21st Century Endocrinology

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Functional Medicine

- Functional medicine looks at the dynamic physiology and biochemistry
- A systems biology approach to managing complex, chronic illness
ELEVEN CORE IMBALANCES & DYSFUNCTIONS

INFLAMMATION • OXIDATIVE STRESS • BODY RHYTHM • ACID/BASE
HORMONAL • NEUROTRANSMITTER • MITOCHONDRIAL • IMMUNE
DETOXIFICATION • DIGESTIVE • MUSCULOSKELETAL

ROOT CAUSES
GENETIC PREDISPOSITIONS • ENVIRONMENTAL STRESS • TOXINS • DIET • NUTRIENTS
EXERCISE • LOW GRADE INFECTIONS • PHYSICAL TRAUMA • BELIEFS • ATTITUDES
EMOTIONAL TRAUMA • PSYCHOLOGICAL STRESS • DRUGS • SLEEP • SPIRITUAL • RELATIONSHIPS
Objectives

- Discuss HPATG Axis
- Explore HPATG and chronic disease
- Adrenal Gland
- Thyroid Gland
History

- Claude Bernard, 1878
  *Milieu interieur*

- Henry Harrower, 1931
  *Functional endocrinology*

- Walter Cannon, 1939
  *Homeostasis*

- Hans Selye, 1956
  *General adaptation syndrome*
HPATG Axis

- H = Hypothalamus (neural/immune tissue)
- P = Pituitary (neural/immune and endocrine tissue)
- A = Adrenal (endocrine tissue)
- T = Thyroid (endocrine tissue)
- G = Gonadal (endocrine tissue)
- G = Gut (immune tissue of the Gut Associated Lymphoid Tissue)
HPATG Function

- Translation of extra cellular “outside” signals to intracellular function
- Transmission through the neuroimmunoendocrine system
- Triggers stimulate the activation of the system, which then
- Results in activation of sympathetic and parasympathetic nervous system function, and
- Release of mediators from the system are produced locally, but act globally
HPATG Function

- Mediators include molecules such as peptide releasing hormones, steroid hormones, neurotransmitters, eicosanoids, cytokines

- Intracellular regulation of the message at the cellular level is controlled by the influence of specific Kinases on cellular function
Protein Kinases

- Definition: They are Phosphorylating Enzymes that translate information from the outside world to coordinate complex cellular physiology
Protein Kinases Function

- Communication network
- Located inside cells
  - cell membrane surface (receptors)
  - Cytoplasm
  - Nucleus
  - Mitochondria

Kinases are everywhere and they talk to each other
Kinases regulate every aspect of physiology
**HPATG Axis / Kinases**

- Kinases coordinate multiple complex functions
- Over 540 Types
- Regulates gene expression
What are the factors that can effect HPATG Axis?

- Immune system
- Stress
- Behavior
- Early life experiences
- Emotions
- Nutrition
- Endocrine disruptors
- Subconscious mind
HPATG and Immune system

- There is a bi-directional connection between the immune system and HPATG Axis
- The systemic inflammatory response syndrome activates the HPATG which in turn results in hypercortisolemia and reduced thyroid function

The GI Immune system and HPTAG Axis

- Potential role of prebiotics and probiotics therapy for the management of immune alterations associated with altered HPAT Axis function.
Stress and HPAT Axis

- Allostatic load activates CRH and locus ceruleus
- CRH activation inhibits growth hormone releasing hormone inhibiting GH, TRH, and TSH secretion
- Increased secretion of cortisol results in further inhibition of 5’deiodinase activity and lower levels of T3 from T4

C Tsigos and GP Chrousos, J Psychosomatic Res 2002;53:865-71
Behavioral Effects and HPATG Axis

- The stress-disequilibrium theory: chronic disease, low social control and physiological changes in HPA axis
  
  R. Karasek, Med Lav 2006; 97: 258-72

- Perceived loss of “locus of control”
- Low self-esteem, lack of love or purpose alters HPAT axis plasticity
- Perceived “Poverty”
Early Life Experiences

- Maternal stress during pregnancy “imprints” off springs HPA axis response
  
  AmJ Report Immune 2005;54:63-9

- “Born to be Fat: Early exposure to common chemicals may be programming kids to be fat.”

