

Introduction to Food Oxalate and Your Health

1. Oxalic acid: What is it?

- a. A naturally occurring tiny molecule that is a **toxic, corrosive acid**
- b. When it has minerals attached to it, it is called **Oxalate (OX)**. (chemically a salt) (E.g. sodium oxalate, potassium oxalate, magnesium oxalate, calcium oxalate) Oxalate likes to form **crystals**. Most kidney stones contain calcium oxalate.

2. Where does oxalic acid come from?

- a. **Plants make it**, possibly for mineral management, seed germination, or self-defense
- b. **You eat it**, in many foods. It comes in many forms, both dissolved and as crystals, in a variety of shapes and sizes
 - i. Some foods have a lot of it, some have very little
 - ii. Examples of High OX Foods:
beans, grains, bran, sesame and other seeds, peanuts, almonds, and other nuts, swiss chard, spinach, beets, potatoes, chocolate, rhubarb, figs, kiwi, blackberries, black pepper, cumin, turmeric.
 - iii. Examples of Low OX Foods:
meats, dairy, eggs, fats and oils, and other non-plant foods;
arugula, avocado, Bok Choy, cabbage, cauliflower, cilantro, cucumber, garlic, kohlrabi, lettuce, mustard greens, mushrooms, green peas, watercress
- c. **Your body makes it**. Oxalate is a metabolic waste product in mammals with no known function
 - i. Higher amounts are made when:
 1. Deficient in B6, or
 2. High doses of vitamin C are taken or injected
- d. Some fungi make it, possibly for mineral management, especially in soil
 - i. Can be made by Aspergillus fungi living in the body

3. How can oxalate harm you?

- a. The body has no way to disarm oxalate and must excrete it. When cells are required to handle oxalate they are moving it or “managing” it, not metabolizing it. This is dangerous work for a cell.
- b. It **steals minerals** from your diet and your body and makes them useless (it is an “anti-nutrient”)
 - i. Soluble forms of oxalate (sodium oxalate and potassium oxalate) can be picked up by other minerals like magnesium, calcium, iron, zinc, copper, etc. This locks up the mineral. Oxalate may also bind with toxic metals such as lead, mercury, aluminum, or cadmium.
 - ii. Mineral deficiency impairs growth and reproduction, and causes many other problems
- c. It is corrosive to the lining of the digestive system, may cause leaky gut or other GI diseases. Some OX crystals have a needle shape known to perforate mucus membrane cells.
- d. Challenges the kidneys and can overwhelm their capacity to remove oxalates from the blood

- e. Forms nanocrystals and microcrystals that can collect in the body and irritate tissues
 - i. crystals can collect in any body tissue, even the plaque in your arteries
 - ii. kidney stones usually contain oxalate crystals
- f. Soluble forms of oxalate are absorbed from food and **trigger inflammation**, causing:
 - i. Membrane and mitochondria damage, and cell death (fatigue and energy issues)
 - ii. Nerve cell damage, pain, and functional problems associated with the brain and nerves
 - iii. Dysfunction of cells, organs, glands
 - iv. Depletion of the antioxidant glutathione in cells. Low levels of glutathione can generate superoxide radicals, increasing toxic stress causing early cell death. Glutathione is especially important in the liver for the detoxification of chemicals. It is also important in preserving brain health.
 - v. Cell communication problems (autoimmunity, hormonal issues, neurological issues). For example: Ox can confuse and stress the immune system, creating auto-immune symptoms.
- g. **Destroys connective tissue's** key building block (hyaluronic acid)
 - i. makes it much harder to fully recover from injury, even surgery
 - ii. can weaken or destabilize joints, bones, skin (skin may be thin or easily damaged)
 - iii. can make you injury-prone
- h. May deplete the B-vitamins, B6 and biotin
 - i. Uses up vitamin B6, possibly initiating a vicious cycle. B6 deficiency increases internal production of oxalate, increases oxalate load, further depleting B6, and so on.
 - 1. Low B-6 increases inflammation and is associated with heart disease and cancer
 - ii. Can alter biotin metabolism, depleting biotin
- i. Can lead to a **wide range of problems**, throughout the body
 - i. Kidney damage
 - ii. Damage to intestines, may contribute to the development of celiac disease and “leaky gut”
 - iii. Breathing problems, mucus production, and congestion
 - iv. Brain problems: sleep, mood, behavior, cognition, organizational ability, autism
 - v. Urinary issues and genital pain
 - vi. Gum and tooth problems
 - vii. Bone and connective tissue instability
 - viii. Contributes to aging, and can make you feel old prematurely
- j. These problems don't always cause obvious symptoms. Onset may include a generalized malaise, poor concentration, some sort of “-itis” (gastroenteritis, tendonitis), joint stiffness, swelling, muscle pain or weakness.
- k. **Oxalate damage is not a sensitivity or allergy. It is a toxicity problem.**
 - i. Reversal of oxalate toxicity is an avoidance and excretion issue. It is not a matter of boosting liver function as is typically addressed in “detox” regimens.

