

Low Oxalate Diet

What Are Oxalates?

Oxalates are naturally occurring compounds. They are found in plants, animals, and humans. Your body can naturally synthesize oxalates from various compounds, including excess vitamin C, fructose, and yeast. Certain nutrient deficiencies may also increase oxalate synthesis.

A 1984 study published in the *Journal of Nutrition* has found that a high sugar diet combined with low levels of vitamin B6 may increase oxalate synthesis (1). According to 1982 research published in the *Journal of Urology*, **magnesium deficiency** may increase calcium oxalate formation (2). A 1987 study published in the *Annals of Nutrition Metabolism* has found that thiamine deficiency may also contribute to oxalate synthesis (3).

The problem is that too many oxalates and oxalate intolerance can lead to chronic inflammation and chronic symptoms in some people. Unfortunately, oxalates are found in high concentrations in some of the healthiest foods we have on the planet.

Though fruits are generally lower in oxalates, raspberries and citrus, especially grapefruit, have high levels. In the vegetable world, beets, olives, spinach, yams, turnips, and rhubarb are among the top high-oxalate foods.

Grains, including oatmeal, whole wheat, brown rice, soy flour, buckwheat, and couscous, are high in oxalates. Meat alternatives, such as tofu, soy, and other vegetarian burgers, are also high in oxalates, so are almonds and most other nuts.

If you have issues with poor oxalate metabolism and oxalate intolerance, the excess oxalates found in food can aggravate your health issues. In this case, you may benefit from a low oxalate diet.

HIGH-OXALATE FOODS



Raspberries



Dark Chocolate
& Cocoa Powder



Swiss Chard



Buckwheat



Tofu, miso &
other soya foods



Spinach



Potatoes
& Yams



Wheat Bran



Black Tea



Beans



Rhubarb



Nuts & Seeds



Beets

Signs & Symptoms of Poor Oxalate Metabolism

Signs and symptoms of poor oxalate metabolism may include:

