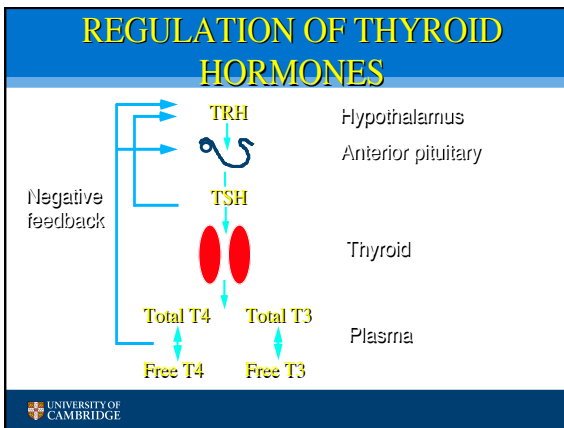
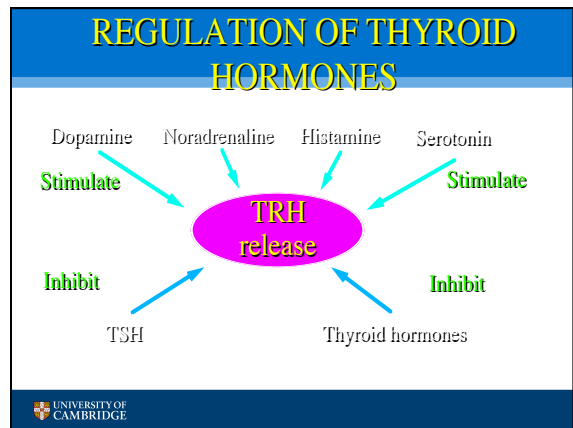
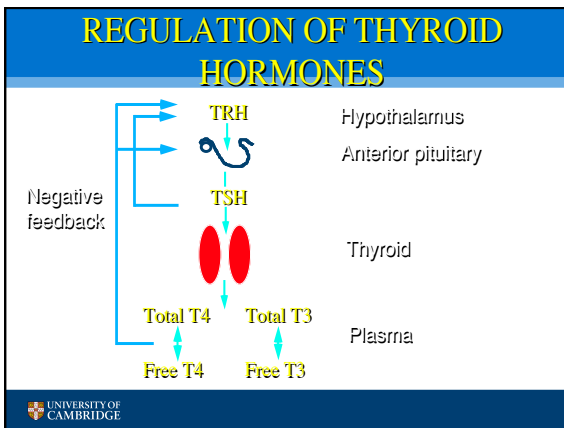
Department of Veterinary Medicine

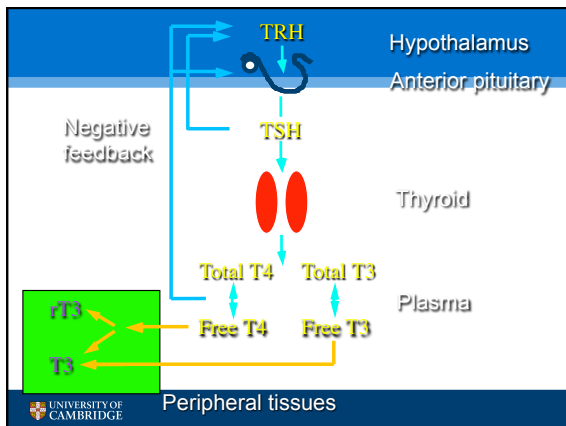


HORMONAL SYSTEMS



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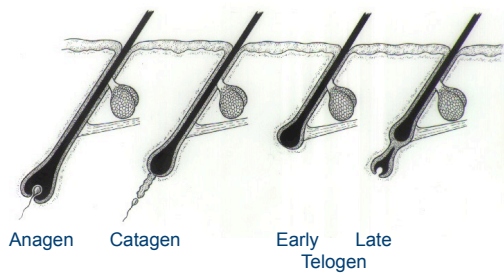


THYROID HORMONES

- Control metabolism
 - stimulate protein synthesis
 - increase cellular oxygen consumption
 - regulate lipid metabolism
- Essential for normal growth and development
- Activate the growth phase of the hair cycle
- Stimulate the heart in a sympathetic fashion

