

# Staghorn Kidney Stones – What They Are and How to Avoid Them

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## STORY AT-A-GLANCE

- › Staghorn kidney stones are large, branched structures primarily composed of struvite. They account for about 10% to 15% of kidney stone cases in developing countries
- › Risk factors for staghorn stones include chronic UTIs, anatomical abnormalities, long-term catheter use, neurogenic bladder conditions and metabolic disorders that affect your urinary composition
- › Unlike smaller kidney stones, staghorn stones initially do not show symptoms, but later cause abdominal pain, blood in urine and fever, leading to sepsis and kidney failure if untreated
- › Treatment for staghorn stones typically requires surgical intervention like percutaneous nephrolithotomy; extracorporeal shockwave lithotripsy is a less invasive option
- › Strategies to prevent recurring UTIs and lower your risk of staghorn stones are included below

Kidney stones are solid mineral and salt deposits that form in the kidneys, causing intense pain and discomfort. Each year, over half a million people visit emergency rooms due to kidney stone issues. According to the National Kidney Foundation,<sup>1</sup> 1 in 10 people will develop a kidney stone at some point in their lives.

There are four primary types of kidney stones – calcium oxalate, uric acid, struvite and cysteine. Among these, the struvite stones have the most distinctive appearance, as

they form into large, branched structures known as "staghorn calculi," which fill the kidney's inner spaces.<sup>2</sup>

Because of their size and position, staghorn stones are particularly dangerous and challenging to treat. Recognizing their symptoms, understanding the risk factors and familiarizing yourself with effective management strategies for this condition are essential for timely detection and treatment.

## **What Are Staghorn Kidney Stones?**

Staghorn stones, named for their distinctive "antler-like" shape, are primarily composed of struvite (magnesium ammonium phosphate) and typically form due to chronic urinary tract infections (UTIs), especially from bacteria that produce the enzyme urease, such as *Proteus mirabilis*. This enzyme breaks down urea, which increases the concentration of ammonia in the urine, raising its pH and creating an alkaline environment conducive to stone formation.<sup>3</sup>

Staghorn stones account for about 10% to 15% of kidney stones in developing countries, while the rate is lower in developed nations due to early detection and preventive measures.<sup>4</sup> The symptoms of staghorn stones differ from other types of kidney stones because of their size and complicated structure.

While smaller stones cause intense, sharp pain when they get stuck in your urinary tract, staghorn stones typically do not produce obvious symptoms at first. Over time, however, they lead to pain on the sides of your abdomen, between your ribs and hip, as well as blood and pus in your urine, exhaustion and fever. In more serious cases, they increase the risk of sepsis, a life-threatening response to infection.<sup>5,6</sup>

The anatomy of staghorn stones complicates treatment. They branch out into the renal pelvis, a funnel-shaped area of the kidney that channels urine into the ureters, which then carry it to the bladder for storage. If the renal pelvis or ureters are blocked, kidney swelling will occur. These stones may also block the calyces, where urine collection

starts. Swelling of these areas, called caliectasis, leads to kidney failure if untreated, so prompt diagnosis and treatment is important.<sup>7,8</sup>

## **Are You at Risk of Developing Staghorn Kidney Stones?**

Certain risk factors increase your likelihood of developing staghorn kidney stones, with chronic UTIs being the most significant. Individuals with a history of frequent UTIs or kidney infections need to be vigilant about developing this condition. Women, in particular, face a higher risk due to anatomical susceptibility to UTIs.<sup>9</sup>

In addition to that, several anatomical and medical conditions significantly increase your risk, such as having an atypical urinary tract anatomy. Any blockages in your urinary tract create areas where minerals accumulate and crystallize, leading to stone development.

