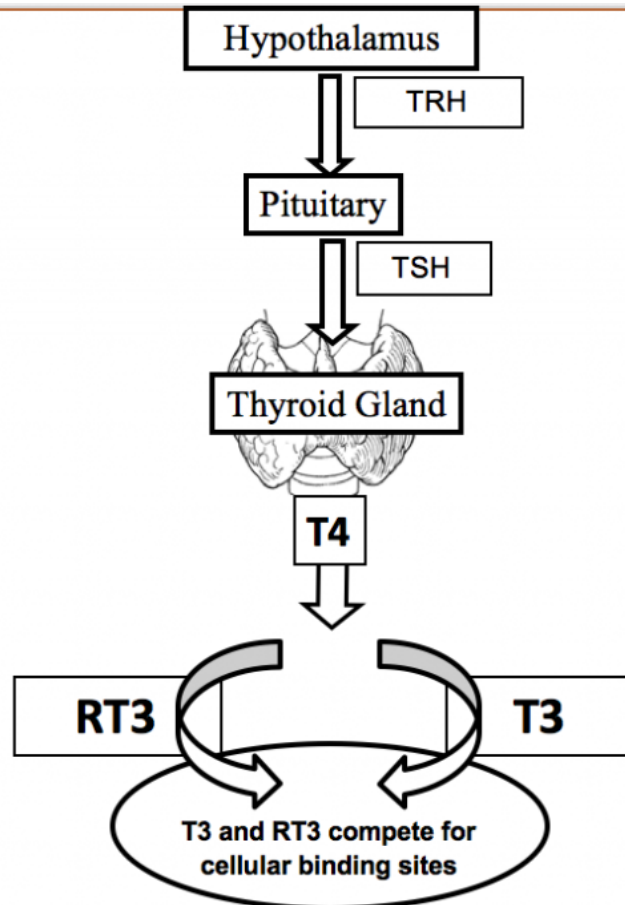


# The Role of Reverse T3 in Thyroid Function (Part 1)

Reverse T3 measurement is one of the important markers that need to be checked periodically while monitoring the thyroid supplemental hormone (supplementation with T4 or T4/T3 especially). Conventional medicine acknowledges that Reverse T3 concentrations are high in patients with chronic nonthyroidal illnesses due to such causes as hypoxia and impaired conversion of rT3 into T2. Unfortunately, conventional medicine does not see any value in checking reverse T3 elevation unless the person has a chronic disease and, possibly, hospitalized, while functional, naturopathic and integrative medicine sees it as a valuable marker of thyroid disease and different kinds of stress on the body.

## What is Reverse T3?

Let's quickly review the thyroid markers (**see the diagram below**):



## Understanding Thyroid Tests

This document was created by the Institute for Functional Medicine. This document may be copied or printed for your own use but cannot be resold or repurposed for commercial use.

Thyroid Releasing Hormone is made by the hypothalamus and it stimulates the pituitary gland in the brain to make TSH (Thyroid Stimulating Hormone). TSH stimulates the thyroid gland to produce as a final product Free T4 and Free T4 has two routes: to convert into an ACTIVE Free T3 or INACTIVE Reverse T3, i.e. the break for your thyroid.

### Why is it important?

High Reverse T3 slows down the metabolism by attaching to the cell receptor sites for the Free T3, so Free T3 cannot get into the cell and optimize its' function. So, your levels on the paper could be great (including optimal Free T4 and Free T3, as well as TSH), but you are still struggling with the weight gain, hair loss, constipation, cold hands, etc. Reverse T3 acts like a key in the keyhole (receptors) of the cell. It is impossible to put a Free T3 key into a keyhole that already

has a different key in it (Reverse T3). With the wrong key, the door will not open, the car will not start, the cell will not get the required Free T3 to function properly.

Reverse T3 is like a break on thyroid function and metabolism. It is the body's ability to store thyroid hormone Free T3 for a "rainy day." Stored Reverse T3 means you cannot use it and even though your level of Free T3 could be within the normal range, you still may experience hypothyroid symptoms.

Even if your level of Free T3 is optimal ( $>3.0$ ), but your Reverse T3 is high, your metabolism slowed down and you may experience the full-blown symptoms of hypothyroidism.

Integrative and functional healthcare providers consider high Reverse T3 to be "cellular hypothyroidism", as rT3 prevents Free T3 from getting into cells of the body where it is actually needed.

Unfortunately, the concept of Reverse T3 is not understood by many healthcare professionals and a lot of times the patients actually are more educated on their thyroid hormone levels and how the difference in these levels makes them feel, what symptoms reappear and when.