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HAIR CYCLE



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THYROID DISEASES

- Hypothyroidism
- Hyperthyroidism



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HYPOTHYROIDISM

AETIOLOGY OF HYPOTHYROIDISM

- Primary hypothyroidism (90% of cases)
 - Congenital -
 - thyroid agenesis (rare)
 - Acquired –
 - lymphocytic thyroiditis
 - idiopathic necrosis and atrophy
 - thyroid neoplasia
 - thyroidectomy or radiation therapy

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PRIMARY HYPOTHYROIDISM

Normal Lymphocytic thyroiditis Lymphocytic thyroiditis

Idiopathic necrosis and atrophy

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AETIOLOGY OF HYPOTHYROIDISM

- Secondary hypothyroidism (10% of cases)
 - Congenital -
 - panhypopituitarism (pituitary dwarf)
 - Acquired -
 - pituitary neoplasia

MRI

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AETIOLOGY OF HYPOTHYROIDISM

- Tertiary hypothyroidism
 - Hypothalamic dysfunction
- Iodine deficiency
- Peripheral abnormalities -
 - Inadequate conversion of T4 to T3
 - Antithyroid hormone antibodies
- Antithyroid drugs

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CONGENITAL HYPOTHYROIDISM

- Boxer
- Giant Schnauzer
- Bouvier des Flandres
- Scottish Deerhound
- Fox terrier
- Rat terrier

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CONGENITAL HYPOTHYROIDISM

86/2187 Boxer pups 6 weeks old
Teddy is affected
Sally is normal

Teddy Sally

Teddy Sally

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CONGENITAL HYPOTHYROIDISM


- Disproportionate dwarfism
- Short legged
- Broad skull
- Enlarged cranium
- Shortened mandible
- Protruding tongue

Gemma 6mth female

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CONGENITAL HYPOTHYROIDISM

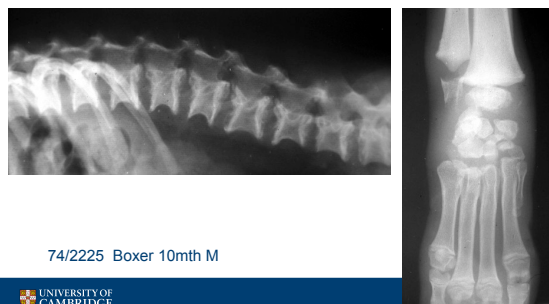
- Mental dullness
- Gait abnormalities
- Alopecia
- Bradycardia
- Muscle weakness
- Delayed dental eruption
- Goitre (depending on cause)



Gemma 6mth female

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CONGENITAL HYPOTHYROIDISM



74/2225 Boxer 10mth M

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CONGENITAL HYPOTHYROIDISM



Teddy Sally

86/2187 Boxer 6mth following thyroid supplementation

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CLINICAL SIGNS OF HYPOTHYROIDISM

- Very variable, often vague
- Usually young to middle-aged dogs
- Middle-sized to larger breeds: Golden Retriever, Doberman Pincher, Irish Setter, Miniature Schnauzer, Dachshund, Cocker Spaniel, Airedale Terrier, Great Dane, Boxer

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LYMPHOCYTIC THYROIDITIS

INCREASED PREVALENCE

- Golden retriever
- Cocker spaniel
- Boxer
- Shetland sheepdog
- Giant schnauzer
- Hovawart

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LYMPHOCYTIC THYROIDITIS

ASSOCIATED WITH CERTAIN HAPLOTYPES

- Doberman pinscher
- Rhodesian ridgeback
- English setter
- Giant schnauzer
- DLA class II haplotype DQA1*00101

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LYMPHOCYTIC THYROIDITIS

ASSOCIATED WITH CERTAIN HAPLOTYPES

- Gordon Setter
- Hovawart
- Rhodesian Ridgeback
- Identified a major hypothyroidism risk locus shared by these breeds on chromosome 12
- Three genes (LHFPL5, SRPK1 and SLC26A8)



CLINICAL SIGNS OF HYPOTHYROIDISM

- METABOLIC RATE CHANGES
- Lethargy, mental dullness and depression
- Unwillingness to exercise, poor exercise tolerance
- Weight gain without polyphagia, obesity
- Intolerance to cold, heat seeking



Boxer 8 Mn



CLINICAL SIGNS OF HYPOTHYROIDISM

- HAIR COAT CHANGES
- Thinning of the hair coat
- Bilaterally symmetrical non-pruritic alopecia - flanks, trunk, neck
- Remaining coat dry and dull
- Occasionally hypertrichosis