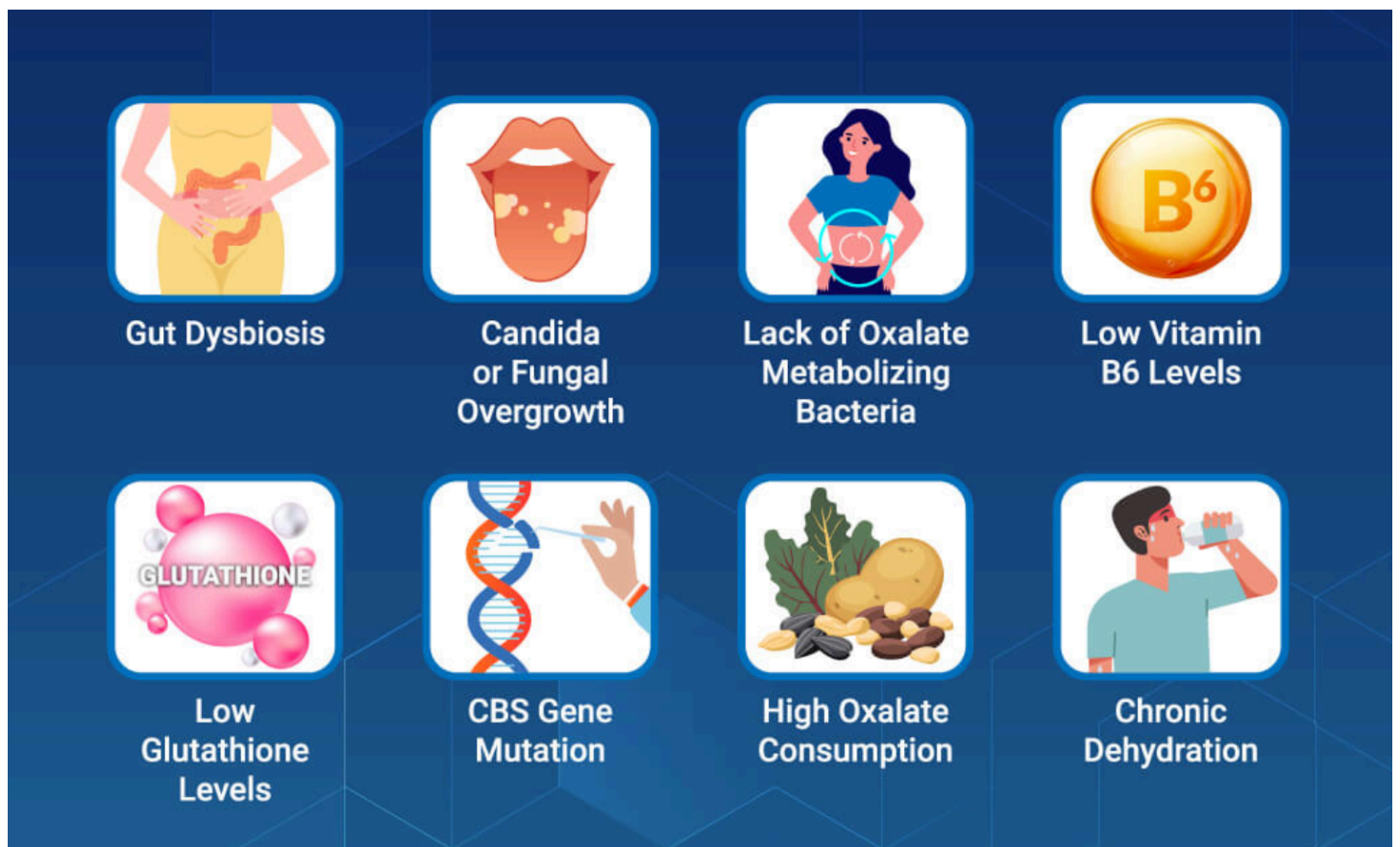
- Inflammation in joints causing muscle stiffness and pain.
- Kidney stones
- Urinary tract irritation, pain or urgency to urinate.
- Vulvar pain (chronic irritation and pain of the female genitalia)
- Abdominal problems such as **constipation** or diarrhea
- Vitamin or mineral deficiency such as magnesium or vitamin B
- Lethargy or problems sleeping
- **Histamine** reactions such as hives
- Crusty eyes in the morning/eye inflammation
- Migraines/headaches

- Depression

Health conditions associated with poor oxalate metabolism may include:

- Vulvar pain syndrome
- Cystic fibrosis
- Chronic obstructive pulmonary disease (COPD) or asthma
- Chronic **kidney stones** (medically termed nephrolithiasis)
- Thyroid disease or problems such as lupus, cirrhosis, or Wilson's Syndrome
- Connective tissue disease
- Autism
- Autoimmune issues and autoimmune antibodies.
- Irritable bowel syndrome (IBS)
- Brain fog

Causes of Poor Oxalate Metabolism



Poor oxalate metabolism can have several underlying causes, including gut dysbiosis, candida or fungal overgrowth, low vitamin B6 levels, low glutathione levels, CBS dysregulation, high oxalate consumption, low water intake, or dehydration. Let's look at each of these factors one by one.

Gut Dysbiosis

Your gut is the home of trillions of microbes. Some of the bacteria in your gut are beneficial or ‘good’ that support your health. While others are harmful or ‘bad’ and can disrupt it. For gut and overall health, you need a nice balance of both, with more beneficial bacteria than bad ones.

Antibiotic overuse, a poor diet, chronic stress, environmental toxins, poor lifestyle choices, and other factors may throw this balance off, increasing the bad bugs in your gut. If your gut microbiome is out of balance and there are too many harmful bacteria, you have **gut dysbiosis**.

Gut dysbiosis may be characterized by low levels of good bacteria that help to reduce oxalate overload. *Oxalobacter formigenes* are bacteria in your intestines that are responsible for breaking down oxalate. A 2002 study published in *Applied Environmental Microbiology* has found that *oxalobacter formigenes* are characterized by oxalate-degrading characteristics and may reduce oxalate levels (4).

