

# THYROIDPHYSIOLOGY & CONCEPTS RELATED TO THYROID HEALTH

Dr. Tara Rasta DC

# Who am I ?

- ▶ B.S from UCLA in Psychobiology & Neuroscience
- ▶ Doctor of chiropractic from LACC
- ▶ Functional Medicine program from LACC
- ▶ Functional Medicine program from FMU
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- ▶ Practice In Anaheim, CA

# Prevalence of thyroid disorder in USA

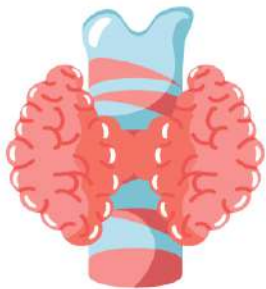
Prevalence of Thyroid disorder in US 2002	Prevalence of thyroid disorder in the world
Hypothyroidism 10,620,000	More than 20 million
Hyperthyroidism 1435000	More than 15 million



**Hypothalamus**  
**Dopamine & serotonin**  
**regulate endocrine output**  
**Thyroid-tropin Releasing**  
**Hormone ( TRH)**



**Pituitary gland**  
**releases**  
**TSH ( 1.8-3)**  
**activates Thyroid**  
**peroxidase to make**  
**T3 & T4**



**I + Tyrosine + TPO**  
**T3 (7%) & T4 (93%)**  
**6-12 VS 100-180**  
**Attached to T-Binding globulin**  
**( globulin proteins come from**  
**liver)**  
**T3 uptake: how well the thyroid**  
**hormones can bind to globulins.**

# Thyroid Physiology

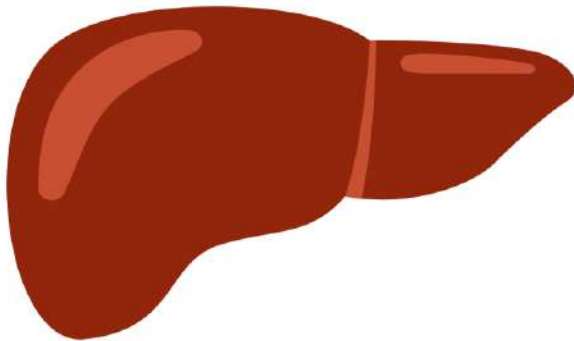
**T4---->T3**

**Majority of conversion happens in liver  
via enzyme 5'-deiodinase**

**40% to available T4**

**20% reverse T3**

**20% T3 Sulphate & T3 acetic acid which  
are inactive**



**Liver**

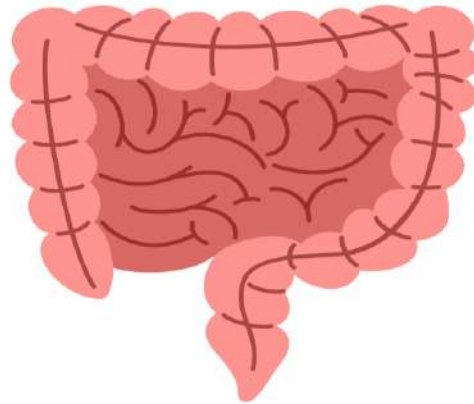
**biotransformation**

**selenium**

**iron**

**serotonin**

**dopamine**



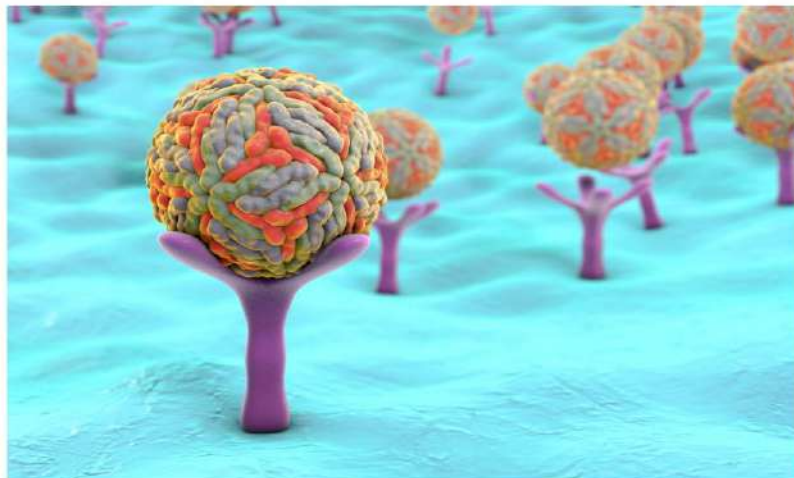
**Gut microbiome**

**turns inactive T3-->**

**T4**

# Thyroid Physiology

**The receptor site of thyroid hormones:**  
**TR-alpha 1-in cardiac and skeletal  
muscles**  
**TR-Beta 1-expressed in liver, kidney  
and brain**  
**TR-Beta 2-hypothalamus and pitutary**



# Thyroid hormones & receptors

- ▶ Intracellular transduction : A series of biochemical reactions that need to happen in order for the thyroid hormone to bind to the receptors.
- ▶ The following interfere with intracellular transduction of thyroid hormones
  - ❑ **Homocysteine** ( Increased in patients taking antacids, contraceptive, estrogen, patients with H.Pylori or other infections, Heart disease)
  - ❑ **Vitamin A deficiency** ( Most common complaint is difficulty with night not related to astigmatism )
  - ❑ **Elevation of Cytokines** ( Food sensitivities, autoimmune disease, gas and bloating, leaky gut symptoms, IBS, Ulcerative colitis)
  - ❑ **Elevation of cortisol** ( anxiety, too much stress, infection)

# Thyroid hormones as free or bound

Protein Bound (99%)	Free (0.03%)
Thyroxine binding protein (TBP) OR Thyroxine binding prealbumin (TBPA) Or Thyroxine binding paraalbumin	Free fraction T3
TRANSTHYRETIN (TTR)	Free fraction T4



# Which hormones have an impact on metabolism?

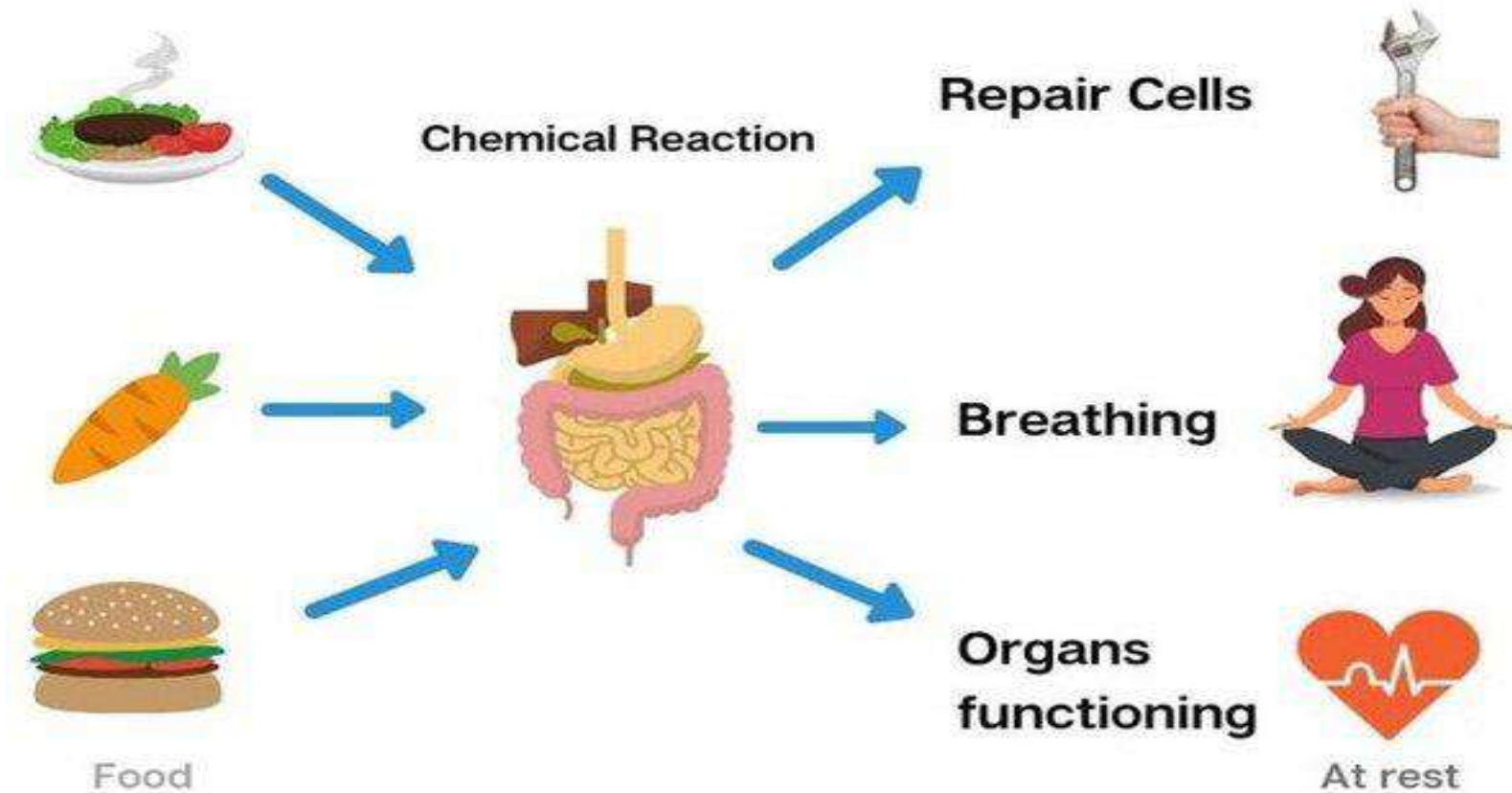
- ▶ **Free fraction hormones are** the only ones that **can bind to receptors**
- ▶ Hormones are bound to proteins so they can be transferred to peripheral tissues.
- ▶ Protein bound T3 & T4 are accurate markers for quantity of thyroid hormone the gland is producing.
- ▶ Free T3 & T4 are more accurate for quantity of thyroid hormones that can bind to the receptor sites.