  Newsweek sept 21,2009
HPATG Axis / Emotions

- State of mind (fear, happiness, anger, joy,...) is also perceived by higher brain centers and information projected to the hypothalamus for processing and comparison to the baseline activities of the other organ systems.
HPATG Axis / Emotions

- The mind is not focused in the head but distributed via signal molecules to the whole body.
- Through self-consciousness, the mind can use the brain to generate "molecules of emotion" and override the system.
“While proper use of consciousness can bring health to an ailing body, inappropriate unconscious control of emotion can easily make a healthy body diseased.”
Biochemical pathways involved in stress hormone response are under dietary regulation.

Emphasize the age-old wisdom to “use food as medicine” in prevention and treatment of chronic conditions.

Am J Nutrition May 2007;85:1169-70
Dietary Fat /HPATG Response

Depending upon what type of fatty acids are in the visceral adipose tissue there are differences in their influence on the HPAT axis.

- J Kippers et al, Am J Physiology Endocrinol Metab 2000;279:1286-93
Endocrine Disruptors

- Chemical, natural and unnatural molecules that bind to hormonal receptors on cell membranes may act as agonists or antagonists and be considered to be endocrine disruptors.
# Endocrine Disruptors

<table>
<thead>
<tr>
<th>Chemical/Element</th>
<th>Common Usage</th>
<th>Example Hormone Target</th>
<th>Organism Type Impacted</th>
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<tbody>
<tr>
<td>Polybrominated Diphenyl Ethers (PBDEs)</td>
<td>Flame retardants</td>
<td>Thyroid</td>
<td>Mammals, Birds, Reptiles, Fish</td>
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<tr>
<td>DDT</td>
<td>Insecticide</td>
<td>Estrogen</td>
<td>Mammals, Birds, Reptiles, Amphibians, Fish, Invertebrates</td>
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<td>PCBs</td>
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<td>Adrenaline</td>
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<tr>
<td>Fenoxycarb</td>
<td>Insecticide</td>
<td>Juvenile</td>
<td>Invertebrates</td>
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<tr>
<td>Bisphenol A</td>
<td>Plasticizer</td>
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<td>Plasticizer</td>
<td>Estrogen</td>
<td>Mammals, Birds, Amphibians, Fish, Invertebrates</td>
</tr>
</tbody>
</table>
Subconscious Mind

- Repository of stimulus response tapes derived from instincts and learned experiences.
- Strictly habitual
- Subconscious mind is millions of times more powerful than the conscious mind.
Selective Assessment Tools for evaluating HPATG Axis Function

- Low dose ACTH stimulation test for secondary hypoadrenocorticism
- Insulin tolerance test measure cortisol and blood glucose after insulin administration
- Metapyrone test to block 11-beta-hydroxysteroid dehydrogenase activity to evaluate adrenal reserve
- Dexamethasone suppression test to evaluate hyper adrenal function
HPATG Assessment

- Serum, Salivary or 24 hour urinary cortisol
- Serum or Salivary DHEA
- FSH and LH Serum Testing
- Thyroid Evaluation
  - T4, T3, T7, TSH
- Gonadal Evaluation
  - Estradiol, Estrone, Estriol, Testosterone, progesterone, Estrogen
  - Metabolites as 2,4 and 16 hydroxyestrogens
HPATG Assessment

- **Inflammatory Markers**
  - hsCRP, TNF alpha, IL-6

- **Insulin sensitivity**
  - PP insulin, serum TAG, HDL, apoB / apoA-1 ratio

- **Auto antibodies**
  - ANA, Anti CCP, Anti TPO
Adrenal Assessment

- Postural Hypotension test (Ragland’s Test)
  
  - Step 1 - Have the patient lie down on a table and rest for 60 seconds or longer. Take the systolic and diastolic pressure reading while the patient is in the supine position. With the patient still in the supine position, pump up the cuff again to approximately 20 millibars above the systolic supine reading.
  
