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DIETARY ADVICE FOR STONE FORMERS

When to do Metabolic Stone Evaluation ?

- Recurrent stone formers
- Strong family history of stones
- Intestinal disease (particularly chronicdiarrhea)
- Pathologic skeletal fractures
- Osteoporosis
- History of urinary tract infection with calculi
- Personal history of gout
- Infirm health (unable to tolerate repeat stone episodes)
- Solitary kidney
- Anatomic abnormalities
- Renal insufficiency
- Stones composed of cystine, uric acid, struvite

How much do I need to drink?

Drinking enough fluid is the most important way of preventing stone formation and reduces your risk of stone formation by almost one third (30-40%). Not drinking enough fluid causes your urine to become concentrated and makes stones more likely to form. Try to drink two to three litres (four to six pints) of fluid each day (water, squash, or fizzy drinks).

You should aim to keep your urine colourless throughout the day. This equates to a urine output of at least two litres (four pints) per day. In patients with cystine stones, however, an output of 3.5 litres per day is required.

Tea, coffee & alcohol can be consumed in moderation but the majority of your fluid intake should be as above. In addition, it is helpful to try and drink one or two glasses of water before going to bed and on rising in the morning.

Tips to help you increase your fluid intake:

- 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);
- Drink a glass of fruit juice with your breakfast;
- Keep a bottle or jug of water at your side all day; you can flavour the water with squash;
- Drinking through a straw may help you drink more;
- Try to drink one glass of water every hour;
- Add slices of lemon, lime or orange to cool water, to give it a pleasant flavour and to help alkalinise your urine;
- Eat more fruit & vegetables because they contain a lot of water; and
- Include moist/liquid foods in your diet (e.g. soup, stew & jelly).

Should my urine be acidic or alkaline?

We may sometimes ask you to test the acidity of your urine at particular times of day and we also measure it in your 24-hour urine collection specimens. The acidity of urine normally varies throughout the day, depending on your diet. Acidity/alkalinity is expressed as pH (pH 7 or less is acidic; pH greater than 7 is alkaline).

The acid-reducing effect of water with a high bicarbonate content is useful for patients who form uric acid stones. Mineral water with a high bicarbonate content (e.g. Vichy, Badoit, Vittel, Buxton) also increases citrate levels in the urine; citrate is a known inhibitor of stone formation.

If you have pure calcium phosphate stones, you should avoid alkalinising urine and should drink tap water rather than mineral water. You should also avoid mineral waters with a high sodium content (e.g. Vichy, Vichy Catalan).

Fizzy drinks such as Diet Coke, Coke Zero & Diet Pepsi are relatively poor at alkalinising your urine. There is some evidence that Diet 7-Up, Diet Sunkist & Diet Sprite may be better, and is worth considering if you have uric acid stones or calcium oxalate stones.

Tips to help you increase your fluid intake:

Yes. A high intake of animal protein appears to increase the risk of stone formation. Avoid large portions of meat, fish, eggs, cheese and milk.

Aim for four of the following exchanges each day:

- 50 - 75g red meat, fish or chicken
- two eggs

- ½ pint of milk
- 50g cheese
- 120g yogurt (one small pot)

Two of the four exchanges should be milk, cheese or yogurt to ensure an adequate intake of calcium. You can replace protein with starchy foods (bread, potatoes, pasta, fruit & vegetables) to fill you up. Reducing your protein intake also increases the amount of citrate you excrete in your urine; citrate is a known inhibitor of stone formation.

You should not consume protein build-up drinks.

An example for a daily meal plan would be:

Breakfast: Two eggs (scrambled) on toast

Lunch: Sandwich with 50g cheddar cheese & salad One apple

Dinner: One small chicken breast (approx 75g) New potatoes Vegetables Fruit salad

Should I lose weight?

It is something to consider, and it will benefit you in other ways (by reducing your risk of Type 2 diabetes, high blood pressure and raised cholesterol). Being overweight has been linked to high uric acid levels and overweight people tend to have acidic urine; acidic urine can increase the risk of most types of stone.

Should I restrict the amount of salt I take?

Yes. A high salt intake can contribute to calcium stone formation as well as reducing urine citrate levels. 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 during cooking.

Foods that contain less than 0.4g (40mg) of sodium per serving are low-salt choices and you should aim to keep your salt intake down to these levels. Avoid tinned, packet and processed foods (soups, salted crisps, nuts, tinned meats, meat paste, smoked fish and fish paste).

Does calcium restriction help?

No. Severe calcium restriction can actually increase the risk of stone formation because it will result in high levels of oxalate in your urine. If you follow the recommendations above for milk, cheese and eggs, no further action is needed.

You should not take calcium supplements or “over-the-counter” medicines for indigestion (which may contain a lot of calcium). If your GP has said that you must take calcium supplements, take them with food to reduce the risk of stone formation. Products containing calcium citrate are better at increasing citrate levels in your urine than those with calcium carbonate.

