Functional Nexus Guide to Oxalate Reduction

What are oxalates and where do they come from?

Oxalates are crystals that occur naturally in plants, they offer the plants rigidity and a degree of protection from pests. Oxalate content of plant-based foods varies widely, but very high intake can be inadvertent (even when consuming an apparently 'healthy diet'). While humans and animals have evolved various strategies to manage intake of these crystals, if they reach high levels in the body they can cause widespread damage and a multitude of systemic symptoms.

Interestingly, humans can also make oxalates in the liver, especially if there is deficiency of vitamins B3 or B6, or if they have a rare genetic predisposition (known as Primary Hyperoxaluria). Excessive intake of vitamin C can also lead to high oxalate production as this can be converted to oxalic acid in the liver.

How can Oxalates affect health?

Unfortunately, these tiny, sharp structures are toxic to human cells and, with higher levels, symptoms can include:

- Kidney stones, recurrent urine infections, bladder pain and genital pain
- Benign positional vertigo (dizziness), due to crystals forming in the inner ear
- Increased risks of Osteoporosis (due to the effects of oxalate on calcium metabolism)
- Skin rashes and Joint pains
- Hypermobility and loss of connective tissue integrity
- Fatigue due to direct mitochondrial toxicity

How can I know whether Oxalates are a problem for me?

Testing the urine to look for signs of active oxalate production in the liver, or high oxalate in the urine can sometimes give us clues as to whether oxalate might be a 'root-cause' of some of the above issues for a particular person. We look for these routinely in our 'Metabolomix' urine organic and amino acid panel. However, these markers can be reassuringly normal even in highly affected individuals. The reverse is also true and high urine oxalate may be seen simply due to recent high oxalate intake.

Unfortunately, this means that the best method of checking whether oxalates are causing a problem is to trial a systematic reduction in oxalate intake, to see whether this helps to reduce any of your systemic health problems. A positive trial result for oxalate sensitivity, would result in gradual improvements in underlying problems (such as joint pain or urinary discomfort). Improvements can be seen after a few days in some people, but may take a few weeks for others.

Sometimes, Oxalate reduction can also lead to a sudden surge in symptom worsening. This is due to sudden release of oxalates into the blood stream when dietary intake has been lowered too quickly. This temporary worsening of symptoms due to rapid oxalate increase is often referred to as oxalate 'dumping'. This phenomenon is strongly suggestive of underlying oxalate overload.

Lowering Dietary Oxalates Safely

In general, oxalate experts recommend reducing oxalates slowly (by 5-10% per week), to avoid the 'dumping' reactions. Unfortunately, this advice is difficult to follow and this guide has been written to support our patients who want to determine whether oxalate overload might be a cause of their problems.

Getting Started: A Gentle Approach

1. Get to Know which foods are high, moderate or low in oxalates and start making informed 'swaps'

- Use the food lists below to start making changes. If you can't find something in our food lists, use the links to the more

2. Go Slowly

- Reduce high-oxalate foods step by step over 2–6 weeks, not overnight.
- Start by removing the highest oxalate foods first (e.g. spinach, almonds).

3. Don't Eliminate Everything at Once

- Keep some moderate oxalate foods initially to avoid sudden shifts.
- Gradually rotate and replace rather than restrict aggressively.

4. Stay Well Hydrated

- Aim for 1.5–2.5 litres/day as oxalates are released from the body in the urine
- Adding Lemon juice to water (for citrate), can help to bind oxalates

5. Support Mineral Balance

- Include calcium-rich foods (e.g. dairy if tolerated), or calcium supplements with meals (as calcium binds oxalate in the gut).
- Ensure adequate magnesium and potassium intake.

6. Support Gut Health

- A healthy gut microbiome helps break down oxalates.
- Include fermented foods (if tolerated): yoghurt, kefir, sauerkraut.

7. Watch for Symptoms of "Dumping"

- Sandy stools, cloudy urine (or tiny snowflakes in urine), fatigue, skin irritation, mood changes
- If these occur, the reduction down a little (or add a bit of higher oxalate food back in).

8. Boil high oxalate vegetables

- Prepare carrots, squash and potatoes by boiling and pouring off the water to reduce oxalate content.

Below is a great guide to getting started, for patients making the move longer term to a low oxalate diet, we have provided links to more detailed resources at the end of this handout.

