

■ To really cut down on salt intake, it is essential to become aware of the salt already in everyday foods by checking nutrition labels

# What I tell families about renal diets for children with CKD

**Changes to the diet are recommended in all patients with chronic kidney disease (CKD). One distinct factor that sets children apart from adults is the fact that they are still growing. The growth issue must be championed in the dietary prescription, which will require frequent review by family and specialised paediatric renal dietitians.**

Many years ago, before the advances in renal replacement therapy, dialysing a newborn with CKD was a technological challenge. Conservative management with harsh fluid and dietary restrictions was the only way forward. Nowadays, manual peritoneal dialysis can begin at a few days old. Dialysis helps to clear the blood of waste products and removes excess fluid, making space for nutrition. If the oral intake is not sufficient, a finebore nasogastric tube or a gastrostomy<sup>1</sup> tube can be inserted into the stomach, to help administer high-calorie, high-protein and nutrient-rich feeds.

The most important window for optimising growth is during the first two years of life. Any ground lost during this time is hard to recover, making an early, detailed nutritional prescription essential in infants. Optimal nutrition is also essential at all ages to maintain good growth and prevent complications of CKD.

## When is a nutritional prescription needed?

CKD can be classified into stages 1–5, stage 1 being the early stage of renal impairment, with very few symptoms, and stage 5 being advanced renal impairment that requires dialysis and

transplantation. It is not necessary to see biochemical changes in renal markers, such as a raised phosphate level, before dietary manipulations are advised. In many cases, it is felt it is beneficial to be proactive by introducing some simple phosphate restrictions at CKD stages 2–3, to maintain good bone growth.<sup>2</sup> Renal dietary manipulation may involve changes to sodium, potassium, protein, phosphate, calcium and micronutrient intake.<sup>3</sup> It is ideal to have dietetic contact as early as possible, with progressive involvement as renal impairment advances.

## Why do we need to make changes to a child's diet?

Many people are unaware of the various functions of the kidney. The obvious task is controlling fluid balance and the production and excretion of urine, but what else does it do?

### Protein

Protein is essential in the diet as it provides the basic building blocks of cells, making it essential for growth. If more protein is eaten than is required, the excess is excreted by the kidneys as urea. The kidneys are responsible for keeping tight control on urea levels. When kidney function is impaired, symptoms of uremia may present, including nausea, vomiting, tiredness and taste changes affecting the appetite and palatability of foods. Protein must never be eliminated from a child's diet. A moderate restriction, focusing on the type of protein (animal or vegetable sources) and portion sizes, may be advised in the older child. As a rule, encourage a meat portion the size of the child's fist.

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For babies and infants, especially those requiring dialysis, protein is increased to account for the loss in dialysate fluid. A renal infant formula (rich in energy, low in phosphate and potassium) may be required, either on its own or to supplement breast milk or standard infant formula. If necessary, special high-protein powders can be added to feeds. During periods of rapid growth or acute illness, if adequate dietary protein is not available, the body will start to use its own muscle stores, resulting in muscle wasting and increased urea production.

A great partner to accompany protein is energy. Optimising energy will help to ensure that body protein (muscle) is not used.

### Energy

Optimising energy intake is very important to help delay the progression of renal impairment. Having a list of high-energy, low-phosphate, low-potassium and low-sodium snacks (a renal-friendly snack list) is useful to encourage energy-dense eating. Food fortification may be advised – simple measures, such as adding oil or margarine to pasta, rice and noodles, or cream to homemade soups and casseroles – to increase the energy content of meals. Tooth care is very important due to the high sugar content of a renal diet.

Examples of foods on a renal-friendly snack list would include:

- Shortbread biscuits
- Pink wafer biscuits
- Bourbons
- Low-salt corn snacks
- Sweetened popcorn
- Pasta, rice, noodles and pitta bread
- Lemon meringue pie
- Jammie dodgers.

### Potassium

Potassium is a mineral that is essential to the muscles and heart. The kidneys normally control potassium levels tightly. If potassium levels in the blood rise, causing hyperkalaemia, this can affect regulation of the heartbeat. Potassium restriction involves limiting the portion sizes of foods moderate-to-high in the levels of potassium they contain. A traffic light system can be used as a teaching aid, with guidelines as to how many measured portions from the green, amber and red group can be eaten daily or weekly. A renal-friendly snack list provides a useful guide to bulking out meals or providing high-energy snacks. The main elements of a low-potassium diet are listed in Box 1.

