

THYROID MASTER CLASS

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1. Introduction

- a. First, let's complete the initial anatomy and physiology, we will move into signs of thyroid hormone imbalance, and how we can support thyroid hormone health with essential oils, herbal supplements, and food. Finally, we will look at some more unconventional concepts by addressing underlying emotional issues related to the thyroid.
- b. Let's start very simply: what is a hormone? Well, a hormone is a regulatory substance produced in an organism and transported in tissue fluids such as blood to stimulate specific cells or tissues into action. Both plants and animals have hormones. Plants have hormones that ensure adequate growth, such as abscisic acid and auxins. Humans have hormones that influence our sexual and reproductive behaviors, blood sugar, energy and mood, water homeostasis, and stress responses.
- c. Hormones impact our bodies in ways that are distinctly different than nerves in the nervous system. Nerves send an electrical signal in a straight line to a cell, prompting a muscle to contract or a visual landscape to be taken into the brain and processed. Hormones, on the other hand, are secreted by a cell and then is usually moved in the blood to a target tissue. Like a radio signal, it requires a receiver to exert its action. So, hormones must hit a receptor to affect the target tissue.
- d. The study of hormones, hormone receptors and their signaling pathways is called endocrinology, and the body system that houses hormone function is called the endocrine system. Hormones are secreted by structures in the brain, such as the hypothalamus and the pituitary gland, and throughout the body in the thyroid, pancreas, adrenal glands, ovaries and testes. These structures combined are known as the classic endocrine organs. There are also specialized cells in the atria of the heart and scattered epithelial cells in the small intestine that are named the diffuse endocrine system.
- e. So why is the hormone system so important? Well every cell, organ and body process is influenced by hormones, and the influence can be very substantial. Additionally, hormone balance is required in order for hormones to carry out their effects in the right way. From growth, to reproduction, to energy and glucose homeostasis, it is all governed by hormones.
- f. Hormones work collaboratively in concert with one another, and rarely are the actions found independent of one another
- g. Hormones function only when they are received by a receptor. Though hormones may pass lots of cells, they will only exert actions on the cells when they have a receptor.
- h. Hormones can work in a few different ways. First, we have the most common action which is endocrine where the hormone is distributed in the blood and binds a receptor distant from it.



- i. Paracrine action happens when the hormone acts locally by diffusing from the source to the target tissues is
- j. Autocrine action is when the hormone acts on the same cell that produced it.
- k. Hormones can turn on a biologic response or turn it off. When a hormone binds a receptor and activates it, this is called agonism or when the hormone acts as an agonist. If it binds the receptor, but does not produce any actions inside the cell, then this is known as an antagonist.
- l. Hormone secretion is governed by a lovely feedback loop. The hypothalamus secretes many hormones that act on the anterior and posterior pituitary gland, and this triggers the anterior pituitary to secrete many hormones that govern growth, reproduction, thyroid and adrenal function and lactation.
- m. If there is too much of the end product hormone, it will feedback to the hypothalamus and/or the pituitary gland and prevent the further release of hormones that encourage the production of more hormones. For example, if testosterone levels are too high, testosterone will send a negative signal to the hypothalamus and anterior pituitary, and this will cause less gonadotropin releasing hormone, luteinizing hormone and follicle stimulating hormone to be produced which will cause the cells in the testis to produce less testosterone. If levels are too low, a positive signal is sent to the hypothalamus, and more gonadotropin releasing hormone is produced, which then increases LH and FSH, which then signal the testes to make more testosterone.