Oxalate Food Guide

Eat Freely:

- Animal Proteins (meat and fish), eggs, animal dairy, cheese, butter and cream contain no oxalate.
- Fats and oils including olive oil and coconut oil are also free from oxalates.

Fruits:

Lower Oxalate Fruits (Good Staples)

- Apples
- Pears
- Bananas
- Grapes
- Melon (watermelon, cantaloupe)
- Mango
- Papaya
- Peaches
- Coconut

Moderate Oxalate (consume in moderation)

- Blueberries
- Strawberries
- Oranges

Higher Oxalate (Avoid / restrict to small amounts)

- Raspberries
- Blackberries
- Kiwi

Vegetables: **Tip:** Boiling vegetables and discarding the water can reduce oxalates.

Low Oxalate Choices

- Bell Peppers
- Broccoli
- Cauliflower
- Cabbage
- Courgette (zucchini)
- Cucumber
- Mushrooms
- Onions
- Peas
- Lettuce
- Tomato

Moderate (Use in Small Portions)

- Carrots
- Green beans
- Aubergine

High Oxalate (Stop First)

- Spinach (very high)
- Swiss chard
- Beetroot
- Sweet potatoes

Nuts & Seeds: Proceed Carefully. Coconut (not a real nut), is low in Oxalates.

Lower Oxalate Options

- Pumpkin seeds
- Sunflower seeds
- Macadamia nuts

Moderate

- Cashews
- Hazelnuts

High Oxalate (Reduce Gradually)

- Almonds
- Peanut products (peanut butter)
- Sesame seeds (tahini)

Gluten-Free Grains

Lower Oxalate (Best Staples)

- White rice
- Basmati rice
- Millet
- Corn (polenta, corn tortillas)

Moderate Oxalate (Use in Rotation)

- Gluten-free oats
- Quinoa
- Buckwheat

Higher Oxalate (Limit Intake)

- Brown rice (higher than white due to bran)
- Teff (moderate-high depending on portion)

Legumes

Moderate Oxalate (Use a few times per week, not daily)

- Chickpeas
- Lentils (especially red lentils in smaller servings)

Higher Oxalate (Limit or Avoid)

- Soybeans (tofu, soy milk)
- Navy beans
- Black beans

Legumes can contribute significantly to oxalate load, especially in larger portions. Soaking and rinsing legumes may reduce oxalates slightly.

Drinks

Lower Oxalate Drinks (best choices)

- Water (ideal)
- Milk (helps bind oxalate)
- Peppermint or Chamomile tea
- Red Bush Tea
- Diluted fruit juice

Moderate

- Coffee (limit to 1–2 cups/day)
- Green tea

Higher Oxalate (limit/avoid)

- Black tea (can be surprisingly high)
- Hot chocolate / cocoa
- Soy milk (often high)

Better swaps:

- Swap black tea → herbal tea
- Swap almond milk → cow's milk or oat milk (moderate)
- Swap hot chocolate → milk with vanilla or honey

Plant Based 'Milk and Yoghurts'

While cow's / goat / sheep Dairy contains calcium and will lower oxalate by binding to it in the gut, not everyone tolerates it and plant-based alternatives are needed.

Lowest Oxalate

- Coconut Milk & Yoghurt
- Oat Milk
- Rice Milk (but avoid regular use due to arsenic content)
- Flax / hemp milk (limited data but generally low oxalate)

Moderate oxalate

- Soy milk and yoghurt (varies by brand – 9-30mg/cup)
- Oat Yoghurt

Higher oxalate (limit if sensitive)

- Cashew milk
- Almond milk

Identified as highest among tested milks but levels can vary hugely (commercial: ~24 mg/cup, Homemade: up to ~165 mg/cup)

Processing matters a lot and calcium fortification can massively reduce absorption.

High oxalate Snacks to avoid:

- Dark chocolate and cocoa powder (cocoa is a very oxalate dense food)
- Nut based protein snacks and energy balls
- Vegetable crisps (especially beetroot and sweet potato)
- Spinach powder (in green smoothies)

Low Oxalate, Gluten-Free Bread Options

Bread can be tricky, because most gluten-free breads are actually higher in oxalates than regular bread due to the flours used.