Another 2002 research published in *European Urology* has found that *oxalobacter formigenes* may play a role in reducing calcium oxalate stone disease (5). Other healthy bacteria that may help to break down oxalates include *eubacterium*, *enterococcus faecalis*, and *lactobacillus acidophilus*, and *Bifidobacterium lactis* (6). Low levels of these bacteria may lead to poor oxalate metabolism and oxalate-related issues.

Candida or Fungal Overgrowth

You may develop poor oxalate metabolism and oxalate-related health issues due to an underlying candida or **fungal overgrowth**. As you already know, your gut microbiome levels are directly related to your urine oxalate levels. It’s not only bad bacteria, but other pathogens, such as candida and other fungi can throw off your gut microbiome balance.

Candida albicans are a common fungus that occur at small levels in the human body. Higher levels can lead to **candida overgrowth** and related health issues. Oxalate stones in the kidney are often surrounded by candida and fungi. Oxalate sensitivity is common in patients with candida overgrowth.

Yeast infections may also be linked to high oxalate levels. 2020 research published in the *Journal de Micologie Medicale* looked at 164 urine samples of 74 kidney stone patients and found 77 candida isolates (7). This suggests that candida may play a role in kidney stones and UTI, which can be characterized by high oxalate levels.

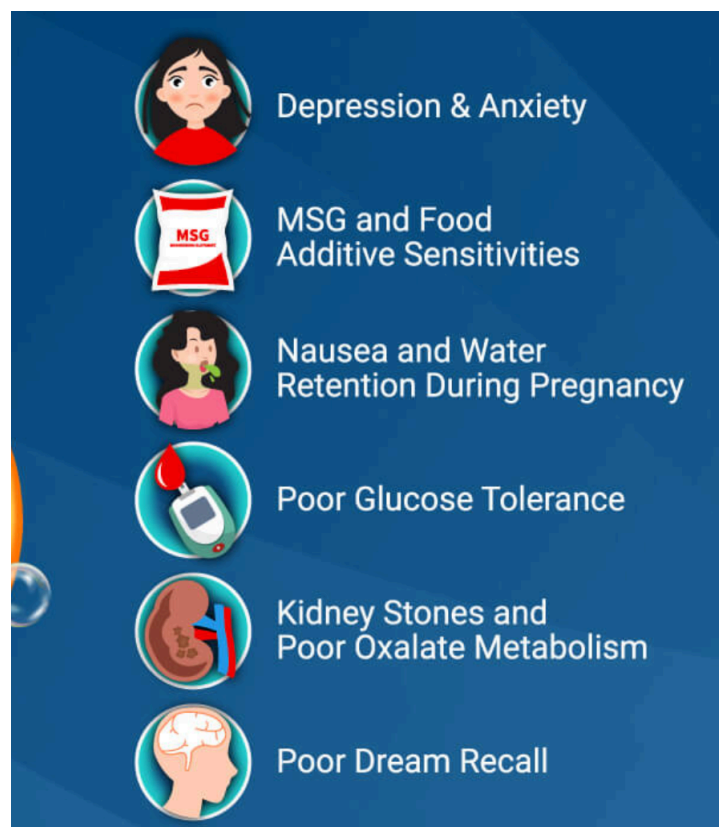
Low Vitamin B6 Levels

Vitamin B6 is critical for your immune, brain, and nervous system health. As mentioned earlier, **vitamin B6 deficiency** may lower your body's ability to adequately methylate and support proper oxalate synthesis. It is critical for the Citric Acid Cycle.

Poor methylation can lead to oxalate buildup, and oxalates may also interrupt methylation. A 1984 study published in the *Journal of Nutrition* has found that a high-sugar diet combined with low levels of vitamin B6 may increase oxalate synthesis (1).

