

Understanding Your Thyroid

Testing and Treatment

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The thyroid gland, one of the larger endocrine (hormone secreting) glands, resides in the lower front of your neck, and controls the body's metabolism (energy expenditure) and calcium levels. Its effect on your body is ever-reaching, with most of your organs responding to thyroid hormones in some way. Hence, when your thyroid is not functioning properly, you may notice any myriad of symptoms. This handout will address **hypothyroidism** (under-active thyroid). However, it is by no means meant to be a thorough presentation, as thyroid function is a very complex process, and a more detailed explanation is beyond the scope of these few pages.

Hypothyroidism affects around 10% of the general population and about 20% of women over 50. Several factors contribute to hypothyroidism including surgical removal, radiation, autoimmune diseases such as Graves' and Hashimoto's Thyroiditis, aging, and probably most commonly, nutritional and iodine deficiency. Although it has been long felt that the United States was an iodine sufficient nation (iodized salt and all), several recent studies have shown we are, in fact, not getting appropriate levels of iodine in our diets. Vitamin and mineral deficiencies, and gut absorption issues also decrease our ability to absorb necessary nutrients for thyroid, and impede the building and processing of thyroid hormones.

Hypothyroidism vs. Sub-Clinical Hypothyroidism

For years, the diagnosis of hypothyroidism was based on more dramatic symptoms and laboratory abnormalities. Improvement in lab technology and interpretation has bettered our ability to diagnose less severe low thyroid abnormalities which we classify as "Sub-Clinical Hypothyroidism" (SCHT). There is still debate not only on the exact definition of SCHT, but whether the entity actually exists. Generally, SCHT refers to the condition where a person has hypothyroid symptoms, but their labs are normal or nearly normal. Many feel that thyroid lab tests are not always accurate or reflective of the actual thyroid status. Conversely, many physicians are adamant that standard testing is adequate enough. Obviously, there is a bit of contention on this subject. None-the-less, *Table 1* shows the typical symptoms associated with low thyroid.

Basic Thyroid Hormone Production

The pituitary gland controls many of the hormone functions, including thyroid, ovaries, and adrenal. Thyroid Stimulation Hormone (TSH) is released in levels determined necessary by the pituitary gland to prod the thyroid to produce several hormones including **Thyroxine (T4)** [with 4 iodines on the molecule], and

Symptoms of Hypothyroidism and Sub-clinical Hypothyroidism

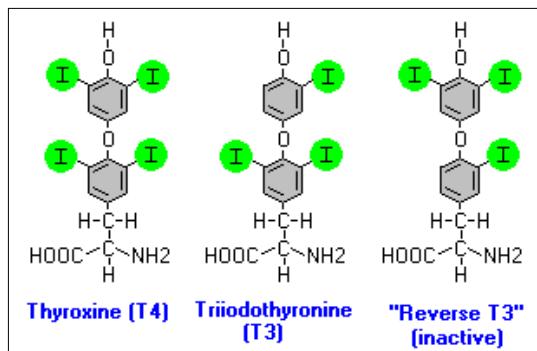
- severe fatigue, loss of energy, afternoon "crashing", hypoglycemic episodes
- insomnia, hot flashes, night sweats
- weight gain, difficulty losing weight, Decreased appetite, increased carb cravings
- depression and depressed mood, moodiness
- joint and muscle aches and pain, headaches
- dry skin, brittle nails, cracked skin of palms and feet
- brittle hair, itchy scalp, hair loss, eyebrow hair loss
- irregular and/or heavy periods, PMS symptoms
- breast milk formation
- cold intolerance and lower body temperature, increased or decreased sweating
- constipation
- diminished sex drive
- puffiness in face and extremities, water retention
- hoarseness
- bruising/clotting problems
- elevated levels of LDL (the "bad" cholesterol) and heightened risk of heart disease
- allergies that suddenly appear or get worse
- persistent cold sores, boils, or breakouts
- tingling sensation in wrists and hands that mimics carpal tunnel syndrome
- memory loss, fuzzy thinking, difficulty following conversation or train of thought
- appearance of a goiter, an enlargement of the thyroid that is externally visible

Table 1

Thyriiodothyronine (T3) [with 3 iodines] based on what it considers to be the current need at that time. (Several others are produced, but we won't get into those). After being released into the blood stream, these hormones are then taken up into other tissues where the T4 is converted to T3 by removing one of the iodine groups. T3 is the actual active thyroid hormone that performs the thyroid functions by binding to a receptor on the cell wall, thereby sending a signal to the cell to do its thing.

