INE | INSTITUTE OF NUTRITIONAL ENDOCRINOLOGY

Food Principles: Oxalates

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"If diet is *Wrong,*
medicine is of no use.
If diet is *Correct,*
medicine is of no need."

~ Ancient Ayurveda Proverb

“Another Broccoli Related Death!”

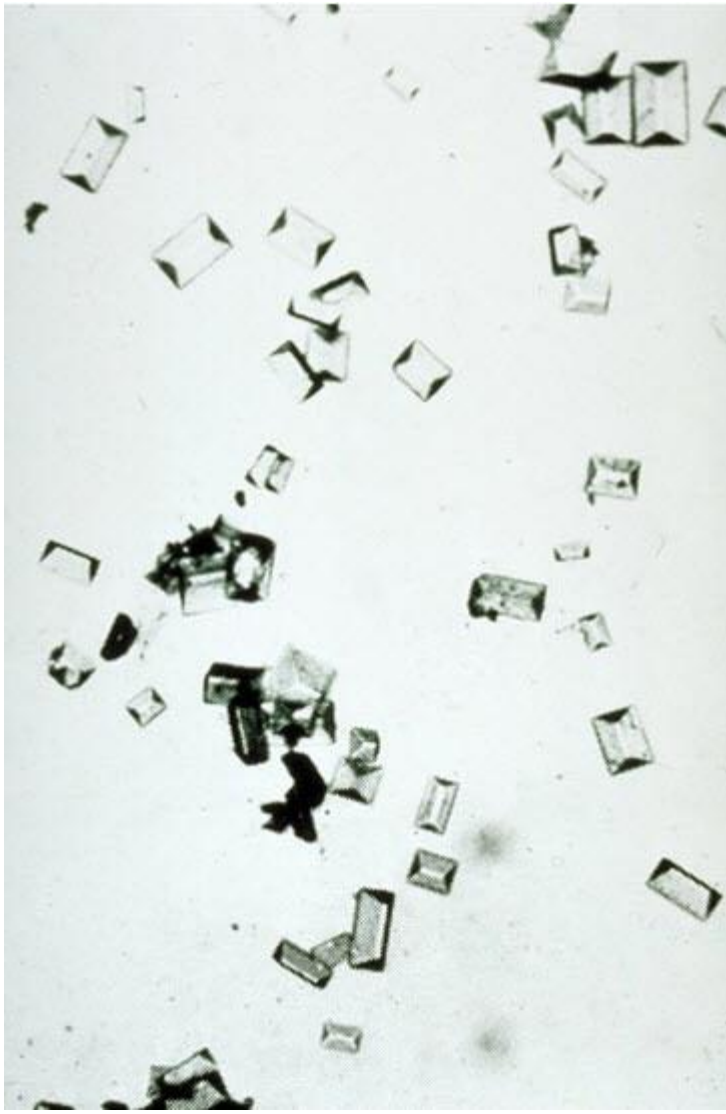
-Dr. Hibbert, The Simpsons

What Are Oxalates?

- Molecule with a negative charge found in plant foods
- Come from food and are made by the body (40/60 or more)
- Oxalates and Oxalic Acid are the same thing

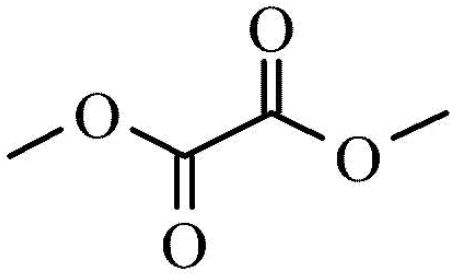
What Do Oxalates Do?