For example, [Merck Manual](#) gives the following interpretation to the Euthyroid sick syndrome or Nonthyroidal Illness Syndrome:

*"Euthyroid sick syndrome is low serum levels of thyroid hormones in clinically euthyroid patients with nonthyroidal systemic illness. Diagnosis is based on excluding hypothyroidism. Treatment is of the underlying illness; thyroid hormone replacement is not indicated. Patients with various acute or chronic nonthyroid disorders may have abnormal thyroid function test results. Such disorders include acute and chronic illness, particularly fasting, starvation, protein-energy undernutrition, severe trauma, myocardial infarction, chronic kidney disease, diabetic ketoacidosis,*

*anorexia nervosa, cirrhosis, thermal injury, and sepsis.*

*Decreased triiodothyronine (T3) levels are most common. Patients with more severe or prolonged illness also have decreased thyroxine (T4) levels. Serum reverse T3 (rT3) is increased. Patients are clinically euthyroid and do not have elevated thyroid-stimulating hormone (TSH) levels.*

*Pathogenesis is unknown but may include decreased peripheral conversion of T4 to T3, decreased the clearance of rT3 generated from T4, and decreased binding of thyroid hormones to thyroxine-binding globulin (TBG)."*

Definitely, to decrease rT3 the underlying causes need to be addressed: resolving starvation, malnourishment, or any other body-crisis situation will help to decrease reverse T3. But more often than not, the high levels of rT3 happen in "healthy" walking, working, barely getting through the day exhausted moms and dads, not just in the patients who are hospitalized or have a very severe chronic kidney disease. I know it as I see it all the time!

The labs give us some information, but it is so much more important to pay attention to our symptoms!

### **The Symptoms of High Reverse T3**

1. Abnormal weight gain
2. Extreme fatigue
3. Constipation
4. Cold hands/feet and other overt symptoms of hypothyroidism
5. Depression (with no history of depression before)
6. Crying for no reason
7. Lack of motivation/ambitions
8. Being overwhelmed by very tiny tasks and having to write big lists to accomplish something that day.

*But your labs look great! So, you may start believing it is*

depression and may even get onto an antidepressant, which will cause you to gain more weight...

## The Causes of High Reverse T3

So, what are the causes high Reverse T3?

- **STRESS (Emotional, Mental, Physical)!!! I literally cannot stress enough how important it is to keep the levels of stress at a minimum.**
- **Chronic Illness Cytomegalovirus – CMV – New or Reactivation, Epstein-Barr Virus (EBV or Mononucleosis), Herpes Viruses (New or Reactivation) to name a few.**
- Medications (beta-blockers, narcotics, antidepressants, blood pressure medications)
- Hidden Gut Infections/Parasites Blastocystis hominis, Different kinds of amoebas, SIBO (Small Intestinal Bacterial Overgrowth), SIFO (Small Intestinal Fungal Overgrowth or yeast overgrowth), etc.
- Inflammation High levels of CRP, Homocysteine, Ferritin (high levels), gut microbiome imbalance, etc.
- Dieting Calorie-restricted dieting, low-protein diets.
- Chronic Cardio, Boot Camps, the Cross-Fit exercise that depletes your adrenals and makes you feel tired all the time.
- Insulin Resistance Increased or suboptimal fasting insulin, metabolic syndrome, diabetes, pre-diabetes.
- Trigger including heart attack, starvation, surgery, hospitalization.
- [HPA-Axis Dysfunction](#)
- Vitamin and mineral deficiencies.
- Sluggish Liver (Congested Liver) High liver enzymes, fatty liver, frequent use of Tylenol, etc.

Ask your healthcare provider to test your Reverse T3 level at the very beginning and periodically as you adjust the doses of your thyroid medication unless you are taking T3-only thyroid replacement hormone. It is not necessary to check Reverse T3

every dose adjustment, but checking every 6 months at the beginning of your treatment would be beneficial. It would help to make sure that if you take a T4-only or T4/T3 thyroid supplemental hormone, you are not converting it into Reverse T3 instead of Free T3. If for financial reasons you choose not to check it (poor insurance coverage or high cash cost), check it, at the least, if you still have hypothyroid symptoms but your thyroid lab-work looks AMAZING!

It is also a great idea to check the levels of antibodies, especially if you make some changes in your lifestyle and diet. It is kind of a compass and lets you know if you are on the right track! You are on a journey of getting and feeling better, it is a process, it is not the destination. It takes time and patience and lots of tweaking.

### **How to Interpret Reverse T3 Levels**

The laboratory range for Reverse T3 is **9 – 24 ng/dL**.