# Basic Functions of Thyroid gland

- ▶ Basal metabolic rate ( Energy released at rest for functioning of vital organs).
- ▶ Protein synthesis
- ▶ Body's sensitivity to catecholamines ( Dopamine & norepinephrine)
- ▶ Development and differentiation of human cells ( Healing)
- ▶ Mitochondria & ATP production
- ▶ All human tissues such as heart, brain, bone and muscles have thyroid receptors.
- ▶ Brain development
- ▶ Immune system

# What is the function of thyroid gland ?

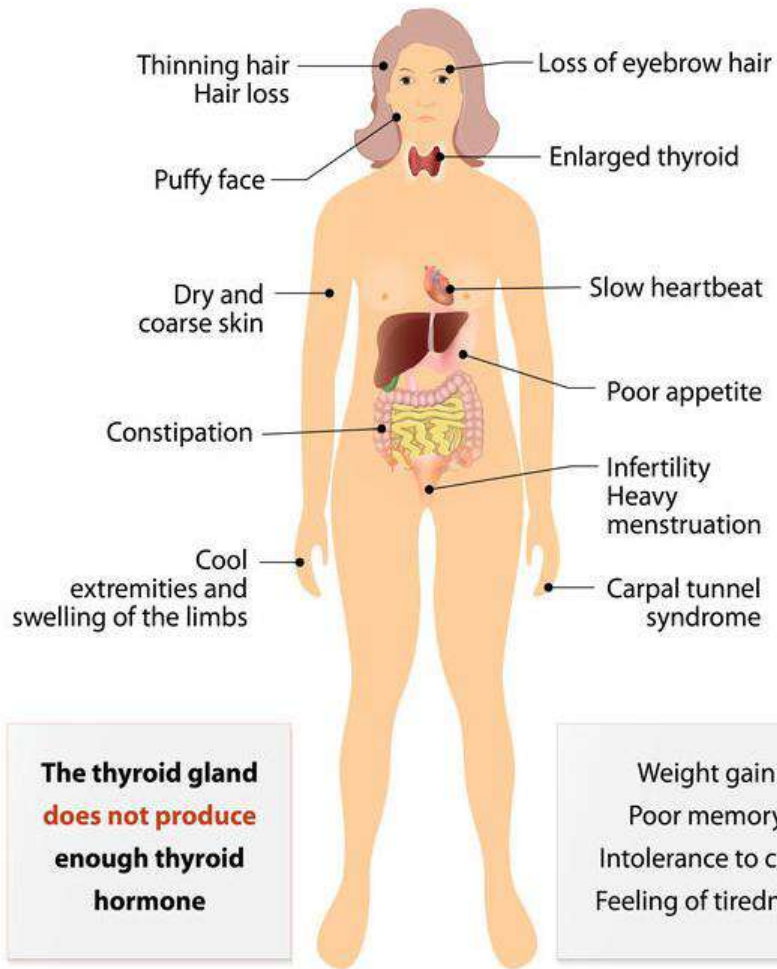
## Basal Metabolic Rate



# How to evaluate the thyroid gland

- ▶ History: symptoms, Past history & family history, medications, supplements and outcome
- ▶ Physical examination: general inspection ( hand & neck), neck palpation, eye examination, neurological examination, tibial examination
- ▶ Laboratory test ( TSH, Total T3 & T4, FREE T3 & T4, TPO AB, TGB AB, REVERSE T3, T3 UPTAKE, homocysteine, CRP, liver and kidney panel, HA1C, CBC & FERRITIN)
- ▶ Diagnostic studies: ultrasound, radioactive iodine uptake, free-needle aspiration
- ▶ Pathological disorders: autoimmune , thyroiditis, euthyroid sick syndrome, goiter, thyroglossal cyst, cancer, chondroma, hypothyroidism, hyperthyroidism or grave's disease

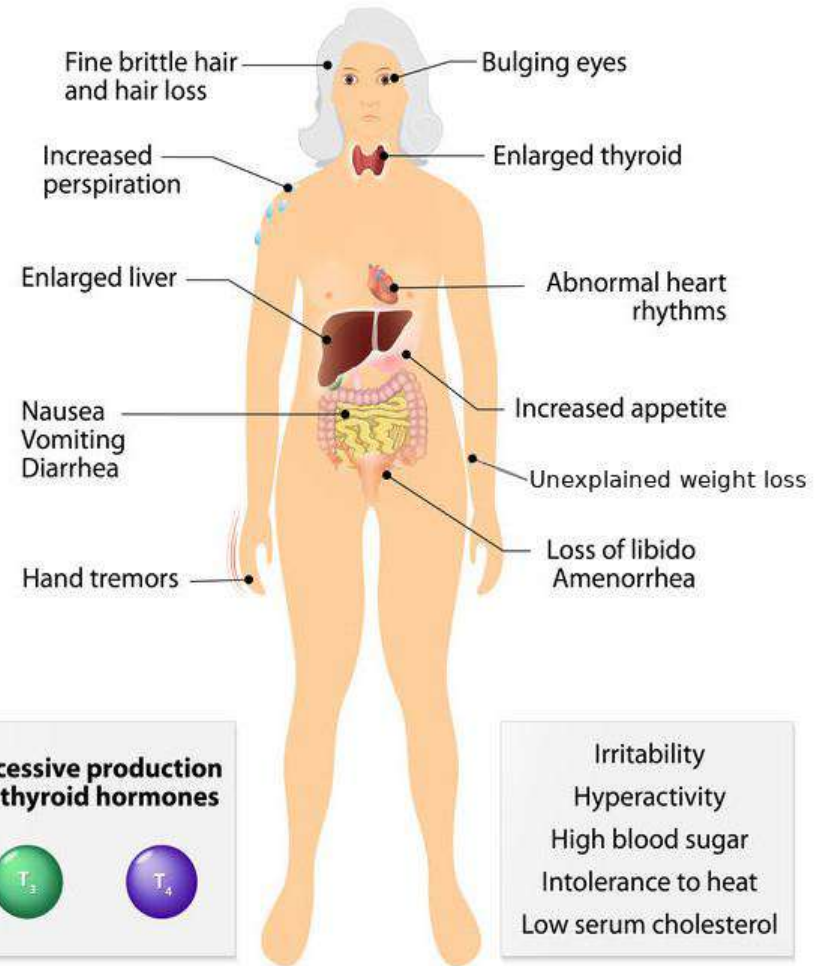
## Symptoms of HYPOTHYROIDISM



The thyroid gland **does not produce enough thyroid hormone**

Weight gain  
Poor memory  
Intolerance to cold  
Feeling of tiredness

## Symptoms of HYPERTHYROIDISM



**Excessive production of thyroid hormones**



Irritability  
Hyperactivity  
High blood sugar  
Intolerance to heat  
Low serum cholesterol

# Thyroid Disorders

Hypothyroidism	Hashimoto ( Autoimmune)	Graves' disease ( Autoimmune)	Hyperthyroidism
Elevated TSH	Tg Antibodies	Thyroid receptors Antibodies	Suppressed TSH
	TPO antibodies	TPO Antibodies	
	Normal TSH, elevated or increased	Tg Antibodies Supressed TSH ' Elevated thyroid hormones	

# What happens in the state of hypofunction?

- ▶ Decreased metabolic rate
- ▶ Decreased motivation and muscle activity, poor muscle endurance, slow heart rate and gastrointestinal mobility, bone loss.



## Myxedema signs & symptoms

- ▶ Myxedema: jelly-like infiltrations in subcutaneous tissue, skin thickening, non-pitting edema, eye puffiness.
- ▶ Found on tibia or face, which is called pretibial myxedema or facial myxedema.





## Acropachy:

- ▶ Characterized by soft tissue swelling and periosteal bone formation, which usually causes clubbing in the fingers, toes and lower extremities.



# Onycholysis ( Plummer's nails)



- ▶ a loosening of the exposed part of the nail from the nail bed, usually beginning at the free edge and continuing to the lunula.



# Palmar and plantar Erythema

- ▶ A reddening of the skin on the plantar aspect of the hands, usually over the hypothenar eminence. It can also be found in the soles of the feet.

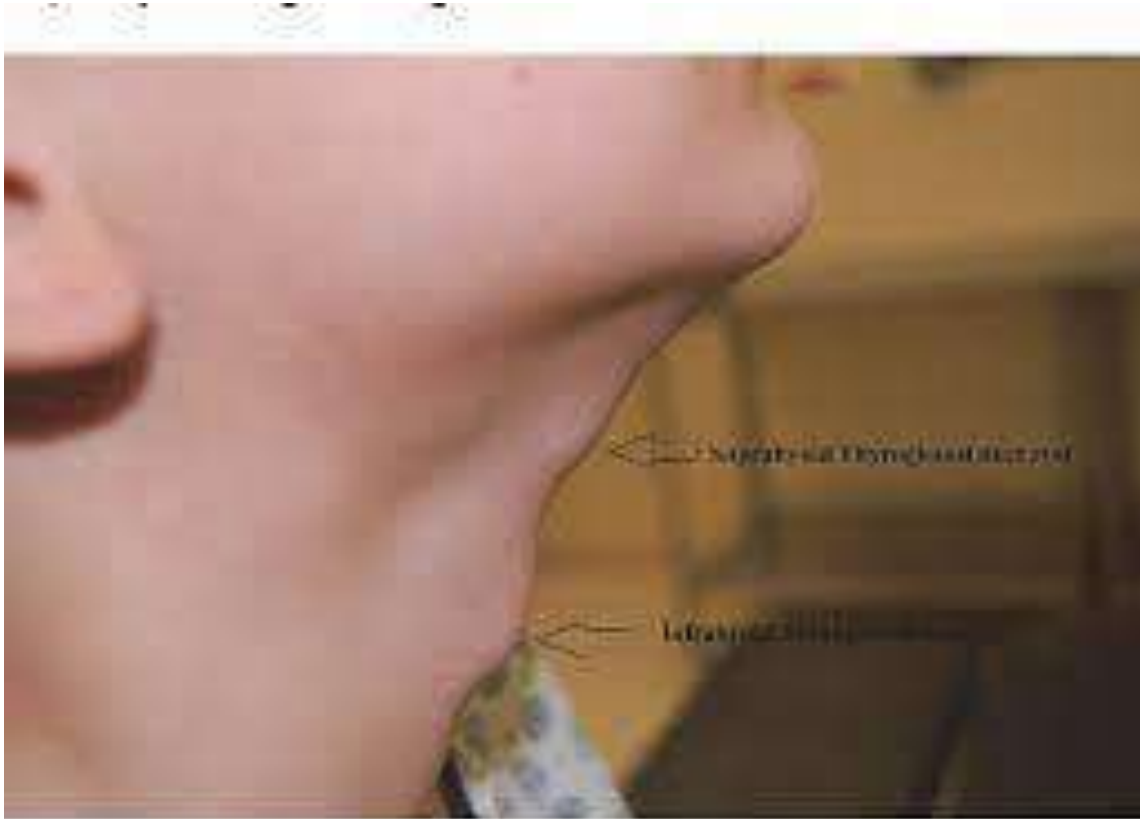


Figure 1. Double thyroglossal cyst in children

## Thyroglossal cyst

- ▶ A fibrous cyst that forms from persistent thyroglossal duct during embryological development.

