This is a very straightforward issue. If you desire your thyroid to work properly and thyroid hormone to work correctly in your body it is vital that you have adequate intake of selenium, otherwise your thyroid will operate in a state of stress which opens the door for all manner of metabolic problems.

While nutrients like iodine and tyrosine are needed for the actual structure of thyroid hormone, selenium is involved with the management of thyroid hormone. In reality there are a great many nutrients needed for thyroid hormone production and regulation; however, the case can be made than none is more important than selenium.

**Selenium Within the Thyroid Gland**

The highest concentrations of selenium in the human body are the liver, kidneys, and thyroid gland. Within the thyroid gland selenium is essential for the production of thyroid hormone. Cells within your thyroid gland, called thyrocytes produce a protein called thyroglobulin. It is the job of thyroglobulin to connect iodine and tyrosine to form basic thyroid hormone (thyroxine or T4). As it turns out tremendous amounts of free radicals are generated during this process in the form of hydrogen peroxide (H2O2). If these free radicals are not deactivated then damage to the thyroid gland occurs and the efficiency of the needed production of thyroid hormone is disrupted.

To deal with this problem your thyrocytes make an antioxidant enzyme called glutathione peroxidase, which requires selenium. Glutathione peroxidase deactivates H2O2 rendering it harmless. Thus, if selenium is low then this antioxidant enzyme is not made at optimal levels and the thyroid is damaged in proportion to the level of selenium deficiency. The thyrocytes also make another selenium-dependent enzyme called thioredoxin, which also acts as an antioxidant to clear H2O2.

**Selenium is Needed for Thyroid Hormone Regulation**

Your thyroid gland’s production of thyroid hormone is certainly important, but it is only part of a much broader and very complex regulatory scheme that your body uses to determine how to use thyroid hormone so that you have a good energy level and proper metabolic rate. The thyroid hormone your thyroid gland produces, T4, is not biologically active. T4 is activated and deactivated by three enzymes called iodothyronine de-iodinases, types I, II, III (known as IDI, IDII, and IDIII). All of these enzymes require selenium to function.

IDI converts T4 to T3, the active thyroid hormone that will be used by your cells to set metabolic rate. This takes place mostly in your liver, and also in your kidneys and muscles – other places that tend to have higher selenium content when selenium levels are adequate. Once the T3 is produced in these key areas then it is transported around your body so that cells can use it.

Your brain has its own system of thyroid hormone activation which utilizes IDII to convert T4 to T3 on a cell-by-cell basis. This system is necessary so that your brain can keep working even if you are in a starvation situation and the rest of your body has had to slow down.

The activities of IDI and IDII enable your metabolism to go. The brakes for this system are managed by IDIII, which converts T4 to inactive reverse T3 or it converts T3 to inactive T2. Just as you can’t drive a car without brakes, you can’t run metabolism properly without an efficient way to slow it down. This natural process is governed by IDIII.

The main point of all this is rather plain; a lack of selenium leaves your body in a thyroid funk.
**Selenium Deficiency**

The preservation of thyroid hormone function is of the utmost importance to survival, as thyroid is setting the pace for all cellular activity. When selenium runs low your body has tough choices. The selenium reserves in your thyroid gland and your brain are the last to diminish. For example, under selenium deficiency the activity of thyroid-related function can decrease by 99% in your liver, kidneys, and muscles while only dropping by 50% in your thyroid gland and brain.

Such a scenario would typically be a response to starvation and reminds us of the vital need to keep your brain functioning (so you can hunt and gather food should you see any). In modern times processed food and mass-produced food grown without care of the soil (no selenium left in the soil) has led to wide-ranging selenium deficiency.

The initial stages of selenium deficiency will simply reduce optimal production of thyroid hormone in the gland as well as how it is used. If deficiency continues then inflammation of the thyroid gland will follow. Eventually this results in thyroid autoimmune problems with elevated autoantibodies against thyroid cells. A 2010 study [1] has shown that selenium supplementation in patients with autoimmune thyroiditis helped to lower their elevated thyroid autoantibodies. Of course, if free radical damage accumulates even further then cells mutate and cancer occurs. Isn’t it interesting that thyroid cancer is on the rise?