*But what is more important is the RATIO of Free T3 to Reverse T3.*

The optimal ratio of FT3/rT3 should be  $> 20$ . If your ratio is 20 then too much of your Free T3 converts into rT3.

For Total T3/rT3 your ratio should be  $>10$ .

I often see patients (including myself) whose rT3 is borderline 24-25 ng/dL and the ratio of FT3/rT3 is suboptimal.

### **What Can Be Done To Improve the Conversion of Free T4 into Free T3?**

The most important thing is to find out the underlying cause for your high Reverse T3. But finding the cause sometimes takes a lot of time and it is important to address your symptoms now to make you feel better, so you would have energy and mental capacity to dig deeper to find the underlying cause. Unfortunately, sometimes, it may be impossible to find

the cause. Sometimes, you also have to address all possible causes at the same time to see a result faster.

The thyroid needs a number of nutrients to function properly.

1. Selenium
2. Zinc
3. Vitamin D
4. B vitamins
5. Tyrosine (an amino acid)
6. Iodine
7. Vitamin E
8. Iron

One of my favorite supplements that includes most of these nutrients is Thyroid Support Complex by Pure Encapsulations.

While you are digging deeper into the causes of your high Reverse T3, the following measures may help you decrease it now, instead of waiting for the stress-reducing techniques to start working.

### **Medications:**

The patients with high Reverse T3 may not do too well on any thyroid supplemental hormone that has T4. Levothyroxine has only T4 and there is a high probability that it will be converted into Reverse T3 instead of Active Free T3.

Natural Desiccated Thyroid (NDT) such Armour Thyroid, Nature-Throid, and NP Thyroid have a combination of T4 (38 mg) and T3 (9 mg) per 1 grain of supplemental hormone. If you are on NDT only, you can work with your practitioner on decreasing the dose of NDT and adding T3-only medication to your regimen. T3-only medications that are available on the market are generic liothyronine or brand Cytomel. You can also get compounded sustained-release T3, but it is more expensive.

If you choose to take T3-only medication, you may notice that

your Free T4 and TSH levels will get suppressed because T3 will be abundant in your body. Review the beginning of this article as for the mechanism of negative feedback loop that works when you have enough active thyroid hormone in your body. Being on T3-only medication can be very challenging, as the administration of the medication may have to be completed 3-5 times a day. You will have to carry T3 medication with you at all times everywhere, because missing even one dose may cause you to have lots of hypothyroid symptoms. Taking T3 at the same time each day can present difficulties too. You may try sustained-release T3 formulation from a compounding pharmacy and see if it works for you. Sustained-release T3 will stay longer in your body and you may be able to dose it only twice a day.

Make sure you check your level of Reverse T3 every 8 weeks to see if there is an improvement and your Reverse T3 got lower.

### **Address the Causes of High Reverse T3:**

- ***STRESS (Emotional, Mental, Physical)*** Start the regular practice of meditation, Thai Chi, yoga, therapy or anything else that makes you feel relaxed.
- ***Chronic Illness Address nutritional imbalances and improve your diet while treating chronic disease.***
- ***Hidden Gut Infections/Parasites Comprehensive Stool and Digestive Analysis (functional lab test of stool) may help figure out if you have Crohn's disease, undigested food in your stool, parasites and other helpful markers of inflammation.***
- ***Inflammation*** Find where the fire is and put out the fire. Low levels of constant inflammation add oil into the fire every day putting you at higher risk for heart disease, cancers, and autoimmune diseases.
- ***Dieting*** Start eating a rainbow of colors in veggies every day, moderate protein and healthy fats. You may benefit from a low-carbohydrate diet if you were



diagnosed or experiencing insulin resistance and/or pre-diabetes and diabetes.

- ***Chronic Cardio, Boot Camps, Cross-Fit exercise*** Start doing yoga, Thai Chi or another mild-to-moderate type of exercise. Walking, swimming, stretching are great alternatives to boot camp and HIIT (High-Intensity Interval Training).
- ***Congested Liver*** Include liver cleansing supplements, such as Milk Thistle and Sweetish Bitters into your daily routine. You may benefit from a 14-day cleanse with medical foods that will support your liver.
- ***Low iron (ferritin) levels.*** Eat more foods rich in iron and if needed, start an iron supplement under the guidance of your healthcare practitioner. Too much iron is not good either, so the best is to monitor your iron levels with a full iron panel every 3 months if choosing to supplement.

What is your experience with reverse T3? What helped you decrease reverse T3 or Free T3/rT3 ratio? Have you noticed a difference? Have you got to the root cause of your thyroid problems?

I hope this article helps to get more answers to your questions about thyroid.