2. Actions of Thyroid Hormone

- a. There are three primary functions of thyroid hormone: metabolic, cardiovascular and developmental.
 - i. Metabolic. The thyroid hormones increase the basal metabolic rate and have effects on almost all body tissues. Appetite, the absorption of substances, and gut motility are all influenced by thyroid hormones. Thyroid hormone increases the absorption of glucose in the gut, as well as the generation, uptake by cells, and breakdown of glucose. They stimulate the breakdown of fats and increase the number of free fatty acids. Thyroid hormones decrease cholesterol levels, perhaps by increasing the rate of secretion of cholesterol in bile even while increasing free fatty acids.
 - ii. Cardiovascular. Thyroid hormones increase the rate and strength heart contraction, as well as increasing the rate of breathing, intake and consumption of oxygen, and speeding up mitochondria. Combined, these factors increase blood flow and the body's temperature
 - iii. Developmental. Thyroid hormones are important for normal development. They increase the growth rate of young people, and cells of the developing brain are a major target for the thyroid hormones T_3 and T_4 . Thyroid hormones play a particularly crucial role in brain maturation during fetal development
 - iv. Other functions: The thyroid hormones also play a role in maintaining normal sexual function, sleep, and thought patterns. Increased levels are associated with increased speed of thought generation but decreased focus. Sexual function, including libido and the maintenance of a normal menstrual cycle, are influenced by thyroid hormones.



3. Structure of Thyroid Hormone

- a. Thyroid hormones are derivatives of the amino acid tyrosine bound covalently to iodine. The two principal thyroid hormones are:
 - i. Thyroxine (T4)
 - ii. Triiodothyronine (T3)
- b. Thyroid hormones are two tyrosines linked together with the addition of iodine at three or four positions on the aromatic rings. The number and position of the iodines is important.
- c. A large majority of the thyroid hormone secreted from the thyroid gland is T4, but T3 is the considerably more active hormone. Although some T3 is also secreted, the bulk of the T3 is derived by deiodination of T4 in peripheral tissues, especially liver and kidney. Deiodination of T4 also yields reverse T3, a molecule with no known metabolic activity.
- d. Thyroid hormones are poorly soluble in water, and more than 99% of the T3 and T4 circulating in blood is bound to carrier proteins. The principle carrier of thyroid hormones is thyroxine-binding globulin.



4. Thyroid Hormone Production

- a. To get more thyroid hormone in the blood the hypothalamus releases TRH (TSH releasing hormone) and then the pituitary secretes thyroid stimulating hormone. TSH acts on the thyroid gland and causes the release of T₃ and T₄
- b. The thyroid hormones are created from thyroglobulin. This is a protein within the follicular space that is originally created within the rough endoplasmic reticulum of follicular cells and then transported into the follicular space. Thyroglobulin contains 123 units of tyrosine, which reacts with iodine within the follicular space.
- c. Iodine is essential to produce the thyroid hormones. Iodine (I⁰) travels in the blood as iodide (I⁻), which is taken up into the follicular cells by a sodium-iodide symporter. This is an ion channel on the cell membrane which in the same action transports two sodium ions and an iodide ion into the cell. Iodide then travels from within the cell into the follicular space, through the action of pendrin, an iodide-chloride antiporter. In the follicular space, the iodide is then oxidized to iodine. This makes it more reactive, and the iodine is attached to the active tyrosine units in thyroglobulin by the enzyme thyroid peroxidase. This forms the precursors of thyroid hormones monoiodotyrosine (MIT), and diiodotyrosine (DIT).
- d. When the follicular cells are stimulated by thyroid-stimulating hormone, the follicular cells reabsorb thyroglobulin from the follicular space. The iodinated tyrosines are cleaved, forming the thyroid hormones T₄, T₃, DIT, MIT, and traces of reverse triiodothyronine. T₃ and T₄ are released into the blood. The hormones secreted from the gland are about 80–90% T₄ and about 10–20% T₃. Deiodinase enzymes in peripheral tissues remove the iodine from MIT and DIT and convert T₄ to T₃ and RT₃. This is a major source of both RT₃ (95%) and T₃ (87%) in peripheral tissues.
- e. Regulation
 - i. The production of thyroxine and triiodothyronine is primarily regulated by thyroid-stimulating hormone (TSH), released by the anterior pituitary gland. TSH release in turn is stimulated by thyrotropin releasing hormone (TRH), released in a pulsatile manner from the hypothalamus. The thyroid hormones provide negative feedback to the thyrotropes TSH and TRH: when the thyroid hormones are high, TSH production is suppressed. This negative feedback also occurs when levels of TSH are high, causing TRH production to be suppressed.
 - ii. TRH is secreted at an increased rate in situations such as cold exposure to stimulate thermogenesis. In addition to being suppressed by the presence of thyroid hormones, TSH production is blunted by dopamine, somatostatin, and glucocorticoids.



