HYPOTHYROIDISM

OVERVIEW

The thyroid is a vitally important hormonal gland that plays an essential role in metabolism, growth, and maturation of the human body. The thyroid produces and releases into the circulation at least two potent hormones, thyroxine (T_4) and triiodothyronine (T_3), which influence basal metabolic processes and enhance oxygen consumption in nearly all body tissues. Thyroid hormones also influence growth, temperature regulation, lipid and carbohydrate metabolism, cardiac myocyte activity, reproduction, cognitive functioning, and bone development.

Hypothyroidism is the insufficient production of thyroid hormone. Overt hypothyroidism is present in 0.1-2% of all adults, with 15% of older women meeting the criteria for subclinical hypothyroidism.[1] Worldwide, iodine deficiency is the most common cause of hypothyroidism. In the United States, where salt is fortified with iodine, autoimmune thyroiditis or Hashimoto's thyroiditis is the most common type of hypothyroidism. In autoimmune thyroiditis there is cell-mediated antibody destruction of the thyroid gland. The second leading cause of hypothyroidism is iatrogenic—including situations when surgery, medications, or radiation have affected the functioning of the gland.[2]

Because the thyroid affects so many different physiologic processes in the body, the clinical signs of hypothyroidism are variable from one individual to another. Some patients present with mild symptoms in spite of having low levels of circulating thyroid hormones, while some patients have more significant symptoms despite only mildly abnormal lab testing.

COMMON SYMPTOMS OF HYPOTHYROIDISM[2]

- Fatigue
- Dry skin and nails
- Cold intolerance
- Hair loss
- Concentration or memory problems
- Constipation
- Weight gain
- Bradycardia and hypothermia
- Carpal tunnel symptoms
- Menorrhagia, irregular menses, or infertility
- Depression

DIAGNOSIS

The diagnosis of hypothyroidism is based on the combination of clinical context and laboratory tests including TSH and Free T4. In primary hypothyroidism, serum TSH is elevated (typically >4.5mI/L) and serum free T4 is decreased.

There is a continuum between the euthyroid state and hypothyroidism and it is suggested that the range be further contracted to an upper limit of normal of 2.5 mIU/L to more appropriately diagnose people with hypothyroidism. Approximately 80% of adults have a TSH below 2.5mml/L suggesting that the "normal" cut-off should be lower to better capture all cases of hypothyroidism. However, natural history data shows us that up to half of older people (ages 50-70) with upper limit TSH 3.0-5.0 and thyroid antibodies will go on to develop hypothyroidism. As few as 10% of people of younger age (ages 20-40) without antibodies will go on to develop hypothyroidism. Many endocrinologists argue that the TSH limit should not be adjusted as the normalization of TSH is common and there are no health consequences for those with a mildly elevated TSH but normal thyroxine levels.[3,4]

Treatment of subclinical hypothyroidism (TSH 5.0-10.0 mIU/L) is also not recommended by conventional medicine as there is no compelling evidence that treatment with levothyroxine improves symptoms compared with placebo in individuals with TSH in the 5.0–10 mIU/L range. Treatment of subclinical hypothyroidism when serum TSH is between 5 and 10 mIU/liter generally does not have a beneficial effect on serum lipid profiles and does not affect cardiac risk. In addition, use of thyroid hormone therapy in nonpregnant adults with subclinical hypothyroidism was not associated with improved quality of life or thyroid-related symptoms.[5] The only documented adverse health outcome for individuals with TSH levels between 3.0 and 5.0 mIU/L is progression to overt hypothyroidism.[6] In general, treatment can be considered in the following situations:

- Patients who have TSH levels higher than 10 mIU/L on repeated measurements
- Patients who have symptoms or signs (e.g., goiter) associated with thyroid failure
- Patients who have convincing family history of thyroid disease
- Pregnant patients
- Patients who have severe hyperlipidemia.[2]

Some practitioners feel conventional methods of diagnosis of hypothyroidism are too narrow and miss many cases of hypothyroidism in patients who are clinically symptomatic. An alternative practice is to look at the absolute levels of T3 and T4, not just TSH. If T3 and T4 are low, regardless of TSH, a patient may be diagnosed by these practitioners with hypothyroidism.