In addition to direct problems for the thyroid gland the lack of selenium impairs metabolic rate, setting off a chain reaction with any other type of health problem as a possible consequence. In other words, when cells can’t make energy properly because metabolic rate is impaired, then whatever those cells were supposed to be doing doesn’t get done at any optimal rate. If you have a genetic weakness, under the condition of poor thyroid function, it is more likely to manifest.

Selenium is also used by your body for immunity and detoxification activities. In conditions of selenium deficiency we have a number of vital body systems crying out for selenium. Those who get sick easily or who have sensitivity to chemicals typically have low-selenium issues as part of their problem, along with all the symptoms of hypothyroid. You can induce a selenium deficiency by working around chemicals, eating foods with too many chemicals on them, or by breathing air with too much pollution in it. A poor health trend in and of itself tends to use up selenium – thus many people with chronic health issues lack selenium. Any of these issues then results in compromised thyroid function on top of other health issues, with the tendency to worsen each other as time goes along. This scenario is all too common in America today and underlies a great deal of the health misery that so many experience.

**How Much Selenium Do You Need?**

The dietary supplement intake of selenium is a matter of hot debate because selenium intake has been shown to reduce cancer risk. This simple fact has gotten the public health goons involved, who typically hate vitamins and want to scare people based on their own prejudice for drugs and the profits of drug companies.

Public health officials now think that 55 mcg of selenium will raise a selenium marker in the blood, selenoprotein P, and they consider that a dose of 100 mcg is the most this particular marker needs. Taking additional selenium dose not boost it further. That’s very nice, except selenoprotein P has nothing to do with thyroid function or optimal selenium status in your body.

For example, a detailed study [2] of immunity testing doses of 50 mcg and 100 mcg found that both doses helped, especially the higher dose, but neither dose was able to optimize immune function in
healthy people. The researchers suggested that higher doses of selenium would need to be tested in order to determine the optimal dose. Another human study [3] showed that 200 mcg of selenium produced a better immune response that 50 mcg or 100 mcg.

A recent human study [4] with doses of 100 mcg, 200 mcg, and 300 mcg of selenium found that as the dose increased there was a better ratio of total cholesterol to HDL Cholesterol.

A study [5] of high-dose selenium, 1000 mcg per day and 1500 mcg per day, in sepsis patients found that the dose was highly effective at boosting antioxidant enzymes that clear toxins. Of course, sepsis is a condition of high toxicity requiring, in theory, higher antioxidants intake including selenium. And this dose was only for several weeks.

A cancer prevention study [6] showed that 200 mcg of selenium reduced cancer by 25% whereas 400 mcg of selenium did not, even though blood levels of selenium were higher.

Collectively, this data tends to indicate that a dose of selenium ranging from 200 mcg to 300 mcg per day may be best for optimizing immune function. However, even the data supporting this does not take into account an individual’s pre-existing health issues that may be decreasing selenium.

Even though public health officials like the idea of a range of 50 mcg – 100 mcg per day, with a safe upper limit of 400 mcg per day, they freely admit in their data that human studies with 1600 mcg or 3200 mcg per day did not have adverse or toxic side effects. One study in men with prostate cancer [7] found that a dose of 800 mcg seemed to have adverse effects on PSA dynamics.

None of this safety data is trying to figure out a dose that optimizes thyroid function, which is quite unfortunate when you consider the millions of people with the problem and the potential dire health consequences for not optimizing selenium status. In the previously-mentioned study showing selenium helped lower thyroid auto-antibodies the dose was 80 mcg over a 12 month period.

In my clinical experience with thousands of people I find that selenium in the 200 mcg to 300 mcg range is adequate for most to improve thyroid function in a noticeable way, although some respond very well to double that dose.

Scientists readily admit that there is no consensus on the dose of selenium required to optimize any person’s thyroid function. The only thing they do agree on is that optimizing selenium intake “not only aids preservation of general health but also contributes substantially to the prevention of thyroid disease.”

References