The calcium you drink in tap water cannot cause kidneys stones and there is no need to restrict your intake of tap water and no point in purchasing a water softener (which is not connected to your drinking water). Some people prefer the taste and smell of filtered water but there is no evidence that it reduces the risk of stone formation.

Do fruit & vegetables help to prevent stones?

Fruit & vegetables have many beneficial effects and they also have an alkalinising effect on your urine. They contain a lot of fluid which helps with your daily fluid intake. Oxalate stone formers should, however, take care to avoid any oxalate-rich fruit & vegetables from the list above.

Drinking fruit juice does appear to reduce urine oxalate and increase citrate levels. Fruit juice should be consumed with caution because some contain a lot of sugar. The evidence for taking cranberry or grapefruit juice is uncertain and, as a general rule, increasing your intake of fruit juice is probably not beneficial. A single glass with your breakfast is, however, recommended but, if you have oxalate stones, fruit juices are probably best avoided.

Should I increase the fibre intake in my diet?

High-fibre, plant-based foods contain a compound called phytate and studies have shown that a low intake of phytates increases your risk of calcium-based stones; Increasing your intake, therefore, will probably be beneficial. The normal recommended intake of fibre for adults is 12 - 24g per day; see below for the fibre content of some common foods:

Should I take vitamin supplements?

Most vitamins are harmless but you should not take Vitamin D preparations (including fish oils and multivitamin preparations) because they increase calcium absorption.

You should avoid taking Vitamin C supplements because they can increase the excretion of oxalate in your urine.

What can I do to prevent my particular type of stones?

Calcium oxalate stones

Only 10 – 15% of urinary oxalate comes from your 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. Foods which are especially high in oxalates (e.g. All-Bran, almonds, beet, rhubarb & spinach) should be consumed sparingly. The following foods are known to be high in oxalate:

- Tea & coffee (more than two to three cups per day);
- Nuts (e.g. almonds), 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, parsely & beetroot).

Uric acid stones

If you form uric acid stones, you should try to limit the amount of purines in your diet. These are natural substances found in most foods, and are broken down by the body into uric acid. The main dietary sources of purines are:

- Meat: all sources of meat as well as liver, heart, kidney, sweetbreads & meat extracts (e.g. Oxo);
- Fish: especially anchovies, crab, fish roe, herring, mackerel, sardines, shrimps & whitebait; and
- Others: yeast extracts (e.g. Bovril), beer, asparagus, cauliflower, mushrooms, legumes (peas & beans) & spinach.

Uric acid formation is also higher in overweight individuals, so losing weight may be beneficial. 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.

Calcium phosphate stones

Specific dietary measures have little effect on the formation of calcium phosphate stones. All the general advice above is valid although it is probably not helpful to alkalinise your urine.

Cranberry juice, however, can be beneficial because it lowers urine oxalate levels slightly and acidifies the urine.

Struvite ("triple phosphate") stones

These are mostly seen in women after the menopause, and are almost invariably due to urine infection. The bacteria involved (usually Proteus species) produce an enzyme (called urease) which splits the urea in urine to form ammonia. This renders the urine highly alkaline and encourages the rapid formation of stones made from calcium, magnesium, ammonium phosphate ("triple phosphate").

A high fluid intake, low-dose antibiotics (as necessary) and acidification of the urine are all effective but the main aim is to remove all stones surgically, thereby eliminating the potential for recurrent urinary infections.

Drugs specifically designed to destroy the enzyme produced by the infecting bacteria have been developed, but are not normally used because of the high-risk of major side-effects.

Cystine stones (cystinuria)

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

- Increase your fluid intake: you must drink enough to produce 2-3 litres of urine per day and this may require you to wake at night to drink water. Diluting your urine is highly effective in mini mising stone formation;
- Modify your diet: reduce your intake of methionine (from which cystine is formed) by cutting your animal protein intake;
- Alkalinise your urine: this increases the amount of cystine which will dissolve in the urine. We normally use potassium citrate to do this. Some patients find this unpalatable unless taken with fruit juice or another flavoured fluid; and
- Monitor your urine pH (acidity): done by using special pH dipsticks to ensure that your urine remains alkaline.

There are drugs are available to treat cystine stones, but they are only required in a minority of patients. The main reasons for using them are very rapid stone formation, a frequent need for surgery and poor compliance with, or response to, the measures described above. Treatment must be very closely monitored and the drugs used include:

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- **tiopronin (α-mercaptopropionylglycine, Thiola® or Acadione®):** the most commonly used drug but not licensed in the UK, although 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; and
- **captopril (Capoten®):** normally used to treat high blood pressure, less effective than the above drugs and only used if they are unsuitable.

Summary

- Normal calcium, low-salt, low-protein diet can reduce your risk of stone formation by a half.
- Keeping your urine colourless by increasing your fluid intake may reduce the risk by a further one third.
- For some types of stone, additional specific measures can help minimise further stone formation