Long-term catheter use presents another significant risk factor, as catheters introduce bacteria and create conditions favorable for stone formation. Similarly, if you've undergone a urinary diversion procedure in the past, your altered urinary anatomy promotes stone development.<sup>10</sup>

Moreover, having a neurogenic bladder, a condition where nerve damage affects bladder function, creates a perfect environment for staghorn stones because of incomplete bladder emptying and frequent infections. Additionally, if you've had untreated kidney stones in the past, they serve as starting points for larger staghorn calculi to develop.<sup>11</sup>

Metabolic disorders play a role in stone formation as well. Obesity increases your risk through various mechanisms, including altered kidney function and increased crystal formation in urine.<sup>12</sup> Diabetic patients face elevated risks due to changes in urine composition and pH levels. High blood sugar also impairs your immune response, allowing bacterial infections to thrive.<sup>13</sup>

The combination of these metabolic conditions with poor dietary habits or dehydration makes stone formation even more likely. Diagnosis of staghorn stones involves urinalysis and imaging to assess both stone presence and infection. A urinalysis checks

for bacteria and elevated pH levels, which are strong indicators of infection-related stones. Imaging through X-rays, ultrasounds or CT scans reveals the stone's shape, size and location within the kidney.

## **How Are Staghorn Kidney Stones Treated?**

While small kidney stones typically pass on their own without medical intervention, larger ones like staghorn stones often require more intensive treatment. Because of their complex, branching structure, staghorn stones typically don't resolve with medical therapy alone.

Medical treatments are often used as supportive measures to reduce infection risk and manage symptoms rather than to remove the stones entirely. Complete surgical removal is often recommended to address staghorn stones, with surgical techniques like percutaneous nephrolithotomy (PCNL) being the most common.<sup>14</sup>

This minimally invasive procedure involves making a small incision on your back, wherein instruments will be inserted directly into the kidney to break up and remove the stones. PCNL has largely replaced traditional open surgeries for staghorn stores, like anatomic nephrolithotomy or pyelolithotomy, which carry significant risks and do not always achieve complete stone removal.<sup>15</sup>

For patients seeking less invasive options, extracorporeal shockwave lithotripsy (ESWL) is another option, especially for smaller fragments or remaining stone pieces after PCNL. In ESWL, sound waves are directed at the stones to break them into smaller fragments, allowing them to pass naturally through the urine over days or weeks.<sup>16</sup>

## **Address Recurring UTIs to Reduce Your Risk of Staghorn Kidney Stones**

Since recurring UTIs are the primary risk factor for staghorn kidney stones, taking proactive steps to maintain a healthy urinary tract is important. Here are practical strategies to reduce your risk of UTIs:

**Stay hydrated** — Drink plenty of pure, filtered water daily to dilute your urine and flush out bacteria.

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**Don't delay urination** — Empty your bladder as soon as you feel the need; holding it in promotes bacterial growth.

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**Practice good hygiene** — Always wipe from front to back to keep bacteria from entering your urethra.

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**Opt for showers over baths** — Avoid prolonged exposure to water in hot tubs or jacuzzis, which encourage bacterial infections.

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**Practice pre- and post-sexual hygiene** — Cleanse your genital area before and after sexual activity.

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**Avoid irritants** — Skip feminine hygiene sprays or other products that will irritate your urethra.

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**Consider using a bidet** — This provides gentle, thorough cleansing, reducing irritation and bacteria transfer compared to wiping with tissue.

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**Eat fermented foods** — Incorporate kefir, sauerkraut and other fermented foods into your diet to support a healthy microbiome.

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Cranberries are also a powerful natural ally against UTIs. They contain proanthocyanidins, which inhibit E. coli — a common UTI-causing bacteria — from adhering to the bladder walls. A comprehensive review in the Cochrane Database of Systematic Reviews<sup>17</sup> found that cranberry products reduced the risk of symptomatic, culture-verified UTIs in women with recurrent infections and in children and individuals prone to UTIs after medical interventions.

The source of your meat matters too, as contaminated meat harbor UTI-causing bacteria. Conventionally raised chicken is particularly problematic, not just for its bacterial load but also for its high **linoleic acid** (LA) content, which is harmful to overall

health. If you choose to eat chicken, opt for organic, pasture-raised options. Ideally, source your meat from local farms that use regenerative farming methods to reduce contamination and protect your health.