# Proptosis & Exophthalmos

- ▶ A bulging of the eye anteriorly out of the orbit. It can be unilateral or bilateral.



# Diplopia

- ▶ Commonly known as double vision or simultaneous perception of two images of a single object.



## Lid Lag (Graef's sign)



- ▶ A condition in which eyelid movement is delayed when the eye moves downward. Have a patient track a finger downward while observing for synchronous eye lid and eye movements.



## Dalrymple's sign

Abnormal wideness of the eyelid opening or eyelid spasm.



# Stellwag's sign & Rosenbach's sign

- ▶ Rare blinking due to excessive contractions of the eyelids. Patients appear that they are always staring because they are not blinking
- ▶ Tremor of the eyelids caused by excessive contractions of the levator palpebral muscle. Have patients close their eyes and see if there are any movements of the eyelids.



*Figure 3*

## Jellinek's sign

Hyperpigmentation of the eyelids

# The two common thyroid disorders

Hyperthyroidism	Hypothyroidism
Swollen fingers/around eyes	Puffy eyes and swelling of facial tissue
Purple lesions on shins	Enlarged thyroid ( Palpation)
Goiter ( enlarged thyroid)	Weight gain
Bulging of the eye	Depression/poor memory & mental fatigue
Anxiety /irritability /restlessness	Low energy
Sweaty palms	Dry. Brittle hair/hair loss
Hyperpigmentation of eyelids	Dry skin
Muscle wasting/lack of endurance	Poor muscle endurance
Restless body movements /tremor of hands or eyes	General lethargy
Heat intolerance/high heart rate	Cold intolerance
Diarrhea	constipation

# General appearances of hyper & Hypo patients

Hyperthyroidism	Hypothyroidism
Swollen fingers	Non-consistent and yellowish skin pores
Clubbing of finger nails	swelling in the face
Purple lesions of shins	Deep voice
Exophthalmus/diplopia, lidlag, Dalrymple's sign, Rosenbach's sign	Normal eyes with puffiness
Goiter	Goiter
Normal body weight with potential muscle wasting	Obesity

# Psychological findings in Hypo & Hyperthyroid patients

Hyperthyroid	Hypothyroid
Irritability & anxiety	Depression
restlessness	Poor mental endurance and brain function
Malaise	Poor memory and loss of alertness
Excessive appetite	Loss of appetite

# Musculoskeletal findings

Hyperthyroid	Hypothyroid
Muscle wasting	Muscle weakness and poor endurance
Muscle weakness and poor muscle endurance	General lathargy
Restless body movements	Carpal tunnel syndrome ( deposition of mucopolysachrides on the median nerve) or swelling of tendons
Tremor of hands or eyelids	
Exophthalmos	

# Dermatological findings

Hyperthyroid	Hypothyroid
Onycholysis	Dry & brittle hair
Palmaer and plantar erythema	Alopecia
Facial or pretibial myxedema	Dry, coarse hair
Oily skin	Dry skin
Hyperpigmentation of eyelids	Swelling and puffiness around eyes

# Neurological findings

Hyperthyroid	Hypothyroid
Excessive activity of levator palpebral muscle	Dropping of the eyelids (ptosis)
Tremors of the hands	Slow deep tendon reflexes
Overactive deep tendon reflexes	Ataxia and coordination difficulty
Diplopia	

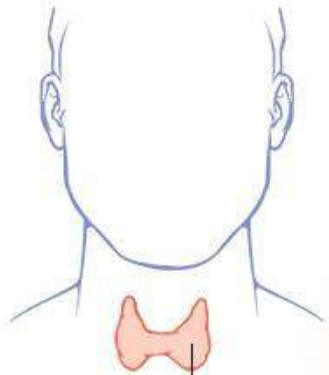


# Gastro-intestinal findings

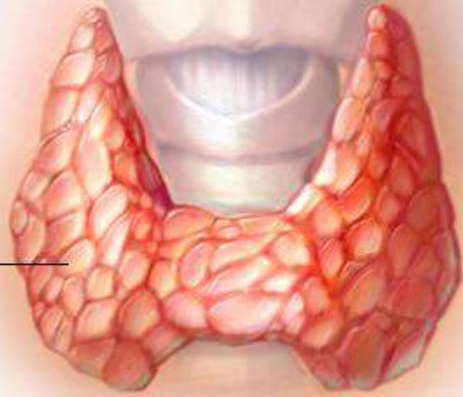
Hyper	Hypo
Diarrhea	Constipation
Vomiting	Candida syndrome
Excessive bowel frequency	Malabsorption and malnutrition

# Physical examination

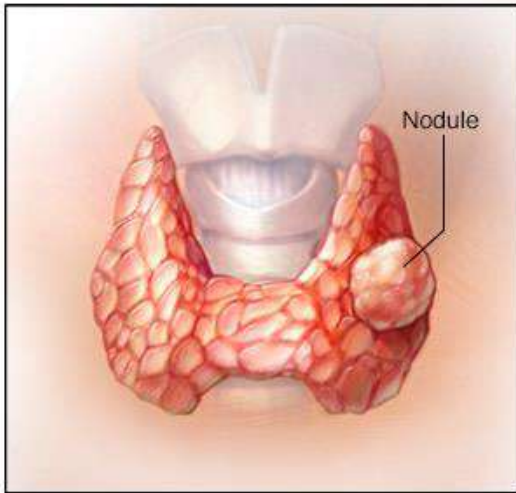
- ▶ General inspection ( their weight, anxious or agitated, muscle mass, facial swelling, hair thinning or loss, loss of the outer third of the eyebrows)
- ▶ Hand inspection ( clubbing of nails, onycholysis, palmar erythema, sweaty or dry palms, does the pulse show tachycardia)
- ▶ Neck inspection & palpation ( goiter, have patient swallow to see if there are any masses and palpate)
- ▶ Eye examination ( perform cardinal fields to see if there is any diplopa, lidlag, or see if there is any exophthalmos)
- ▶ Motor examination ( DTR) & Muscle test
- ▶ Auscultation ( listen for Bruit) Abnormal and often harsh sound heard with stethoscope over the blood vessels, usually an artery.



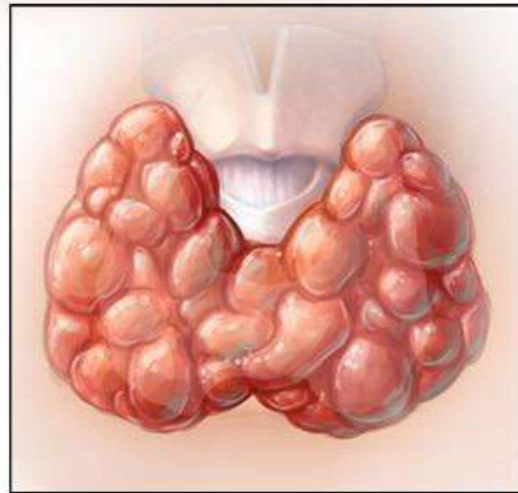
Normal thyroid gland



# Thyroid Enlargement



Thyroid with single nodule



Thyroid with multiple nodules  
(Multi-nodular goiter)



# Diffuse Enlargement



# Multi- Nodular Enlargement



# Solitary Nodule enlargement

# Thyroid Enlargement classification

Diffuse enlargement	Multinodular	Solitary nodule enlargement
Hypothyroidism	Multinodular goiter	Solitary nodule goiter
Hashimoto		Colloid cyst
Iodine deficiency		Adenoma
Grave's disease		Carcinoma
Thyroiditis		
Anaplastic carcinoma		

# Thyroid disorders

Euthyroid Sick syndrome	Subacute Granulomatous Thyroiditis	Suppurative Thyroiditis	Radiation-induced Thyroiditis
<p>Abnormal finding on a thyroid function test in the absence of hypothalamic-pituitary and thyroid gland dysfunction.</p>	<p>Painful and swollen throat, low grade fever, laryngitis and myalgia. A viral illness that invades the thyroid gland.</p>	<p>Rare form of thyroiditis caused by bacterial infection (strep)</p>	<p>Typically seen in hyperthyroid patients who are being treated by radioactive iodine therapy to manage hyperthyroidism.</p>
<p>Cytokine dysregulation, excess or inhibition of thyroid binding proteins, deiodination, inhibition of thyroid releasing hormones, and TSH. Leaky gut syndrome, heart, kidney or metabolic disorders.</p>	<p>Majority develop hypothyroidism and need medication. Lab high WBC, Tg, ESR, CRP. TSH may be normal or not. Generally aspirin or ibuprofen is given and if not resolved prednisone. It is</p>	<p>Fever &amp; dysphagia, dysphonia. Elevated CRP, WBC, ESR &amp; Tg. TSH may be normal or not. Conventional treatment is IV antibiotics.</p>	<p>Appears as pain in the thyroid and increased hyperthyroid symptoms post therapy .</p>



# Thyroid disorders

Trauma induced	Post-partum thyroiditis	Sub-acute lymphocytic Thyroiditis	Drug induced thyroiditis
<p>Significant trauma to the thyroid gland such as being punched in the neck or being hit by a baseball or seatbelt restrain</p>	<p>Autoimmune process that causes the thyroid gland to enlarge with hyperthyroid symptoms It starts with hyperthyroidism and hypothyroid could occur in 6-8 months post-partum</p>	<p>Autoimmune process that usually starts with a goiter, hyperthyroid responses, and is painless. Positive thyroid antibodies You can only differentiate from hashimoto via FNA biopsy.</p>	<p>Certain medications in the presence of autoimmune thyroid physiology may promote thyroiditis due to their impact of up regulating the immune response. (amiodarone, interferon, long term treatment of lithium for manic depression)</p>
<p>Bruise must be present to diagnose</p>	<p>Elevated antibodies</p>		