- Oxalates are excreted in the urine or may be stored in the tissues of the body
- Oxalates bind to minerals, particularly calcium, magnesium, and potassium
- Bound to minerals in the gut, many oxalates are excreted in the stool before being absorbed
- Oxalates can reduce the quantity and quality of bone formation/density when in high concentrations



Oxalic Acid is an Anti-Nutrient that Inhibits Mineral Absorption

- Spinach: Calcium availability is poor due to oxalates
- Oxalate levels are so high they bind to calcium in the food making it unavailable
- Oxalates in spinach can bind to the calcium and minerals from other sources in the diet (1, 2)
- Raw spinach oxalate level - 1000 mg/3 oz



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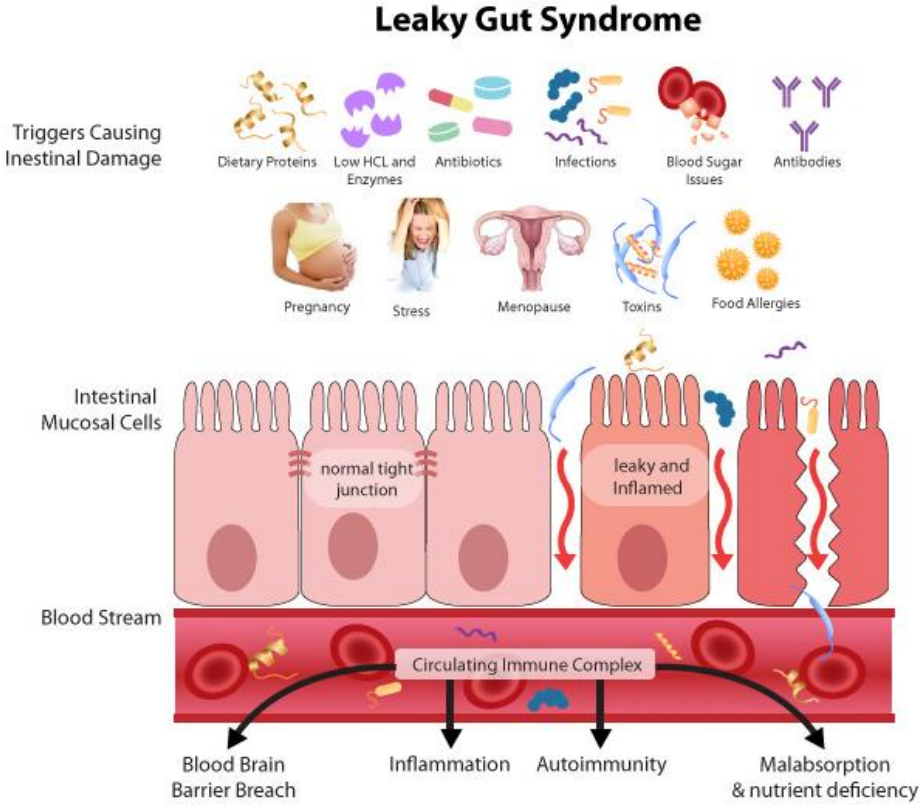
Oxalic Acid