NUTRITION

GOITROGENS

Goitrogens are food substances that block thyroid hormone synthesis. Thiocyanate and isothiocyanate are compounds found in cruciferous/brassica vegetables (cabbage, broccoli, cauliflower, and Brussels sprouts) and they have been found to block the iodination of thyroglobulin if they are consumed in high amounts. This is especially true if a person is iodine deficient.[7] Studies also show suppression of thyroid peroxidase activity, TSH elevation, and increase in thyroid symptoms in people eating high quantities of soy isoflavones.[8] When eating a reasonable amount of soy and Brassica vegetables (less than 30 gm daily), steaming or cooking these foods briefly may help reduce their goitrogenic effect while preserving their nutrient content.[9]

GLUTEN AND THYROID

The link between celiac and other autoimmune diseases, including autoimmune thyroiditis is well-established. Treatment of celiac disease with the avoidance of gluten can improve absorption of levothyroxine and enhance subsequent treatment effects.[10] While current evidence does not suggest that a gluten-free diet mediates thyroid symptoms in patients with celiac disease or gluten intolerance, many patients do find this to be helpful.

THE ANTI-INFLAMMATORY DIET

A number of medical conditions are linked to too much inflammation, including autoimmune thyroiditis. Any long-term, healthy eating plan should try and incorporate the principles of the anti-inflammatory diet. The pertinent aspects of this diet include: avoiding trans-fats, limiting fats that are high in omega-6 fatty acids including many saturated fats, increasing monounsaturated fats and omega-3 in the diet, aiming for 8-10 servings of fruits and vegetables, and eating at least 30 gm of fiber daily, choosing whole grains whenever possible.

VITAMINS & MINERALS

IODINE

Iodine is an essential element for humans and is required for the synthesis of thyroid hormones (refer to Table 1). Iodine deficiency is common in many land-locked developing areas of the world, but not in the United States and other industrialized countries, where table salt is fortified with iodine. Ironically, ingestion of too much iodine can lead to iodine-induced hyperthyroidism (the Jod-Basedow phenomenon) or iodine induced hypothyroidism (the Wolff-Chaikoff effect) in patients who are iodine deficient. In patients without iodine deficiency, chronic exposure to high levels of iodine reduces binding over time and can also cause hypothyroidism.[11]

Sea vegetables and seaweed including kelp, nori, and dulse are natural sources of iodine. The quantity of iodine in each serving will vary based on where they were grown, species, part of plant, climate they grew in and how they were prepared.

Iodine testing is typically not necessary, though it can be considered in patients with dietary restrictions, medication use or heavy metal toxicity. The unprovoked 24-hour urine iodine test is currently the best method to evaluate iodine levels. A provoked 24-hour urine iodine test with a 50 mcg iodine load can be done, but is rarely necessary.[12]

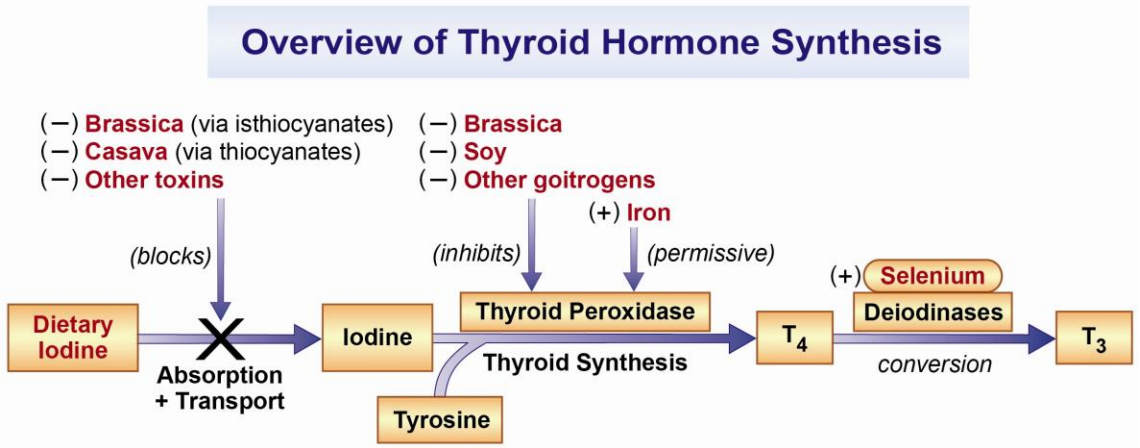

Figure 1. Overview of Thyroid Hormone Synthesis. Reprinted with permission from Elsevier.[2]