  - Step 2 - Have the patient immediately stand, taking care to the patient in case he/she becomes light-headed or begins to wobble. Immediately take the systolic and diastolic pressure when the patient reaches the standing position.
Adrenal Assessment

- **Interpretation**

- A normal reading should see a rise of 6-10 mm/Hg from the supine to standing position.
- A patient who drops by 10 mm/Hg should be considered for Adrenal Fatigue
- A patient who drops over 20 mm should be considered chronic hypoadrenia.
- The greater the drop, the greater the degree of hypoadrenia.
Barnes Thyroid test

Basal body temperature measurement
Recording temperature in the AM for 5 days

1. The night before, shake down the thermometer (an oral glass thermometer only), and set it on the night stand next to the bed.
2. Immediately upon waking, without raising your head from the pillow, place the thermometer under the arm.
3. Leave thermometer under arm for 10 minutes.
4. Move as little as possible in this process; you must remain flat on your back during the entire time, otherwise the thyroid gland will be activated and a false reading will be taken.
5. After 10 minutes, remove thermometer and record temperature.
6. The test is invalidated if you expend any energy just before recording the temperature, i.e. getting up for any reason, shaking down the thermometer, etc.
Barnes Thyroid test

- **Interpretation**
  - A mean average temperature of between 98.2 and 98.8 is considered normal.
  - To figure average: \( \text{Total}/5 \)
Low Body Temp

- Human enzymes are designed to operate at constant temp of 98.6
- Symptoms start at a drop in 0.4 degrees from 98.6
Heart Rate Variability

- Heart rate variability is a direct reflection of how well your nervous system adapts to stress and how much energy reserves you have.
- The more depleted and stressed you are, the more monotonous, or constant the heart rate is.
Heart Rate Variability

- Several studies have shown that HRV can predict survival rate after heart attack and congestive heart failure exacerbation.

- Cir1998;98:1510-1516
- Cir1996;94:2850-2855
# Lab values

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<tr>
<th>TEST</th>
<th>REF. RANGE</th>
<th>OPTIMAL</th>
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<tbody>
<tr>
<td>TSH</td>
<td>0.35-5.50</td>
<td>1.3-2.0</td>
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<tr>
<td>Free T-3</td>
<td>2.3-4.2</td>
<td>3.0-3.25</td>
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<tr>
<td>Total T-3</td>
<td>60-180</td>
<td>120-125</td>
</tr>
<tr>
<td>Free T-4</td>
<td>0.70-2.4</td>
<td>1.0-1.5</td>
</tr>
<tr>
<td>T-4 thyroxine</td>
<td>4.5-12.5</td>
<td>7.5-8.1</td>
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<tr>
<td>Cholesterol</td>
<td>130-200</td>
<td>150-220</td>
</tr>
<tr>
<td>Triglyceride</td>
<td>30-150</td>
<td>70-110</td>
</tr>
<tr>
<td>LDL</td>
<td>60-130</td>
<td>&lt;120</td>
</tr>
<tr>
<td>HDL</td>
<td>40-90</td>
<td>&gt;55</td>
</tr>
</tbody>
</table>
Case

- 55 y old WF with h/o chronic fatigue syndrome since 2001.

PMH:
- Sever PMS which resolved after she had hysterectomy 1993
- Intermittent muscle weakness, vertigo and imbalance since hysterectomy
- Intermittent “mental fussiness” since 2005
- HTN and Tachycardia 2006

PSH:
- hysterectomy
- C-section x2
Case

Social history:
- Divorced-Single mother
- Director for promotion and outreach
- Non smoker
- No alcohol use
- No drug use
- Strong family support

Family history:
- Brother committed suicide as a teenager
Case

Spiritual health:
Has strong spiritual beliefs
Active in her faith

Medication:
Toprol 50 mg daily

Eating habits:
Healthy eater (eats whole food hardly ever eats any processed food) all her life.

