



DIETARY ADVICE for STONE FORMERS

Information about preventing stone formation from The British Association of Urological Surgeons (BAUS)

You have been given this leaflet because you have been diagnosed with urinary stones. The aim of the leaflet is to provide you with advice on how to modify your diet and fluid intake to reduce your risk of getting further stones.

We have consulted specialist surgeons during its preparation, so it represents best practice in UK urology. You should use it in addition to any advice already given to you.

To view this leaflet online, scan the QR code (right) or type the short URL below it into your web browser.



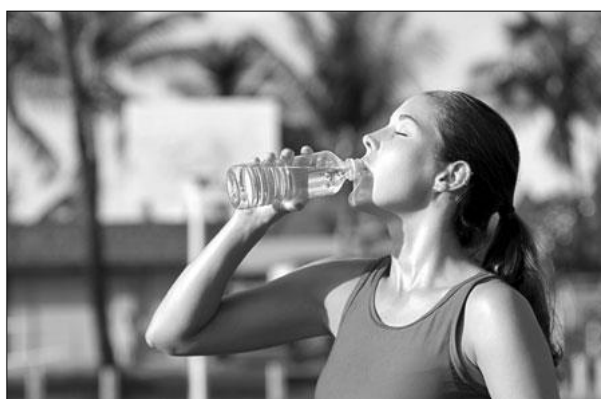
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KEY POINTS

- Specific types of stone can be managed by measures aimed at the cause of your stone formation
- Generally, keeping your urine dilute & colourless reduces your risk of forming a further stone by almost one third (30 to 40%)
- In addition, a normal calcium, low-salt, low-protein dietary intake can reduce your risk of stone formation even further

How much do I need to drink?

Drinking plenty of fluid is the most effective way of preventing stone formation and reduces your risk of stone formation by almost one third (30 to 40%). Not drinking enough can cause your urine to become concentrated, making stones more likely to form.



Try to drink two to three litres (four to six pints) of fluid (water or squash) each day. You should aim to keep your urine colourless throughout the day. This should give you a

urine output of at least two litres (four pints) per day. If you have cystine stones, you will need to drink enough to produce more than four litres of urine each day.

You can drink tea, coffee & alcohol in moderation, but most of your fluid intake should be water or squash. We recommend that you drink one or two glasses of water before going to bed, and on getting up in the morning.

Tips to help you increase your fluid intake are:

- drink a large glass of water at specific times each day (e.g. when you get up, when you arrive at work, after using the toilet etc);
- keep a bottle or jug of water by your side all day; you can flavour it with fruit squash;
- try to drink one glass of water every hour;
- add slices of lemon, lime or orange to cold water; this gives it a pleasant flavour and helps to make your urine less acidic;
- eat more fruit & vegetables because they contain a lot of water; and
- include moist / liquid foods in your diet (e.g. soup, stew & jelly).

Does what I eat influence stone formation?

What you eat is not as important as how much you drink, but it does play a part in stone formation.

It is essential to have a well-balanced diet, avoiding too many calories. This should include fresh fruit, salad and vegetables, low-fat dairy produce, and whole grain products such as bread or cereals.

A high fibre intake is helpful, although you should not eat **wheat bran** because of its high oxalate content.

Is calcium in my diet bad for stones?

Interestingly, reducing the amount of calcium in your diet can **increase** the risk of stone formation, by raising oxalate levels in your urine. A daily intake of up to 1000 mg per day is safe for calcium stone formers.

Most dietary calcium is found in dairy products (milk, yoghurt, cream and cheese). A normal, varied diet will give you about 500 mg of calcium each day. The approximate calcium contents of dairy produce are:

- **milk and yoghurt** – 120 mg per 100 g

- **soft cheese** - 400 mg per 100 g
- **hard cheeses** - up to 1000 mg per 100 g

If you have too much calcium in your **urine**, you may benefit from restricting your calcium intake, but you should discuss this with your urologist, specialist nurse or GP.

Does oxalate intake play a part in stone formation?

Yes. You should try to avoid oxalate-rich foods to keep the oxalate levels in your urine at a normal level. You should avoid eating rhubarb, celery, spinach, beetroot and sesame seeds, all of which have a very high oxalate content.

Black tea, chocolate, nuts (including peanut butter), cocoa and carob are all moderately high in oxalate. You should take them in moderation, but you do not need to exclude them completely. See below for further information.

Should I restrict my salt intake?

Yes. Salt contains sodium, and a high sodium intake can increase calcium stone formation. Do not add salt to your food at the table: use pepper, herbs, spices or vinegar as alternative flavourings. You can, however, add a small amount of salt to your food during cooking.

You should limit your sodium intake to between 2300 & 3000mg per day; this is equivalent to 5 – 6 grams (one teaspoonful) of salt.

Try to eat foods with a low salt content. Avoid tinned, packet or processed foods (e.g. soups, salted crisps or nuts, tinned meats, meat paste, smoked fish and fish paste), all of which have a high salt content.

Is there anything else I can do to help myself?

It is important to reduce your weight if you are overweight. Increased physical activity should be part of any weight-reducing programme. Remember to drink plenty of fluid and avoid getting dehydrated if you sweat a lot during exercise.



Can you find out why I have made stones?

Yes in most patients. All patients who have had a kidney stone should have blood tests to check their kidney function, and make sure that their uric acid and calcium levels are not raised.