# Thyroid Goiters

Multi-nodular goiter	Diffuse goiter	Nontoxic goiter	Toxic goiter
Palpable thyroid nodules that are often benign colloid nodules	Diffuse enlargement of the thyroid gland that can be toxic or nontoxic depending on the changes in the thyroid hormones	Enlargement of the thyroid that is not associated with changes in the thyroid hormones or malignancy.	The thyroid gland is enlarged and causes excess thyroid hormone production which causes accelerated body metabolism.
It can be toxic or non-toxic but they are often non-toxic Caused by malnutrition, medication and defects in hormones	Non-toxic is a simple enlargement of the thyroid gland without changing the hormones. Causes: lack of iodine or inflammation or pregnancy because of HCG, or increased TSH. If patient has changes in their basal metabolic activity then the goiter may	The thyroid becomes enlarged due to increased TSH. In other places it is due to iodine deficiency and in US is due to defect in normal thyroid synthesis.	Grave Toxic adenoma Toxic nodular goiter  This usually presents as a single nodule  Often due to iodine deficiency but once this issue develops iodine supplementation will make

# Thyroid Cysts

Thyroglossal cysts	Chondroma	Dermoid cyst
A fibrous cyst that forms from persistent thyroglossal duct during embryological development and appears as a lump in the midline of the neck	Benign cartilaginous tumor	Bening cystic teratoma
It is a palpable lump below the hyoid bone	Palpable	Most likely palpable
The mass moves during swallowing	Mass over the thyroid that does not move during swallowing.	Mass over thyroid that does not move during swallowing
The tract can lie dormant until something stimulates it to cystic dilation		

# Thyroid cancers

Papillary Thyroid cancer	Follicular Thyroid cancer	Medullary Thyroid cancer	Anaplastic Thyroid cancer
Dominant solitary nodule	Dominant solitary nodule	Dominant solitary nodule	Dominant solitary nodule
Normal thyroid panel unless it has metastasis is in the thyroid cells that is producing hyperfunction	Normal thyroid panel unless it has metastasis is in the thyroid cells that is producing hyperfunction	Normal thyroid panel unless it has metastasis is in the thyroid cells that is producing hyperfunction	Normal thyroid panel unless it has metastasis is in the thyroid cells that is producing hyperfunction
Most common of thyroid cancer Ages 30-50 Spreads to lymph nodes in 50% of cases	Spread to lymph nodes is uncommon 10%	Spreads to neck lymph quickly	Rapid growing neck mass Spreads to lymph nodes in 80% Cure rate is very low.

# What lab test should be ordered to determine thyroid health ?

- ▶ Comprehensive blood work
- ▶ TSH ( functional range (1.8-2)
- ▶ FREE T3 (3-4)& T4 (9-24) to know how much of thyroid is available to bind to cell
- ▶ T3 (6-12) & T4 (100-180) to know how much thyroid hormone is being produced
- ▶ T3 uptake
- ▶ Reverse T3
- ▶ TPO & Thyroglobulin Antibodies
- ▶ Thyroid Receptor Antibodies

# What are the factors that disturb thyroid physiology?

- ❑ Autoimmunity
- ❑ Immune-activated cytokines
- ❑ Hormones
- ❑ Environmental/nutritional compounds
- ❑ Medications


# Thyroid and the immune system

- ▶ T CELLS & B CELLS
- ▶ Cellular apoptosis
- ▶ Cytokine release ( TH1, INF, IL-2, TNF) Pro-inflammatory cytokines OR TH2 (IL-4, IL-5, IL-6, IL-10 & IL-13) anti-inflammatory cytokines

# Thyroid hormones and inflammation

- ▶ Decreased thyroid hormones causes abnormal natural killer cells activity and increases inflammatory receptor density in T-cells which leads to systemic inflammation

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> [Int Immunopharmacol.](#) 2007 Dec 15;7(13):1747-54.  
doi: 10.1016/j.intimp.2007.09.015. Epub 2007 Oct 5.

**Inhibitory effects of thyroxine on cytokine production by T cells in mice**

[Chengfang Yao](#)<sup>1</sup>, [Jian Zhang](#), [Li Wang](#), [Yuqi Guo](#), [Zhigang Tian](#)

Affiliations + expand

PMID: 17996685  
DOI: [10.1016/j.intimp.2007.09.015](#)

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# Lack of thyroid hormones leads to intestinal permeability or “Leaky gut”

- ▶ Endoscopic examination of gastric ulcers found low T3, LOW T4 & ABNORMAL levels of reverse t3 on gastric ulcerative colitis. (3)

## Effect of thyroid hormones on stress ulcer formation

Ayhan Koyuncu <sup>1</sup>, Semih Aydintu, Saval Koçak, Cengiz Aydın, Seher Demirer, Omer Topçu, Ercüment Kuterdem

Affiliations + expand

PMID: 12269922

DOI: [10.1046/j.1445-2197.2002.02519.x](https://doi.org/10.1046/j.1445-2197.2002.02519.x)

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### Abstract

**Background:** Stress ulcers are gastric mucosal lesions that may cause life-threatening upper gastrointestinal bleeding. Although it is known that hyperthyroid status prevents stress ulcer formation, the effect of thyroid hormones given just as the stress is beginning has not been studied. The aim of this study was to assess the effect of thyroid hormone supplementation on gastric stress ulcers at the beginning of the restraint stress.

**Methods:** Thyroid hormones were administered to rats 2 days before or at the beginning of the restraint stress. The linear length of the gastric mucosal lesions, mucosal pH and thyroid hormone levels were measured and histopathological examinations were carried out.

**Results:** It was found that both triiodothyronin and thyroxin reduce the length and depth of the stress ulcers ( $P < 0.001$ ).



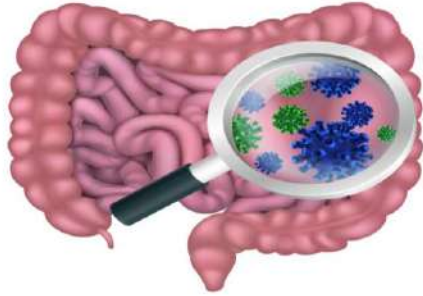
NEXT

# Euthyroid Sick Syndrome or Non-thyroidal Illness.

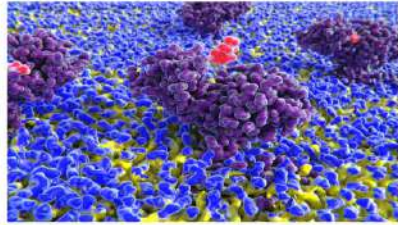
- ▶ **When Inflammatory cytokines have impacted the HTP AXIS.**
- ▶ Because the ranges of TSH is so broad people with this kind of disease will not get the right diagnosis
- ▶ These patients will have normal TSH, yet have thyroid symptoms and will not be properly diagnosed. Most often if patient has. TSH lower than 1.8 with thyroid symptoms, the possibility of this pattern is suggested. Evaluation of (IL-1, TNF, IFN, IL-6) should be considered.

# Cytokines (leaky gut) impact T4→T3 Conversion

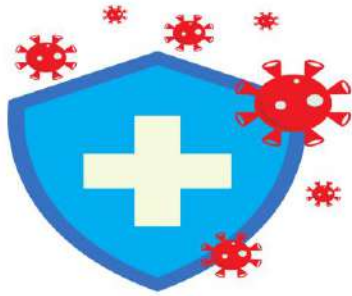
- ▶ Cytokines also downregulate conversion of inactive thyroid to active thyroid (2)
- ▶ A pattern of normal tsh, normal t4 and depressed t3 suggests down regulation of the 5'-deiodinase enzyme.
- ▶ TSH 1.8 -3
- ▶ T4 6-12
- ▶ T3 100-180



**Gram-negative  
bacteria in the gut**



**release of (LPS )**



**LPS BINDS TO Immune  
complexes**

1. **T3 receptor site  
resistance.**
2. **Reduction of T3**
3. **Reduction of TSH**

# The thyroid and Gut connection

- ▶ The lipopolysaccharides released from gram negative bacteria in the gut are endotoxins that can promote secretion of pro-inflammatory cytokines in many cell types.
- ▶ LPS have the potential to decrease TSH, Diminish expression of thyroid receptors, reverse t3 levels, and promote autoimmune thyroid disorders.
- ▶ When treating patients with thyroid issues we must address the gut and inflammation.
- ▶ How do we know they have gut issues? History taking, GI-stool test, Cyrex intestinal permeability test, increase eosinophils in the blood

# Thyroid impacts Immunology

- ▶ Thyroid hormones have an impact in immune cells differentiation and metabolism



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Advanced

> [J Endocrinol](#). 2006 Apr;189(1):45-55. doi: 10.1677/joe.1.06137.

## **Integrative study of hypothalamus-pituitary-thyroid-immune system interaction: thyroid hormone-mediated modulation of lymphocyte activity through the protein kinase C signaling pathway**

[Alicia J Klecha](#)<sup>1</sup>, [Ana M Genaro](#), [Gabriela Gorelik](#),  
[María Laura Barreiro Arcos](#), [Dafne Magalí Silberman](#), [Mariano Schuman](#),  
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PMID: 16614380

DOI: [10.1677/joe.1.06137](#)

# Summery of Thyroid hormones impact on immune system

- ▶ Thyroid hormones have a protective influence on immune system & differentiate immune cells
- ▶ Thyroid hormones improve the intestinal barrier system and prevent against leaky gut syndrome
- ▶ Thyroid hormones module T-cells and B cells activity.
- ▶ Thyroid hormones modulate cytokine release
- ▶ Thyroid hormones dampen the excess of inflammatory cytokine responses in an inflammatory state.