Physical activity:
Has had no energy to exercise for past several years.
Case

- **ROS(General)**
  - Forgetful
  - Weight gain
  - Excessive need for sleep
  - Very easily fatigued
  - Hungry between meals
  - Irritable between meals
  - Carves sweets
  - Drowsiness
  - Bruise easily
  - Ringing in the ear
  - Dizziness
  - Dry skin
  - Painful bowel movements

- **ROS(endocrine)**
  - Lack of energy and strength
  - Losing outer eyebrow hair
  - Hearing impaired
  - Excessive hair loss
  - Dry skin
  - Sleepy during the day
  - Sensitive to cold
  - Weight gain
  - Inability to loss weight
  - Failing memory
  - Increase weight in the hip area
  - Brittle nails
  - Weakness
  - Hot flashes
Case

PE: BP 116/72  P79  Wt 154
Average 5 day temp reading
(Barnes Thyroid test) =96.7
Ragland’s test: supine 129/87
standing 106/80

Brittle nails
Absence of the out part of the eyebrow bilaterally

Labs:
TSH:1.58
T4:1.1
CBC WNL
Glucose 88
Cholesterol 193
TAG 91
HDL 63
LDL 112
LFT’s WNL
Electrolytes WNL
GFR>60
Case

Treatment:
- Minimize daily activities to essentials
- Gave her permission to say “No”
- Increase activities that brought her joy and laughter
- Self care
- Gratitude list
- Cognitive behavioral therapy
  Forgiveness
  Improving self worth
  Trust
  Release burden of limited beliefs
- Meditation
- Relaxation

Nutritional supplements
- Adrenal support
- Trace mineral
- Vitamin B support
- EFA supplements

After 3 months added
- Thyroid nutritional support
- Female hormone nutritional support
**Case**

**In 3 months**
Barnes Thyroid test 97.0
She noticed a change in her level of energy

**In 5 months**
She lost 14 pounds
Her eyebrow regrow
Life stressor increased she has another loss in her family. She had sudden decrease in her hearing and was put on steroids by her ENT.

**In 7 months**
Regained her ground continued to loss weight and had increase in her energy level. Was able to start exercising regularly but plateau in her progress.
Case

- Based on her symptom survey her GI and cardiovascular symptoms have not been improving
- Added GI enzymes, liver, gallbladder support as well as probiotics
- Vitamin D and CoQ10 supplementation
In 3 months
She noticed a change in her level of energy

In 5 months
Barnes Thyroid test 97.0
She lost 14 pounds
Her eyebrow regrow
Life stressor increased she had sudden decrease in her hearing and was put on steroids by her ENT.

In 7 months
Regained her ground continued to loss weight and had increase in her energy level but plateau in her progress.

In 9 months
Her GI symptoms all resolved.
Her basal body temp increased 97.5

In 12 months
Her basal body temp increased 97.8
High BP resolved no more medication required
Tachycardia resolved no more medication required.

In 15 months
Her basal body temp increase 98.2
Fatigue completely resolved
Adrenal Gland

- Necessary for life
- Energy production
- Controls carbohydrate, protein and fat conversion to blood glucose
- Fluid and electrolyte balance in cells, interstitial fluid and blood stream
- Fat storage
- Sex hormone production, especially after menopause
**Adrenal Insufficiency**

- Primary adrenal insufficiency
  - Anatomic destruction of gland autoimmune
  - Surgical removal
  - Infection
  - Hemorrhage
  - Invasive; metastatic
  - Metabolic failure in hormone production
  - Congenital adrenal hyperplasia
  - Enzyme inhibitors
  - Cytotoxic agents
  - ACTH blocking antibodies

- Secondary adrenal insufficiency
  - Hypopituitarism due to hypothalamic-pituitary disease
  - Suppression of hypothalamic-pituitary axis
  - Exogenous steroid
  - Endogenous steroid from tumor

Harrison's principles of internal medicine, 13th edition, page 1970
FACTORS AFFECTING THE ADRENALS

- Death of a Loved one
- Repeated Stresses
- Psychological Stress
- Financial Pressures
- Toxins
- Infection: Acute & Chronic
- Emotional Stress
- Allergies
- Over Exertion
- Smoking
- Lack of Sleep
- Poor Eating Habits
- Unwanted Unemployment
- Fear
- Lack of Relaxation
- Negative Attitudes & Beliefs
- Coffee
- Caffeine
- Lack of Good Food
- Lack of, or Excessive Exercise
- Marital Stress
- Prescription, Non-Prescription Drugs
- Wound Healing
- Sugar & White Flour Products
Frequency of Adrenal Fatigue

- “Hypocortisolism appears to be a frequent and widespread phenomenon.”