SELENIUM

Adequate selenium is also required for proper thyroid function.[13] (Refer to Figure 1, above.) Specifically, selenium facilitates conversion of T4 to the active T3 through selenium dependent deiodinases.[14] A 2019 review found that patients with hypothyroidism exhibited lower selenium levels than healthy controls.[15] Selenium supplementation may improve thyroid dysfunction in patients who are deficient. It is unclear to what extent selenium benefits patients with hypothyroidism in the absence of a selenium deficiency.

OTHER NUTRIENTS: VITAMIN A, IRON, AND ZINC

Many other vitamins and nutrients influence thyroid function, most notably vitamin A, iron, and zinc (refer to Figure 1). A 2019 review found that patients with hypothyroidism had lower levels of zinc compared with healthy controls.[15] Consider supplementing with them in hypothyroidism, especially if deficiency states are suspected.[12]

L-TYROSINE

L-Tyrosine is an amino acid and is important for thyroid function. Thyroxine (T4) is produced through the iodination of tyrosine (Figure 1). Tyrosine is absorbed through diet and also created by the conversion of phenylalanine. Tyrosine supplementation may be

helpful in patients for hypothyroid symptoms in patients who are deficient.[16] The recommended dose of L-Tyrosine is 500 mg three times daily.

Recommended daily doses based on the Recommended Daily Allowances (RDAs) and Tolerable Upper Intake (TUI) levels for adults are listed in Table 1.

TABLE 1. RECOMMENDED DAILY ALLOWANCES (RDA) AND TOLERABLE UPPER INTAKES (TUI) FOR THYROID-RELATED NUTRIENTS

Vitamin/Mineral	RDA	TUI
Iodine	150mcg/day	1100mcg/day
Selenium	55mcg/day	400mcg/day
Vitamin A	800mg/day	3000mg/day
Iron	12mg/day elemental	45mg/day elemental
Zinc	10mg/day	40mg/day

THYROID HORMONE SUPPLEMENTATION

SYNTHETIC T4 (LEVOTHYROXINE, SYNTHROID)

L-Thyroxine is a synthetic thyroid hormone and chemically similar to thyroxine (T4), which is secreted by the follicular cells of the thyroid. Synthetic T4 is the conventional treatment of choice in most cases of hypothyroidism.

SYNTHETIC T3 (LIOTHYRONINE, CYTOMEL)

Chemically, liothyronine is nearly identical to triiodothyronine (T3) which is also an active thyroid hormone in the body. In euthyroid patients, most of the thyroid action in the body results from the action of T3 which is converted from T4 by the deiodinases in the body. About 80% of the active T3 form is produced by this peripheral conversion, with the remaining 20% of T3 being produced by the thyroid gland. The presence of individual and organ tissue variance of deiodinase enzyme activity raises concerns that for some patients with hypothyroidism, supplemental T4 alone may not be adequate. It is important to recognize that T3 should always be prescribed 2-3 times daily due to its shorter half-life.

Numerous clinical trials and one meta-analysis have evaluated the potential advantages of combined T3 and T4 replacement over T4 alone, with mixed results.[17-20] One meta-analysis involving 1,216 patients concluded that there was no advantage to combined T4 and T3 over T4 alone in terms of several patient- and clinician-oriented measures.[20] However, there was considerable heterogeneity in the populations included in this meta-

analysis. A subsequent double-blind randomized cross over study did show a benefit to combined therapy versus T4 therapy alone in terms of numerous patient-oriented quality of life and well-being measures.[19] A 2018 review of three systemic reviews showed that adding liothyronine to levothyroxine has minimal or no effect on fatigue and quality of life, and likely does not improve mood, pain, or cognitive function.[21]

Given the possibility of benefits to sub-groups of hypothyroidism patients, an empirical trial of combined T3 and T4 could be considered in cases refractory to T4 alone, especially those with persistent low or low normal T3 levels.