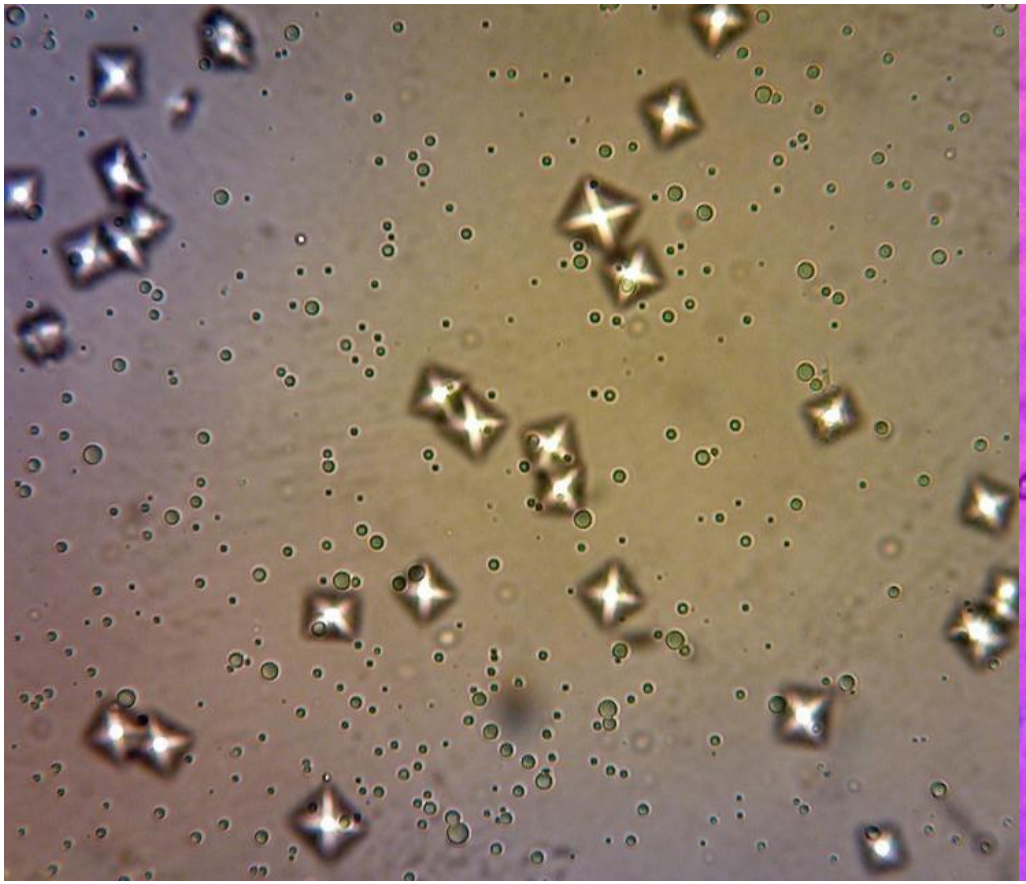
- Can bind to calcium, forming crystals with sharp edges which can cause inflammation and pain
- Can disrupt other minerals, impair mitochondrial function, and create oxidative stress
- Can deplete glutathione

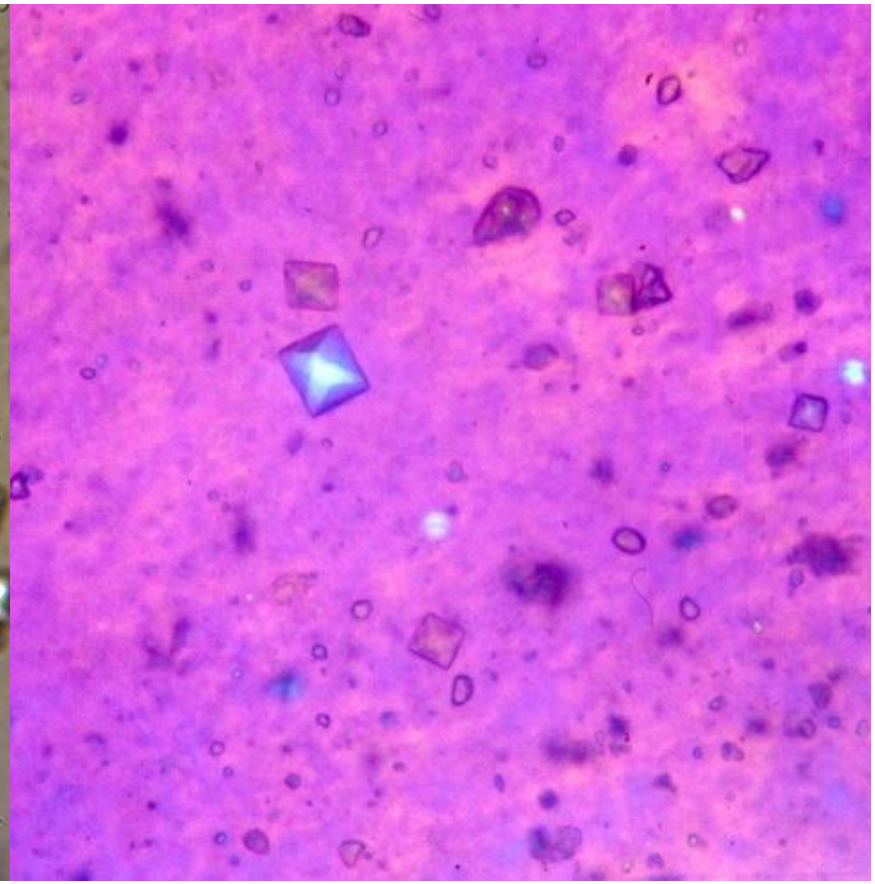
Who is Affected?