- ‘80% of Americans are suffering from adrenal fatigue and the other 20% are in denial.’
  Morganthaler, J. 2002. Author of Smart drugs & Nutrients and smart Drugs: The Next Generation
Adrenal Fatigue

The sub optimal functioning of adrenal glands:
- At rest
- Under stress
- In response to constant, intermittent, or sporadic demands
HPATG
Functional Somatic Syndrome

- Irritable bowel syndrome
- Chronic fatigue syndrome
- Fibromyalgia syndrome
- Multiple chemical sensitivity syndrome
- Premenstrual syndrome
- Non-ulcer Dyspepsia syndrome
- Chronic Low Back Pain syndrome
- Food “Allergy” Syndrome
- Interstitial Cystitis Syndrome
- Sleep Apnea syndrome
- Migraine headache syndrome
- Hypoglycemia Syndrome
- Immune sensitivity syndrome
- Non-specific chest pain syndrome
- Idiopathic hypertension syndrome
- Tempromandibular joint syndrome
- Myofacial pain syndrome

Lancet 2007;369:946-52
Diseases Involving Decreased Adrenal Function

- Fibromyalgia
- Chronic fatigue syndrome
- Rheumatoid arthritis
- Most autoimmune disorders
- Cancer survival
- AIDS survival
- Asthma
- Influenza
- Respiratory ailments (bronchitis, pneumonia)
- Most disease for which corticosteroids are involved in the treatment
Clinical Conditions Involving Decreased Adrenal function

- Decreased immunity
- Weak cardiac function (inotropic and chronotropic)
- Lack of stamina
- Emotional paralysis
- PTSD
- Poor wound healing
- Increased susceptibility to infection
- Alcoholism and drug addiction
- Burn out
- Hypoglycemia
- Allergies
- Environmental sensitivities
- Chemical intolerance
- Toxic chemical exposure
Clinical Conditions Involving Decreased Adrenal function

- Unresponsive hypothyroidism, persistence of hypothyroid symptoms despite treatment with thyroid hormones
- Sexual dysfunction; lack of libido
- Increased perimenopausal and menopausal S&S
- Increased PMS S&S, especially depression
- High-risk or hemodynamically unstable patients in the ER
- Post MI, specially the first 24 Hours

*The greater the adrenal fatigue, the less likely one will survive cardiac arrest or other life-threatening situations.*
Adrenal Fatigue Key S & S

- Craves sweets or salty foods
- Often becomes hypoglycemic under stress
- Has increased PMS, perimenopausal, or menopausal S & S
- Mild depression
- Lethargy, lack of energy
- Everything seems to take more effort
- Decreased ability to handle stress
- Chronic Fatigue
Adrenal Fatigue Key S& S

- Swollen ankles—worse in PM
- Multiple allergies or sensitivity
- Intolerance to high potassium food
- Excessive fears and apprehensions
- Nervousness or irritability
- Chronic cold, cough, hay fever
- Alternating constipation and diarrhea
- Syncope or lightheadedness when rising rapidly from a sitting or laying down position
Adrenal Fatigue: Relieving factor

- Rest-mental, emotional & physical
- Restful sleep
- Sleeping in/naps
- Alleviation of stressful situation
- Regular meals
- Elimination of refined carbohydrate and caffeine
- Periods of relaxation and play
- Exercise
- Massage adrenal Chapman point's
Nutrition and Adrenal gland

- Vitamin C
- Vitamin B1, B2, B6, B12
- Trace minerals
- Essential fatty acids
- Adrenal glandular tissue cell extract
- Phosphatidylserine
Botanical Nervines (Adaptogens)

- Reduced stress response
- Reduce stress-induced neurotransmitter responses in the brain and thereby HPA activation
Botanical Nervines (Adaptogens)