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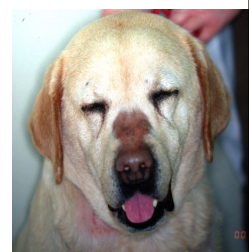
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CLINICAL SIGNS OF HYPOTHYROIDISM

- SKIN CHANGES
- Thickened (myxoedematous)
- Hyperpigmented
- Cold and clammy to the touch
- Comedones
- Seborrhoea
- Hyperkeratotic plaques on pinnae
- Pyoderma (\pm pruritus)



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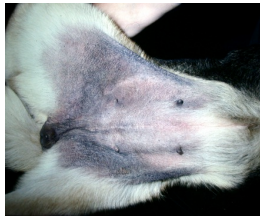
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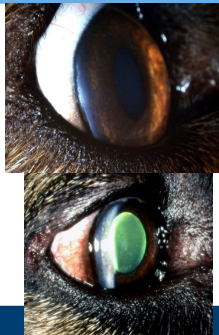
- CARDIOVASCULAR CHANGES
- Bradycardia
- Weak apex beats
- Decreased QRS amplitudes
- Impaired myocardial function
- ?Dilated cardiomyopathy



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CLINICAL SIGNS OF HYPOTHYROIDISM

- OCULAR SIGNS
- Corneal lipidosis (arcus lipoides)
- Chronic uveitis
- Lipid effusion into aqueous
- Secondary glaucoma
- Keratoconjunctivitis sicca



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CLINICAL SIGNS OF HYPOTHYROIDISM

- NEUROMUSCULAR CHANGES
- Peripheral neuropathies
 - dragging front feet
 - head tilt (vestibular nerve paralysis)
 - facial nerve paralysis
 - laryngeal paralysis

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CLINICAL SIGNS OF HYPOTHYROIDISM

- REPRODUCTIVE SIGNS
- Bitch
 - Anoestrus, sporadic cycles
 - Infertility, abortion, poor litter survival
 - Inappropriate galactorrhoea
- Male
 - Lack of libido, testicular atrophy, hypospermia, infertility



MYXOEDEMA COMA

- Impaired mental status, thermoregulation, respiratory and cardiovascular function
- Stupor, coma, hypothermia without shivering, bradycardia, hypotension and hypoventilation
- Most commonly Doberman pinschers
- Decompensation of chronic hypothyroidism



MYXOEDEMA COMA



Doberman pinscher 8yr F



MYXOEDEMA COMA



Doberman pinscher 8yr F



CLINICAL SIGNS OF HYPOTHYROIDISM

- **Common signs:** lethargy, weight gain, alopecia, pyoderma, seborrhoea
- **Uncommon signs:** neuromuscular signs, female infertility, myxoedema, ocular disorders, congenital hypothyroidism
- **Unknown:** male infertility, coagulopathies, cardiovascular disorders, gastrointestinal disorders, behavioural disorders



AUTOIMMUNE POLYGLANDULAR SYNDROMES

- Hypothyroidism and diabetes mellitus
- Hypothyroidism and hypoadrenocorticism
- Hypothyroidism, hypoadrenocorticism and diabetes mellitus
- Hypothyroidism, hypoadrenocorticism, diabetes mellitus and hypoparathyroidism



LABORATORY FINDINGS IN HYPOTHYROIDISM

- Mild normocytic, normochromic, non-regenerative anaemia
- Raised cholesterol > 8 mmol/l
- Mild to moderate increase in ALT, AST, ALP and CK
- Reduced T4 concentrations - but often unreliable

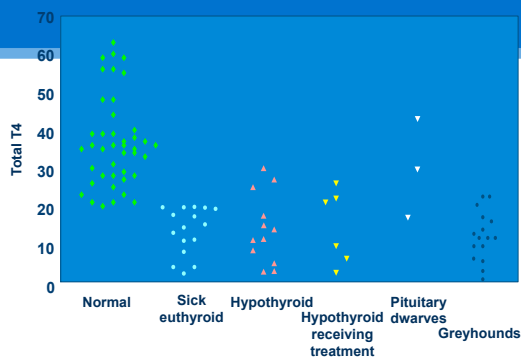
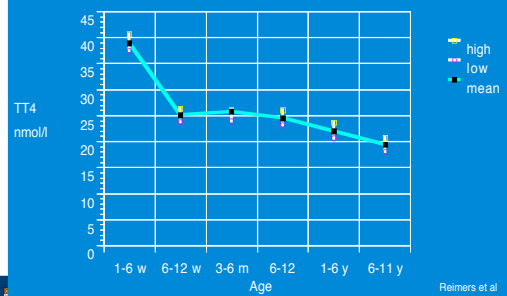
DIAGNOSIS OF HYPOTHYROIDISM

