



**SPECTRACELL LABORATORIES**  
*ADVANCED CLINICAL TESTING*

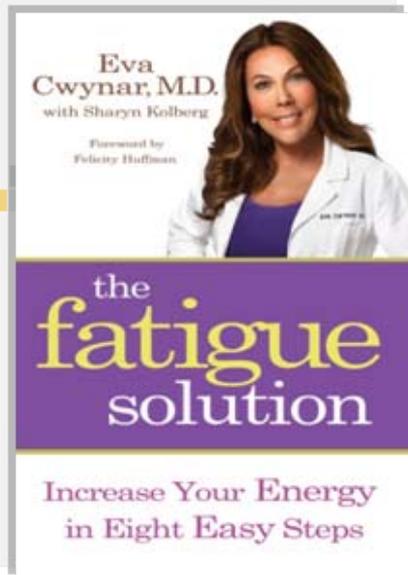


# Managing Thyroid Function

Eva Cwynar, MD  
September 2012



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# Eva Cwynar, MD

Eva Cwynar, M.D., is a practicing Endocrinologist, Metabolic Medicine Specialist, and Internist in Beverly Hills, CA. Dr. Cwynar provides medical care that includes state-of-the-art testing for fatigue, metabolism, weight loss and anti-aging. Her clients include both high-profile celebrities and everyday people. She has appeared on such shows as CBS News, Extra, The Doctors, Dr. Phil, Celebrity Fit Club, The Rachel Zoe Project, On-Air with Ryan Seacrest and Jimmy Kimmel Live!

Dr. Cwynar is on faculty at Cedars-Sinai Medical Center, serves as an Assistant Clinical Professor of Medicine at UCLA, and is world-renowned for her expertise in bio-identical hormone replacement, menopause, male menopause, thyroid function, weight loss and overcoming fatigue. She is a member of The Endocrine Society, and has received numerous honors and awards, including California's Doctor of the Year and Top Thyroid Doctor of Beverly Hills. She is also the author of *The Fatigue Solution*.

# Thyroid – An Unrecognized Problem



## Thyroid disease incidence

- Diagnosed – 25 million Americans
- Undiagnosed – 15 million
- Thyroid disease – 80% hypothyroid, 20% hyperthyroid
- Women four times more likely than men to have a thyroid disorder
- 1 in 8 women will have a thyroid problem in their life
- 1 in 5 women over 60 have a thyroid problem

Most common endocrine disorder in America

Source: National Thyroid Institute  
American Association for Clinical Endocrinologists

# Thyroid Publicity

In 2007, Oprah Winfrey publically announced she had thyroid disease

- Hyperthyroidism first, then hypothyroidism
- Weight gain, intense fatigue
- Thyroid medication started
- Made thyroid disease a household word