# How can we support the immune system

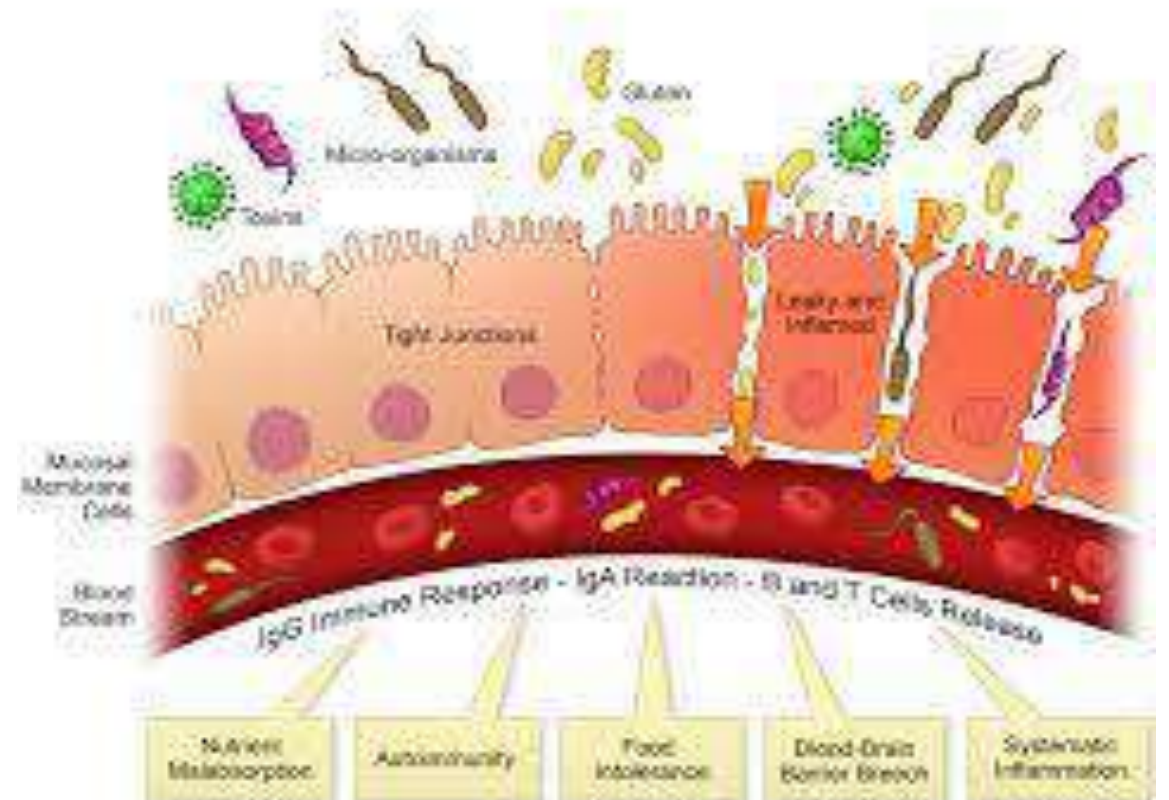
- ▶ Always support the gut first!
- ▶ Elimination diet as a gold standard for food sensitivity
- ▶ KMBO testing or cyrex testing
- ▶ Personalized supplementation to support the organs that need help!





# Address the Leaky gut

- ▶ Eliminate inflammatory foods
- ▶ Repair the intestinal mucosa using nutrition
- ▶ Replenish the good bacteria



# Foods to Avoid

**Remove all potentially irritating foods and potential allergens**

- ▶ **Processed Foods:** including canned, boxed and bottled foods
- ▶ **Sugars:** including corn syrup, molasses, honey, chocolate, candy
- ▶ **High Glycemic Fruits:** like watermelon, mango, pineapple and raisins
- ▶ **All Grains:** including wheat, oats, rice, soy, corn, wheat germ, quinoa etc.
- ▶ **Gluten Containing Compounds:** such as processed salad dressing, ketchup, soy sauce, barbecue sauces, mayonnaise, condiments and modified food starch
- ▶ **Cow's milk products:** including whey, cheeses, creams, yogurt
- ▶ **Soy:** including soy milk, soy sauce, soy protein, etc.
- ▶ **Eggs**
- ▶ **Alcohol:** including beer, wine, etc.
- ▶ **Lectins:** including nuts, beans, soy, potatoes, tomatoes, eggplant, peppers, peanut oil and soy oil

# Foods to eat

- ▶ **Most Vegetables:** except tomatoes, potatoes and mushrooms
- ▶ **Fermented Foods:** like sauerkraut, kimchi, pickled ginger, kombucha tea, homemade coconut yogurt and pickles
- ▶ **Meats:** including fish, chicken, beef, lamb, etc.
- ▶ **Low Glycemic Fruits:** including apricots, plums, apples, peaches, pears, cherries and berries
- ▶ **Coconut:** including fresh coconut, coconut oil, coconut milk
- ▶ **Herbal teas, olives, olive oil**

# Elimination Diet

- ▶ Use elimination diet to figure out what foods they are sensitive to
- ▶ Use food sensitivity testing (KMBO OR CYREX LAB)

## FOOD SENSITIVITY TESTING

Are the "healthy" foods you're eating **sabotaging** your health?

Blueberries



Almonds



Tomatoes



# Use natural substances to treat Gut Pathogens

Yeast/Candida	Parasites	H Pylori
Undecylenic acid	Olive oil leaf extract	Golden Seal Root extract
Caprylic acid	Garlic extract	Oregano oil extract
Cat's claw	Wormwood	Barberry extract
Pau D' Arco	Black Walnut	Oregon grape root extract
		Coptis chinensis extract
		Yerba mansa extract

# Intestinal microbial support:



Saccharomyces Boulardii  
Lactobacillus Sporomgenes  
Lactobacillus Acidophilus  
Arabinogalactin



# Healing the intestinal Mucosa

- ▶ L-Glutamine
- ▶ Licorice
- ▶ Aloe Vera extract
- ▶ Spanish Moss
- ▶ Marshmallow Extract
- ▶ Gamma Oryzanol (Rice bran oil)

## Slippery elm & Chamomile extract

Slippery elm is used for inflammatory bowel disease, heart burn and GERD. it works through coating the membrane.

Chamomile helps with the inflammation in the gut and decreasing the inflammatory cytokines. It also soothes the nervous system.







Helping the  
liver may  
help with  
conversion of  
T3→T4



Milk Thistle is the most-well researched plant in the treatment of liver disease.

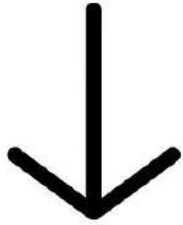
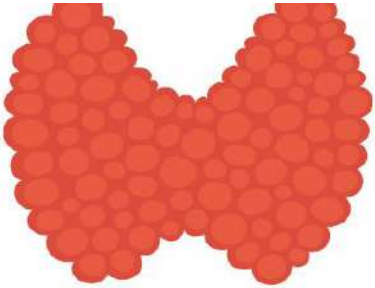
# Ingredients that help with liver biotransformation

- ▶ Vitamin A, C, D, E, Bs
- ▶ Minerals such as calcium, magnesium, zinc, selenium, manganese, chromium, molybdenum, evening primrose oil
- ▶ Inulin
- ▶ Medium chain triglycerides
- ▶ Quercetin
- ▶ Rutin as a powerful antioxidant ( helps the body produce collagen using vitamin C)
- ▶ Jerusalem artichoke



## Impact of the thyroid hormones on the brain

- ▶ **Thyroid hormones modulate microglia and are important for brain development, thus when someone has congenital hypothyroidism their brain does not develop well.**
- ▶ **Hypothyroid patients have cognitive and mood issues**
- ▶ **Thyroid hormones help with healthy brain aging and plasticity**



### **Thyroid hormones support :**

- Neurogenesis
- Cell proliferation
- Dendritic and Axonal growth
- Myelination
- Synaptogenesis (plasticity, healthy brain function and decrease neurodegeneration)

Thyroid hormones have been shown to have a direct influence on the quantity of peripheral serotonin measurements.

Title & authors

 Full text links

## Thyroid hormones, serotonin and mood: of synergy and significance in the adult brain

M Bauer <sup>1</sup>, A Heinz, P C Whybrow

Affiliations + expand

PMID: 11840307

DOI: [10.1038/sj.mp.4000963](https://doi.org/10.1038/sj.mp.4000963)

 Full text links

 Cite

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### Abstract

The use of thyroid hormones as an effective adjunct treatment for affective disorders has been studied over the past three decades and has been confirmed repeatedly. Interaction of the thyroid and monoamine neurotransmitter systems has been suggested as a potential underlying mechanism of action. While catecholamine and thyroid interrelationships have been reviewed in detail, the serotonin system has been relatively neglected. Thus, the goal of this article is to review the literature on the relationships between thyroid hormones and the brain serotonin (5-HT) system, limited to studies in adult humans and adult animals. In humans, neuroendocrine challenge studies in hypothyroid patients have shown a



St. John Wort works as a selective serotonin reuptake inhibitors (SSRI)

**SHOULD NOT BE TAKEN WITH ANTI-DEPRESSANTS**



The seed of  
Griffonia  
contains 5-HTP.

**SHOULD NOT BE  
TAKEN WITH  
ANTI-  
DEPRESSANTS**





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▶ SAME increases serotonin levels and has been shown effective against depression.

[Journal List](#) > [HHS Author Manuscripts](#) > PMC5501081



[J Clin Psychiatry](#). Author manuscript; available in PMC 2017 Dec 1.

PMCID: PMC5501081

*Published in final edited form as:*

NIHMSID: NIHMS82202

[J Clin Psychiatry](#). 2017 Jun; 78(6): e656–e667.

PMID: [28682022](#)

doi: [10.4088/JCP.16r11113](#)

## S-Adenosylmethionine (SAME) for Neuropsychiatric Disorders: A Clinician-Oriented Review of Research

[Anup Sharma](#), MD, PhD,<sup>1</sup> [Patricia Gerbarg](#), MD,<sup>2</sup> [Teodoro Bottiglieri](#), PhD,<sup>3</sup> [Lila Massoumi](#), MD,<sup>4</sup> [Linda L. Carpenter](#), MD,<sup>5</sup> [Helen Lavretsky](#), MD,<sup>6</sup> [Philip R. Muskin](#), MD,<sup>7</sup> [Richard P. Brown](#), MD,<sup>7</sup> and [David Mischoulon](#), MD, PhD<sup>8</sup>

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Thyroid hormone deficiency may lead to acetylcholine depletion and inefficient cholinergic synapse which leads to cerebellar degenerations.