4. How and why are the crystals formed?

- a. Science is studying these questions, because we don't know enough yet. It is hard to study oxalate handling, distribution, and oxalate crystal deposition in the body.
- b. Blood delivers oxalates to tissues; higher concentrations of oxalates and a number of other factors may encourage crystallization and deposits in the body.
 - i. Injured tissue is prone to oxalate deposits. Cell fragments may become hosts to OX crystal formation and growth.
 - ii. Too little citrate (perhaps due to acidity in tissues) allows for crystallization of oxalate.
- c. Sometimes oxalate molecules attached to membrane fats don't grow into crystals; even these non-crystalline oxalate deposits disturb cell biochemistry.

5. Why does it affect some people and not others?

- a. We don't know how many people are affected by dietary oxalate. Excessive exposure to oxalate is generally unrecognized and is hard to identify and quantify.
 - i. Even patients with known high-oxalate problems are often described as **"asymptomatic"** in the medical literature. **This means it can be hard to know if oxalates are causing damage to your health.** Eventually a problem will develop, such as a kidney stone, but *you typically don't know that it is happening until it gets really bad.*
 - ii. When symptoms are present, they don't neatly correlate with recent intake of oxalate, but instead may flare up as the body releases oxalate, when less oxalate has been consumed. Measures of blood oxalate and urine oxalate do not necessarily correlate with symptoms, for many reasons.
 - iii. The problems associated with oxalate toxicity are presumed to have other causes and factors generating these symptoms. Oxalate rarely gets the blame, even in part, for the problems it is capable of causing.
- b. Modern lifestyles may be increasing the number of people affected by dietary oxalate, by increasing exposure and lowering our tolerance.
 - i. It is easier than ever to eat a high oxalate diet. High-oxalate foods are now more accessible year-round and very popular. Ironically, the health-conscious may have a greater affinity for some high-oxalate foods such as spinach and almonds which are promoted as healthy.
 - ii. The oxalates we munch on may be more readily absorbed and less efficiently excreted due to our reliance on medications, including over-the-counter pain (NSAIDs) and cold medications and popular prescription drugs. These drugs can harm the gut flora and function and reduce the kidneys' ability to remove the oxalate from the body.
 - iii. Adequate oxalate excretion can also be impaired by other toxic exposures, such as indoor air pollution, which can erode kidney function.
 - iv. Gastro-intestinal resection surgeries dramatically increase susceptibility to food oxalates.
- c. The potential for harm from a high oxalate diet can be magnified by other factors besides the health and function of the gastro-intestinal (GI) tract and kidneys.
 - i. The mix of foods within your meals affects how much oxalate is absorbed and how much your body has had to handle over your lifetime. For example, meals rich in calcium and fiber can lower the amount of oxalate absorbed from foods, while diets low in fiber and calcium may increase the amount of oxalate you absorb.

- ii. Gender and other genetic factors affect the way the body handles oxalate. Women are less prone to kidney stones, but more prone to pain syndromes.
- iii. Fetal exposure to oxalate and other toxins may set the stage for oxalate trouble, perhaps including autism and other brain function issues, such as learning and behavior problems.
- iv. Older people have less efficient function of their kidneys and digestive processes, and more years of oxalate exposure and accumulation. They may thus be especially vulnerable to the toxic effects of oxalate.
- v. High oxalate intake when inflammation is occurring allows for more tissue deposits and more damage. Gut inflammation is a chronic problem in many conditions, including obesity.
- vi. Deficiencies of vitamins and minerals may aggravate oxalate's toxic effects. Heavy drinkers, the obese, and those who have undergone gastric bypass surgery are at especially high risk for micro-nutrient deficiencies.
- vii. There are undoubtedly many other factors we have yet to discover and document.