# Thyroid Function



Thyroid regulates basal metabolism

Thyroid affects every cell in the body

- Heart
- Blood vessels
- Muscle
- Bone
- Brain

Thyroid dysfunction causes *systemic* problems



# Thyroid Hormones

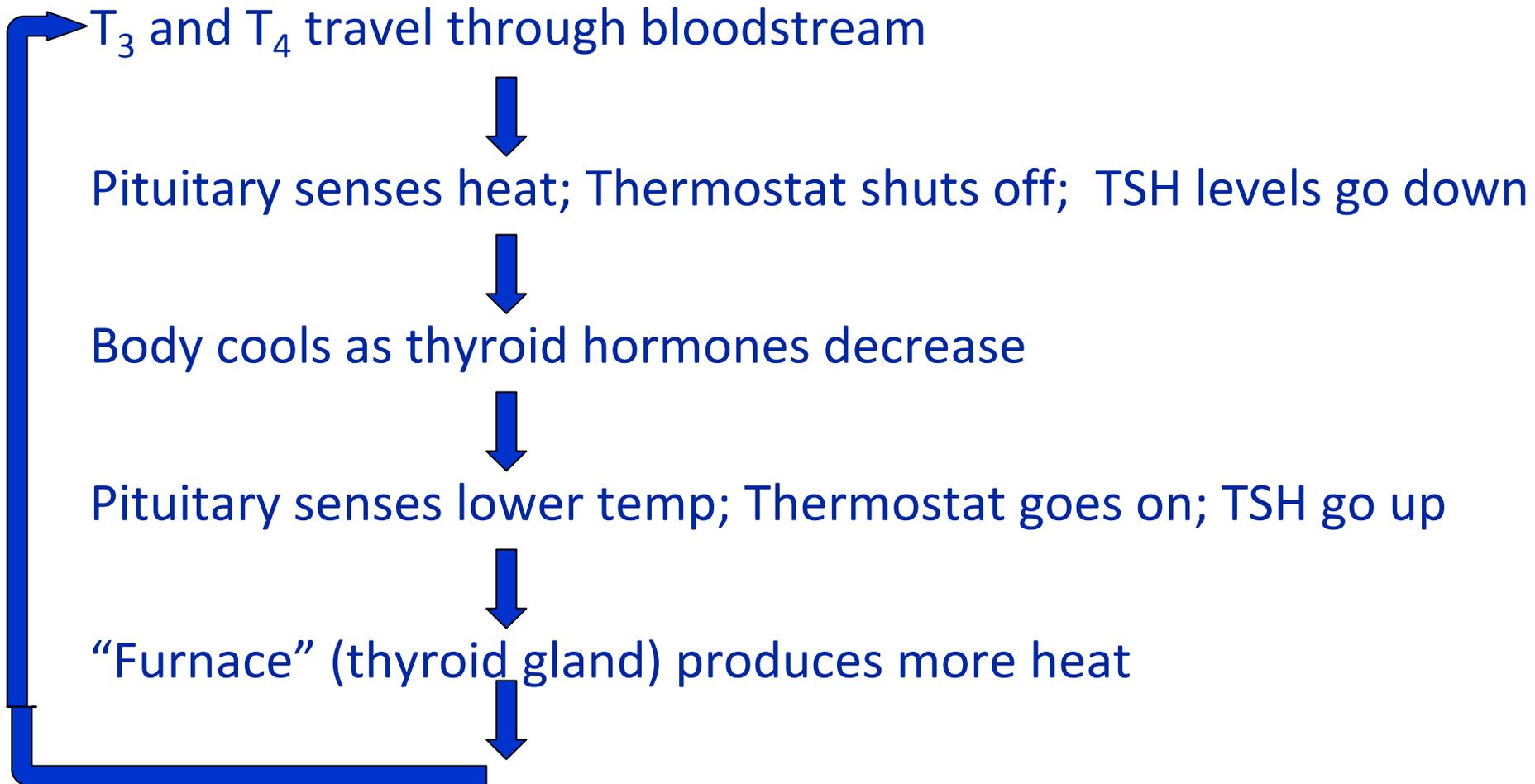
- Thyroid gland converts iodine into thyroid hormones
- Iodine + tyrosine =  $T_3$  and  $T_4$ 
  - $T_3$  = Triiodothyronine
  - $T_4$  = Tetraiodothyronine (precursor to  $T_3$ )
- Normal thyroid gland
  - 80%  $T_4$  and 20%  $T_3$
  - $T_3$  is four times as potent as  $T_4$
  - In liver,  $T_4$  loses one iodine molecule to become  $T_3$

# Thyroid Hormones

- TSH (thyroid stimulating hormone)
  - Produced by pituitary
  - Thermostat-like function
- Furnace analogy
  - Thyroid = furnace
  - $T_3$  and  $T_4$  = heat
  - Pituitary = thermostat
  - TSH = tells thyroid to raise or lower heat
- TRH (thyroid releasing hormone)
  - Oversees all the above



