

Diet and Cystinuria

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Dietary Advice

- Increase fluid intake – reduces the concentration of cystine in the urine
- Reduce salt intake – higher sodium intake correlates with higher cystine excretion
- Increase fruit and vegetable intake – can aid alkalinisation of the urine
- Reduce animal protein intake – contains methionine (which is broken down to cystine in the body) so this should help limit the amount of cystine passing through the kidneys

Dietary Advice

- General healthy eating advice – to achieve / maintain a healthy weight. Being overweight / obese increases risk of stone formation
- Adequate calcium intake – inadequate / excessive calcium intake increases risk of stone formation

Fluid intake

- High fluid intake is one of the main measures a patient can take to help prevent stone formation (Dent et al., 1965)
- The aim is to decrease urine cystine concentration to less than 250mg/L (Goldfarb and Mattoo, 2008)
- Patients are advised on achieving / maintaining a fluid intake of 3-4 litres per day and strategies are discussed to help them with this

Fluid

- If patients can drink at bedtime this will help decrease nocturnal aggregation of crystals
- Worcester et al. (2006) reported that in their experience patients found it very difficult to maintain a high fluid intake, however, this improved with the frequent monitoring and feedback they received in their 6 monthly clinics

Fluid

- We have encouraged our patients to maintain high fluid intakes
- 58% have increased their fluid intake since attending our clinic
- 66% are maintaining a fluid intake of greater than 3 litres daily
- 13% are managing a daily intake of 4 litres and above

Fluid – what to drink?

- Cola can acidify the urine (phosphoric acid)
- Excessive intake of wine and beer is associated with an reduced urine pH and although alcoholic drinks increase the urine flow temporarily, this effect is followed by a period of reduced urine flow
- Orange juice and other citrus fruit juices alkalinise the urine (citric acid)
- Water with a high bicarbonate content helps alkalinise the urine

Fluid – what to drink?

- Drinks which are high in sugar can bring about excessive calcium excretion
- All in all, the most sensible advice would be anything in moderation, providing it is in liquid form and the majority of which is a fluid such as water, which does not dehydrate

Salt

- There is plenty evidence to show that decreased sodium intake reduces the amount of cystine excreted in the urine (Rodriguez et al., Goldfarb et al., Lindell et al.)
- In the UK, the average salt intake per day is 8.6 g (3.4g sodium)
- 75% of this salt intake comes from processed foods

Salt – practical advice

- Patients are encouraged to restrict their salt intake to 6g per day or less
- They are advised on eating more fresh foods and checking the labels of processed foods so that they know how to choose the lower salt options
- Patients are also advised to stop adding salt to their food and to experiment with alternative seasonings

Animal Protein Restriction

- A reduced animal protein intake is recommended, this consequently reduces methionine (a precursor to cystine) and cystine intake
- Reducing animal protein intake has been shown to decrease cystine excretion (Rodman et al.)
- Kolb et. al reported on a case where a patient who followed a strict low methionine diet for 10 years found that his cystinuria effectively disappeared

Animal Protein Restriction

- Also, an extremely low protein diet (20g/day) was found to reduce urinary cystine excretion by 34% (Dent and Senior, 1955) However, this level of protein restriction is not advisable as it may be harmful to patients
- The efficacy of dietary protein restriction to prevent actual stone recurrence has never been shown in a randomised controlled trial

Animal Protein Restriction

- Guideline – limit animal protein to no more than 60% of total protein requirements per day (Meschi et al.)
- Animal protein foods – meat, fish, chicken, eggs, cheese, milk , yoghurt
- Vegetable protein foods – pulses (beans, lentils, peas), quorn, tofu
- Protein exchange system used to help patients achieve this

Protein Exchange System

- **Animal protein exchanges** and **vegetable protein exchanges** provide 7g of protein each
- The animal protein exchange list is subdivided into two groups: **meat & fish** and **milk & milk based protein**.
- Aim - no more than 60% of protein requirements from animal sources

Animal protein exchanges

Meat & fish

- 25g (1oz) red meat (cooked weight)
- 1 egg

Protein exchange System

Milk & milk based protein

- 25g (1oz) hard cheese
- 200ml (1/3 pint) milk

Vegetable protein exchanges

- 100g (4oz) cooked pulses (such as, lentils, peas, kidney beans, haricot beans)
- 50g (2oz) quorn

Vegetable protein intake

- Traditional British diet – limited in vegetable protein , high in animal protein
- Cookbook produced to help patients change their dietary habits
- New cookbook currently in production – can be ordered today

Protein

- However, some patients who try the vegetable protein foods do not like them and do not include them in their diet
- It is important that these patients get adequate amounts of protein from animal protein sources but should avoid excessive amounts

Alkalinisation of the Urine

- Dent et al. showed that solubility of cystine in the urine is approx. 250mg/L up to a pH level of 7.0 but solubility of cystine increases to 500mg/L or more with a pH level of 7.5 or greater
- Reduction of animal protein intake increases urine pH
- Increase in fruit and vegetable intake increases urine pH

Achieving a Healthy Weight

- Urinary pH is also inversely related to body weight, overweight patients, therefore, have a lower urine pH, which is conducive to stone formation
- 30% of our patients were overweight when first seen in clinic (defined as a BMI 25.1–30 kg/m²) and 28% were clinically obese (BMI >30kg/m²)
- With the regular dietetic support, 12.5% of patients in the overweight group and 34.8% of patients in the obese group lost weight

Anthropometry

- Weight
- Height
- BMI
- Waist circumference
- MUAC
- Grip strength – values that are 85% of normal may indicate protein malnutrition.

Dietary Changes made by our Patients

- 72% of patients increased their fruit and vegetable intake
- 68% patients reduced their animal protein intake
- 68% of patients reduced their salt intake
- 62% of patients increased their vegetable protein intake
- 58% of patients increased their fluid intake

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