6. How can I know if oxalates are an issue for me?

- a. There is no sure way to determine the extent that oxalate is causing health issues. Most health care providers are not even aware of this possibility.
- b. Accepted medical tests for oxalate accumulation in the body involve taking tissue samples from kidneys, bones, or skin. Biopsies are invasive tests that are reserved for the rare situation when there is strong clinical evidence for advanced kidney failure with a genetic component.
- c. Urine tests measuring oxalate are not reliable because of natural variations in urine content. Some people with advanced kidney deposits of oxalate have very little oxalate in their urine. The more extensive the oxalate deposits are in the urinary tract, the more likely that excessive oxalates become trapped there instead of being released into the urine. Thus, low levels of oxalate in the urine are not necessarily reassuring. The body needs to be capable of continuously excreting oxalate.
High levels of oxalate in urine may indicate that the kidneys are indeed able to excrete oxalate despite a heavy workload, either from a recent meal, from high levels of internal production, or from the release of body stores of oxalate. High urine oxalate maybe a sign that the body is reversing the accumulation of oxalates in the body, once the source of oxalate has been adequately limited.
- d. The low-oxalate diet itself can offer some strong indicators, when the diet is implemented correctly and consistently. This requires accurate data on the oxalate content of foods. You also need to know how to recognize common reactions.
- e. Often, a person with oxalate issues will experience some temporary worsening of several symptoms after being on a truly low oxalate diet for a while. This could be a sign that cells are moving stored oxalate out and being damaged in the process. Sticking with the diet is an important part of waiting out the healing process.
- f. There is no single pattern of symptoms that identifies oxalate toxicity, everyone has their own unique set of reactions to over-exposure to oxalates. But there are patterns of symptoms that are often associated with oxalate toxicity. If you have ever had kidney stones, or if you have three or more of the following problems, you may benefit from lowering your oxalate consumption:

- i. Kidney infections
- ii. GI problems, or have had GI surgery, especially colon re-sectioning and gastric by-pass
- iii. You have pain that comes and goes without obvious cause, or that affects different body parts on different days.
- iv. You have pain or weakness in the arms, hands, legs, or feet
- v. You have back stiffness or pain
- vi. Your urine is frequently cloudy or hazy looking
- vii. You don't sleep well or are tired a lot
- viii. You have other brain function problems: brain fog, cognitive losses, mental fatigue
- ix. You have incomplete recovery from injury or surgery
- x. You tend to have disappointing responses to both conventional and alternative therapies
- xi. You eat one or more high-oxalate foods daily

7. How should I start the food plan and switch to a lower oxalate diet?

Prepare: Learn about oxalates in foods.

- a. Resolve to give this an honest try for a minimum of 6 months. Write down your reason.
- b. Learning new things takes time. Set aside just a little time to learn and plan for the changes you'll be trying out. Luckily, a gradual approach is the best.
- c. Seek a health care provider with some knowledge about oxalates, or openness to it.
- d. Obtain a truly accurate and current list of the very high oxalate foods and supplements. The Trying Low Oxalates group on Facebook keeps a list – they are the Autism Oxalate Project. They get a lot of their data from the VP Foundation. Consider joining this organization.

Gradually eliminate high oxalate foods with sensible selections from known low-oxalate foods.

- e. Some people get quick pain relief just by stopping one food, such as almonds and almond beverages.
- f. If you eat high oxalate foods frequently, you may be very loaded with oxalates and will need to go slow in getting off of them!
- g. Consider how much calcium you are eating and keep this as high as you can. If you tolerate dairy products, eat them with most meals.
- h. Eliminate just one high-ox food from your life, and don't plan to let it back.
- i. Note any changes or new symptoms that occur.
- j. Eliminate another high oxalate food, in about a week or so. This is a gradual process.
- k. Use an accurate list of very low oxalate foods and stock your fridge and pantry with these foods. See my list in the Beginner's Guide.
- l. Learn to use and enjoy those low-oxalate foods that agree with your stomach, and immune system. Keep experimenting with these foods.

Assemble a supplement program to support safe oxalate elimination.

- a. To reduce how much oxalate you absorb, purchase calcium citrate, 1000 or 500 mg. Take calcium citrate before meals. Tablets need time to dissolve, so take them 20 – 30 minutes before meals. Take at least 2000mg daily. This is intended to carry oxalate out with the feces.
 - i. Avoid supplements with Vitamin D, which encourages absorption of calcium and reduces the efficacy of calcium supplements in managing dietary oxalate.
 - ii. Include high calcium foods in meals with plant foods.
 1. Milk and milk products, as best as you tolerate.
 2. Eat the bones in sardines and canned salmon.
 3. Cabbage and mustard greens have favorable calcium-to-oxalate ratios and can be considered a calcium source, and also oxalate neutral.

8. Watch for the oxalate release process!

- a. Be prepared for some purging of toxic oxalate from your tissues. It is normal to experience unpleasant symptoms in the tissues that are releasing oxalates. This will not cause “die off” of pathogens, but can make you feel tired, headachy, and fuzzy brained like a die-off can. This can be difficult. When oxalates move out, they cause pain. This may also release dormant viruses from damaged tissues. Mild infections are possible, such as athletes’ foot, cold sores, or yeast infections. Appetite may increase or be more variable. They should yield to gentle treatments and not persist. A sudden rash is common, as are other skin symptoms. You may feel prickly pores when sweating or bathing in Epsom salts.
- b. Make note of cloudy urine, which may confirm that your symptoms are related to oxalate release.
- c. This process has the potential for serious tissue damage! To minimize this, you must support the body and go slow. Oxalates on the move cause oxidative stress that can kill cells. Healing may improve blood flow; this can also increase oxidative stress by flooding tissues with oxygen (oxygen causes additional oxidative damage).
- d. If you don’t experience at least some bad side-effects, you may not have an oxalate problem. Or, you may still be eating a moderately-high-oxalate diet.
- e. Make sure you are getting appropriate medical care, but beware that conventional medicine doesn’t have any health care protocols for this problem.