For lowest oxalate content look for breads based mainly on:

- White rice flour
- Potato starch (NOT potato flour)
- Corn starch / maize starch
- Tapioca starch (in moderation)

These starches contain far less oxalate than whole flours

Moderate (okay occasionally)

- Oat flour (GF oats)
- Chickpea flour
- Sorghum (depends on amount)

High oxalate (avoid if possible)

- Brown rice flour
- Almond flour
- Buckwheat
- Quinoa
- Teff
- Soy flour
- Linseeds
- Wholegrains

Lower-Oxalate "Bread Alternatives"

Sometimes better than bread:

- Rice cakes (very low)
- Corn tortillas (simple ingredients)
- Homemade flatbreads (rice flour + yogurt)
- Potato-based wraps (using potato starch)
- Egg wraps / very thin omelette or lettuce wrap (zero oxalate)

Best Practical Strategy

- Use commercial GF bread occasionally
- Choose white/starch-based versions
- Make your own for regular use
- Pair with calcium foods (cheese, milk) to reduce absorption

UK Gluten-Free Breads

Lowest Oxalate

- Warburtons GF white wraps and white bread/rolls
- Schär White Wraps and White Bread / Rolls

Oxalate estimate: Wrap / Slice: ~5–10 mg, Roll: ~10–15 mg

- Old El Paso Gluten Free Corn Tortilla Wraps
- Tesco Corn Tortillas

Oxalate estimate: ~8–15 mg per wrap (moderate-low)

Moderate Oxalate

- Genius Gluten Free White Bread
- Old El Paso GF tortillas

Oxalate estimate: 10–20 mg/ wrap / slice

High Oxalate Breads (avoid)

Seeded / Brown / "Healthy" GF breads (with linseed /flax or whole grain flours)

- BFree wraps
- Seeded GF breads
- Wholegrain GF products

Oxalate estimate: ~20–40+ mg per serving

Best Practical Strategy

For lowest oxalate intake:

- Use white GF wraps (Warburtons / Schär) as default
- Use white GF bread occasionally
- Limit wraps to 1 per meal max

Simple Low-Oxalate GF Bread Recipe

Ingredients:

- 2 cups white rice flour
- 1 cup potato starch
- ½ cup cornstarch
- 2 tsp xanthan gum
- 1 tsp salt
- 1 tbsp sugar
- 2 tsp yeast
- 2 eggs
- 1½ cups warm milk
- 2 tbsp olive oil

Method:

1. Mix dry ingredients
2. Add eggs, milk, oil
3. Beat into a thick batter (not dough)
4. Pour into loaf tin
5. Rise 30–45 mins
6. Bake at 180°C for ~40–45 mins

Why this works:

- Uses starches (low oxalate) instead of whole flour and avoids nut/seed flours entirely
- Includes eggs + milk → adds calcium (helps bind oxalate)

Simple Low-Oxalate Potato Starch Wrap Recipe

This is the closest you'll get to a true low-oxalate wrap.

Ingredients

- 1 cup potato starch
- ¼ cup cornstarch (improves texture)
- ½ tsp salt
- 1 tbsp olive oil
- ~¾ cup warm water

Method

1. Mix dry ingredients
2. Add water gradually → soft dough
3. Divide into small balls
4. Roll thin between baking paper
5. Cook in dry pan (medium heat, ~1–2 min each side)

Estimated oxalate: ~2–5 mg per wrap

For an even Easier Version (no rolling), make into a pourable batter by adding more water/ Milk to make a pancake-like batter and pour into pan and cook like a crêpe.

Techniques to Reduce Oxalates Content in Foods

High-impact changes

- Boiling and draining potatoes → noticeable drop
- Switching roasting → boiling for moderate veg

Using vegetable cooking water in soups or sauces puts the oxalates back into the meal.

While boiling and draining is the most effective way to reduce oxalates, it doesn't eliminate them completely. Some foods (like spinach) remain moderate/high even after cooking. Soaking and then boiling potatoes will help to remove extra oxalates. Steaming, frying and roasting will retain most oxalate content.

Here's a practical "before vs after" oxalate chart for common vegetables, showing how much you can reduce oxalates with the right preparation methods (mainly boiling + draining). Values are approximate (mg per 100g cooked/raw edible portion) and vary by source, but the reduction trends are reliable:

Vegetable	Raw	Boiled	Reduction
Spinach	~1,145	~460	↓ ~60%
Swiss chard	~964–1,167	~335–428	↓ ~63–65%
Carrots	~44	~18	↓ ~59%
Broccoli	~14	~4	↓ ~71%
Brussels sprouts	~15	~6	↓ ~60%
Beets	~64	~48	↓ ~25%
Potatoes	~31	~25	↓ ~6% (minimal)

Combine Oxalates with Calcium

Add cheese, milk, yogurt and this can reduce oxalate absorption by a further 20–50%. For those who are sensitive to dairy, calcium supplementation can be used instead.