- 3-fold greater plasma oxalate levels in people with conditions on the autistic spectrum and 2.5 fold in urine oxalate levels
- Those with compromised digestive barriers

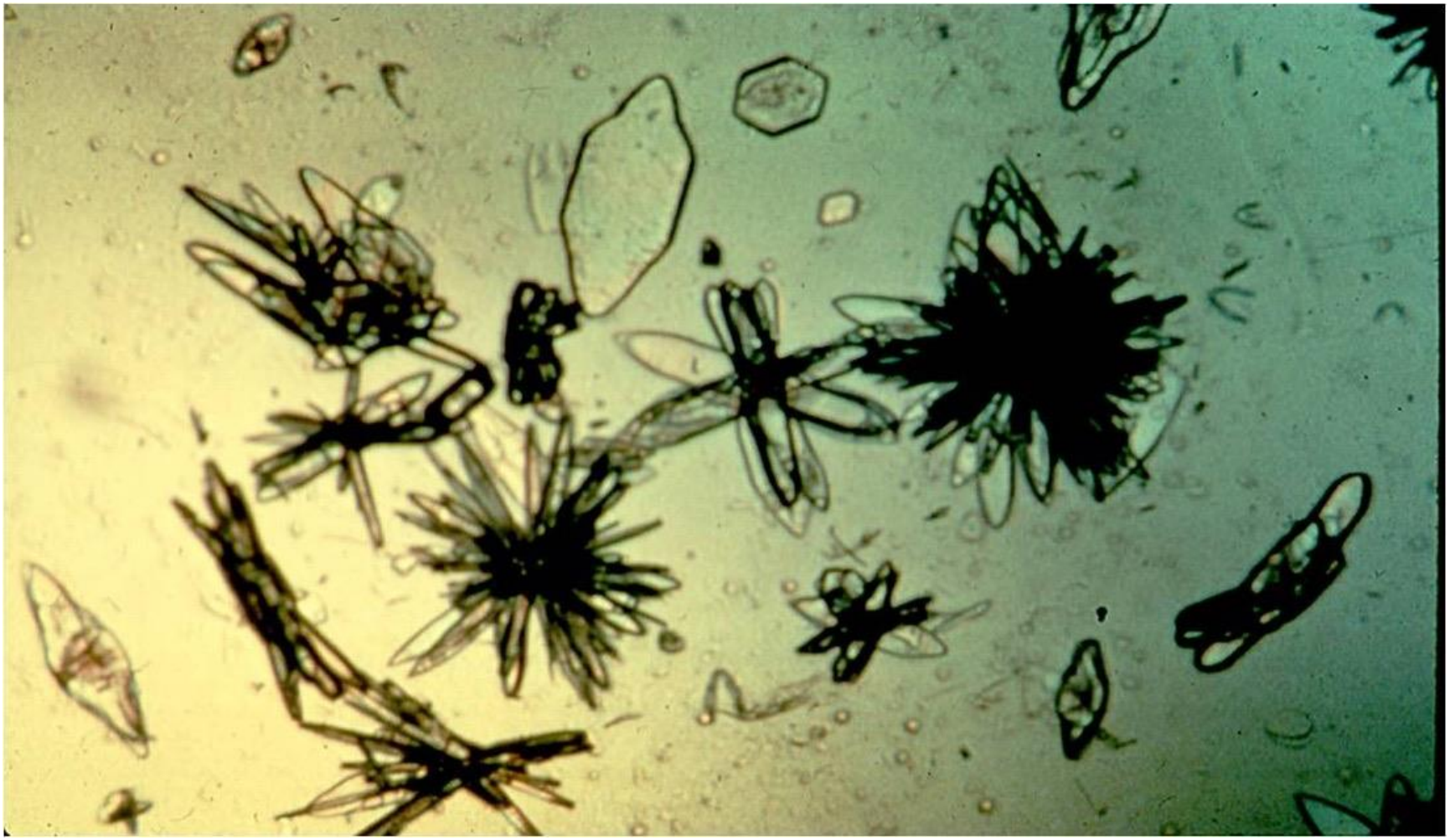


Calcium Oxalate Crystals





Uric Acid Crystals (for comparison)