9. Protect yourself from side-effects of oxalate release; individualize your program

- a. Optionally replace other missing nutrients and minimize internal production of oxalate
 - i. Especially B6 (as P5P), and Biotin
 1. Make sure you are *not* taking the *pyridoxine* form of B6 (which unfortunately is how it is almost universally offered); pyridoxine ironically can induce deficiency.
 2. It is important instead to take the biologically active form of B6, *pyridoxal 5'phosphate* (also called PLP or P5P)
 3. The best natural source of active B6 is pork
 - ii. Thiamin and magnesium
 1. Thiamin is a common deficiency, and, in some people, mega doses may be necessary to benefit from taking it.
 2. *Benfotiamine* is a bioavailable form. Therapeutic doses may go to 600mg or more daily. There is no known toxic level of thiamin.

- iii. Mineral supplements: mixed broad spectrum with zinc and selenium
- iv. Mineral water (remember filtered water has reduced minerals).
- b. Reduce inflammation and oxidative damage
 - i. Both biotin and thiamin have antioxidant effects, and help spare glutathione
 - ii. Arginine (replenishes nitrous oxide)
 - iii. Taurine (a sulfur-containing amino acid, antioxidant); meat is a good source of taurine
 - iv. Occasional and limited use of Vitamin E and Retinol (Vitamin A)
 - v. Others: CoQ10 (mitochondrial support); zinc; selenium
 - vi. Avoid Vitamin C supplements in large doses (greater than 200mg per day). It elevates oxalate levels in the body. Use of Vitamin C and Vitamin E supplements have been associated with a shorter lifespan, as they interfere with the body's "redox balance" and suppress the body's own antioxidant powers.
 - vii. Do not overload yourself with external antioxidants. Choose real foods, especially easily digested meats and other animal-sourced foods that are not overly processed or heat-damaged.
- c. Protect and restore connective tissues, promote healing
 - i. Make bone broth at home and make soup a part of your daily diet. Please limit to 1 cup (240ml) of broth per day. Excessive gelatin and collagen (whether from broth or supplements) may increase oxalate production in the body.
 - ii. Bio-Sil – triggers regrowth of damaged connective tissues – especially discs and joints
 - iii. N-acetyl glucosamine (N-A-G) may help connective tissues, but contributes to fatigue in some people.
- d. Support Detox
 - i. Sauna, plenty of sleep, mineral baths. Consider adding some sodium thiosulfate to the bath for its antioxidant properties.
 - ii. Fresh lemon juice every day because it alkalizes the body - as long as you protect your teeth by taking plain water afterwards, avoid sipping on acidified water all day
- e. Prevent new crystals and break down existing crystals
 - i. Lemon or lime; ½ cup daily has been shown to help cells dissolve kidney stones.
 - ii. Citrate supplements (calcium or magnesium)

10. Important

- a. Rest. Protect your sleep by keeping to a routine
- b. Take low-oxalate snacks with you when you leave home.
Examples: plain yogurt, pumpkin seeds, cucumber sticks, cheese, apples, jerky.
- c. Calm body, mind, spirit
 - i. Epsom salts baths (a good way to get needed magnesium)
 - ii. Meditation
 - iii. Time in nature
 - iv. Learn to be flexible, some days will be healing days others will be amazing days, it is hard to predict this ebb and flow.
- d. Optional. If you feel a need to feed your gut microflora: Include some retrograde resistant starch in your diet in the form of cooked and cooled green peas, turnips, or black-eyed peas.

11. What can I drink? (select low sugar beverages, avoid artificial sweeteners)

Coffee, (up to 3 cups) (1.5 mg ox/C)

Black tea (has about 20mg oxalate)

Mineral water or filtered water with minerals replaced

Herbal teas - most are low

Apple cider, Apple juice

Cherry juice (3mg ox/ C)

Cranberry juice

Lemon and lime juice

Orange juice (>1mg/C)

Pineapple juice (3mg/C)

Kefir water

Milk and milk kefir

Barley water

Pale Ale and Beer

Orange Squash (soda)

Ginger ale; Root beer; Sprite (reserve for special occasions)

Red wine, sherry, vermouth, small amounts

Electro mix electrolyte water

Kombucha in small amounts (8oz per day)