## In vitro effect of thyroxine on cholinergic neurotransmission in rat sympathetic superior cervical ganglion

M E Landa <sup>1</sup>, G González Burgos, D P Cardinali

Affiliations + expand

PMID: 1664498 DOI: [10.1159/000125959](https://doi.org/10.1159/000125959)

### Abstract

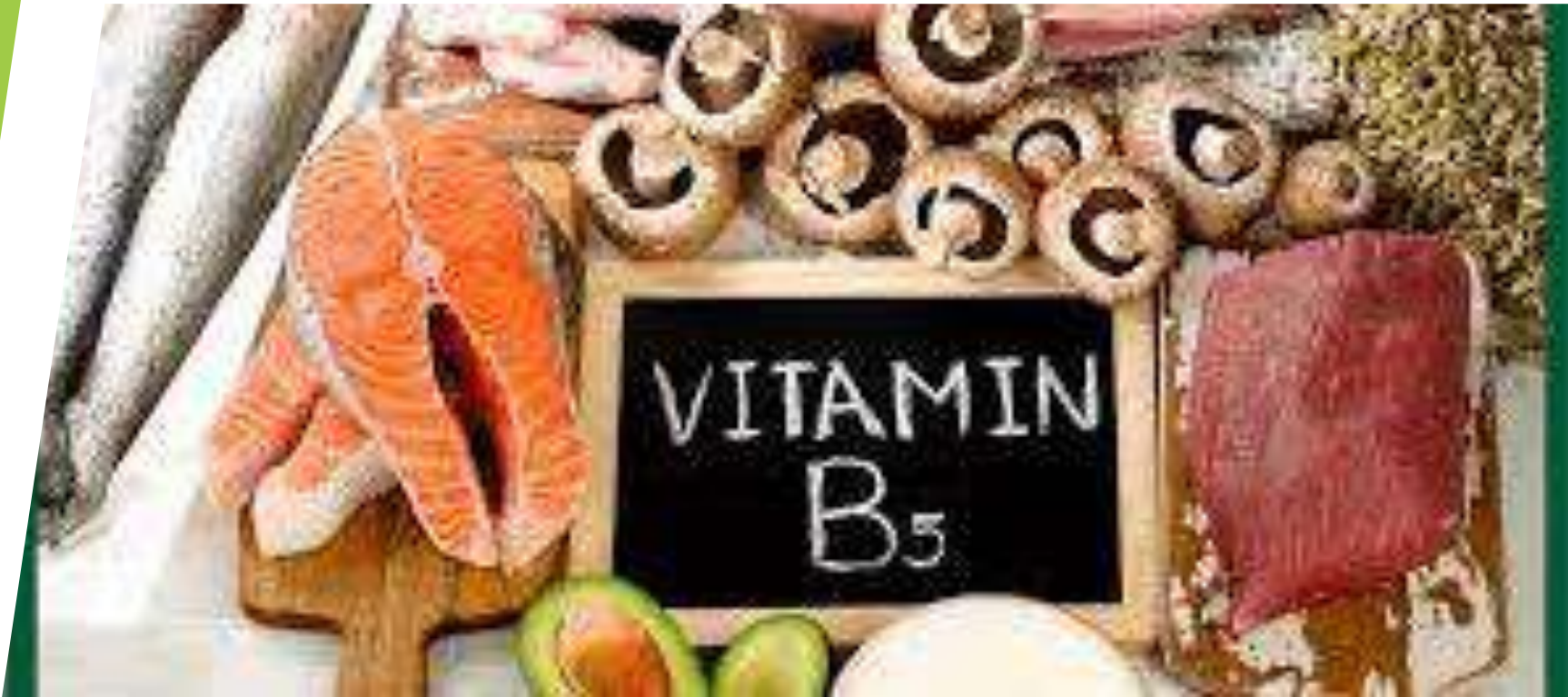
This study aimed at examining the effect of thyroid hormones on cholinergic transmission in isolated rat superior cervical ganglia (SCG). In SCG explants incubated with 3H-choline, thyroxine (T4) and 3,3',5'-triiodothyronine (T3) added to the medium before a second depolarization stimulus of 60 mM K<sup>+</sup> resulted in a dose-dependent increase of S2/S1 ratio for 3H release. The concentration of hormone that produced 50% of maximal increase in K(+)-induced radioactivity release was  $8 \times 10^{-9}$  M for T4 and  $1.6 \times 10^{-8}$  M for T3 while 3,3',5,5'-tetraiodothyroacetic acid was almost ineffective. Preincubation of SCG with  $10^{-7}$  M iopanoic acid for 30 min before S2, although not affecting by itself S2/S1 ratio, effectively prevented the increase given by T4 or T3. 3H-acetylcholine release by SCG was augmented in a high K<sup>+</sup>, and the effect was amplified by T4 to a similar extent as that for total 3H release. When added to the incubation medium together with 60 mM K<sup>+</sup> for 30 min, T4 ( $10^{-7}$  M) increased significantly the activity of choline acetyltransferase (ChAT). T4 did not affect ChAT activity in SCG exposed to 4.7 mM K<sup>+</sup>, nor in SCG homogenates. 3H-choline uptake measured immediately after exposure of SCG to 60 mM K<sup>+</sup> decreased by 25%, whereas it increased by 71% after a subsequent 30-min incubation with 4.7 mM K<sup>+</sup>. Addition of  $10^{-7}$  M T4 prevented the changes in choline uptake observed in a high K<sup>+</sup> medium. These results indicate that T4 increases SCG cholinergic transmission.



Chinese Club moss (*Huperzia Serratta*) it prevents the breakdown of acetylcholine, it also prevents excess glutamate to prevent damaging of brain cells. As a result improves cognition and memory.

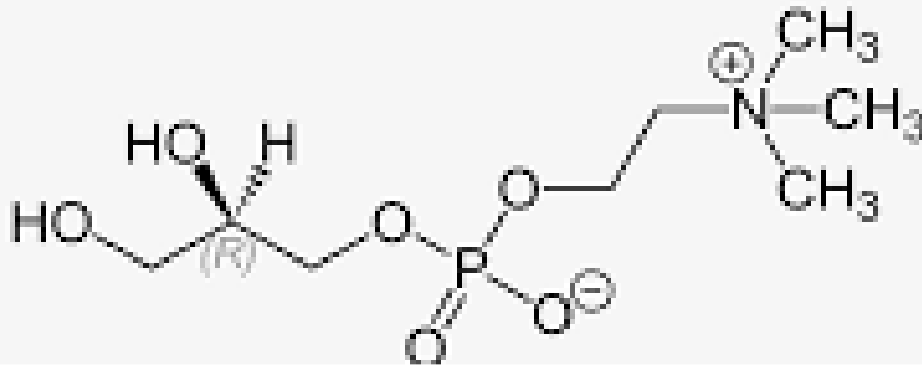


Huperzine-A  
supports brain cell  
mitochondria and  
works as an  
antioxidant and  
prevents the free  
radical damage in  
the brain.



Pantothenic acid as d-calcium Pantothenate is the precursor of acetyl-CoA which is used for synthesis of Acetylcholine and Myelin.

# ALPHA - GPC



A chemical made in the body and laboratory used for dementia. It increases acetylcholine in the brain because it can easily cross the blood brain barrier and it is currently the best cholinergic for increasing plasma and choline levels.

# Acetyl-L-Carnitine

- ▶ It can easily cross the brain blood barrier and increase production of Acetylcholine



> [Neurochem Res.](#) 1990 Jun;15(6):597-601. doi: 10.1007/BF00973749.

## Acetyl-L-carnitine as a precursor of acetylcholine

[H L White](#)<sup>1</sup>, [P W Scates](#)

Affiliations + expand

PMID: 2215852

DOI: [10.1007/BF00973749](#)

“ Cite

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### Abstract

Synthesis of [3H]acetylcholine from [3H]acetyl-L-carnitine was demonstrated in vitro by coupling the enzyme systems choline acetyltransferase and carnitine acetyltransferase. Likewise, both [3H] and [14C] labeled acetylcholine were produced when [3H]acetyl-L-carnitine and D-[U-14C] glucose were incubated with synaptosomal membrane preparations from rat brain. Transfer of the acetyl moiety from acetyl-L-carnitine to acetylcholine was dependent on concentration of

# GABA & Thyroid interactions

- ▶ Increasing and decreasing circulating thyroid hormone levels experimentally in vivo alter density of GABA receptors and benzodiazepines in the brain.

## GABA uptake is inhibited by thyroid hormones: implications for depression

G A Mason, C H Walker, A J Prange Jr, S C Bondy

PMID: 2884685 DOI: [10.1016/0306-4530\(87\)90022-9](https://doi.org/10.1016/0306-4530(87)90022-9)

### Abstract

Studies of the effects of thyroid hormones on the uptake of neurotransmitters by homogenates of rat cerebral cortex have revealed a significant competitive inhibition of neuronal uptake of [3H]GABA by thyroid hormones (T3 greater than T4 greater than rT3). The IC50 for inhibition of GABA uptake by T3 was estimated at 4 microM and that of T4 at 11 microns. GABA uptake in homogenates of cerebral cortex from hypothyroid rats was significantly enhanced over that of controls; however, uptake in tissues from hyperthyroid rats was not significantly diminished.

### Similar articles

[The effects of thyroid hormones on potassium-stimulated release of 3H-GABA by synaptosomes of rat cerebral cortex.](#)

Hashimoto H, Walker CH, Prange AJ Jr, Mason GA.



# Vitamin B6 is a cofactor for synthesis of GABA



Zinc enhances the release of GABA & inhibits the release of Glutamate





L-Taurine is a weak agonist of GABA & intake of it causes inhibition of neuronal excitability.

# Valerian extract



- ▶ Valerian is a medicinal herb that acts via GABA-nergic mechanism and can bind to GABA receptors



# Passion flower



[Phytomedicine](#). Author manuscript; available in PMC 2011 Oct 1. *Published in final edited form as:* [Phytomedicine](#). 2010 Oct; 17(12): 940–949.

