Oxalates, Kidney Stones, and Thyroid Health

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I've spoken about oxalates in the past, but over the last couple of years I've learned a lot more about oxalates through organic acids testing. Not all companies that offer organic acids testing will test for the presence of oxalates, but this could be a very valuable marker to look at. Over the years I have seen many people with elevated oxalate levels, but I didn't truly understand the significance of these findings until I recently attended an organic acids workshop.

So what are oxalates, and why should you be concerned about them? Well, oxalates are small molecules that have the ability to form crystals, which in turn can deposit in different areas of the body, including the thyroid gland. In fact, these oxalates can form just about anywhere in the body, and when they do they can impair the function of the organ or gland. Some of the most common areas where they accumulate include the bones, blood vessels, central nervous system, peripheral nervous system, retina, skin, and thyroid gland.

Oxalates can also bind to heavy metals, such as mercury, and having higher levels of oxalates will usually result in the trapping of heavy metals inside of the body. In fact, according to Dr. William Shaw from Great Plains Laboratories, a reaction of oxalate with heavy metals such as mercury and lead can cause the precipitation of the heavy metal oxalate complex in the tissues, which in turn will increase the toxicity of these heavy metals by delaying their excretion **(1)** [1]. In other words, if you have high oxalates then this can prevent you from effectively detoxifying heavy metals from your body.

The Relationship Between Oxalates and Kidney Stones

A kidney stone is a hard mass that is developed from crystals that separate from the urine within the urinary tract **(2)** [2]. They are formed in the kidneys, and most will be produced and pass through the urinary tract without causing any symptoms. However, larger stones (i.e. at least 2 to 3 millimeters) can cause problems, which is what happens when someone "passes a stone".

When someone develops a kidney stone, this usually is caused by high oxalates. This doesn't mean that everyone with high oxalates will develop kidney stones. But if someone tests positive for high oxalates, then they have a much greater chance of developing kidney stones when compared with someone who has low oxalates. And the advantage of testing is that if high oxalate levels are detected you can take the necessary precautions to lower these oxalates. Of course this is something you can do even if you don't do this type of testing.

What Causes Elevated Oxalate Levels?

Here are four of the main reasons why some people have elevated oxalate levels:

1. Overgrowth of fungi/yeast. Candida, aspergillus, and some other types of yeast and mold produce oxalic acid. As a result, if someone has a yeast or mold overgrowth along with high oxalates, taking antifungal herbs or drugs might help to lower the oxalate levels.

2. Eating foods high in oxalates. I have a habit of eating foods high in oxalates. For years I used to load my smoothies with spinach and berries, which are very high in oxalates. These days I still have smoothies on a daily basis, but I've cut down a great deal on the spinach, and I only add a small amount of organic berries to my smoothies. However, one of my main indulgences is dark chocolate with almonds, and both of these are high in oxalates.

3. Having problems with oxalate metabolism. Some people have a genetic predisposition for developing higher amounts of oxalates, and there is genetic testing available to determine this. On the organic acids test I commonly recommend to my patients, which is from Great Plains Laboratory, the lab tests for the metabolites oxalic acid and glycolic acid. While elevated oxalic acid levels are usually related to yeast or dietary intake, elevated glycolic acid levels are common when someone has a condition such as genetic hyperoxaluria type 2. Great Plains Laboratory also has a genetic test that looks at five genes related to oxalate metabolism.

4. Taking very high doses of vitamin C. This isn't to suggest that taking high doses of vitamin C will always lead to high oxalate levels, and I realize that there is a time and place for high doses of vitamin C for short periods of time. However, there is evidence that taking one to two grams per day of ascorbic acid results in increased oxalate excretion, which might promote stone formation **(3)** [3]. As a result, if someone is taking 1,000 mg or greater of vitamin C for a prolonged period of time then this can increase their risk of developing high oxalates.

Note: After publishing this article someone sent me **an article** [4] that discusses why vitamin C DOES NOT cause kidney stones. In addition, Dr. William Shaw of Great Plains Laboratory **wrote an article** [5] which mentioned that vitamin C can break down to form oxalates, but in adults this doesn't happen until the amount exceeded four grams per day. Dr. Shaw also mentioned another study involving 85,000 women which found no relationship between vitamin C intake and kidney stones.

Can Taking Collagen Increase Oxalates?