According to a 2022 review published in *Frontiers in Nutrition and Food Science Technology*, vitamin B6 is also an essential nutrient for your gut lining (8). Thus, low vitamin B6 levels may lead to **gut inflammation**, leaky gut syndrome, and gut microbiome imbalance, increasing poor oxalate metabolism. It may also contribute to fat malabsorption issues, which in cystic fibrosis patients may further aggravate gut inflammation and increase kidney stones (9, 10).

Low Vitamin B6 Levels Symptoms:



Low Glutathione Levels

Glutathione is a powerful antioxidant that is critical for gut health, **insulin** sensitivity, and the reduced risk of disease. Low glutathione levels may increase oxalate issues. According to a 1998 study published in *Molecular and Cellular Biochemistry*, glutathione plays a role in mitochondrial health in the kidneys and hyperoxaluria (11).

It's not only vitamin B6 and good methylation but also glutathione that's necessary for oxalate metabolism in the Citric Acid Cycle. Glutathione may protect B vitamins from toxins in the methylation cycle.

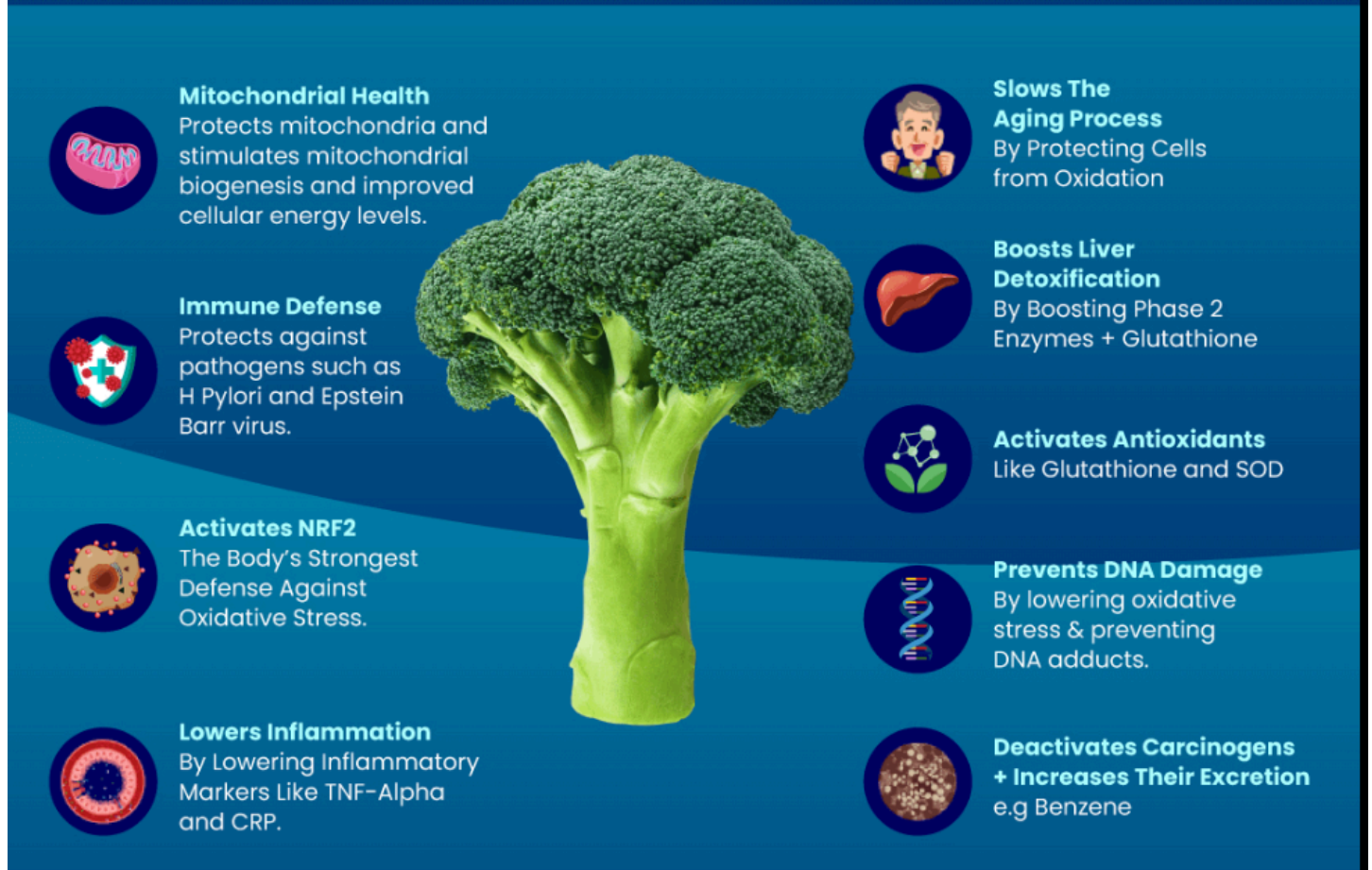
According to 2004 research published in *Chemical Research in Toxicology*, **glutathione** is critical for protecting vitamin B12 from xenobiotics (12). Low glutathione levels may result in the inefficiency of methylation. Poor methylation and poor vitamin B6 levels may lead to oxalate issues.