### Phosphate

Phosphate is also a mineral. It is essential for bone health. The kidneys control how much phosphate is retained and excreted by the body. If phosphate levels rise, causing hyperphosphataemia, the short-term

#### Box 1. Main advice for restricting potassium

- Limit certain fruit and vegetables
- Boil vegetables in a large pan of water to remove some of the potassium. Do not use the potassium-rich vegetable water to make soups or casseroles
- Potatoes need to be peeled and boiled, and made into mash, roast potatoes or chips. Jacket potatoes and chips that have not been pre-boiled must be restricted
- Potato crisps must be replaced by corn or wheat snacks
- Avoid certain wholegrain or high-fibre breakfast cereals
- Limit cakes, biscuits and breads containing chocolate or dried fruit
- Avoid pure fruit juices and squashes containing >8% fresh fruit concentrate
- Limit chocolate bars
- Limit certain meats

#### Box 2. Main advice for restricting phosphate

- Limit hard cheese, cheese spread and processed cheese – instead use full-fat cream cheese
- Limit cows' milk, eggs and yogurts
- Avoid cola-based drinks and other dark drinks (such as Dr Pepper®, dandelion and burdock)
- Avoid nuts
- Avoid processed meats, such as sausages, that use phosphate as a preservative
- Oily fish (such as mackerel and sardines) and shellfish (such as prawns and scampi) should be avoided
- Limit chocolate-coated biscuits and bars

symptoms are few, with occasional itching. However, because phosphate works closely with calcium, in the long term a high phosphate level can remove calcium from the bones and deposit it in the blood vessels, compromising cardiac and bone health.

In older children, phosphate restriction is partly achieved through moderate protein restriction, as many foods that are high in phosphate are also high in protein. However, the diet for the infant, who requires more protein, will provide a significant phosphate load. So as not to compromise on protein, it is often necessary to administer a phosphate binder with infant formula and with solids rich in phosphate. A calcium-free phosphate binder is available as a powder, and a calcium-containing phosphate binder as a liquid. A prescribed dose should be given before a feed or mixed with the feed. However, if the feed is left to stand the phosphate binder may settle, making it ineffective.

An infant or toddler who is reliant on tube feeding or nutritional supplement drinks may not show much interest in food and, therefore, very few dietary restrictions are imposed. When a child starts to eat more phosphate-rich foods, a restriction may be required; the focus is placed on portion sizes and food choice. Foods rich in phosphate are limited – it is essential to provide alternative low-phosphate foods

to aid compliance. A diet sheet using a traffic light system and a renal-friendly snack list is used to aid teaching. Box 2 lists the main sources of phosphate.

### **Salt (sodium chloride)**

Salt (sodium chloride) is an essential mineral that is important in the maintenance of fluid balance and blood pressure. The kidneys have a major role in tightly controlling the amount of sodium that the body holds onto. Limiting dietary salt intake can significantly help with blood pressure control. As a nation, we consume too much salt: the average adult in the UK consumes 8–9 g daily, while the recommended intake for adults is 6 g or less.

When asked, 'How much salt do you consume?' many parents believe that they are following a low-salt diet, as they do not add salt to food in cooking or at the table. However, around 75–85% of the salt we consume is found in processed foods.

The daily recommended maximum amount of salt children should eat depends on their age.

- One to three years: 2 g salt per day (0.8 g sodium).
- Four to six years: 3 g salt per day (1.2 g sodium).
- Seven to ten years: 5 g salt per day (2 g sodium).
- 11 years and over: 6 g salt per day (2.4 g sodium).

It is not necessary to add salt to a baby's milk or food.

### **Reading nutrition labels**

To really cut down on salt intake, it is essential to become aware of the salt already in the everyday foods we buy and choose lower-salt options. Nutrition labels on food packaging make this easy to manage. Many foods display information on the salt content on the front of the packaging. This may show the salt content as a percentage of your guideline daily amount, or display a traffic light to show whether the food is low, medium or high in salt. Where traffic lights are used, red means high: these foods should be avoided – aim to mainly eat foods that are green or amber.

Look at the figure for salt per 100 g:

- A product is high in salt if the salt content is more than 1.5 g per 100 g (or 0.6 g sodium), and may display a red traffic light
- A product is low in salt if the salt content is 0.3 g or less per 100 g (or 0.1 g sodium), and may display a green traffic light.

If the amount of salt per 100 g is 0.3–1.5 g, that is a medium level of salt, and the packaging may display an amber traffic light. As a rule, aim for foods that have a low or medium salt content – <0.75 g salt or 0.3 g sodium.

### **Salt and sodium**

Salt is also called sodium chloride. Sometimes, food labels only give the figure for sodium. There is a simple way to work out how much salt you are eating

### **Box 3. Main principles of a no added salt diet**

- Avoid adding salt to food in cooking and at the table
- Choose processed foods (such as meat and meat products) containing medium-to-low salt content, or choose plain meat
- Smoked fish, or fish canned in brine (such as tuna, sardines and anchovies) should be limited. Instead choose fresh fish (salmon, plaice, cod, haddock, lemon sole and trout) or canned fish in oil or spring water
- Consume more freshly prepared foods
- Hard cheeses should be limited and only used in measured amounts. Processed cheese (such as cheese slices, Laughing Cow and Dairylea) should be avoided. Instead use full-fat cream cheese and cottage cheese
- Use pepper, vinegar, herbs and spices to add flavour to food
- Avoid salt substitutes as they still contain sodium and are high in potassium
- Choose low-salt crisps, corn or wheat snacks
- Miscellaneous foods such as Marmite®, stock cubes, gravy granules, Bovril®, ketchup and soy sauce should be avoided or replaced with a lower-salt brand if available

from the sodium figure: amount of salt = amount of sodium x 2.5.