5. Interactions with Other Hormones

a. Calcitonin

- i. The thyroid gland also produces the hormone calcitonin, which helps regulate blood calcium levels. Parafollicular cells produce calcitonin in response to high blood calcium. Calcitonin decreases the release of calcium from bone, by decreasing the activity of osteoclasts, cells which break bone down. Bone is constantly reabsorbed by osteoclasts and created by osteoblasts, so calcitonin effectively stimulates movement of calcium into bone. The effects of calcitonin are opposite those of the parathyroid hormone, produced in the parathyroid glands. However, calcitonin seems far less essential than PTH, as calcium metabolism remains clinically normal after removal of the thyroid (thyroidectomy), but not the parathyroid glands.

b. Estrogen/Progesterone

- i. Supplemental estrogen and progesterone in post-menopausal or women post-hysterectomy may increase the need for thyroid hormone. This is because estrogen and progesterone increases the level of circulating thyroxine-binding globulin, thereby decreasing the amount of free T4.
- ii. This may change the dose requirements needed of T4 or change the pituitary-thyroid axis in women with normal thyroid.



6. Signs of Thyroid Underactivity

a. If thyroid levels are too low

- i. Trouble sleeping
- ii. Tiredness and fatigue
- iii. Difficulty concentrating
- iv. Dry skin and hair
- v. Depression
- vi. Sensitivity to cold temperature
- vii. Frequent, heavy periods
- viii. Joint and muscle pain
- ix. Hashimoto's thyroiditis

1. Most common form of thyroid imbalance.
2. The strong genetic component with monozygotic twins there is a concordance of 38-55%, with an even higher concordance of circulating thyroid antibodies not in relation to clinical presentation (up to 80% in monozygotic twins). Neither result was seen to a similar degree in dizygotic twins, offering strong favor for high genetic etiology.
3. Hashimoto's thyroiditis is associated with CTLA-4 (Cytotoxic T-lymphocyte Antigen-4) gene polymorphisms. CTLA-4 downregulates., i.e. transmits an inhibitory signal to T cells so reduced functioning is associated with increased T-lymphocyte activity.
4. Having another autoimmune disease is a risk factor to develop Hashimoto's thyroiditis, and the opposite is also true. Autoimmune diseases most commonly associated to Hashimoto's thyroiditis include celiac disease, type 1 diabetes, vitiligo, and alopecia.
5. Preventable environmental factors, including high iodine intake, selenium deficiency, as well as infectious diseases and certain drugs, have been implicated in the development of autoimmune thyroid disease in genetically predisposed individuals.



7. Signs of Thyroid Overactivity

- a. If thyroid levels are too high, there can be a wide range of complication.
 - i. Anxiety
 - ii. Irritability or moodiness
 - iii. Nervousness, hyperactivity
 - iv. Sweating or sensitivity to high temperatures
 - v. Hand trembling (shaking)
 - vi. Hair loss
 - vii. Missed or light menstrual periods
- b. Grave's disease. The exact cause is unclear; however, it is believed to involve a combination of genetic and environmental factors. While a theoretical mechanism occurs by which stress could cause an aggravation of the autoimmune response that leads to Graves' disease, more robust clinical data are needed for a firm conclusion. Possible related to infection, Y. enterocolitica. Methimazole and PTU can treat, but the side effects can be gnarly (agranulocytosis for one), and many people opt for radioactive iodine treatment or thyroidectomy.