Sulforaphane from BROCCOLI and radish MICROGREENS and sprouts is an excellent way to increase glutathione. Microgreens are very low oxalate foods:



THE MANY BENEFITS OF SULFORAPHANE

Sulforaphane is a compound within the isothiocyanate group of organosulfur compounds. It is found in highest amounts in cruciferous veggies such as broccoli, kale, collard greens and especially broccoli sprouts. In these foods it is in the inactive form glucoraphanin. The myrosinase enzymes are released in the plant when it is damaged and they turn glucoraphanin into sulforaphane. So cruciferous veggies must be cut, chopped or chewed to release myrosinase and active sulforaphane.



CBS Gene Dysregulation

The Cystathionine Beta Synthase or **CBS gene** plays a role in creating an enzyme called cystathionine beta-synthase, which is responsible for using vitamin B6 to convert the amino acids, **homocysteine** and serine to cystathionine. After this, another enzyme makes the amino acid cysteine from cystathionine.

Cysteine is then used to build proteins or is broken down and removed through urine. The CBS pathway is a sulfuration pathway that plays a role in glutathione production and detoxification.

CBS gene dysregulation may happen due to genetic expression or environmental upregulation from a yeast infection or other health issues. CBS gene dysregulation may result in oxalate formation because it needs vitamin B6 and its role in glutathione formation.

According to a 2018 study published in *Molecular Genetics and Genomic Research*, CBS mutations may help to predict B6-responsiveness in homocystinuria (13). Moreover, when the CBS pathway is impaired, and not enough glutathione is made, it may increase oxalate levels.

NOTE can be tested via SNP tests (ie MYDNA)

High Oxalate Consumption (most common issue!)

High oxalate consumption or a high-oxalate diet may also lead to poor oxalate metabolism-related issues and high oxalate levels. A healthy body with enough oxalate-degrading bacteria and without other health issues contributing to poor oxalate metabolism should handle high oxalate foods.

However, people who are dealing with gut dysbiosis, candida or fungal overgrowth, CBS gene mutation, **nutrient deficiencies**, kidney or liver problems, or even chronic stress may have difficulties breaking down and eliminating oxalates properly.

If you are one of these people, a high oxalate diet may lead to chronic symptoms and oxalate-related health issues. For example, according to a 2020 review published in *Nutrients*, a high oxalate diet may increase kidney issues (14).

HIGH-OXALATE FOODS



Raspberries



Dark Chocolate
& Cocoa Powder



Swiss Chard



Buckwheat



Tofu, miso &
other soya foods



Spinach



Potatoes
& Yams



Wheat Bran



Black Tea



Beans



Rhubarb



Nuts & Seeds



Beets

Low Water Intake and Dehydration

Finally, low water intake and **dehydration** may also contribute to high oxalate levels. Dehydration may increase the formation of calcium oxalate stones. Calcium and oxalates both play a role in the development of kidney stones.