High Oxalate Signs/Symptoms

- ❑ Headaches
- ❑ Vulvar pain (Vulvodynia)
- ❑ Feeling of having a UTI or burning urine
- ❑ Joint pain
- ❑ Muscle pain
- ❑ Kidney stone formation
- ❑ Bladder pain/burning
- ❑ Poor bone health
- ❑ Poorly formed or “sandy” stool
- ❑ Eye pain

Hyperoxaluria Type 1 and 2

- Body is lacking in enzymes to break down oxalates to some degree
- Type 1 usually has stronger symptoms and is often noticeable earlier in life
- Clinical diagnosis of these disorders is rare

Organic Acid Test

- Great Plains Lab
- Spot oxalate tests are less accurate
- Genova test doesn't have oxalates

Interpreting the OAT

20	Glyceric	0.71	- 9.5	H	17		
21	Glycolic	20	- 202	H	207		
22	Oxalic	15	- 174	H	223		

Organic Acids Test - Nutritional and Metabolic Profile

Metabolic Markers in Urine	Reference Range *(mmol/mol creatinine)*	Patient	Reference Population - Females Under Age 13

- Glyceric = type 2
- Glycolic = type 1
- Oxalic = measurement of oxalic acid

Oxalate Degrading Enzymes

20	Glyceric	0.71	- 9.5	H	17	
21	Glycolic	20	- 202	H	207	
22	Oxalic	15	- 174	H	223	

Organic Acids Test - Nutritional and Metabolic Profile

Metabolic Markers in Urine	Reference Range *(mmol/mol creatinine)*	Patient	Reference Population - Females Under Age 13

- Serine-Pyruvate Aminotransferase
- Alanine-Glyoxylate Aminotransferase
- Glyoxylate Reductase (Hydroxypyruvate Reductase)
- D-Glycerate Dehydrogenase

Most At Risk

- Children grabbing their heads, joints, or genitals and/or poking at their eyes
- Those with **leaky gut**
- Those with a history of **upper GI surgery**
- Popeye (ha ha!)
- Those with **low gallbladder function** or gallbladders removed
- Those with **mineral imbalances**, known methylation or sulfation issues, and fat deficiencies
- Those with conditions on the autistic spectrum
- Those with impaired Krebs cycle
- Those with a **history of IBD, IBS**, interstitial cystitis, headaches, high histamine, or **thyroid insufficiency**

Oxalates and Sulphates

- High oxalates can lead to poor sulphation/low sulphate
- Low sulphates slow detoxification
- Low sulphates can overwhelm methylation cycles
- Low sulphates can let oxalates into cells, affecting the mitochondria

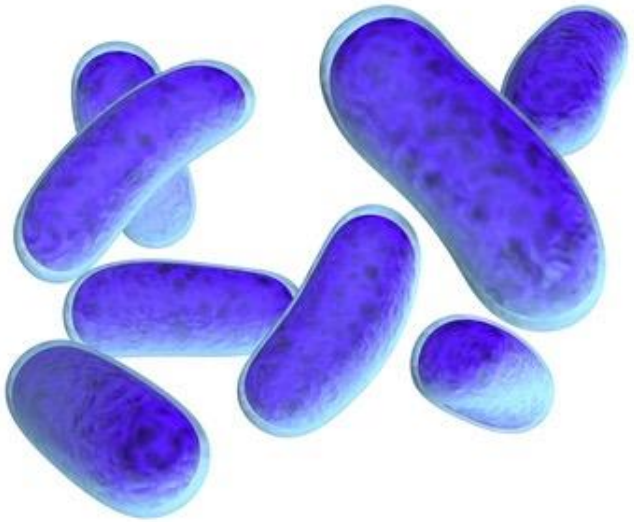
Durian is a dietary source of sulphur

Oxalates and Phenols

- Low sulphates can cause phenol reactions
- Salicylates (Aspirin) = similar reactions to phenols
- Phenols = petrolium
- High phenol foods =
  Natural/artificial color/flavor, tomatoes, apples, peanuts, bananas, honey, oranges, cocoa, coffee, grapes/wine, colorful berries
- Also high phenol =
  Castoreum, sodium benzoate, petroleum based preservatives, BHT, fragrance, phenoxyethanol, mineral oil, PEG (6, 7, 40 etc.)