8. Why does imbalance occur?

- a. High chronic cortisol secondary to stress.
 - i. Suppression of TSH, decreased conversion of T4 to T3, increased production reverse T3 (rT3) and decreased cellular thyroid receptor binding.
- b. Medicines.
 - i. Sulfadimethoxine, propylthiouracil, potassium perchlorate, and iopanoic acid, and oxazolidinones such as goitrin.
 - ii. Ions such as thiocyanate (from cigarette smoking for example).
 - iii. Perchlorate decreases iodide uptake by competitive inhibition. Because of reduced T4 and T3 secretion by the gland, there is an increased release of thyrotropin which then stimulates the gland.
 - iv. Amiodarone inhibits peripheral conversion of T4 to T3 and interferes with thyroid hormone action.
 - v. Lithium inhibits thyroid hormone release.
 - vi. Phenobarbitone, phenytoin, carbamazepine, rifampin can also disrupt thyroid function.



9. Essential Oils and the Thyroid

- a. There is not great data to support the use of essential oils in protecting the thyroid.
- b. Inhalation of a proprietary blend of 1 mL of lemon and 0.5 mL of ginger essential oil may help to protect the salivary glands during radioactive iodine ablation.
- c. Skhuzestanica essential oil (SKEO) was tested for effects on the thyroid and antioxidant system. This was assessed by measuring levels of T3, T4, TSH, malondialdehyde, reduced glutathione (GSH), and glutathione peroxidase activity. SKEO + Vitamin E could compensate the decline of GSH levels in response to hyperthyroidism. Supplementation of SKEO, plus Vitamin E as antioxidants is useful in attenuating lipid peroxidation and may potentially benefit hyperthyroid patients.



10. Essential Nutrition for the Thyroid

- a. Foods high in Protein
 - i. Protein is required to build the initial structure of thyroid hormone.
 - ii. High quality protein is strongly recommended, and my personal preference is always for vegetable sources vs animal sources. Be cautious not to eat too much protein as it can lead to challenges for the kidney.
 - iii. Vegetarian sources of protein
 - 1. Spirulina
 - 2. Lentils
 - 3. Seeds: hemp, chia, sunflower, flax, and pumpkin seeds
 - 4. Quinoa
 - 5. Nutritional yeast
 - 6. Nuts
 - 7. Beans
 - iv. Certainly, if you choose to, you can get protein from animal protein.
- b. Foods high in Iodine
 - i. Before the iodination of salt, up to 95% of thyroid deficiency is caused by iodine deficiency. On the other hand, in people who have enough thyroid hormone, long-term iodine intake above the tolerable upper intake level of 1,100 $\mu\text{g}/\text{day}$ may increase the risk of thyroid disorders. This means that we need enough iodine, but not too much less it be risky for us long term.
 - ii. Because various edible seaweed species substantially contribute to traditional Asian meals, average Japanese dietary intakes are estimated to range between 1,000 and 3,000 μg of iodine/day. Iodine-induced goiter and hypothyroidism are not uncommon in Japan and can be reversed by restricting seaweed intake.
 - iii. Prolonged intakes of more than 18,000 $\mu\text{g}/\text{day}$ (18 mg/day) increase the incidence of goiter in adults. In newborns, iodine-induced goiter and hypothyroidism can be due to either high maternal intakes or high exposure to iodized antiseptics.
 - iv. Examples of foods high in iodine
 - 1. Seaweeds
 - 2. Cod fish
 - 3. Cranberries
 - 4. Navy Beans
 - 5. Potatoes
 - 6. Yogurt
 - 7. Strawberries
 - 8. Cheese
 - 9. Parsley
- c. Foods high in Selenium