- May improve cortisol regulation (*Panax, Hypericum, Withania*)
- May bind GABA receptors (*Valerian, Withania, Hypericum, Passiflora, Scutellaria*)
- May act on opioid, dopaminergic, and/or serotonergic pathways (*Hypericum, Melissa, Eschscholtzia, Cimicifuga, Avena, Matricaria*)
Treatment Time Line

Adrenal fatigue takes time to heal.
- Mild - 6 to 9 months
- Moderate - 12 to 18 months
- Severe - 12 to 24+ months
Thyroid

Relationship of the Endocrine Organs

Solid lines = Stimulates
Dotted lines = Inhibits
Thyroid Disorders

- Prevalent and increases every year in US population.
- Thyroid medications have been on the top ten most prescribed medications for decades.
- Most thyroid conditions are not diagnosed in early stages and lead to loss of function and quality of life.
Thyroid Disorders

- Every cell in the body has receptor sites for thyroid hormones.
- Lack of ideal Thyroid hormone leads to global decline in cellular function of all bodily systems.
- Thyroid physiology is very sensitive to imbalances in physiological system.

- Mastering the Thyroid-Rev(020410). Datis Kharrazian
### Hypothyroid Symptoms & Signs

- Weakness
- Lethargy, fatigue
- Memory impairment
- Cold intolerance
- Weight gain
- Constipation
- Loss of hair
- Hoarseness
- Deafness
- Dyspnea
- Myalgia, arthralgia
- Paresthesia
- Percordial pain
- Menstrual irregularity
- Dry, coarse, cold skin
- Periorbital and peripheral edema
- Coarse, thin hair
- Pallor of skin
- Thick tongue
- Slow speech
- Decreased reflexes
- Hypertension
- Bradycardia
- Pleural, pericardial effusion
- Ascites
- Vitiligo
- Loss of the outer eyebrow
Thyroid Interactions

- Cardiovascular system
- Brain
- Bone metabolism
- GI tract
- Gallbladder function
- Liver function
- Lipid and cholesterol Metabolism
- Protein metabolism
- Red blood cell Metabolism
- Glucose metabolism
Thyroid function is affected in:
- Autoimmune disease
- Immune activated cytokines
- Imbalances of endocrine system
- Environmental disruptors
- Medications
- Stress
- Nutritional deficiencies
Effect of stress on Thyroid Function

- Stress increase Cortisol
- Cortisol inhibits conversion T4 to T3 and favors conversion T3 to RT3
- Prolonged stress can create a condition called reverse T3 dominance
- Reverse T3 dominance can last even after the stress passes
Reverse T3 Dominance

- Too many receptor sites are blocked by reverse T3
- Causes hypometabolism
- Chemical reaction are slowed down which drops body temp
- Drop in Body temp slows down the enzymes in every cell
- Multiple enzyme dysfunction is the heart of hypometabolism which results in clinical symptoms.
- Another example of the connection between adrenal and thyroid function
Hashimoto’s Disease

- Hashimoto thyroiditis is most common form of chronic thyroiditis in United States
- 1.1% to 16.7% prevalence of postpartum thyroiditis

J Clin Endocrinol Metab. 2002 Sep;87(9):4042
Pathogenesis

- Chronic autoimmune process
- Activation of thyroid antigen-specific helper T cells
- Hashimoto thyroiditis may progress from thyrotoxicosis to hypothyroidism
Risk Factors

- Postpartum state
- Association with HLA-DR3, HLA-DR4, HLA-DR5 in white population
- High iodine intake
- Selenium deficiency
- Amiodarone (Cordarone)
- Occupational exposure to ionizing radiation

(1) Eur J Endocrinol 1998 Sep;139(3):290
(2) Curr Opin Rheumatol 2007 Jan;19(1):44
History

- Need for frequent adjustment of medications
- Stay symptomatic regardless of normal TSH after Thyroid hormone replacement.
- Gradual decline in energy, mental function, GI motility, mood, basic metabolic rate,...
Diagnosis

- Elevated serum antithyroid antibodies in conjunction with painless goiter and/or clinical hypothyroidism
- Anti-thyroid antibodies
  - Antithyroid peroxidase antibodies - present in 90%-95%
  - Antithyroglobulin antibodies
  - Thyroid-stimulating hormone (TSH) antibodies
Functional Lab Range