If you don't drink enough water, they may bind together in the kidneys instead of your digestion tract. If you are dehydrated and there isn't enough liquid in your urine, oxalates, and calcium can build up and form kidney stones.

The stones may also pass the **kidneys** and get stuck in your ureters or urethra. According to a 2020 review published in the *Turkish Journal of Urology*, proper hydration may help to prevent kidney stone disease (15).

Factors that Affect Oxalate Metabolism that Are Covered in the Urine Organic Acid Test

Metabolites	Significance
Oxalic acid	Extremely acidic organic acid that traps heavy metals and deposits in a variety of tissues throughout the body.
Pyridoxic acid	Major metabolite of vitamin B6 - high amounts of vitamin B6 shunt oxalate precursors to the formation of glycine instead of oxalic acid.
Glycolic acid	Byproduct of <i>Candida</i> produced when <i>Candida</i> enzyme collagenase converts hydroxyproline to glycolic acid. It is found elevated in the genetic hyperoxaluria type 1.
Glyceric acid	Found elevated in the genetic hyperoxaluria type II.
Arabinose, tartaric acid	<i>Candida</i> markers.
5-hydroxy-methyl-furoic acid, 2.5 -furandicarboxylic acid	Metabolites of fungi as <i>Aspergillus</i> that may produce oxalates directly. High oral or intravenous intake may lead to excessive oxalate production.

Testing For Oxalate Metabolism:

Clinically, I use the Mosaic labs [organic acid test](#) (to determine if someone has elevated oxalates in their system. This is a simple urine test done in the comfort of your own home.

When I see elevated oxalic acid with elevated glyceric or glycolic acid it is usually a sign of a genetic hyperoxaluria. When oxalic acid is elevated without an elevation in glyceric or glycolic acid it is typically related to *Candida Albicans* overgrowth or a very high vitamin C intake.

This test also lets me analyze for vitamin B6 deficiencies and for *Candida* overgrowth which are both major causes of hyperoxaluria. From a functional nutrition and natural medicine perspective this **test** helps me to determine the cause and best diet and treatment for this condition.

Food to Avoid or limit to 1x per week:

Also avoid white potato:

VERY HIGH OXALATE (over 50mg per serving)

The following foods may contain **very large** amounts of oxalate in the range of 50-520mg oxalate per serving size listed.

Vegetables

	Serving Size
Beetroot - boiled or pickled	1/4 cup (50mg)
Beet Greens (Mangold)	1 oz (30mg)
Leeks	1/2 cup (62mg)
Okra	1/2 cup (100mg)
Poke Weed	1 oz (30mg)
Spinach	1 oz (30mg)
Sweet Potatoes	1/2 cup (120mg)
Swiss Chard (boiled)	1 oz (30mg)
Swiss Chard (raw)	1/4 cup (9mg)

Fruits

	Serving Size
Elderberry, raw	3.5 oz (100mg)
Figs, dried	3.5 oz (100mg)
Green Gooseberries	1/2 cup (75mg)
Rhubarb, raw, canned or stewed	1/4 cup (120mg)
Star Fruit (Carambola)	1 oz (30mg)

Grains and Starches

	Serving Size
Amaranth	1 oz (30mg)
Buckwheat, dry	2 oz (60mg)
Wheat bran, dry	1 oz (30mg)

Soybeans and Soy Products

	Serving Size
Soy Milk	1/4 cup (10mg)
Soy Burger	1 item (67mg)
Texture Vegetables/ Soy Protein	1 oz (30mg)
Soy Flour	1 cup (94mg)
Soy Nuts	1 oz (30mg)
Soy Tofu	3 oz (200mg)
Soy Yogurt	1/2 cup (150mg)
Soy Breakfast Links	1 item (45mg)

Legumes, Nuts and Seeds

	Serving Size
Almond (slices)	1/8 cup (14mg)
Hazelnut (chopped)	1/4 cup (28mg)
Lentils, Dried Beans (cooked)	1/2 cup (85mg)
Refried Beans (cooked)	1/4 cup (42mg)
Peanuts	1/4 cup (28mg)
Peanut Butter	1/2 T (8mg)
Pecans (and other nuts)	1/4 cup (28mg)
Pistachio	1/2 cup (56mg)
Sesame Seeds (and Tahini)	1 teaspoon (~2.5mg)

LOW OXALATE FOODS TO ENJOY

These foods are considered low oxalate. Oxalates are only found in plant based foods so meat, fish, dairy and poultry do not have oxalates unless they are processed with grains, herbs, spices, etc.