# Normal Thyroid Function



# Hypothyroidism Symptoms

- Anxiety, nightmares
- Difficulty losing weight
- Dry skin
- Inability to concentrate, poor memory
- Menstrual irregularities
- Mood swings
- Severe fatigue
- Thinning eyebrows & hair
- Always feeling cold
- Constipation
- Yellow skin (poor conversion of vitamin A to beta carotene)



# Abnormal Thyroid Function

- When you have low thyroid hormone, the feedback mechanism does not work optimally...
- Result = hypothyroidism
  - Body temperature drops
  - Metabolic rate decreases
  - Energy production is inefficient
  - Tendency to store fat vs. burn calories



# Causes of Hypothyroidism

- Hashimoto's thyroiditis (*autoimmune disease*)
  - Progressive destruction of thyroid gland
  - Also known as lymphocytic thyroiditis or autoimmune thyroiditis
  - Usually causes *hypothyroidism*, sometimes preceded by *hyperthyroidism*
  - Detected clinically by antibody testing
  - Antibodies to TPO (thyroid peroxidase) or thyroglobulin
- Iodine deficiency
  - Results in inadequate production of  $T_4$
  - Causes goiter and cretinism and hypothyroidism



# Meet My Patient - Cheryl

- Typical patient
  - Female, mid 40s
  - Stressful job
  - Otherwise “healthy” (standard labs tests are normal)
- Symptoms (*for over a decade*)
  - Tired (in bed by 8pm every night)
  - Irregular periods, thinning hair, weight gain
  - Assumed it was “genetic” (Her mom had same issues)
  - Family doctor never ordered thyroid tests



# Meet My Patient - Cheryl

## Diagnosis – Hashimoto's thyroiditis (hypothyroidism)

- Autoimmune disorder that attacks thyroid
- Thyroid becomes inflamed and cannot make enough thyroid hormones ( $T_3$  and  $T_4$ )
- Low thyroid hormone so thermostat goes “on”
- Pituitary wants to send out more TSH
- Thyroid cells enlarge causing nodules and swelling



# Hyperthyroidism Symptoms

- Nervousness, moody
- Excessive sweating
- Fine hair, losing hair
- More bowel movements
- Rapid heartbeat
- Red, itchy skin
- Shaky hands
- Shortness of breath
- Bulging, or frog eyes (fat deposits build up behind eyes)

# Causes of Hyperthyroidism



- Graves Disease (*autoimmune disease*)
  - Thyroid stimulating immunoglobulins activate TSH receptors
  - Excessive thyroid hormone is released
  - Also called thyrotoxicosis
  - Most common cause of hyperthyroidism
- Subacute thyroiditis
  - Sudden and painful enlargement of thyroid gland
  - Usually accompanied by fever and/or general malaise
  - Possible cause is infection (viral)
  - Self-limiting – thyroid function returns to normal with no treatment
  - Rare

# Subclinical Hyperthyroidism

- Normal level of “free”  $T_3$  and  $T_4$
- Low levels of TSH
- Clinical presentation different from Grave’s Disease
- If untreated, eventually it causes problems
  - Bone loss
  - Heart abnormalities



# Meet My Patient - Elsa

- Patient – female, 30s, just had second child
- Symptoms
  - Insomnia
  - Anxiety
  - Unprovoked irritability
  - Heart palpitations
    - Cardiologist prescribed meds that made blood pressure too low
    - Collapsed due to low blood pressure
    - Discontinued meds for heart palpitations



# Meet My Patient - Elsa

## Diagnosis – Graves' disease (hyperthyroidism)

- Misconception that hyperthyroidism means endless energy & weight loss
- Eventually, it compromises adrenal function
- Adrenals are stressed so more cortisol is produced
- Cortisol: DHEA ratio impaired
- Result = fatigue

## Treatment

- PTU (propylthiouracil)
- Tapazol
- Radioactive iodine



# Testing Thyroid Function

*Conventional* thyroid test “gold standard” is TSH

- No consensus exists on reference range
- 2010: Most labs for TSH is 0.5 to 5.0 mcg/dL
- 2003: AACE\* recommend normal range as 0.3 to 3.0 mcg/dL
- 5% of people have TSH above 5.0 (diagnosed as hypothyroid)
- 20% of people have TSH above 3.0
- 80% of people with TSH between 3.0 – 5.0 will eventually have TSH above 5.0

***Take home message:***

Millions of people are undiagnosed.