- Total T4 / Free T4
- Total T3 / Free T3
- Thyroid autoantibodies (TgAA, T4AA, T3AA)
- Total reverse T3
- TSH / TRH stimulation test
- Endogenous TSH concentration
- Predictive formulae
- Thyroid biopsy

FACTORS AFFECTING THYROID FUNCTION

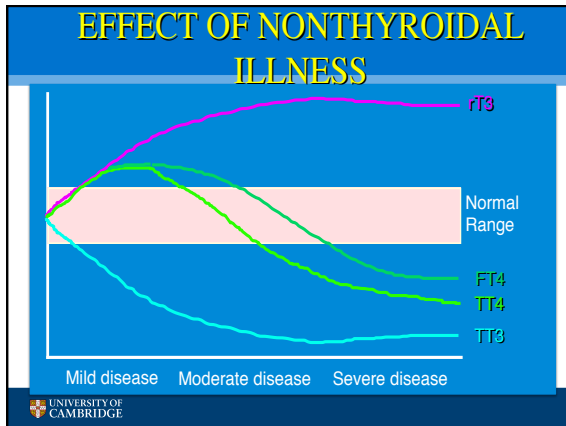
- Age
- Breed
- Non-thyroidal illness
- Certain drugs

EFFECT OF AGE ON TT4 CONCENTRATIONS

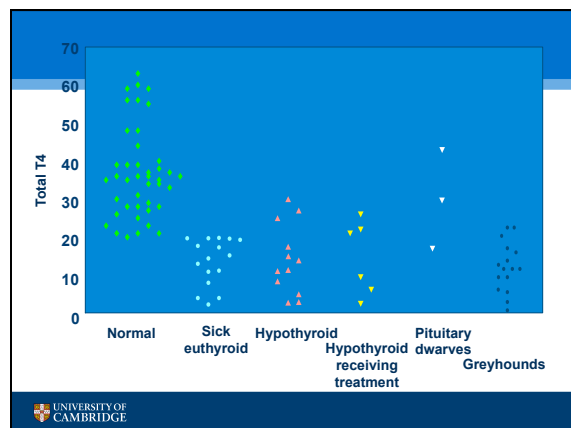
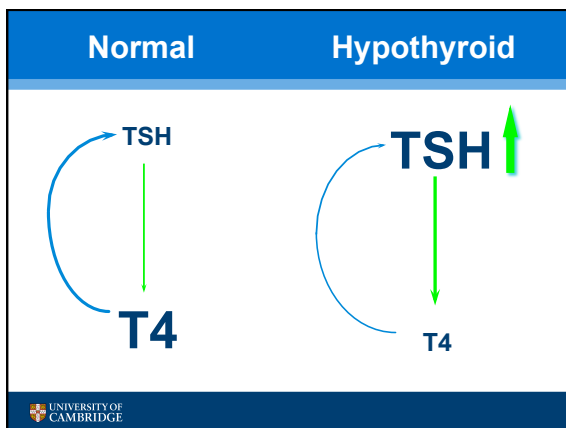
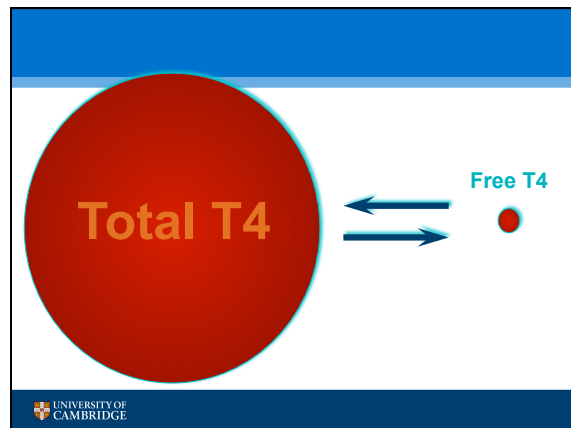
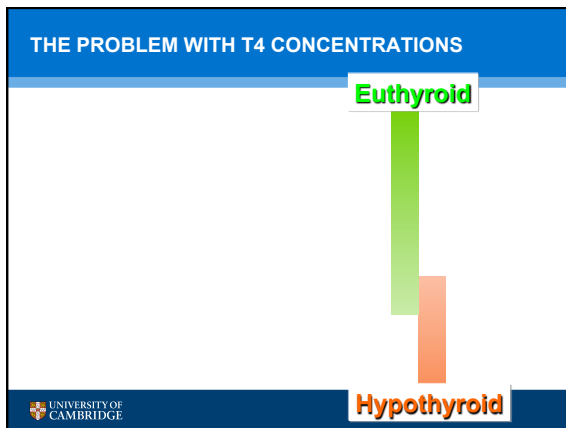