PORCINE HORMONE

Ground pig thyroid (Armour Thyroid, NP Thyroid and Nature-Thyroid) is an older form of supplemental thyroid hormone that is still requested or preferred by many patients. Like endogenous human thyroid secretions, porcine thyroid preparations contain a combination of about 80% T4 and 20% T3, in addition to other possibly active iodinated compounds. Many patients consider this to be more natural and experience better results with this form. Monitoring response to treatment may be done just as with standard synthetic levothyroxine, based on symptoms and TSH levels after six to eight weeks of therapy. One grain (60 mg) of porcine thyroid = 100 mcg of levothyroxine. The starting dose is 0.5 grains in young healthy adults.

To Increase absorption of thyroid supplements:

- Take on an empty stomach
- Do not take with iron, calcium antacids, anti-seizure medications, PPIs
- Eat a consistent amount of fiber in your diet

OTHER COMPLEMENTARY APPROACHES

YOGA

There is a particular yoga asana or posture that is purported to stimulate the thyroid gland—Sharvangasana, or the shoulder stand. This claim has apparently not been investigated scientifically, but doing the pose is generally safe under the guidance of a qualified teacher.

ENERGY MEDICINE: REIKI TREATMENT OF THE FIFTH CHAKRA

According to the Reiki tradition, the throat chakra is the fifth of seven chakras, or energy centers. It is located in the center of the neck in the area of the thyroid gland. It is believed that this chakra is responsible for aiding supporting thyroid function. When the throat chakra is blocked, patients may suffer from hypothyroidism, among other physical ailments. The throat chakra is associated with self-expression, creativity, writing, listening to words and music, and the senses of smell and taste. When this chakra is balanced, one is more effective at speaking and listening to people and what they have to say. In fact, a

person may be encouraged to "speak your truth" in order to improve the health of the fifth chakra. Reiki for thyroid care has not been investigated scientifically, though it is generally safe from a certified practitioner.

For more information, refer to "Energy Medicine (Biofield Therapies)," Chapter 17 of the *Passport to Whole Health*.

HYDROTHERAPY

Contrast hydrotherapy (application of hot and cold) to the neck and throat may stimulate thyroid function. It is done by alternating 3 minutes heat exposure with 1 minute cold. This is repeated three times for one set, and two to three sets are done per day.

TRADITIONAL CHINESE MEDICINE/ACUPUNCTURE

Although not well studied for addressing hypothyroidism, traditional Chinese medicine (TCM) can have positive effects on imbalances in the immune system, and it is useful in treating other autoimmune conditions. In TCM, hypothyroidism is generally considered to be a spleen or kidney "yang" deficiency, especially if the disorder is characterized by cold sensation, lack of appetite, fatigue, and weight gain. Acupuncture and herbal treatments aim to strengthen qi and yang deficiency. For more information, refer to the "Acupuncture" Whole Health tool.

ENVIRONMENT

The incidence of thyroid disease, including cancer and hypothyroidism is increasing in the United States. There is a growing body of evidence which supports the idea that environmental toxins may be contributing. Thyroid disrupters, including PCBs, PBDEs, and phthalates have all been shown to interfere with the production, transport, and metabolism of thyroid hormone. Patients who want to maximize their thyroid function should attempt to avoid these chemicals by choosing organic foods, avoiding food/drink stored in plastic bottles and packaging, and by purchasing flame-retardant-free products when possible.[22]

RESOURCE LINKS

- Acupuncture: https://www.va.gov/WHOLEHEALTHLIBRARY/tools/acupuncture.asp
- *Passport to Whole Health*: https://www.va.gov/WHOLEHEALTHLIBRARY/docs/Passport_to_WholeHealth_FY2020_508.pdf

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