Published online 2010 Apr 10. doi: [10.1016/j.phymed.2010.03.002](https://doi.org/10.1016/j.phymed.2010.03.002)

PMCID: PMC2941540 | NIHMSID: NIHMS187812 | PMID: [20382514](https://pubmed.ncbi.nlm.nih.gov/20382514/)

*Passiflora incarnata* L. (Passionflower) extracts elicit GABA currents in hippocampal neurons *in vitro*, and show anxiogenic and anticonvulsant effects *in vivo*, varying with extraction method

[S.-M. Elsas](#),<sup>a,\*</sup> [D. J. Rossi](#),<sup>b</sup> [J. Raber](#),<sup>a,b,c</sup> [G. White](#),<sup>a</sup> [C.-A. Seeley](#),<sup>a</sup>  
[W. L. Gregory](#),<sup>d</sup> [C. Mohr](#),<sup>b</sup> [T. Pfankuch](#),<sup>b</sup> and [A. Soumyanath](#)<sup>a</sup>

# Thyroid hormones modulate the dopaminergic system

## Hypothyroidism alters striatal dopamine release mediated by 3,4-methylenedioxymethamphetamine (MDMA, ecstasy)

[Andrea L Peterson](#)<sup>1</sup>, [Tracy L Gilman](#), [Matthew L Banks](#), [Jon E Sprague](#)

Affiliations + expand

PMID: 16421905 DOI: [10.1002/syn.20244](https://doi.org/10.1002/syn.20244)

### Abstract

Microdialysis cannulas were surgically implanted into the striatum of thyroparathyroidectomized (TX) and sham rats in order to determine differences in dopamine release and core body temperature following MDMA administration. Rats were subsequently treated with MDMA (10 mg/kg, s.c.), and striatal DA levels were monitored at 20 min intervals, as well as core temperature every 30 min. Sham rats responded to MDMA with a characteristic hyperthermic response and significant increases in extracellular dopamine. Conversely, TX rats responded to MDMA with a hypothermic response and failed to demonstrate a similar increase from basal dopamine levels. On the basis of these data, thyroid hormones are not only important in the thermogenic effects of MDMA but also appear to have an auxiliary role in MDMA-induced striatal dopamine release.



Velvet bean has a amino acid called Levodopa that is the precursor of dopamine, it can cross brain blood barrier and enhance dopamine neurotransmission.



Dietary supplementation with blueberry improves the function of dopamine neurons via its flavonoids and phytochemicals.





Studies show low selenium in diet contributes to Parkinson disease, and selenium is required for release of dopamine.

# Thyroid hormones impact endocrine system in males and females

Females	Males
Overian cyst	Decreased LH & FSH which leads to testosterone production and sperm synthesis
FSH ( Follicle maturation) amplification	LH receptor sites become insensitive
Irregular cycle	Increase in cholesterol and LDL
Decreased LH (ovulation)	Alter growth hormones and gonadal function
Progesterone insensitivity receptor sites and increased progesterone levels in blood	Adrenal dysfunction & cortisol activation
Increased adrenal cortex activation	Increased protein breakdown and glucose turnover

# Medications that impact thyroid physiology

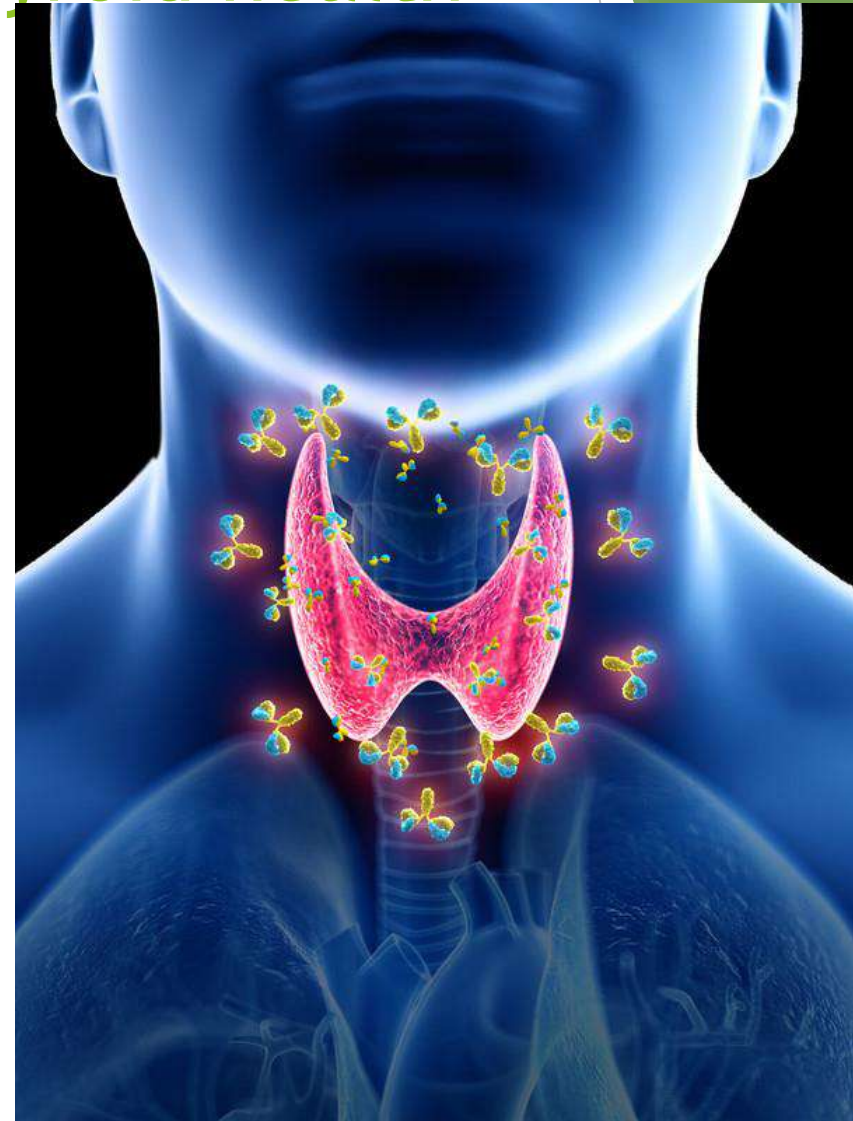
- ▶ Antibiotics
- ▶ Anti-inflammatory agents
- ▶ Hyperthyroid medication
- ▶ Diabetic medication
- ▶ Anti-nausea medication
- ▶ Statins
- ▶ Pain medications
- ▶ Antacids

# Thyroid replacement hormones

- ▶ Synthroid- Synthetic T4 only (contains corn starch) may be too harsh for hashimoto patients
- ▶ Levothroid- Synthetic T4 only-contains food dyes
- ▶ Levoxyl- Synthetic T4 only -contains dyes
- ▶ Unithroid- Synthetic T4 only- contains corn starch
- ▶ Cytomel-Synthetic T3 only - may have starch or gluten
- ▶ Thyrolar- Synthetic fixed ratio of T3:T4- contains corn starch
- ▶ Armour-Bioidentical fixed ratio T3:T4- the most clean
- ▶ Westhroid-Bioidentical fixed ratio of T3:T4- contains lactose
- ▶ Nature-throid-Bioidentical fixed ratio of T3:T4- contains lactose

# Recognizing different parts of thyroid health

- ▶ Gut health and micro-flora ( cleavite, repairvite, sibiotica)
- ▶ Inflammatory cascades ( reservetrol, tumrmeric, glutathione, nitric oxide)
- ▶ Diagnosting testing to find out the WHY ? ( blood, stool, food, chemical testing, SIBOand pathogens)
- ▶ Brain health ( serotonin, acetylcholine, dopamine and Gaba)



# What can we do for our patients with thyroid problems ? Address the root cause

- ▶ Gut issues
- ▶ Inflammation
- ▶ Immune system
- ▶ Stress
- ▶ Spine
- ▶ Malabsorption and malnutrition
- ▶ Circulation

# Case Studies 1

- ▶ Patient presents with hypothyroid symptoms, sugar cravings after food, irritability when meals are missed, fatigue, loss of pleasure in hobbies and interest, feeling overwhelmed with ideas to manage, inner rage, paranoia and depression specially when there is no sunlight, unable to have a restful sleep, feeling much more susceptible to pain.

Lab work shows

TSH = 1.2, T4= 7 CRP= 3 HA1C= 5.5 Glucose= 85

# Case study 1

- ▶ Hypothalamic Paraventricular defect related to deficiency of serotonin
- ▶ Look at dysglycemia/ insulin resistance ( dysglycemia is the most common cause for serotonin deficiency)
- ▶ Consider addressing the gut, enhance serotonin levels via the nutrients we talked about



## Case study 2

- ▶ Patient presents with hypothyroid signs and symptoms, feeling of worthlessness and hopelessness, inability to handle stress, anger and aggression, distracted easily, inability to finish tasks, needs caffeine to feel mentally alert, low libido and loss of temper for minor reasons, sugar cravings and irritability when meals are missed, patient smokes marijuana and drinks alcohol once or twice a week.
- ▶ All thyroid markers are within range with TSH AT 1.8 and T4 AT 5

## CASE STUDY 2

- ▶ Hypothalamic paraventricular defect related to dopamine deficiency
- ▶ Consider diet, nutrition and life style to support sugar metabolism, dopamine levels and methylation.
- ▶ Guidance in decrease use of phone, drugs, video games
- ▶ Look to see if they have methylation issues since that causes issues with dopamine synthesis, make sure to supplement with B12 & glutathione
- ▶ This pattern is more common in people taking HRT & Antacids

## Case 3

- ▶ Patient presents with thyroid symptoms and along with autoimmune symptoms of psoriasis, eczema and food sensitivities. Patient reports that they have been diagnosed with lyme disease few years back.
- ▶ TSH 1.00 T4 10 TPO ANTIBODIES 9

## Case study 3

- ▶ Hypothalamic paraventricular defect due to elevated Cytokines
- ▶ Test cytokines such as IL-2, IL-2, TNF-ALPHA & IL-6
- ▶ IF PATIENT IS STILL INFECTED WITH LYME, OR ANY OTHER BACTERIA OR VIRAL INFECTION THE SOURCE HAS TO BE addressed.
- ▶ Support T cell Function( Vitamin D, EPA &DHA, Glutathione, and super oxide dismutase)
- ▶ Support Th1 pathway with botanicals such as ECHINACEA, ASTARAGLUS, REISHI, AND BETA GLUCANS
- ▶ Support Th-2 Pathways with grape seed extract, pine bark extract, and green tea extract.