\*AACE: American Association for Clinical Endocrinologists

# Testing Thyroid Function



## Case in point:

- Maryanne, early 40s
- Tired, mood swings, irregular periods
- Her TSH was 4.0 mcg/dL so her doctor said she was normal
- 10 years later, TSH was 5.0 mcg/dL
- Treated her hypothyroidism and symptoms improved
- Could have had better quality of life for an entire decade if treated according to narrower thyroid range



# Testing Thyroid Function

- Palpation (Size, shape, firmness, location)
- Ultrasound testing
- How well thyroid produces  $T_4$
- How well body converts  $T_4$  into  $T_3$
- How much of active form of  $T_3$
- Thyroid antibody testing
- Free (unbound)  $T_4$  and  $T_3$



# Thyroid and Alzheimer's

## Abnormal thyroid strongly linked to Alzheimers

- “Clinical hypothyroidism and hyperthyroidism are recognized causes of reversible dementia”
- 12 year study linked hypo or hyperthyroidism to dementia
- Dementia- thyroid link only seen in women
- Women with abnormal TSH levels had twice the risk of Alzheimers than euthyroid women

Source: Tan, Beiser, Vasan et al. Thyroid function and the risk of Alzheimer disease: the Framingham Study. *Arch Int Med* 2008;14:1514-1520.



# Iodine Deficiency and Thyroid

- Thyroid cells combine iodine with tyrosine to make  $T_3$  &  $T_4$
- Iodine deficiency is a leading cause of hypothyroidism
- Iodine in salt is main source, also seafoods
  - Only 20% of salt consumed in US is iodized
  - Kosher and sea salts do not contain iodine
  - Food manufacturers use uniodized salt
  - Iodization of salt is now voluntary (non-mandated by FDA)
  - Iodine intake has decreased by 50% in past 30 years
  - Most soil is iodine deficient
- WHO states “iodine deficiency , as the single greatest preventable cause of mental retardation, is an important health concern” (2007)



# Thyroid and Pregnancy

- During pregnancy, thyroid production increases 50%
- Joint publication\* in 2007 called ***“Assessment of iodine deficiency disorders and monitoring their elimination”***
  - Spontaneous abortion
  - Stillbirth
  - Congenital abnormalities
  - Perinatal mortality
  - Cretinism
  - Mental retardation
  - Delayed physical development

\***WHO** (World Health Organization)

**UNICEF** (United Nations Childrens Fund)

**ICCIDD** (International Council for the Control of Iodine Deficiency Disorders)



# Thyroid and Pregnancy

- 10% of postpartum complaints caused by thyroid imbalance
- 2006, American Thyroid Association recommended that pregnant women take prenatals with iodine
- Hypothyroid women often have to up their dosage during pregnancy
- Even mild iodine deficiency can lower IQ in offspring
- RDA (recommended daily allowance) for iodine
  - 150 mcg/day – adults
  - 220 mcg/day – pregnant women
  - 290 mcg/day – lactating women



# Thyroid Treatments

## ■ Armour Thyroid

- Contains both  $T_3$  and  $T_4$
- Made from desiccated pig & cow thyroid glands
- Natural (good for people who don't want synthetic)
- Quality control was an issue in the past