## **Methylene Blue Helps Against UTIs, Too**

For treating UTIs, consider using methylene blue, a potent compound with a long history of medicinal use. Discovered in 1876, it was originally used as a textile dye but is now recognized for its remarkable antimicrobial properties. Unlike antibiotics, methylene blue is excreted directly into the bladder, where it becomes highly concentrated, effectively killing pathogens there without disrupting the gut microbiome.

In addition to fighting UTIs, methylene blue offers cognitive benefits, such as improving brain health and reducing dementia risk, making it especially valuable for older adults prone to UTIs. It serves as a unique, targeted treatment with minimal side effects compared to traditional antibiotics. Learn how to use it as a part of your treatment protocol in "[Benefits and Side Effects of Methylene Blue – A Comprehensive Guide](#)."

## **Can You Eat Oxalate-Containing Food if You Have Staghorn Stones?**

Staghorn stones are primarily composed of struvite, but they sometimes include calcium oxalate or calcium phosphate. While these are usually secondary components, limiting high-oxalate foods is a smart precaution if you're dealing with any type of kidney stone. In fact, I believe managing oxalate intake benefits everyone – not just those with kidney stones, metabolic challenges or mineral imbalances.

Oxalates are natural compounds found in many plant foods, including beans, grains, seeds, nuts, fruits, berries and herbs. When consumed in excess, oxalates interfere with various body functions and lead to joint pain, digestive issues, skin irritation and reduced cellular energy production.

Gut health and kidney stone risk are closely linked, and since oxalates are gut-irritating antinutrients, reducing them in your diet supports healing. Start by identifying and cutting out high-oxalate foods until your gut health improves. Common high-oxalate foods to watch for include:

- **Spinach** – Contains up to 600 to 800 milligrams (mg) of oxalates per 100 grams. In addition to spinach, other leafy greens considered "superfoods," like Swiss chard and beet greens, are also high in oxalates, so you'll want to avoid them, especially if you're prone to kidney stones or sensitive to oxalates.
- **Almonds** – Contains around 122 mg of oxalates per 100 grams. However, all nuts in general are particularly problematic, since they contain LA. Even macadamia nuts add to your toxic load, as they contain oleic acid, which could just be as bad as LA.
- **Peanut butter** – Contains around 140 mg of oxalates per 100 grams.
- **Sweet potatoes** – Approximately 30 mg of oxalates per 100 grams. Although this is considered high compared to other vegetables, it's actually much lower than spinach or nuts.
- **Figs** – They have approximately 40 mg of oxalates per 100 grams.

I recommend watching my [interview with Sally Norton](#), an esteemed authority on oxalates, to learn more about oxalates and how to reduce their harmful effects to your health.

## **Additional Strategies to Minimize Oxalate-Related Risks**

Since excess oxalates sometimes contribute to the development of staghorn stones,<sup>18</sup> I recommend implementing strategies to reduce and eliminate them from your body. In addition to avoiding high-oxalate foods listed above, consider the following key recommendations:

**Increase your calcium intake** – Eating calcium-rich foods or taking calcium supplements helps bind oxalates in the gut, preventing their absorption and

promoting excretion through your stool. Good sources of calcium include dairy products and low-oxalate leafy greens like kale.

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**Stay hydrated** – Drink plenty of water throughout the day to flush oxalates from your system and lower the risk of kidney stone formation.

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**Optimize your gut health** – A balanced gut microbiome aids in breaking down oxalates. Add probiotic-rich foods like yogurt, kefir and fermented vegetables to your diet to encourage the growth of beneficial bacteria such as *Oxalobacter formigenes*, which naturally degrade oxalates.

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**Incorporate citrate into your diet** – Found in lemons, limes and oranges, citrate binds with calcium and oxalates, reducing the likelihood of stone formation. However, be careful not to take excessive ascorbic acid (vitamin C), as high doses convert into oxalates.

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**Cook high-oxalate foods well** – If you do choose to eat high-oxalate foods, boiling them will significantly lower their oxalate content as the compounds leach into the cooking water, which is then discarded.

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**Use topical calcium for oxalate-related skin irritations** – If oxalates are causing you skin irritation, applying topical calcium will neutralize them and provide relief directly at the site.

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## Sources and References

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- <sup>1</sup> National Kidney Foundation, Kidney Stones
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