Fruits:

- Blueberries
- Strawberries
- Blackberries
- Apples
- Peaches
- Apricots
- Cherries
- Bananas

Some Grains:

- Corn flour
- Oat bran
- White rice

Liquids:

- Water
- Coffee

Animal Foods:

- Eggs
- Red Meat
- Poultry
- Fish

Some Spices and Herbs:

- Cinnamon
- Dill
- Cumin
- Cilantro

Some Vegetables:

- Cauliflower
- Broccoli
- Onions
- Peas
- Zucchini
- Mustard greens
- Cabbage
- Mushrooms

Organic Dairy:

- Yogurt
- Cheese
- Butter
- Milk



In addition enjoy:

All animal products, micro-greens (except beet), all vegetables not listed in HIGH (squash, pumpkin, etc) , macadamia nuts, coconut and coconut milk/cream, ORGANIC wheat products ok 2-3x per week (don't go overboard)

STRATEGIES TO REDUCE OXALATE LEVELS



Limit High Oxalate Foods

One of the easiest ways to reduce your oxalate levels is to limit your consumption of high oxalate foods. Use the list in the earlier section and limit or avoid those foods.

Researching and following a low oxalate diet is one of the first steps you should take when it comes to reducing oxalate induced inflammatory issues. Depending on your issues, this may be temporary or may be critical for the long term.

Cook Higher Oxalate Foods

As I mentioned earlier, cooking higher oxalate foods may help to reduce oxalate levels. A 2005 study published in the *Journal of Agriculture and Food Chemistry* has analyzed and compared nine different types of raw and cooked foods for oxalate content (16).

They found that boiling was the most effective at 30 to 87 percent of oxalate reduction. Steaming led to 5 to 53 percent reduction. Baking was also tested for potatoes, and it didn't lead to any oxalate loss.

Consume High Calcium, Low Oxalate Foods

Calcium binds to oxalates and helps move them out of the body. If you are dehydrated however, it can cause kidney stones. I recommend staying well hydrated and consuming low oxalate, high calcium foods. The best combination is high calcium foods that are also high in magnesium and low in oxalates and low in sugar.

For example, organic unsweetened yogurt, cheese, canned fish, broccoli, and bok choy are good options for foods that. Combine high calcium/magnesium foods with low oxalate foods using the list from earlier.

HIGH CALCIUM AND LOW OXALATE FOODS

Consuming high calcium, low oxalate foods help to bind oxalates and move them out of the body.



Organic,
Unsweetened
Yogurt



Organic
Cheeses



Canned Fish
(Salmon, Tuna,
Sardines)



Wild-Caught
Seafood



Broccoli



Bok Choy



Bone Broth



Eggs

Good Hydration

Since dehydration may lead to high oxalate levels and kidney stones, I recommend hydrating your body appropriately. Start your day with 16 to 32 oz of water.

You may add some lemon or low oxalate fruits or herbs for taste. Drink a glass of water every hour after. Consume hydrating low oxalate fruits and vegetables.

Use Oxalate Competitors

You may also add some oxalate competitor compounds to your diet and lifestyle. These oxalate competitors, including sulfur, biotin, bicarbonate, and chloride, have a similar molecular shape to oxalic acid.

Thus, they may take over and use the pathways normally oxalic acid would move into your cell. This can crowd out oxalates and reduce its impact on cellular levels. Taking a bath with **Epsom salt**, magnesium chloride, or soda bicarbonate may be the easiest way to use oxalate competitors. Taking biotin or eating biotin-rich foods may also help.