## ■ Levothyroxine

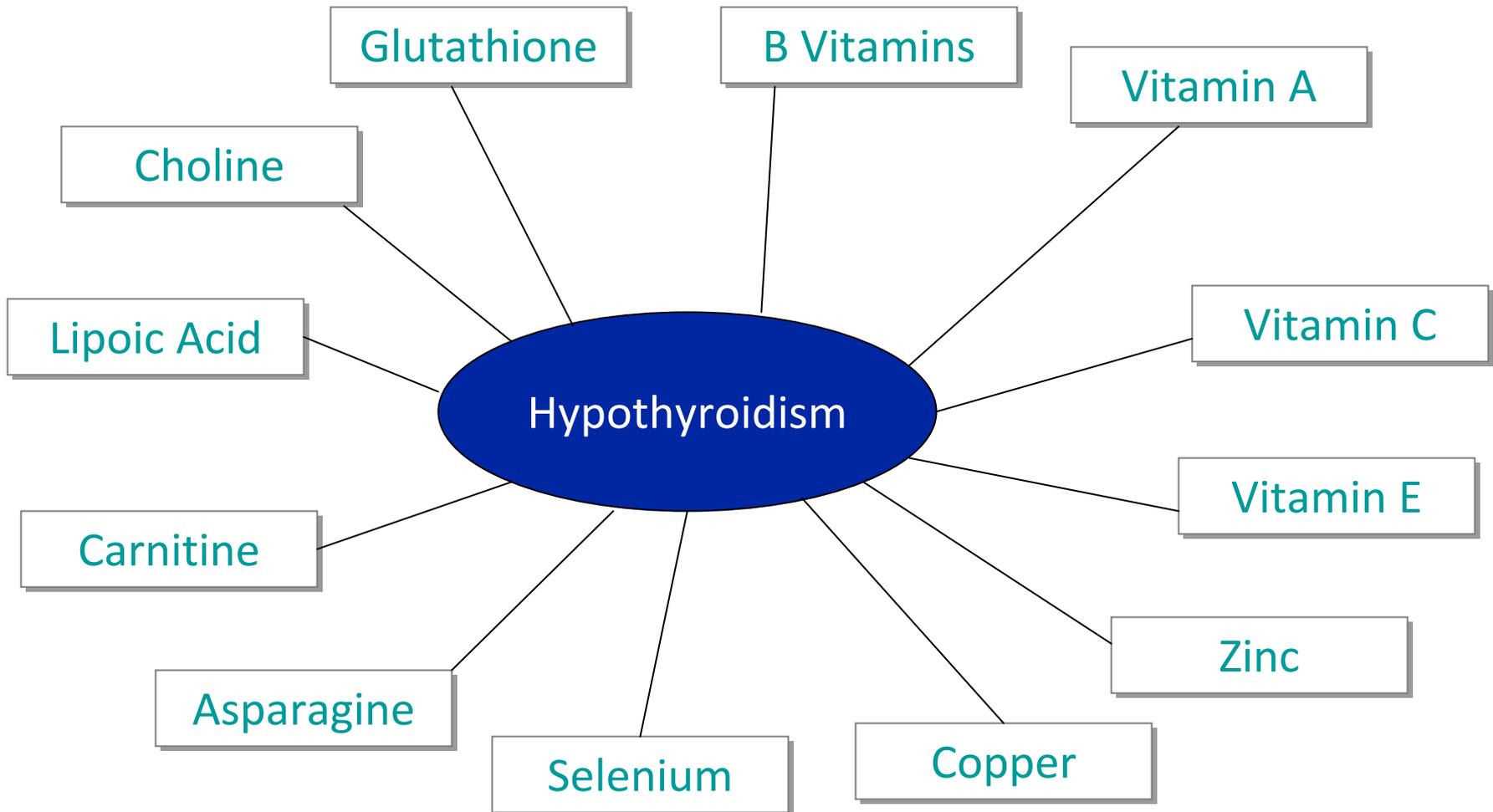
- Synthroid (contains only  $T_4$ )
- Levothroid
- Levoxyl
- Unithroid
- Tirosent (made in Switzerland, distributed in US, less additives)
- Cytomel (contains only  $T_3$ )