- TSH: 1.8-3.0 mlu/l
- TT4: 6-12 ug/dl
- TT3: 100-180 ng/dl
- Free T4: 1.0-1.5 ng/dl
- Free T3: 3.0-4.0 pg/ml
- T3 Uptake: 28-38 md/dl
- Reverse T3: 25-30 ng/dl
- TBG: 18-27 ug/dl
Hashimoto’s Disease

- This is an autoimmune and systemic disease
- Restoring immune system balance is an important part of the treatment.
Treatment Plan

- Thyroid hormone replacement
- Correct dysglycemia
- Treat stress
- Treat sleep problems
- Gluten free diet
- Screen for Vitamin D def
- Screen for Barrier system compromise (gut, lung, brain)
- Avoid any supplements with iodine
- Control cytokine load
Case

- 33 y old WF with h/o bilateral leg pain started 3 years ago after she was training for a marathon. After one year of conservative treatment. She continued to have pain. Bone scan confirmed multiple stress fractures.

- In past 2 years she has had 2 pregnancies and after the birth of her child in Jan 2009 she developed severe fatigue, memory lapse, difficulty recalling words, and cold intolerance. In Sept 2009 was diagnosed with Hashimoto’s thyroiditis.
Case

- She was referred to endocrinologist started on Synthroid however her symptoms never improved later Cytomel was added to her meds again with no improvement of her symptoms however her TSH, free T4 and total T3 normalized with medication.
Case

- She was referred to me for further evaluation in July 2010.
- Leg pain, severe fatigue, weight gain, lack of energy, overall unwell feeling, memory lapse, muscle switching.
<table>
<thead>
<tr>
<th>ROS (General)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>- Craves sweets</td>
<td>- Fatigue after meals</td>
</tr>
<tr>
<td>- Irritable if meals are missed</td>
<td>- Must have sweets after meals</td>
</tr>
<tr>
<td>- Get light headed when meals missed</td>
<td>- Difficulty loosing weight</td>
</tr>
<tr>
<td>- Eating relieves fatigue</td>
<td>- Under high amount of stress</td>
</tr>
<tr>
<td>- Agitated, easily upset, nervous</td>
<td></td>
</tr>
<tr>
<td>- Poor memory/ forgetful</td>
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</table>
### ROS

#### Endocrine
- Hypothyroid
- Hypo adrenal

#### General brain function
- Memory declining
- Cannot remember names and phone
- Has a hard time learning
- Misses appointments
- Loosing attention spam endurance
- Fatigued when reading or driving
Case

- TSH: 2.09
- Total T3: 137
- Free T4: 1.0
- 25-OH vitamin D: 30
Treatment Plan

- Nutritional counseling
  Avoid processed foods, small frequent whole food meals, increase protein and EFA. Discussed gluten free diet.
- Fish oil, Vitamin D, Supplement for general support dysglycemia and hypo adrenal
Case

- 2 months later
  - Sleep much improved
  - Her energy level was improved
  - Still had leg pains

- Gluten free diet
  - added Ca/mg and more central adrenal support supplements
Case

- 2 months later
  “I have not felt this good in the past 4 years”
  Leg pain resolved
  Fatigue resolved
  Memory lapses resolved
  Insomnia resolved
  Irregular period resolved
  Irritability resolved
  Sugar craving resolved

- Gluten free diet is essential in treatment of autoimmune thyroid conditions.
“Mastering the Thyroid”
Pituitary Suppression from Cortisol leading to low TSH

- Altered cortisol (hyperadrenal, hypoadrenal or adrenal maladaptation)
- TSH below 1.8, T4<6
- Most common cause is an uncontrolled blood sugar imbalance (insulin resistance or hypoglycemia).