A child with CKD needs to follow a 'no added salt diet'. This is not the avoidance of salt, but a significant reduction in the amount that is added to food and the careful selection of processed foods to avoid foods containing a lot of salt (see Box 3).

Reducing your salt intake will encourage a change in your desire for salt. Foods may initially taste bland, but taste buds adapt to using less salt and start to taste the new flavours in food. It is beneficial for the whole family to reduce their salt intake, thereby taking the focus off of the renal patient. Eating together as a family should be encouraged.

### **Fluid restriction**

As kidney function deteriorates, the kidneys become less efficient at removing fluid and less urine is produced. To avoid the body becoming fluid-overloaded, which can increase blood pressure and place strain on the heart, it is important to control fluid intake. Fluid includes what is consumed from drinks and the liquid in foods – for example, soup, sauces, gravy, jelly and yogurt.

A useful guide to fluid management is as follows:

- Measure out the daily allowance in a jug and place in the fridge. Use this fluid throughout the day
- Use a small cup when drinking
- Suck on ice cubes or ice pops when thirsty
- Avoid salty foods
- Place slices of fruit (such as grapes or strawberries) in the freezer and use as a thirst-quencher (remember, though, that these are high in potassium).

### **Exercise, vitamin D and exposure to sunlight**

The kidneys play an important role in changing the vitamin D that we consume in our diet into a form

that the body can use. When the kidneys are not working well, vitamin D levels can be low; this affects the absorption of calcium and bone health. Playing outside in the sunshine is important to encourage the body to produce a form of vitamin D that the body can use effectively.

Many children with reduced renal function require vitamin D supplements; these will be prescribed by their nephrologist. When following a renal diet, a child's micronutrient intake (vitamins such as C and B-complex) may be suboptimal. Boiling vegetables causes nutrient loss, and vitamins and minerals are excreted during dialysis. All children with CKD need an assessment of their vitamin and mineral intake. A suitable micronutrient supplement will be prescribed where necessary.<sup>4</sup>

### Balanced diet

Due to the potential micronutrient losses in a renal diet, it is important to keep the food intake as balanced as possible. Eating a variety of foods from all groups shown on the 'eat well plate' guide to healthy eating will ensure that all the nutrients needed to optimise health are included. With the help of traffic light food lists, it should be possible to follow a renal diet and still follow a basic pattern of 5-2-2-5 portions daily – five portions of fruit or vegetables; two measured portions of meat, fish, eggs or beans; two portions of milk or dairy (200 ml milk, a small pot of

yogurt or a matchbox-sized cheese portion); and five portions of cereals, potatoes or starchy foods. Portion size and cooking method are key factors.

### Vomiting and tube feeding

Gastro-oesophageal reflux and vomiting in infants with CKD is a major cause of anxiety, and can affect appetite and interest in food. Because the amount of food consumed is often small, very few restrictions are placed on the infant's diet, and more emphasis is placed on the child eating with others, and adopting normal social eating behaviour. Often these children will be receiving most of their nutrition orally or enterally from a renal infant formula. Raised levels of phosphate, potassium and calcium can be controlled by manipulating their milk formula. If oral intake is inadequate, then enteral feeding may be suggested, to maintain optimal nutrition and growth. This involves a finebore tube being placed down the nose into the stomach (also called a nasogastric tube) or, more preferably, a tube directly into the stomach (gastrostomy).<sup>5</sup>

The need for and use of these tubes will be discussed with you by the dietitian and other team members. The tubes also provide a convenient route for delivering medication.

### Further information

There are a number of specialist children's renal units around the country, and each will have its own dietary resources for educating the child and family. In addition, a number of websites will also have information. Each child with CKD is treated as an individual and specialist renal dietitians are there as members of a multiprofessional team to offer advice and suggestions as part of maximising your child's growth potential and minimising any problems ■

**Declaration of interest**  
None declared.

#### References

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## Key points

- Changes to the diet are recommended in all patients with chronic kidney disease (CKD), but one distinct factor that sets children apart from adults is the fact that they are still growing.
- The most important window for optimising growth is during the first two years of life. Any ground lost during this time is hard to recover, making an early, detailed nutritional prescription essential in infants.
- Optimal nutrition is essential at all ages to maintain good growth and prevent complications of CKD.
- Gastro-oesophageal reflux and vomiting in infants with CKD is a major cause of anxiety. If oral intake is inadequate, then enteral feeding may be suggested, to maintain optimal nutrition and growth.

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