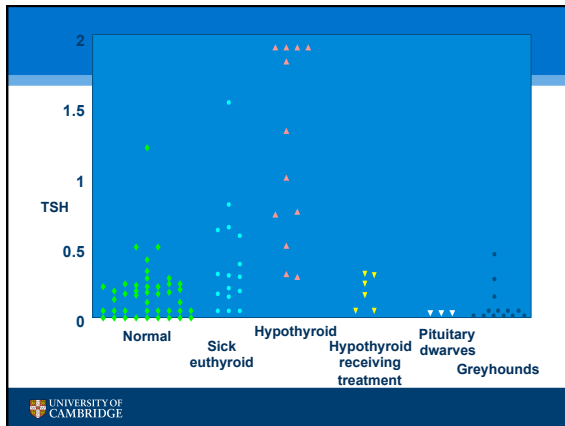
CAUSES OF NON-THYROIDAL ILLNESS

- Caloric protein deprivation
- Surgery/anaesthesia
- Debilitating disease for example:
 - Diabetes mellitus, hyperadrenocorticism, hypoadrenocorticism, renal failure, liver disease, pyoderma



- ### DRUG-INDUCED SUPPRESSION OF THYROID HORMONES
- Glucocorticoids
 - Phenobarbitone
 - Phenytoin
 - Flunixin
 - Salicylates
 - Phenylbutazone
 - Sulphonamides
 - Frusemide
 - Anabolic steroids
 - Fatty acids
 - Ipodate
 - Anaesthetic agents
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THYROID HORMONES IN GREYHOUNDS

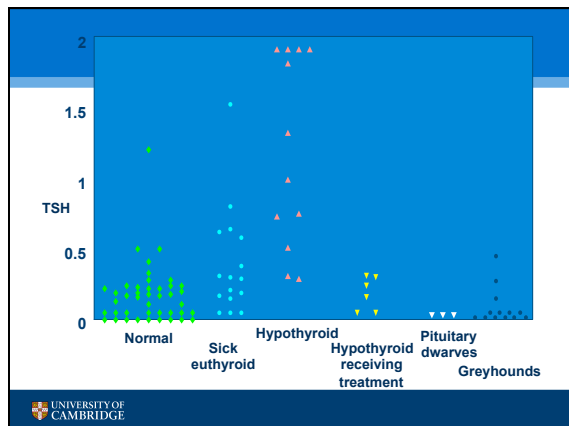
- Pet dogs n = 20
- Greyhounds
 - oestrus suppression n = 37
 - racing (kennels) n = 51
 - non-racing (pets) n = 10
- T4, fT4, TSH stimulation, TRH stimulation
- cTSH not measured

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CONCLUSIONS

- Greyhounds have lower T4 concentrations
 - pet dog total T4 = 25 nmol/l
 - greyhounds total T4 = 14 nmol/l
- Oestrus suppression does not affect T4 concentrations
 - Female greyhounds have slightly higher T4 concentrations
- TSH stimulation produces a greater increase in T4 concentrations in pet dogs
 - post TSH in pet dogs = 66 nmol/l
 - post TSH in greyhounds = 40 nmol/l