# Thyroid Treatment Interaction



- Thyroid medication absorption is compromised by
  - Estrogen
  - Birth control pills
  - Hormone replacement
  - Calcium supplements
  - Iron supplements
- At home thyroid tests
  - Basal resting temperature (below 97.8° may be hypothyroid)
  - Iodine home test

# Nutrients Linked to Hypothyroidism



# Thyroid and Selenium

## Selenium

- Decreases antibodies in Hashimoto's thyroiditis
- Facilitates communication between thyroid & adrenal gland
- Converts  $T_4$  into  $T_3$  (deiodination of  $T_4$ )
- Deficiency reduces  $T_3$  levels
- Low  $T_3/T_4$  ratio is linked to impaired selenium status
- Selenium deficiency a determining factor of cretinism
- Supplementation with 200  $\mu$ g/d of sodium selenite or selenomethionine decreased thyroid antibodies.

Note: 100  $\mu$ g/d dosage was ineffective.

Source: Gartner, Gasnier. Selenium in the treatment of autoimmune thyroiditis. *Biofactors* 2003;19:165-170.

# Thyroid and Zinc

## Zinc

- Zinc is part of the enzyme needed to form TSH
- $T_3$  receptors are zinc dependent
- Deficiency causes 30% less  $T_3$  (impairs  $T_4$  to  $T_3$  conversion)
- Supplementation increases  $T_3$  in deficient subjects and can restore normal thyroid function

In one study, people with low free T3 were given 4-10 mg/kg of zinc sulfate body weight for 12 months. In nine (of 13) people, their thyroid hormone levels normalized.

- Zinc absorption can be an issue (phytates)
- Very common deficiency (1 in every 4 MNT samples)

Source: Nishiyama et al. Zinc supplementation alters thyroid hormone metabolism in disabled patients with zinc deficiency. *J Am Coll Nutr* 1994;13:62-67.

# Thyroid and Copper

## Copper

- Low levels seen in experimentally induced hypothyroidism
- Indirectly affects thyroid status via antioxidant role in superoxide dismutase
- Serum copper levels are regulated by thyroid
- Thyroid stimulates production of the protein that transports copper in tissues (ceruloplasmin)

Source: Mittage et al. Serum copper as a novel biomarker for resistance to thyroid hormone. *Biochem J* 2012;443:103-109.



# Vitamins and Thyroid

## Vitamin A

- Activates a gene that regulates TSH (thyroid stimulating hormone)
- Decreases thyrotropin stimulation of thyroid
- Repletion may reduce goiter
- Thyroid hormones facilitate conversion of carotenoids (why some patients with low thyroid look yellow)

## Oleic Acid

- Doesn't directly affect thyroid (that we know) but does affect how much vitamin A is absorbed in the gut

***Take home message:*** A single deficiency has both direct and indirect effects on metabolic pathways.

# Vitamins and Thyroid

## Vitamin C & E

- Restores thyroid function when liver detoxification is compromised
- Prevents heavy metal induced alterations of thyroid (heavy metal toxicity reduces  $T_3$  levels)
- Specific metabolic pathway affected by vitamin C and E: hepatic thyroxine 5'-deiodination (conversion of  $T_4$  to  $T_3$ )



# Vitamins and Thyroid



## Vitamin B12

- B12 deficiency reduces  $T_4$  to  $T_3$  conversion in liver in animal studies
- Hypothyroidism reduces B12 absorption which can cause anemia & fatigue & neurological complaints (tingling)
- Deficiency of B6, B12 or B9 (folate) can elevate homocysteine, which has been linked to hypothyroidism