Many of my patients follow either a standard Paleo diet, or an autoimmune Paleo diet. And many of these people will include collagen as part of their diet. Some will add collagen powder to their smoothies, while others will drink a lot of bone broth. And while collagen itself isn't high in oxalates, it is high in hydroxyproline, which is amino acid, and this can lead to the formation of oxalates. I'm not suggesting that you should never add collagen to your smoothies or drink bone

broth, and in fact I commonly recommend for my patients with Graves' Disease and Hashimoto's Thyroiditis to drink bone broth. But just as is the case with anything else, moderation is the key, and too much gelatin can contribute to high oxalates in the body.

It's also worth mentioning that eating a very high protein diet can be a factor in the formation of kidney stones **(4)** [6] **(5)** [7]. However, the high protein doesn't lead to high oxalate levels. Instead, eating too much protein can lead to uric acid stones, which account for 15% of kidney stone formation **(6)** [8]. The reason for this is because animal protein increases urinary calcium and uric acid, and decreases urinary citrate and pH **(6)** [8]. While I'm not suggesting for those who eat animal protein to stop eating meat, I would make sure you are eating plenty of alkaline foods, specifically plenty of vegetables, along with some fruits.

What Are Some Common Symptoms Of High Oxalate Levels?

Below are some of the more common symptoms of having high oxalate levels. Keep in mind that most people who have elevated levels of oxalates on an organic acids test don't have these symptoms. But if someone has one or more of these symptoms for a prolonged period of time then they might want to consider testing for oxalates:

Sandy stools
Bladder irritability
Pain on urination
Urethral irritation
Eye pain
Body aches, burning feeling in muscles
Fibromyalgia-like discomfort
Moodiness and irritability
Tendon pain
Trigger point tenderness

What Foods Are High In Oxalates?

There are a lot of foods that are high in oxalates. And I realize it can become frustrating trying to minimize your exposure to high-oxalate foods, as many people reading this are already following a restrictive diet. For example, many people with Graves' Disease and Hashimoto's Thyroiditis follow an autoimmune Paleo diet, and while some foods high in oxalates are excluded from this diet (i.e. nuts, seeds, soy), other foods such as spinach and berries are included, as I mentioned earlier. Sweet potatoes are another food higher in oxalates that many people who follow an AIP-diet eat on a regular basis.

For those looking for a comprehensive list of foods high in oxalates I would visit the website www.lowoxalate.info.com [9]. This also lists foods that are lower in oxalates, such as avocados. But below I'll also list some of the foods that have high levels of oxalates:

Spinach
Nuts (especially almonds)
Soy
Peanuts
Raspberries and blackberries
Swiss chard
Beets
Sweet potatoes

Even though the foods I just listed are considered to be very high in oxalates, one study I came across showed that eight foods caused a significant increase in urinary oxalate excretion **(7)** [10]. You'll notice some overlap with the foods I listed, but there are some differences as well:

Spinach
Rhubarb
Beets
Nuts
Chocolate
Tea
Wheat bran
Strawberries

What Conditions Are Associated With High Oxalates?

Here are some of the different conditions that may be associated with high oxalates:

Kidney stones. Since approximately 80% of kidney stones consist of calcium oxalate, there is no question that higher amounts of oxalates will increase the risk of developing kidney stones.

Autism. There is evidence that oxalates can play a role in autism. One study involving 36 children with autistic spectrum disorders (ASD) showed that children with ASD demonstrated 3-fold greater plasma oxalate levels when compared with 60 healthy non-autistic children **(8)** [11]. The authors concluded that hyperoxalemia and hyperoxaluria may be involved in the pathogenesis of ASD in children, although they were unsure whether this is caused by impaired renal excretion of oxalates, increased intestinal absorption, and/or oxalates crossing the blood brain barrier and disturbing the function of the central nervous system **(8)** [11].

Oxalate arthropathy. Also known as oxalate crystal disease, this is a rare cause of arthritis that is characterized by deposition of calcium oxalate crystals within the synovial fluid **(9)** [12]. This usually occurs in those people with primary or secondary hyperoxaluria.

Fibromyalgia. Although I was unable to come across any studies showing evidence of oxalates playing a role in fibromyalgia, some of the healthcare professionals at Great Plains Laboratories feel that one reason behind the muscle pain associated with fibromyalgia can be the accumulation of

oxalic acid crystals in the connective tissue cells. So at the very least it might be a good idea for those people with fibromyalgia to get an organic acids test to determine the levels of oxalic acid.