- i. Critical to produce thyroid hormone because it helps to build selenoproteins that govern hormone balance (both thyroid and reproductive hormones), DNA synthesis and protection from oxidative damage. It is recommended to eat no less than 55 mg per day in the average adult (60 mg in pregnant women and 70 mg in lactating women).
- ii. Examples of foods high in selenium:
 - 1. Brazil nuts
 - 2. Yellowfin tuna
 - 3. Halibut
 - 4. Spinach
 - 5. Eggs
- d. Goitrogens are substances (whether in drugs, chemicals, or foods) that disrupt the production of thyroid hormones by interfering with iodine uptake in the thyroid gland. This triggers the pituitary to release TSH, which then promotes the growth of thyroid tissue, potentially leading to goiter.
 - i. Cooking inactivates goitrogens, so be sure to cook any of the foods below if you have any type of thyroid imbalance.
 - 1. Brassica family of vegetables
 - a. Bok choy
 - b. Broccoli
 - c. Brocollini
 - d. Brussels sprouts
 - e. Cabbage
 - f. Cauliflower
 - g. Chinese cabbage
 - h. Collard greens
 - i. Horseradish
 - j. Kale
 - k. Kohlrabi
 - l. Mustard greens
 - m. Radishes
 - n. Rapeseed
 - o. Rapini
 - p. Rutabagas
 - q. Turnips
 - 2. Cassava melon (crush and detoxify by soaking before consumption)
 - 3. Soybeans (and soybean products such as tofu, soybean oil, soy flour, soy lecithin)
 - 4. Pine nuts



5. Flax seed, flax seed contains cyanide which transforms into thiocyanate inside the body leading to hypothyroid syndrome.
6. Pearl millet - all millets are not the same and as far as the research shows, there are no goitrogens in other millets.
7. Strawberries
8. Spinach
9. Bamboo shoots
10. Sweet potatoes



11. Eastern Medicine and the Thyroid

- a. Causes of Imbalance
 - i. Disturbance of qi by sorrow and anger. Liver and spleen qi become disharmonious, and, as a result, moist sputum coagulates to form a goiter. The swelling in the neck should be one of the first noted symptoms when this is the primary cause.
 - ii. Heart fire. The disorder is often marked by highly agitated emotional condition. Fright, dreaminess, mania, panic, and other distress that may cause insomnia, excessive talking, or heart palpitations belong to this category. Heart fire is often associated with heart yin deficiency. The skin in the area of the thyroid may become discolored (purple).
 - iii. Extreme anger may produce liver fire, which dries yin and blood. The vessels surrounding the thyroid may bulge.
- b. External factors: geography plays a part (iodine deficiency, goiterogenic foods dominant in local crops, or some toxin in the environment induces thyroid disease).



12. Vitamins and Herbal Supplements

- a. L-tyrosine
 - i. From the Greek word tyros, meaning cheese, tyrosine is an amino acid that is important in the production of epinephrine and dopamine. L-tyrosine is an amino acid necessary for the manufacture of thyroid hormones (as we mentioned above, it takes more than 123 tyrosine molecules to create thyroglobulin, so it is a critical building block.
 - ii. Tyrosine can exacerbate hyperthyroid conditions, so take care not to supplement in these conditions. Tyrosine may interact with MAO-I medicines and interfere with the absorption of medicines that look like amino acids (such as Levodopa). If you choose to use them together, be sure to talk to your doctor and pharmacist about the signs that your medicine levels may be too high or too low.
 - iii. Long term safety data is lacking with L-tyrosine supplementation, and durations of studies are only up to 2 weeks. Use caution if you choose to use it long term.
- b. Cysteine, L-cystine, N-acetyl-cysteine
 - i. Cysteine is a precursor to glutathione and an important source of sulfides in the body.
 - ii. Regarding thyroid health, cysteine may aid in the chelation of heavy metals, help produce normal reactions to inflammation, disrupt biofilm, and lower homocysteine levels. It also is a critical piece of selenocysteine which protects the thyroid from free radical damage.
- c. Thyroid powder
 - i. Desiccated thyroid powder is widely available from different animals (usually cow or pig), in strengths varying from 8 mg to more than 300 mg. Young Living's Thyromin contains 100 mg of bovine thyroid powder per dose.
- d. Adrenal and pituitary extract
 - i. Also derived from animals, adrenal and pituitary extract is widely available in varying strengths. Young Living's Thyromin contains 33.4 mg of adrenal and pituitary extract per dose.
- e. Iodine
 - i. 800 million people are affected by iodine deficiency disorders that include goiter, hypothyroidism, mental retardation, and a wide spectrum of other growth and developmental abnormalities. Iodine is an essential component of thyroid hormones and its deficiency is considered as the most common cause of preventable brain damage in the world.
 - ii. The recommended daily allowance of iodine is 150 micrograms (mcg) per day for adult men and women. 220 mcg for pregnant women. 290 mcg for breastfeeding women.