## CASE STUDY 4

- ▶ Patient presents with hypothyroid symptoms, food sensitivities, gas and bloating after food, tension headaches and pressure in their throat that comes and goes.
- ▶ TSH = 1.2 T4 = 7 TPO ab= ABOVE 500

## CASE STUDY 4

- ▶ Thyroid imbalance due to autoimmune response/  
Hashimoto
- ▶ Consider addressing the gut, elimination diet,  
support Regulatory T cells, Th1 system & th-2  
System

## Case study 5

- ▶ Patient presents with hypothyroid symptoms, heavy menstrual cycle, infertility or miscarriage, migraines in the second half of their menstrual cycle, depression, menstrual cramps, and has been previously diagnosed with ovarian cyst.
- ▶ TSH= 1.5 T4= 7 TPO ab = 2

## Case study 5

- ▶ Downregulated thyroid peroxidase activity due to progesterone deficiency
- ▶ The most common cause of progesterone deficiency in a female of menstruating age is decrease LH due to high stress and dysglycemia
- ▶ Consider nutrition to support female hormone levels ( vitamin A, D, E, K, B6, B9, B12, B5, Shepherd's purse & chaste tree)
- ▶ Address sugar metabolism
- ▶ Decrease stress
- ▶ Support adrenal function ( Vitamin C, Asian Ginseng extract, Ashwagandha, Holy Basil, & Rhodiola)



## Case Study 6

- ▶ Patient presents with Hyperthyroid symptoms. They reports variety of food sensitivities to gluten, cheese and milk, and sometimes she feels bloated after eating and she can not figure out what food caused it. She also reports of eczema and random itchiness.
- ▶ TSH: 1.2 T4: 5 Tg Ab= 20 TPO Ab= 3

## Case Study 6

- ▶ Hashimoto Thyroiditis
- ▶ Positive Tg Ab suggest Hashimoto.
- ▶ Consider diet & nutrition to support Regulatory T cells (Vitamin D, EPA & DHA, Glutathione, and super oxide dismutase)
- ▶ Support Th1 pathway with botanicals such as
  - ▶ Echinacea, Astaraglus, Reishi, and Beta glucans
- ▶ Support Th-2 Pathways with grape seed extract, pine bark extract, and green tea extract.

## Case Study 7

- ▶ Patient presents with hypothyroid symptoms. The patient seem overweight and reports drinking alcohol regularly. The patient has been diagnosed with liver cirrhosis. Patient also reports difficulty with night vision and when you ask if they have astigmatism, they report they have been checked and they do not have astigmatism.
- ▶ TSH= 1.5 T4=6 Ferritin= 7

## Case Study 7

- ▶ Thyroid resistance due to Vitamin A deficiency
- ▶ Vitamin A is required for Thyroid hormone binding to the Thyroid receptors.
- ▶ Always consider Vitamin A deficiency in anemic patients
- ▶ The key clinical symptoms is difficulty with night vision not related to astigmatism
- ▶ Consider Vitamin A and liver detox protocols

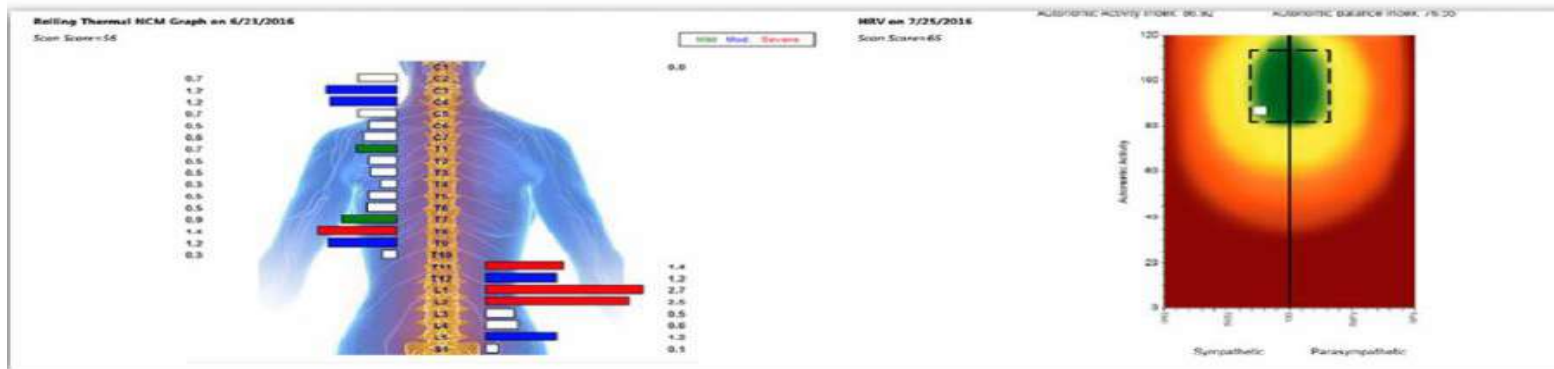
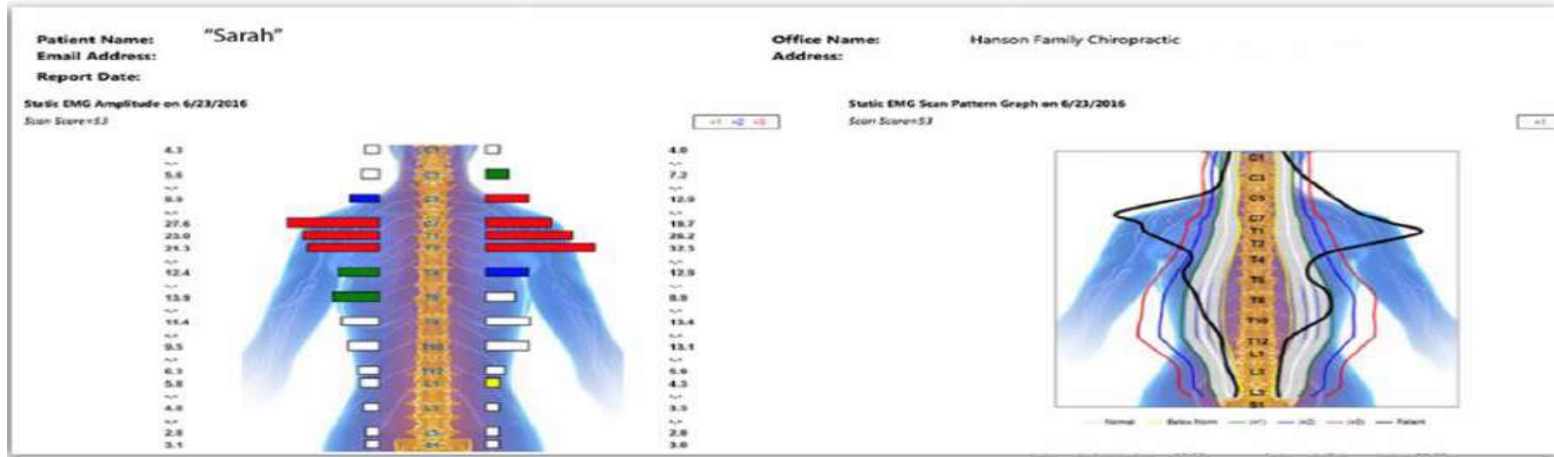
## Case Study 8

- ▶ Patient presents with hypothyroid symptoms, reports having GERD & taking antacids, all thyroid markers are within range. Blood work shows the homocysteine levels are functionally high but within range.

## Case Study 8

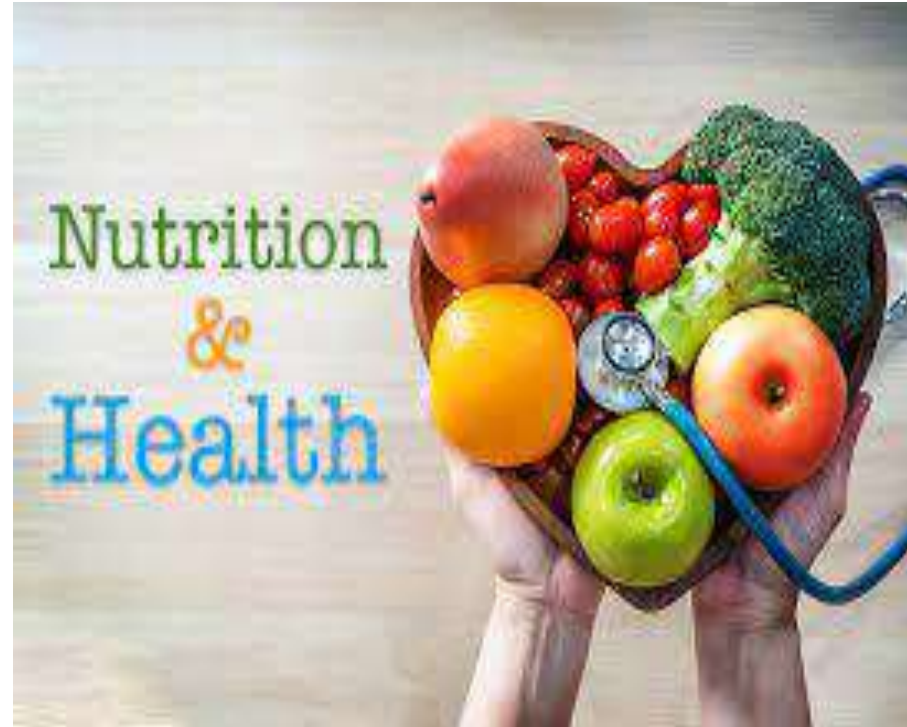
- ▶ Thyroid receptor resistance due to elevation of homocysteine
- ▶ Support methyl donors via methylated B12, glutathione and B complex.
- ▶ Address inflammation via elimination diet & supporting the gut.

# Are you energy efficient ?



# DETOX PROTOCOLS & NUTRITION

- ▶ FOOD SENSITIVITY TESTING
- ▶ BLOOD TESTING
- ▶ ELIMINATION DIET
- ▶ NUTRITIONAL PROTOCOLS & COACHING
- ▶ INFARED SAUNA
- ▶ EXERCISE







Technologies that help with  
detox



Blood circulation



# Vibroacoustic Sound Therapy



The best of it all: Chiropractic

You must find the root cause of disease



# THE NERVOUS SYSTEM & EMOTIONAL HEALTH OF THE BODY



# References

- ▶ 1. Continuous infusion of interleukin-1 beta induces a nonthyroidal illness syndrome in the rat
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