Drink Water with Lemon Juice

Lemon water is high in citrate (from citric acid). Citrate binds with calcium in the gut and in the urine, forming soluble complexes. This reduces calcium-oxalate crystal formation, which is the main cause of kidney stones. Citrate doesn't lower oxalates in food, but reduces the risk of oxalate absorption and stone formation.

Studies show ½ cup lemon juice/day in water significantly raised urinary citrate, making the urine less likely to form stones.

Practical tips

Add fresh lemon juice to water or salad dressings.

Drink throughout the day — 1–2 cups of lemon water is effective for most adults.

5-Day Moderately Low Oxalate Meal Plan (Gluten-Free)

Day 1

- Breakfast: Yoghurt (dairy, oat or coconut), with banana & pumpkin seeds
- Lunch: Grilled chicken and salad (lettuce, cucumber, tomato, olive oil dressing)
- Dinner: Salmon, broccoli, green beans and boiled potatoes
- Snack: Apple

Day 2

- Breakfast: Scrambled eggs with mushrooms and low oxalate toast / wrap
- Lunch: Turkey lettuce wraps with avocado and salad
- Dinner: Beef stir-fry with cabbage, bell peppers & courgette
- Snack: Pear and macadamia nut butter

Day 3

- Breakfast: Smoothie (mango, strawberries, dairy / coconut yoghurt and milk)
- Lunch: Mackerel salad with cucumber, tomatoes and olives
- Dinner: Roast chicken, boiled carrots, green beans and broccoli
- Snack: Grapes

Day 4

- Breakfast: Omelette with courgette, onions & herbs
- Lunch: Leftover chicken with salad
- Dinner: Cod, cauliflower mash, peas
- Snack: Rice cake

Day 5

- Breakfast: Porridge with dairy / oat yoghurt, pumpkin and sunflower seeds and grapes
- Lunch: Beef burger (lettuce leaf bun) with crunchy apple and cabbage 'slaw with mayo dressing and lemon juice
- Dinner: Lamb, roasted courgette & boiled carrots with rice
- Snack: Banana and fresh coconut pieces

3-Day Very Low Oxalate Plan (Gluten-Free)

Day 1

- Breakfast: Eggs and sautéed mushrooms
- Lunch: Chicken soup with cabbage and rice cakes
- Dinner: Grilled salmon, cauliflower, cucumber salad

Day 2

- Breakfast: Yoghurt with melon
- Lunch: Turkey slices with salad & avocado
- Dinner: Stir-fried Beef with broccoli & courgette and rice

Day 3

- Breakfast: Omelette with onions
- Lunch: Mackerel with cucumber salad & olives
- Dinner: Roast chicken with cabbage & peas

Vegetarian Low Oxalate Meal Planning

Lower oxalate staples (build your meals around these):

- Dairy: milk, yogurt, cheese
- Eggs
- Grains: white rice, oats (oatmeal is better), rice pasta / noodles
- Vegetables: cabbage, cauliflower, peas, mushrooms, onions
- Fruits: bananas, apples, grapes, melon
- Protein: eggs, dairy, tofu (moderate—limit portions)

Below is a practical, balanced plan that keeps oxalates moderate-to-low while staying vegetarian (with eggs and dairy). I've included variety (salads, soups, casseroles, desserts, snacks) for a 5 day plan and a stricter very low oxalate 3-day plan afterwards.

5-Day Moderately Low Oxalate Plan

Day 1

- Breakfast: Scrambled eggs with sautéed mushrooms + tomatoes, Gluten-free white toast (rice/potato-based) and a Banana
- Lunch: Potato, green bean & egg salad (olive oil + lemon dressing), with Lettuce + cucumber
- Dinner: Vegetable stir-fry (cabbage, carrots, courgette), White rice, Small portion tofu
- Dessert: Baked apples with cinnamon + cream / coconut cream
- Snack: Yogurt + honey

Day 2

- Breakfast: Greek yogurt + banana + small handful strawberries
- Lunch: Creamy cauliflower & leek soup, Gluten-free roll
- Dinner: Cheesy vegetable bake (potatoes, cauliflower, peas, carrots)
- Dessert: Rice pudding
- Snacks: Cheese + apple