Conversion of T4 to T3 (Non–Thyroid illness)

- The majority of hormone production at the thyroid is inactive T4 (94%).
- T4 is metabolized peripherally via enzyme 5’deiodinase in the liver.
- T3 levels have very little influence on the TSH negative feedback loop.
Conversion of T4 to T3 (Non-Thyroid illness)

- A pattern of normal TSH, normal T4 and a depressed T3 strongly suggests down regulation of the 5’diodinase enzyme.
Down-regulated 5’-deiodinase Activity

- Deficiency of cofactors
- GI dysbiosis and liposacharides \(^{(1)}\)
- Elevated cytokines \(^{(2)}\)
- Elevated cortisol \(^{(3)}\)

- \(^{(1)}\) JBioChem2000;275:38296-38301
- \(^{(2)}\) Nueopsychobiology 2004;49(2):84-7
- \(^{(3)}\) J endocrinol Invest.1994;17:269-274.
Cofactors for Conversion of T4 to T3

- Selenium
- Copper
- Magnesium
- Niacin
- Riboflavin
- Pyridoxal-5-Phosphate
- Zinc
Selenium and Thyroid

- Selenium is an essential component of type I iodothyronine 5'-deiodinase, which converts thyroxin to the more biologically active hormone 3,5,3'-triiodothyronine

  American Journal of Clinical Nutrition, Volume 57, 236S-239S

- Selenium deficiency impairs thyroid hormone metabolism by inhibiting the synthesis and activity of the iodothyronine deiodinases, which convert thyroxin (T4) to the more metabolically active 3,3′-5 triiodothyronine (T3).

  Biological Trace Element Research, Vol 34, Number 3/September 1992
Effect of GI Dysbiosis on T4 to T3 conversion

- Under normal circumstances about 40% of T4 is converted to T3, 20% is converted to reverse t3 and 20% is converted to T3 sulfate (T3 S) and tiriiodothyroacetic acid (T3AC).
- T3S and T3AC are inactive thyroid hormones until they circulate into GI tract and acted upon by intestinal sulfatase into active T3
- GI sulfatase activity is dependent upon a healthy gut microflora.
What are the factors that affect HPA axis function?

A. Stress  
B. Nutrition  
C. Endocrine disruptors  
D. Subconscious mind  
E. All of the above
PTSD, poor wound healing, PMS, hypoglycemia, hypothyroidism are associated with:

A. Hyper adrenal
B. Hypo adrenal
C. Selenium deficiency
D. Magnesium deficiency
What are the proper treatment considerations in Hashimoto’s Thyroiditis?

A. Thyroid hormone replacement
B. Correct dysglycemia
C. Gluten free diet
D. Screen for Vitamin D deficiency
E. Avoid any supplements with iodine
F. All of the above
Treatment

- Therapies that have been identified to be successful in improving HPATG function include:
  - Regular graded exercise
  - Cognitive behavioral therapy
  - Mindfulness therapy focusing on locus of control
  - Building of self-worth
  - Energy psychology
  - Biofeedback
  - Meditation
  - Yoga
  - Reducing fear
  - Introducing joy, laughter and love
Treatment

- Physical Medicine focused on the neuroimmune connection
  - Osteopathy
  - Chiropractic / Applied Kinesiology
  - Massage

- Energy medicine focused on neuroimmune connection
  - Acupuncture
  - Homeopathy
  - Frequency specific Microcurrent
  - Reiki
Treatment

- Nutritional Interventions
  - Low Glycemic index diet high in stress reducing phytochemicals (ie. curcumin)
  - Vegetable based protein
  - Increased intake of omega 3 oils and medium chain triglycerides and lower intake of saturated fats
  - Insulin stimulating phytochemically dense foods
  - Cruciferous vegetables containing glucosinolates (estrogen metabolism)
  - Prebiotics and probiotics for GI restoration
  - Proper intake of vitamin B complex, C, D and minerals (Mg, K, Zn, Cr, Se, I, Fe)

Dr Jeffery Bland, The 14th International Symposium on functional medicine, 21st century endocrinology
Summary

- Alteration in HPATG function do not define a disease, but rather an alteration in a systems biology outcome.
- The use of single molecular interventions to manage individual symptoms is not the optimal long-term therapeutic approach for maximizing favorable patient outcome in patients with symptoms associated with altered HPATG function.
- The best clinical approaches are those that identify in the patient the origin of their altered function in the HPATG system and individualize the treatment to their needs.