- iii. On the other hand, excessive iodine intake is not recommended in people with enough thyroid hormone. Long-term iodine intake above the tolerable upper intake level of 1,100 µg/day may increase the risk of thyroid disorders.
 - iv. Supplement with enough iodine, but not too much as it may be risky for us long term.
 - v. Young Living's Thyromin contains a large dose of iodine. Use caution with long term use, especially in combination with NingXia Nitro which also contains iodine.
- f. Selenium
- i. Three different selenium-dependent iodothyronine deiodinases (types I, II, and III) can both activate and inactivate thyroid hormones, making selenium an essential micronutrient for normal development, growth, and metabolism. Furthermore, selenium is found as selenocysteine in the catalytic center of enzymes protecting the thyroid from free radical damage. In this way, selenium deficiency can exacerbate the effects of iodine deficiency and the same is true for vitamin A or iron deficiency. Substances introduced with food, such as thiocyanate and isoflavones or certain herbal preparations, can interfere with micronutrients and influence thyroid function.
 - ii. This one is critical for the conversion of T4 into active T3.
- g. Taurine may help to prevent damage to the thyroid from environmental toxins such as chlorpyrifos (an organophosphate insecticide) and lead.
 - h. Spearmint extract is commonly purported to support the thyroid, but studies are mixed levels. It has, however, been shown to be safe and effective at a variety of doses and in certain studies can increase the weight of the pituitary gland and thyroid gland in both sexes of rats.
 - i. Magnesium, Vitamin B₁₂, and Zinc are all cofactors to produce TSH.
 - j. Vitamin B₂ and Vitamin C are cofactors for a symporter that draws iodine in to the thyroid so it can be added to the growing structure of thyroid hormone.
 - k. Vitamin D and Vitamin A must be present for T3 to adequately activate nuclear receptors of T3 and turn on a cellular response.



13. Yoga for the Thyroid

- a. Shoulder stand pose
- b. Inverted Pose
- c. Plough pose
- d. Fish pose
- e. Camel pose
- f. Sun salutation
- g. Cobra pose
- h. Bridge pose
- i. Headstand pose
- j. Bow pose



14. Emotional Imbalance of the Thyroid

- a. There are several theories on what emotions can cause imbalances in the thyroid, including:
 - i. Conflict between the conscious and the unconscious self
 - ii. Lack of self-love
 - iii. Fear of self-expression
 - iv. Deep sense of frustration or anxiety
 - v. Feeling unprotected
- b. For frustration
 - i. Apply lemon essential oil over the common bile duct on the outer edge of the upper right side of the body.
 - ii. Meditate on the mantra: "I move beyond my limitations."
 - iii. Say each of these phrases three times each: I choose to release the trauma behind the emotion of frustration. I choose accomplishment.
- c. For anxiety
 - i. Apply Joy essential oil over the capillary points on either side of the midline of the body.
 - ii. Meditate on the mantra: "Peace, be still."
 - iii. Say each of these phrases three times each: I choose to release the trauma behind the emotion behind anxiety. I choose confidence.
- d. For feeling unprotected
 - i. Apply thyme to the cellular memory point at the midline, just above the umbilicus.
 - ii. Say each of these phrases three times each: I choose to release the trauma behind the emotion of feeling unprotected. I choose security.



15. Before you start.

- a. Always consult your endocrinologist before starting a supplement to support the thyroid. Never start a new wellness routine without consulting a physician.
- b. Place priority dosing on your medications. It is very important to take your thyroid medicine first thing in the morning before eating any food or beverages other than water. Because iodine is very negatively charged, it sticks to many positively charged ions such as magnesium, calcium, and potassium. Eating food alongside thyroid medicine can render it ineffective.
- c. If you choose to take Thyromin with thyroid medication, you must ensure that you are having your thyroid levels consistently checked. Thyromin is not a benign supplement, and it is important to collaborate with your physician on supplement routine.



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