Oxalate Producing Organisms

- Aspergillus
- Candida
- Carbohydrate malabsorption feeds fungi



- LPS (lipopolysaccharides) are produced by gram-negative dysbiotic flora
- Toll Like Receptors in the kidneys can become desensitized to oxalates by LPS

Oxalates and the Kidneys

- Kidneys protect themselves with a mucosal lining
- Toll Like Receptors in kidneys signal when to produce a more protective barrier
- Toll Like Receptors can become desensitized to oxalates by LPS (lipopolysaccharides)
- LPS are produced by gram-negative dysbiotic flora
- LPS can get into the body through a weak digestive barrier (leaky gut)

High Oxalate Foods

- ❑ Nuts, especially almonds and peanuts
- ❑ Beans, most
- ❑ Beets
- ❑ Figs
- ❑ Rhubarb
- ❑ Swiss chard, field greens, spinach
- ❑ Buckwheat
- ❑ Amaranth
- ❑ Soy
- ❑ Sweet potatoes
- ❑ Chocolate
- ❑ Citrus peel
- ❑ Kiwi and starfruit
- ❑ Tea
- ❑ Blackberries
- ❑ Raspberries
- ❑ Gooseberries

Sneaky Oxalate Foods

- ❑ Turmeric (curcumin okay)
- ❑ Black pepper
- ❑ Horsetail
- ❑ Stinging nettle
- ❑ Herbal tinctures (of high oxalate herbs)
- ❑ Dandelion greens
- ❑ Chicory
- ❑ Figs
- ❑ Tamarillo
- ❑ Curry leaf
- ❑ Moringa
- ❑ Aronia (chokeberry)
- ❑ Purslane

Safe Food Alternatives

- ❑ Flour: coconut, water chestnut, garbanzo bean
- ❑ Seeds: pumpkin and sunflower
- ❑ Blueberries
- ❑ Dinosaur/lacinato kale
- ❑ Oils
- ❑ Squash
- ❑ Basil
- ❑ Cilantro
- ❑ Cranberries
- ❑ White pepper
- ❑ Cherries, peaches, plums

Medications, Supplements, Chemicals

- Miralax (Constipation)
- Antifreeze (Cars)
- Lexapro (SSRI)
- Naftidrofuryl (Reynauds and peripheral neuropathy, dementia)

Band-aids and Relief

- Calcium or Magnesium Citrate with meals
  - (powder, liquid, or chewable = best)
- B6 (pyridoxine)
- Magnesium
- B1 (thiamin)
- B7 (biotin)
- Gravel root, Chanca Piedra, Hydrangea root (decoctions)
- High antioxidant diet
- Acetyl-L-Glutathione, liposomal or transdermal glutathione

Long-Term Solutions

- Better fat absorption
- Digestive bacteria balancing including Oxalobacter formigenes, Bifidobacterium (all), Lactobacillus plantarum
- Healing tight junctions in the gut
- Liver / gallbladder (bile) support
- Adequate mineral, amino acid, and vitamin intake
- Reducing oxalate intake for a time to give the liver a chance to detoxify stored oxalates

Myths and Mix-ups: 1

- Oxalates can inhibit LDH (lactate dehydrogenase), which may or may not have an effect on the growth of cancer cells
- Oxalates from anti-cancer medications have been found to be neurotoxic
- Oxalates are poisonous; one would have to eat at least 11 pounds of the highest oxalate foods (like turmeric or rhubarb) to get to this level
- The body can make oxalates from ascorbic acid (vitamin C), although studies have not shown this to extend to levels excreted in urine
- High oxalates can lead to high histamine by triggering its release, just like anything irritating can cause histamine release
- No, cooking foods does not reduce oxalates
- Boiling vegetables and dumping the water will reduce oxalates and nutrients