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CAUSES OR HIGH cTSH

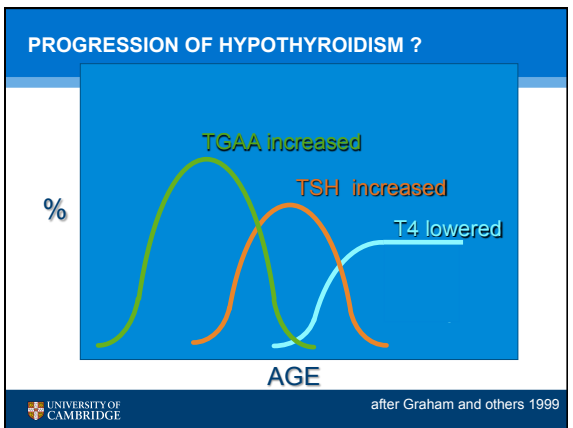
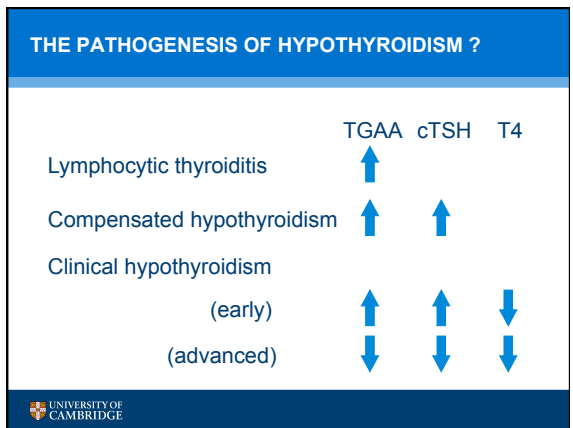
- Hypothyroidism
- Recovery from non-thyroidal illness
- Sulphonamide therapy
- Other causes

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SERUM THYROGLOBULIN AUTOANTIBODIES

- Thought to correlate with lymphocytic thyroiditis
- TgAA detected in 34-59% of hypothyroid dogs
- TgAA detected in 85% of dogs with lymphocytic thyroiditis, but 0% with thyroid atrophy.
- 14% of euthyroid dogs and 43% dogs with non-thyroidal illness have TgAA

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TREATMENT OF HYPOTHYROIDISM

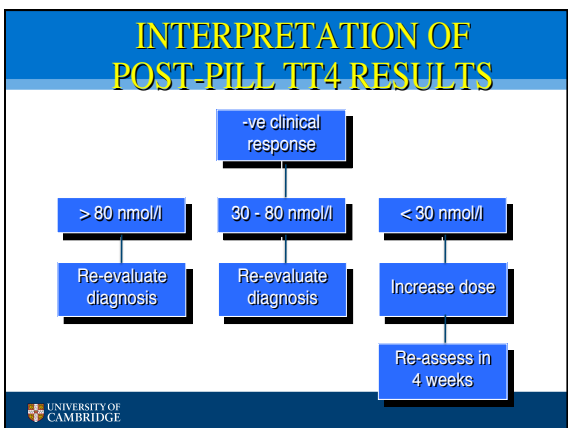
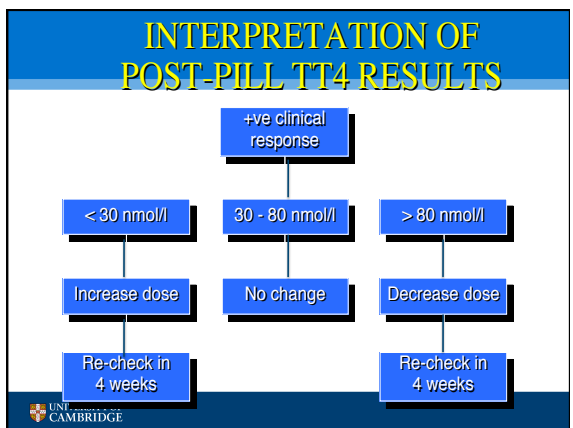
- L-thyroxine (Soloxine®, Leventa®, Thyforon®)
 - 20 mcg/kg twice daily
- L-triiodothyronine (Tertroxin®)
 - 4 - 6 mcg three times daily

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MONITORING THYROID SUPPLEMENTATION


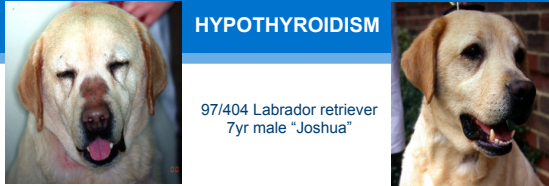
- Evaluate clinical response after 6 to 8 weeks
- Measure total T4 concentration 4 - 6 hours post-pill
- Measure total T4 concentration pre-pill, if therapy is SID

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HYPOTHYROIDISM

97/404 Labrador retriever
Tyr male "Joshua"



Post thyroid supplementation

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ANY QUESTIONS?



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