Day 3

- Breakfast: Omelette with mushrooms + peppers and Gluten-free toast
- Lunch: Warm rice bowl with roasted courgette, carrots, and halloumi
- Dinner: Vegetable frittata (potato, onion, courgette), Side of steamed cabbage
- Dessert: Jelly + cream
- Snacks: Rice cakes + cream cheese

Day 4

- Breakfast: Smoothie (milk, banana, mango)
- Lunch: Carrot & coriander soup. Cheese + gluten-free crackers
- Dinner: Stuffed peppers (rice, vegetables, cheese), side salad (lettuce, cucumber, tomato)
- Dessert: Semolina-style pudding (use cornmeal/polenta alternative if needed)
- Snacks: Grapes and macadamia nuts

Day 5

- Breakfast: Boiled eggs, Gluten-free toast + butter, Apple
- Lunch: Pasta salad (GF white pasta, cucumber, sweetcorn, cheese, mayo)
- Dinner: Vegetable stew (carrots, cabbage, peas, potatoes, herbs). Optional small lentil portion (moderate oxalate—keep modest)
- Dessert: Sponge cake (gluten-free, rice flour based) + custard
- Snacks: Yogurt and grapes

3-Day VERY Low-Oxalate + Gluten-Free Plan

Stricter modifications: Avoids oats, lentils, tofu, most berries, and higher oxalate veg

Day 1

- Breakfast: Scrambled eggs + sautéed mushrooms, GF white toast / wrap
- Lunch: Egg mayonnaise lettuce wraps, Cucumber + carrot sticks
- Dinner: Roasted vegetables (cauliflower, carrots, courgette). Boiled potatoes + cheese
- Snacks: Rice cakes

Day 2

- Breakfast: Yogurt + banana
- Lunch: Cream of mushroom soup, GF bread
- Dinner: Vegetable omelette (peppers, onion), Steamed cabbage + carrots
- Snacks: Cottage cheese and Apple

Day 3

- Breakfast: Boiled eggs + GF toast and butter
- Lunch: Potato salad with egg + lettuce and low oxalate veggies
- Dinner: Simple vegetable stir-fry (cabbage, courgette, carrots), White rice
- Snacks: Banana Milkshake

Eating Out: Practical Advice

What to Do

- Choose simple dishes: grilled meat or fish + vegetables
- Ask for sauces/dressings on the side
- Opt for rice or boiled potatoes instead of unknown mixed sides
- Request swaps (e.g. "no spinach, extra broccoli")

Hidden high-oxalate ingredients to look out for

- Spinach in salads or sauces
- Nut-based sauces
- Chocolate desserts

Safe Choices

- Steak with vegetables
- Grilled fish with salad
- Omelettes
- Roast dinners (avoid spinach sides)

Further Resources

Sally K Norton

Probably the best known expert in the field of oxalate toxicity, Sally has produced extensive guides for beginners and experts alike. She also offers coaching 1-1 and group sessions for those with oxalate issues.

For those who are on a longer term oxalate lowering Journey, her data companion and recipe book can be purchased here: https://shop.sallyknorton.com

Wizards of Ox

This Youtube site has loads of video's recipes and resources for those wanting to pursue low oxalate trials.

Low Oxalate Info

A well-established low-oxalate site with information, recipes, food list guides, substitutions and diet tips for everyday cooking. Includes low-oxalate recipes that are flexible for many dietary styles (vegan/vegetarian options included).

The recipe section is here: https://lowoxalateinfo.com/low-oxalate-recipes/

The Kidney Dietitian (low-oxalate recipes)

A renal nutrition specialist's blog with lists of low-oxalate recipes (many plant-forward/vegetarian-friendly). Recipes are here: https://www.thekidneydietitian.org/low-oxalate-recipes/

Low Oxalate Kitchen

This blog that provides info, recipes, and practical tips on low-oxalate diet planning. The recipes are here: https://lowoxalatekitchen.com/blogs/recipe-blog

Marek Doyle's Low oxalate calculator For those wanting to keep a close eye and calculate the oxalate content of their meals, this calculator is really helpful.

Want to Contribute?

This is my first time writing a low Oxalate guide and I know there are lots of improvements and tips that many of our 'pro' low Oxalate patients can offer.

In future I may add sections on supplements and links to more recipes – what would you like to see?

To join in and contribute (or point out a typo), email the team at enquiries@functional-nexus.co.uk

Best wishes

Dr Sarah