# Vitamins and Thyroid



## B Vitamins: B6, B9 (Folate) and Choline

- Folic acid linked to TSH levels (thyroid stimulating hormone)
- B6 deficiency depresses uptake of iodine by thyroid gland
- Low B6 reduces gastric secretions causing lower absorption of other nutrients, especially B12
- Hypothyroidism negatively affects choline function in the brain, affecting mood and cognition

# Antioxidants and Thyroid



## Glutathione

- Hypothyroidism decreases efficacy of antioxidants such as GPX (glutathione peroxidase) and SOD (superoxide dismutase)
- Protects thyroid from peroxides that are created during thyroid hormone synthesis
- Works closely with selenium

# Antioxidants and Thyroid

## Lipoic Acid

- Improves endothelial dysfunction in subclinical hypothyroidism
- Protects thyroid from oxidative stress
- May interfere with T<sub>4</sub> therapy
- Supplement only when deficient

# Amino Acids and Thyroid



## Carnitine

- Transports fatty acids into mitochondria; key nutrient for energy production
- Decreased levels seen in both hypo- and hyperthyroidism which contributes to muscle fatigue

## Asparagine

- Included in the structure of TSH (thyroid stimulating hormone)
- Plays a role in thyrotropin receptor function

# What SpectraCell Measures

## *35 components...*

### VITAMIN

Vitamin A  
Vitamin C  
Vitamin D  
Vitamin E  
Vitamin B1  
Vitamin B2  
Vitamin B3  
Vitamin B5  
Vitamin B6  
Vitamin B12  
Vitamin K2  
Biotin  
Folate

### MINERA

Calcium  
Chromium  
Copper  
Magnesium  
Manganese  
Selenium  
Zinc

### AMINO

Asparagine  
Carnitine  
Glutamine  
Serine

### ANTIOXIDANT

Coenzyme Q10  
Glutathione  
Cysteine  
Lipoic Acid

### SPECTROX

Total Antioxidant Function

### CARBOHYDRATE

Fructose sensitivity  
Glucose – Insulin Interaction

### BRAIN

Oleic Acid  
Choline  
Inositol

### IMMUNIDEX<sup>t</sup>

Lymphocyte Proliferation Response



# Case Study

46 year old female with hypothyroidism

## Clinical symptoms

- Paresthesia (tingling and numbness) in feet for over 10 years
- Extreme fatigue despite sleeping well
- Severe intolerance to cold (moved from Ohio to Florida)
- Edema
- Weight gain despite working out with trainers
- Elevated homocysteine



# Case Study (continued)

## Micronutrient Test results – INITIAL (January 2007)

- Deficient in B12 but did not comply with supplements; had MRIs due to worry about having multiple sclerosis due to paresthesia

## Micronutrient Test results – SECOND (January 2008)

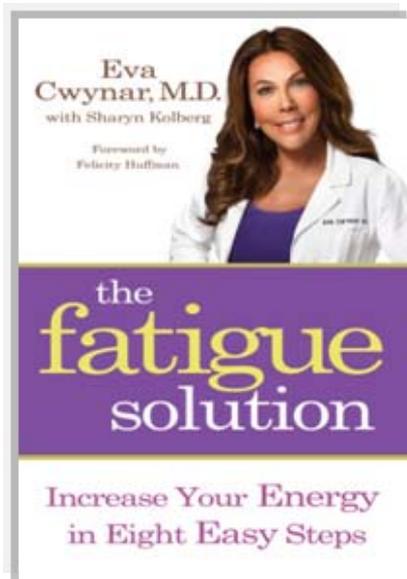
- Deficient in B12 and zinc and glutathione; treatment given:
  - Sublingual B12
  - 30mg/d zinc
  - 1200 mg/d of N-acetyl cyteine (glutathione precursor)
  - 150 mg/d of Armour Thyroid

## Micronutrient Test results – THIRD (Follow Up)

- B12 and glutathione deficiency was resolved; Zinc still deficient
- Paresthesias totally gone after B12 was repleted (could have saved thousands in MRI costs)
- Hypothyroidism symptoms improved



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