Thyroid health. A few different studies show that calcium oxalate crystals can deposit in the thyroid gland. One study detected calcium oxalate crystals in 79 of 100 thyroid glands of routine autopsies **(10)** [13]. Another study detected calcium oxalate crystals in 19 out of 20 adult thyroid glands **(11)** [14]. One study showed that the highest prevalence of these crystals was in nodular goiters (87.9%), and only a 25% prevalence in those with Graves' Disease **(12)** [15].

Are Gallstones Associated With High Oxalate Levels?

Unlike kidney stones, most gallstones are not caused by calcium oxalates, although sometimes oxalates can play a role in their formation **(13)** [16] **(14)** [17]. High biliary protein and lipid concentrations are risk factors for the formation of gallstones, while gallbladder sludge is thought to be the usual precursor of gallstones **(15)** [18].

How To Test For Oxalates

The organic acids test by Great Plains Laboratory measures a few oxalate metabolites which can determine if someone has high oxalate levels. These include oxalic, glyceric, and glycolic. The one I see most commonly high on this test is oxalic, which usually relates to yeast/fungi or eating foods high in oxalates. When either glyceric and glycolic are high this usually is more of a genetic problem. Conventional labs such as Labcorp also offer a 24-hour urine oxalate test, but the advantage of the organic acids test is that it also tests for numerous factors that are associated with high oxalates.

How Can You Lower Oxalate Levels?

For those that have high oxalate levels, here are a few things you can focus on to help lower them:

1. Address yeast/fungi overgrowth. Having a yeast or mold overgrowth can lead to high oxalates, and so if this is the case with you then it makes sense to address this problem.

2. Reduce your intake of high oxalate foods. If you test high for oxalates then it makes sense to reduce your intake of high-oxalate foods. This includes spinach, Swiss chard, soy, nuts and peanuts, raspberries, blackberries, beets, and sweet potatoes. This doesn't mean that you need to completely eliminate these foods, although it probably would be a good idea for those with high oxalates to completely avoid spinach and soy, and to greatly reduce your consumption of other foods higher in oxalates. I also mentioned earlier how eating too much gelatin can indirectly lead to high oxalates.

3. Supplement with vitamin B6. An enzyme called alanine:glyoxylate aminotransferase (AGT) is involved in the breakdown of oxalates, and it is dependent on vitamin B6. So if someone has a

vitamin B6 deficiency they will have problems breaking down oxalates, and taking larger doses of vitamin B6 may reduce the risk of kidney stone formation **(16)** [19].

4. Supplement with calcium and magnesium citrate, and consider drinking lemon juice. These all can help to neutralize oxalates in the urine. Citrate helps to prevent the formation of kidney stones by binding to calcium oxalate crystals and prevent crystal growth **(17)** [20]. If someone has high oxalate levels and/or low citric acid (both of these are measured on an organic acids test) and they want to continue eating high oxalate foods, then they definitely should consider taking calcium and/or magnesium citrate, or they can drink some lemon juice.

However, if you take this approach then you would want to take these right before you eat the high oxalate foods. So for example, if you have a smoothie with spinach, raspberries, and other foods high in oxalates, then you might want to add some calcium and/or magnesium citrate powder to the smoothie as well. Or you can drink four ounces of lemon juice. But if you test high for oxalates it also would be a good idea to minimize your consumption of higher oxalate foods.

5. Supplement with arginine and omega-3 fatty acids. Both L-arginine and fish oils can help to reduce the deposition of oxalate crystals while reducing oxidative damage **(18)** [21] **(19)** [22] **(20)** [23].

6. Supplement with conjugated bile acids. One study showed that taking 9 grams per day of conjugated bile acids over a 3-month period can reduce urinary oxalate excretion **(21)** [24]. However, this is a large dosage of bile acids, and in most cases I would recommend doing some of the other things I mentioned first. The exception would be if someone is having problems with bile metabolism, which I spoke about in an article entitled "**The Importance of Bile In Thyroid Health** [25]".

7. Stay well hydrated. Regardless of whether you have high oxalates you of course want to stay well hydrated, and drinking plenty of water will help with the excretion of oxalates from the body.

Can Probiotic Supplements Shrink Kidney Stones?