Myths and Mix-ups: 2

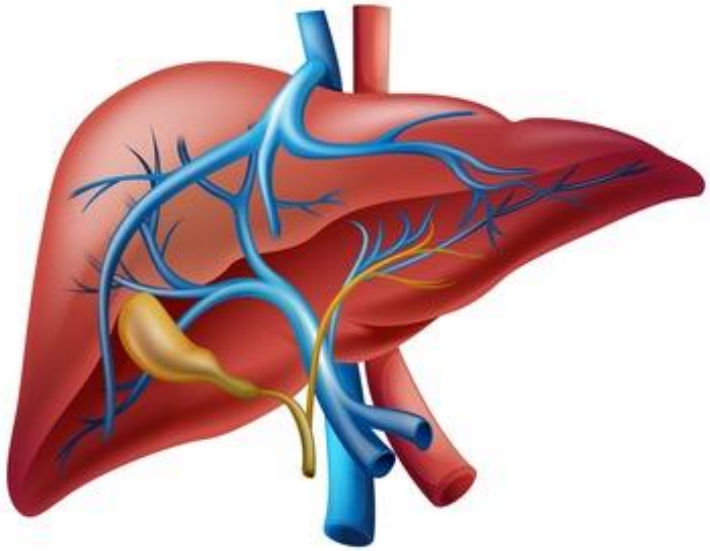
- Essential oils are ok even if the plants may not be (e.g. black pepper, turmeric, herbs)
- Curcumin is okay, turmeric is high oxalate
- Green juices can be high oxalate
- Think in ***oxalates per meal***

Helping Your Clients

- Eliminating one food at a time
- Supporting children and families
- Facebook recipe groups
- Lists/charts/handouts
- Eating out

How to Remove Oxalates from the Diet

- Cut out one oxalate food at a time (several days between)
- If your client feels worse they may be dumping oxalates (detoxifying rapidly)
- This is art/science; everyone is different



The Real Problem

- Oxalate LOAD
- Too many coming in, not enough going out
- Oxalates are absorbed in higher amounts when there is fat malabsorption, leaky gut, and dysbiosis
- The body can detoxify oxalates via citric acid (endogenous)
- The body can detoxify oxalates through these enzymes:
  - Serine-Pyruvate Aminotransferase
  - Alanine-Glyoxylate Aminotransferase
  - Glyoxylate Reductase (Hydroxypyruvate Reductase)
  - D-Glycerate Dehydrogenase

Vitamin/Mineral Interactions

- B6 is depleted by high oxalates
- B6 is required for oxalate metabolism
- Calcium is depleted by high oxalates
- Calcium can bind to oxalates in the gut
- Cholesterol and taurine (cysteine, B6, C) help us produce bile and absorb less oxalic acid
- Magnesium, manganese, potassium, iron, zinc

Low Oxalate Diet

- **Pros:**
  - Can support those with mitochondrial dysfunction
  - Has positive implications for many disorders
  - Gets people out of physical pain
  - Can have dramatic effects with children
  - Can address yeast overgrowth for some people that diet can't
- **Cons:**
  - Must remove oxalates SLOWLY over time
  - Reactions can seem confusing - often worse before better
  - Best to include supplements for support along with diet changes
  - Adds another level of restriction
  - May not be a long-term solution for most

Address the Following

- Cellular metabolism (Krebs/citric acid cycle)
- Bile production and liver health
- Leaky gut
- Dysbiosis and fungal overgrowths
- Nutrient deficiencies and imbalances
- Oxalate load
- Endogenous antioxidant production

Low Oxalate Diet Resources

- **Food chart:** http://www.drritamarie.com/go/LowOxalateRecipes
- **Facebook:** Trying Low Oxalates
- **WHfoods:** http://www.drritamarie.com/go/WHFoodsOxalates
- **Rotating greens:** http://www.drritamarie.com/go/LowOxalateGreens
- **Julie Matthews:** *Nourishing Hope for Autism* (book)
- **Phenols:** http://www.drritamarie.com/go/Phenols

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