Reverse T3

Some T4 is converted to what is known as Reverse T3 (rT3) which is an inactive thyroid hormone. The only difference is that the wrong iodine is removed (see *Figure 1*). The molecule will still bind the receptor on the cell, but does nothing. This prevents the T3 from performing its duties, so metabolism is slowed



down. Too much rT3 can also cause hypothyroid symptoms. Again, there are different opinions on the importance of rT3, as well as, the normal ratio of rT3 to T3. Some sources state that the ratio should be 1:20 (1 rT3 to 20 T3 molecules), but, in my opinion (and it is just my opinion) a 1:10 ratio seems more reasonable, and that is number I use based on my clinical experience.

Figure 1

Factors that Affect Thyroid Function

As mentioned earlier, there are several factors that can adversely affect thyroid function including how nutrients are absorbed, how thyroid hormones are made, and how thyroid hormones are processed and activated. This is well diagrammed in *Figure 2*. Some of the more common deficiencies are vitamin D (from absorption issues), zinc, selenium (due to farming practices and soil depletion), B vitamins and copper. Medications, stress, lifestyle and genetics also can adversely affect thyroid function.

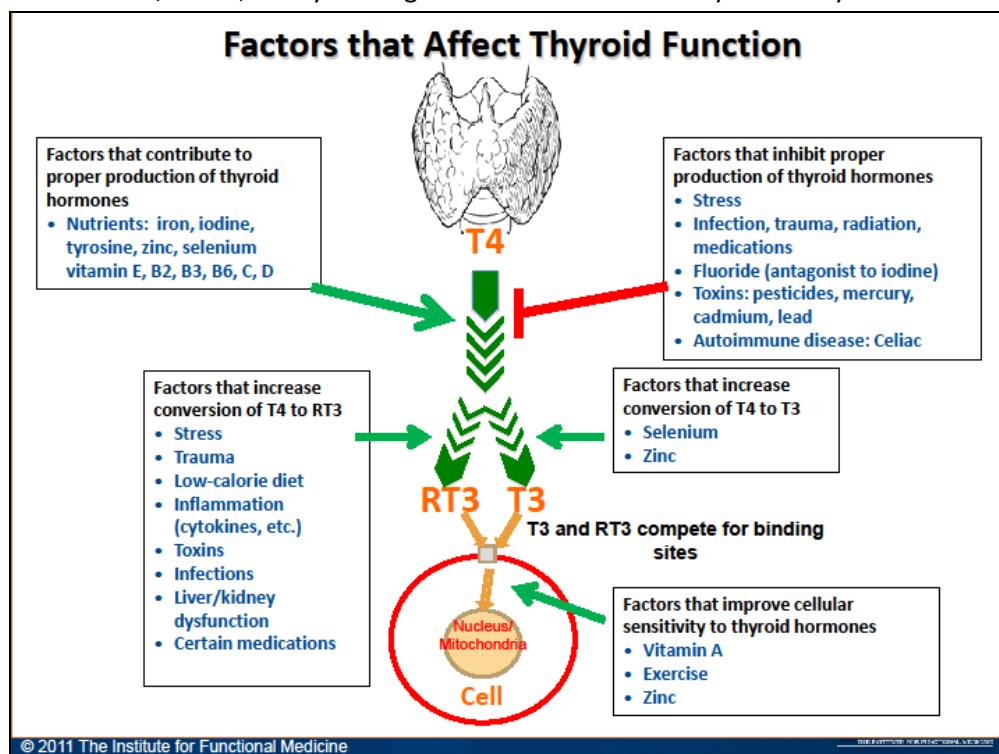


Figure 2

Thyroid Treatment

There are several different options for replacing low thyroid. No matter which medication you use, the dose will have to be individualized, usually via a trial and error approach. We start low and gradually increase the dose until symptoms are relieved and lab tests are in the normal range (but symptoms always trump lab results, since there is so much variation in “normal”).

Synthetic options include **levothyroxine (Levoxy^l®)** and **Synthroid®**. These are T4 compounds which are then converted to T3 like the T4 naturally produced by the thyroid. If there is a conversion issue to T3 (i.e. high rT3 production), T4 supplementation can worsen the problem resulting in side effects including an increase in hypothyroid symptoms, weight gain, swelling and palpitations to name a few. Most people will do well with either medication, but if not there are several other options.

Natural options include desiccated porcine thyroid (that's right—dried pig thyroid glands). The most popular is **Armour®**, but other options include **Naturethroid®** and **NP Thyroid®**. By using the entire thyroid, the medication contains both T4 and T3, along with several other thyroid products (T1,T2 and calcitonin) which, many times, provides a more physiologic (equal to what the body would do) replacement and hence, better results and symptom relief. There are still strong opinions about the pros and cons of natural thyroid (most stemming from outdated and incorrect information) and concerns about consistency in dosing. Some physicians are unyielding in their opinion that a T4 product should cover everyone since the body will “always” properly convert it into T3. From my, and many others' experience, we know that this is simply not true. In fact, based on my patients' improvement (or lack thereof) and laboratory results, the majority of my patients do better on a natural thyroid medication.