HOW TO USE OXALATE COMPETITORS

Certain compounds have a similar molecular shape as oxalic acid and can block oxalate uptake into cells and tissues. These include sulfur, biotin, bicarbonate and chloride.

You can use Epsom Salts (magnesium sulfide), Baking Soda (sodium bicarbonate), Magnesium chloride and consume sulfur and biotin rich foods such as (eggs, salmon, sardines, broccoli and organ meats).



Take an
Epsom Salt Bath
with Baking Soda



Eat Low-Oxalate,
Sulfur & Biotin
Rich Foods



Use Topical
Magnesium
Chloride



Drink Water
with 1 tsp of
Baking Soda*

Use Lemon Juice

Fresh lemon juice is not only great for your immune health but may help to reduce your oxalate levels as well. A 2021 study published in *E Clinical Medicine* has found that using fresh lemon juice of 60 ml twice a day may help with recurrent stones in patients with calcium oxalate nephrolithiasis (17). They followed patients for two years.

Within those two years, 21 of 100 patients using lemon juice and 32 of 103 controls not drinking lemon juice had a stone recurrence. However, many patients reduced

their intake of lemon juice over the course of the study. Patients drinking **lemon** juice had significantly better results.

Researchers found that lemon juice may be a safe way to reduce kidney stones. If you have poor oxalate metabolism-related issues or high oxalate levels, I recommend drinking lemon juice daily. You can mix it with your water in the morning and mid-day.

Lemon Water Benefits

1 Aids in Digestion & Detoxification

Because lemon juice's atomic structure is similar to the digestive juices found in the stomach, it tricks the liver into producing bile, which helps keep food moving through your body and gastrointestinal tract smoothly. Lemon water also helps relieve indigestion or ease an upset stomach.

2 Helps the Body Use Fat For Fuel

Regularly sipping on lemon water can help you lose those last pounds. That's because lemons contain pectin, a type of fiber commonly found in fruits. Pectin helps you feel full longer.

3 Improves Mood and Energy

Skip the morning cup of coffee - lemon water can boost energy levels without the caffeine crash. When negative-charged ions, like those found in lemons, enter your digestive tract, the result is an increase in energy levels.

4 Improves Vitamin C Levels

Because your body doesn't make Vitamin C on its own, it's important to get enough of it from the foods and drinks you ingest, like lemon water. Vitamin C stimulates white blood cell production, vital for your immune system to function properly, and also protects cells from oxidative damage.

5 Rejuvenates Skin & Body Healing

The antioxidants in lemon water fight damage caused by free radicals, keeping your skin looking fresh. It also helps the body produce collagen, essential in smoothing out lines in the face.

Optimize Vitamin B6 Levels

Vitamin B6 deficiency may increase your risk of high oxalate levels (**1, 8, 9, 10**). Optimizing your vitamin B6 levels may help.

Low oxalate foods rich in vitamin B6 include beef liver, chicken liver, beef, salmon, tuna, and eggs. I also recommend supplementing with methylated **vitamin B6** or a

vitamin B complex. I recommend **B Strong** as a B complex.

Take a Good Quality Probiotic/ Eat fermented foods

Gut dysbiosis may be among the underlying driving forces of high oxalate levels (**4, 5, 6**). Taking care of your gut flora with a healthy diet is important but not enough.

Fermented foods include, sauerkraut, yogurt, etc

Take Citrate Salts/Magnesium

You may also benefit from taking calcium citrate or magnesium or potassium citrate. According to a 1997 clinical trial published in the *Journal of Urology*, potassium-magnesium citrate helped to reduce recurrent calcium oxalate stones and using it for up to 3 years may decrease the risk of recurrence by 85 percent (**18**).

A 2014 study published in the *Korean Journal of Urology* has found that using **magnesium** citrate along with vitamin B6 may decrease recurrent calcium oxalate and phosphate stones (**19**).

I like Tri-Mag supreme, Fibroplex by Metagenics, Basica active etc.