In high-risk stone formers (young patients and those who have had repeated stones), two 24-hour urine samples should be collected to measure the level of several chemicals in your urine. Your urologist, specialist nurse or GP can tell you more about this. It is not, however, always possible to identify why you have made stones.

Is there anything I can do to prevent certain types of stone?

Calcium oxalate stones (pictured below)

Only 10 – 15% of oxalate in your urine comes from dietary intake. It is not, therefore, necessary to eliminate oxalate-containing foods completely from your diet. You should, however, aim for a moderate (and sensible) intake of oxalates.

It is best to avoid high-dose supplementation with vitamin C because this can lead to raised oxalate levels. No more than 60mg per day is needed for a normal intake.

Foods which are especially high in oxalates should be consumed sparingly. The following foods are known have a high oxalate content:

- **tea & coffee** (more than two to three cups per day)
- **nuts** (e.g. almonds), **sesame seeds & nut products** (e.g. peanut butter)
- **cocoa & chocolate**
- **some fruit** (figs, tangerines, plums, berries & currants)
- **rhubarb**
- **soy products** (tofu, soy milk, soy cheese & soy ice cream)
- **some vegetables** (celery, spinach, leeks, okra, parsley & beetroot)



Uric acid stones

You should try to limit your dietary intake of purines. These are naturally-

occurring chemicals, found in most foods, which are broken down by the body into uric acid.

The main dietary sources of purines are:

- **meat** - all meats, including liver, heart, kidney, sweetbreads & meat extracts (e.g. Oxo)
- **fish** - especially anchovies, crab, fish roe, herring, mackerel, sardines, shrimps & whitebait
- **others** - yeast extracts (e.g. Bovril), beer, asparagus, cauliflower, mushrooms, peas, beans & spinach.

Uric acid levels are often higher in people who are overweight, so losing weight can help you. Taking the drug allopurinol, which lowers uric acid levels in the blood, has **not** been shown to help in reducing the risk of uric acid stones. If you are diabetic, good control of your blood sugars can also reduce the risk of uric acid stones.

Calcium phosphate stones

Dietary changes have little effect on the formation of calcium phosphate stones. All the general advice above is valid but you should avoid taking anything to alkalinise your urine.

Cranberry juice may be beneficial because it acidifies your urine and lowers urine oxalate levels slightly.

Struvite (“triple phosphate”) stones

These are seen mostly in women after the menopause and are usually due to infection in your urine. The bacteria involved (*Proteus* species) produce an enzyme (urease) which splits urea in your urine to form ammonia. This makes the urine highly alkaline, encouraging the formation of calcium, magnesium, ammonium (“triple”) phosphate stones. Once these stones form, they encourage further infection, resulting in a “vicious circle” of rapid stone growth.

A high fluid intake, low-dose antibiotics (as necessary) and acidification of the urine are all effective, but the main aim is to get rid of all your stones, which eliminates the potential for recurrent urinary infections.

Drugs (urease inhibitors) are available that block the enzyme produced by the bacteria, but they are not normally used because of the high-risk of major side-effects.

Cystine stones (cystinuria)

Simple, basic measures remain the most important way of preventing cystine stone formation:

- **increase your fluid intake** - you must drink enough fluid to produce two or three litres of urine per day; this usually means you need to get up at night to drink water
- **modify your diet** - reduce your intake of methionine (from which cystine is formed) by cutting your animal protein intake
- **alkalinise your urine** - this encourages cystine to dissolve in your urine. We normally do this using potassium citrate; this tastes unpleasant, and some patients can only tolerate it by flavouring it with fruit juice
- **monitor your urine acidity (pH)** - using special pH dipsticks, to be sure that your urine stays alkaline. Your urologist or specialist nurse can supply you with these

Drugs are available for the treatment of cystine stones, but are only used in patients with:

- very rapid & frequent stone formation;
- a frequent need for surgical intervention; or
- poor compliance with, or a poor response to, the measures above.

Drug treatment must be very closely monitored for side-effects; the agents used include:

- **tiopronin** (α -mercaptopyrionylglycine, Thiola™ or Acadione™) - this is not licensed in the UK but it is available under special agreement. It binds to cystine molecules forming a more soluble compound which is easily excreted in the urine
- **d-penicillamine** (Distamine™) - the same mode of action as tiopronin but with a higher risk of side-effects
- **captopril** (Capoten™) - normally used to treat high blood pressure but relatively ineffective, so it is only used if the drugs above are unsuitable.



What sources have we used to prepare this leaflet?

This leaflet uses information from consensus panels and other evidence-based sources including:

- the [Department of Health \(England\)](#);
- the [Cochrane Collaboration](#); and
- the [National Institute for Health and Care Excellence \(NICE\)](#).

It also follows style guidelines from:

- the [Royal National Institute for Blind People \(RNIB\)](#);
- the [Information Standard](#);
- the [Patient Information Forum](#); and
- the [Plain English Campaign](#).

DISCLAIMER

Whilst we have made every effort to give accurate information, there may still be errors or omissions in this leaflet. BAUS cannot accept responsibility for any loss from action taken (or not taken) as a result of this information.

PLEASE NOTE: the staff at BAUS are not medically trained, and are unable to answer questions about the information provided in this leaflet. If you have any questions, you should contact your Urologist, Specialist Nurse or GP in the first instance.