There are some studies which show evidence that probiotic supplements might be able to help to break down oxalates, although this remains controversial. For example, one study looked at a range of Bifidobacteria and Lactobacillus species to determine the impact of oxalate degradation **(22)** [26]. The study showed that 11 of the 18 Lactobacillus species degraded the oxalates, whereas none of the 13 Bifidobacterium species tested were effective. While this seems promising, more research definitely needs to be conducted before we can conclude that specific strains of probiotics can effectively degrade oxalates in humans.

What Can Be Done For An Existing Kidney Stone?

Earlier I said that most kidney stones are small enough where they don't cause any symptoms. But is there anything people can do for larger kidney stones that are producing symptoms? In other words, is there is anything that can be done to dissolve larger kidney stones? I can't say that I have much experience in this area. One case study I came across showed that taking boron with antioxidants might help with shrinking kidney stones **(23)** [27]. Another journal article I came across showed that alcohol extracts of Jasminumauriculatum Vahl (Oleaceae) flowers can help with kidney stones **(24)** [2]. The same article showed that ethanolic extracts of leaves of hibiscus sabdariffa linn can also help **(24)** [2].

In summary, oxalates are small molecules that have the ability to form crystals, and these can deposit in different areas of the body. While oxalates can directly affect thyroid health in some cases by binding to the thyroid gland, probably the biggest concern associated with high oxalates is the risk of developing kidney stones. Some of the causes of elevated oxalates include the overgrowth of yeast and fungi, eating foods high in oxalates (i.e. spinach, soy, berries, nuts, sweet potatoes), having problems with oxalate metabolism, and taking very high doses of vitamin C. Lowering oxalate levels can be accomplished by addressing a yeast/fungi overgrowth, reducing your intake of high oxalate foods, staying well hydrated, along with supplementing with vitamin B6, calcium citrate, omega 3 fatty acids, and/or arginine.

URLs in this post:

[1] **(1)**: **https://www.greatplainslaboratory.com/articles-1/2015/11/13/the-green-smoothie-health-fad-this-road-to-health-hell-is-paved-with-toxic-oxalate-crystals**
[2] **(2)**: **http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4027340/**
[3] **(3)**: **http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1472830/**
[4] **an article**: **http://orthomolecular.org/resources/omns/v09n05.shtml**
[5] **wrote an article**: **https://www.greatplainslaboratory.com/articles-1/2015/11/13/oxalates-control-is-a-major-new-factor-in-autism-therapy**
[6] **(4)**: **https://www.ncbi.nlm.nih.gov/pubmed/2826524**
[7] **(5)**: **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1169452/**
[8] **(6)**: **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4265710/**
[9] www.lowoxalate.info.com: **http://www.lowoxalate.info.com**
[10] **(7)**: **http://www.ncbi.nlm.nih.gov/pubmed/8335871**
[11] **(8)**: **http://www.ncbi.nlm.nih.gov/pubmed/21911305**
[12] **(9)**: **http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3710657/**
[13] **(10)**: **http://www.ncbi.nlm.nih.gov/pubmed/2435146**
[14] **(11)**: **http://www.ncbi.nlm.nih.gov/pubmed/3368759**
[15] **(12)**: **http://www.ncbi.nlm.nih.gov/pubmed/8317610**
[16] **(13)**: **http://clinchem.aaccjnls.org/content/28/8/1804.long**
[17] **(14)**: **http://www.ncbi.nlm.nih.gov/pubmed/17897915**

[18] **(15)**: **http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3899548/**
[19] **(16)**: **https://www.ncbi.nlm.nih.gov/pubmed/10203369**
[20] **(17)**: **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2637791/**
[21] **(18)**: **https://www.ncbi.nlm.nih.gov/pubmed/15992786**
[22] **(19)**: **https://www.ncbi.nlm.nih.gov/pubmed/15748613**
[23] **(20)**: **https://www.ncbi.nlm.nih.gov/pubmed/25102784**
[24] **(21)**: **https://www.ncbi.nlm.nih.gov/pubmed/12500242**
[25] **The Importance of Bile In Thyroid Health**: **https://www.naturalendocrinesolutions.com/archives/the-importance-of-bile-in-thyroid-health/**
[26] **(22)**: **https://www.ncbi.nlm.nih.gov/pubmed/19028028**
[27] **(23)**: **http://www.ncbi.nlm.nih.gov/pubmed/25110210**