Another option is a T3 compound such as **liothyroxine (Cytomel®)**. This bypasses the T4-T3 conversion and can be helpful in correcting persistently elevated rT3 levels. Dosing can be a bit trickier, but the results can be quite dramatic in these circumstances. We will frequently combine T3 with Armour or even Levoxyl at times to achieve optimal therapeutic response.

Nutritional supplements can enhance thyroid treatment. As noted above, deficits of some vitamins and minerals can adversely affect the efficacy of replacement or thyroid function in general. Zinc, Selenium, Vitamin D, and the B vitamins are some of the more common and important deficiencies. And, of course, as mentioned earlier, iodine deficiency probably contributes to a great majority of low thyroid (you can't build a wall without bricks).

Thyroid Laboratory Testing

Now that you are an expert in thyroid hormones, it's time to discuss thyroid testing. There are several thyroid labs that make up the majority of our testing. We test more in-depth than is typical since this will give us a better insight into diagnosis and effectiveness of treatment.

- **TSH or Thyroid Stimulating hormone** is produced by the pituitary to stimulate the thyroid (clever, huh?). The more behind the thyroid is, the more TSH level released (the slower your kids are walking, the louder you yell). Again, there is a debate on what the normal level is. Traditionally, anywhere from 4.5-5.5 mU/ml was considered normal, however, this was based on old and erroneous group studies. More recent studies show that the upper range of normal should be 2.5-3.0, and possibly as low as 2.0. This is why many patients who have hypothyroid are told that their levels (and hence, their thyroid) are normal when their TSH is 4 or so (pick a number between 3 and 5.5). To complicate matter further, TSH may not even be the best measure of overall thyroid function (or treatment adequacy since it may not reflect the total effect of the medication).

- **T4** --can be measured in *total* or *free* form—the latter being unbound (bound hormones are inactive), available hormone. T4 is the main hormone produced by the thyroid. This level can give us an idea of how the thyroid is responding to the TSH or blood levels of medication taken.
- **T3** (also total and free options) measures the final step in thyroid production and/or replacement. This is the one that really matters, since, being the most active of the thyroid hormones, determines the end result.
- **rT3** (reverse T3) measures the inactive form of the T3, and is compared to the level of T3. Again, the ratio of rT3 to T3 is one of the most important results of the labs that we obtain, since this is where “the rubber meets the road” and tells us if we have accomplished our goal in effective thyroid replacement.
- **Thyroid Antibodies:** Depending on the situation, we may also test for antibodies to the thyroid gland components. **Thyroglobulin Antibodies** are elevated in Hashimoto’s Thyroiditis, an autoimmune disease against the thyroid gland. **Anti-Thyroid Peroxidase (TPO)** antibodies attack the enzyme in the thyroid important to the production of thyroid hormones. Elevated TPO antibodies are commonly triggered by inflammation in the gut, worsened in many cases by gluten sensitivity. If your TPO antibodies are elevated, you will be referred for gluten-free diet counseling and supplement instructions.

Caveats and Pearls

- Successful Thyroid replacement can be much more difficult than it sounds. Adrenal fatigue/ cortisol depletion (a whole other topic), iron deficiency, and antibodies to name a few, can cause increased side effects or treatment failure when taking thyroid replacements.
- Thyroid medications should be taken in the morning with water and nothing else. You should wait to eat for 1 hour and avoid supplements and vitamins for 4 hours. If you go to the bathroom at night, just take it then and go back to bed. You can then have breakfast when you get up. Cytomel may be taken with food, however.
- Armour can be crushed or chewed (no, it doesn’t taste like bacon, unfortunately) or placed under your tongue to dissolve and absorb (takes about 20 minutes). This can help lesson some of the side effects like nausea or headaches one may get with these meds.
- You can’t easily cut Armour since it will crumble. Instead, straddle the tablet on the edge of your medicine bottle opening, and push down on either side to break it. It may not be exactly ½, but it will be close enough.
- Track your levels in the handy chart below. But remember—how you feel is always more important than the levels and, sometimes, the levels do not correlate to how you feel. In fact, they may just be totally off the wall.
- For more in-depth information, check out the following websites:
www.stopthethyroidmadness.com, www.nahypoathyroidism.org (National Academy of Hypothyroidism), www.thyroid.org,

Date							
TSH							
T4							
T3							
rT3							
TPO							
Medication and dose							