



Nutrition in Children with Chronic Kidney Disease

Introduction

Every child needs good nutrition. If your child has been diagnosed with kidney disease, learning about nutrition is vital because your child's diet can affect how well the kidneys work. Always consult with your child's health care team before making any major changes in your child's diet.

Our kidneys do many things to help maintain our health. To keep the body working properly, the kidneys remove wastes and extra water from the blood. They balance the salts—made of sodium, potassium, calcium, and phosphorus—that circulate in the blood. And they control the release of natural chemicals called hormones that help make red blood cells, control blood pressure, and keep bones strong.

In the early stages of chronic kidney disease (CKD), the kidneys continue to work. They just don't do their job as well as normal kidneys do. Since the decline in kidney function happens slowly, your child's body may adapt, and you may not notice any change in the way your child looks or feels. Unfortunately, over time, small changes can build up, and as the kidney disease worsens (CKD stages 4 and 5), your child may develop more symptoms of kidney disease.

As kidney disease progresses, nutritional needs change as well. When the kidneys don't work normally, your child's

health care team may recommend a change in your child's diet to protect the kidneys. Health problems from CKD can be prevented or delayed by eating the right foods.

Kidney disease can limit a child's growth. Your child's health care team will work with you to make sure that your child's growth is as normal as possible. As children grow, their nutritional needs change as well. Work with your child's health care team to be certain your child gets the right amount of all necessary nutrients. At different times, the team may suggest changes in both the amount and the types of food your child needs to eat. Learning about food choices will help you understand what changes need to be made to ensure that your child is as healthy as possible.

Energy

Everyone needs energy to grow and be active. We measure the amount of energy in the diet by counting calories. Taking in too little energy can lead to decreased activity, poor growth, and decreased resistance to infection. As your child grows, energy needs change depending on age, height, and weight. Work with the health care team to determine your child's daily calorie needs. If your child is not growing as well as possible, your child's health care team can provide appropriate ways to add calories to your child's diet.



Health care professionals calculate a child's daily energy needs using the child's weight as part of the equation. For example, a 3-month-old baby requires 49 calories a day for each pound of her body weight. If the baby weighs 8 pounds, she would need 392 calories per day.

$$8 \times 49 = 392$$

As the baby gains weight, she requires more calories. If she gains 2 pounds, her daily calorie requirement would increase to 490.

$$10 \times 49 = 490$$

The following chart shows how energy needs change as a child grows. A growing child requires more and more energy, or calories. But the older child does not need as many calories per pound of body weight as an infant needs.

Energy Needs for Children with Kidney Disease			
Age Range		Calories / Pound / Day	
Infant	0–6 months	49	
	7–12 months	45	
Toddler	1–3 years	46	
Child	4–6 years	41	
	7–10 years	32	
Adolescents		Girls	Boys
	11–14 years	21	25
	15–18 years	18	20

Energy needs will vary and you should discuss any changing needs with your child's health care team.

Protein

Protein is an essential part of any diet. It helps build and maintain muscle, bone, skin, organs, and blood. Some proteins help fight disease and heal wounds. All proteins break down into waste products that must be cleaned from the blood by the kidneys.

Doctors sometimes recommend that patients with CKD eat moderate or reduced amounts of protein. In some patients, however, restricting protein can prevent adequate growth and may lead to malnutrition. For children with kidney disease, the goal is to eat enough protein for growth but to stay away from high protein intake. If your child is on dialysis, your child's protein needs will increase, but the amount of this increase will be based on the type and frequency of dialysis.

Talk with your child's health care team about the amount of protein and the sources of protein in your child's diet. Animal sources such as eggs, milk, cheese, chicken, fish, and red meats contain more of the essential amino acids the body needs. A well-balanced vegetarian meal plan can also provide these nutrients. Your child's health care team can suggest ways to make adjustments in eating habits to help meet your child's protein needs. The following table has examples of the protein content of some common foods, but your child's health care team can customize the list to your family's diet habits.

Protein Content of Foods	
Food	Serving Size
Turkey breast	41 grams/cup
Large hamburger with vegetables and condiments	34 grams/8-oz sandwich
Tuna sub	30 grams/6-inch sub
Cottage cheese	26 grams/cup
Chili con carne	24 grams/cup
Cold-cut sub	21 grams/6-inch sub
Fast food taco	20 grams/6-oz taco
Fish sandwich with tartar sauce and cheese	20 grams/6.5-oz sandwich
Baked beans	17 grams/cup
Chicken nuggets	16 grams/6 nuggets
Yogurt	13 grams/8-oz container
Beef stew	12 grams/cup
Fast food burrito with meat and beans	11 grams/4-oz burrito
Cooked peas	8 grams/cup
Chicken noodle soup	6 grams/cup

Source: United States Department of Agriculture (USDA) National Nutrient Database for Standard Reference, Release 16-1 (www.nal.usda.gov/fnic/foodcomp/Data/SR16-1/wtrank/16-1w203.pdf; accessed October 13, 2005)

Here is a table with the typical protein needs for growing children with kidney disease. A child on hemodialysis needs more protein than a child who has not started dialysis because the dialysis process removes protein from the child's blood. Peritoneal dialysis removes even more protein than hemodialysis.

Protein Needs for Children with Kidney Disease				
Age Range		Grams / Pound / Day		
		Pre-Dialysis	Hemo-dialysis	Peritoneal Dialysis
Infant	0–6 months	1	1.2	1.3–1.4
	7–12 months	0.73	1.1	1.0–1.1
Toddler	1–3 years	0.5	0.7	0.9
Child	4–6 years	0.5	0.7	0.9
	7–10 years	0.45	0.6	0.8
Adolescents	11–14 years	0.45	0.6	0.8
	15–18 years	0.4	Girls 0.5	Boys 0.6

For example, a 10-year-old boy who weighs 60 pounds would need 27 grams of protein a day before starting dialysis.

$$60 \times 0.45 = 27$$

Limiting a child to this amount may be difficult because some foods contain that much protein in a single serving. You may need to cut sandwiches in half or serve smaller portions of soups and vegetables.

If this same boy started hemodialysis, his daily protein needs would increase to 36 grams.

$$60 \times 0.6 = 36$$

On peritoneal dialysis, the boy would need 48 grams of protein a day.

$$60 \times 0.8 = 48$$

Your child's protein needs may vary—discuss them with your child's health care team.

Sodium

Sodium is a mineral that is important for many body functions. Sodium is found in ordinary table salt and many seasonings like soy and teriyaki sauces. One teaspoon of table salt contains 2,300 milligrams of sodium. Canned foods, some frozen foods, and most processed foods have large amounts of table salt. Some snack foods like chips and crackers are also high in salt. Too much sodium can increase thirst, raise blood pressure, and cause water retention that may lead to excess weight gain or fluid buildup in the lungs. On the other hand, in some patients, too little sodium can lead to dehydration and poor weight gain. Figuring out how much sodium your child needs is complicated by the kind of kidney problem your child has, your child's age, and sometimes other factors. Depending on your child's own special needs, your health care team may ask you to either limit or add sodium to your child's diet.

Talk with your child's health care team about how much sodium your child needs. Look at the sodium content on the nutrition labels of the foods you buy. Choose "sodium-free" or "low-sodium" food products if you need to reduce sodium in your child's diet. Nearly all fresh vegetables and fresh, unprocessed meat are preferable to processed foods. Try alternative seasonings like lemon juice or hot pepper sauce. **But avoid salt substitutes that use potassium.**

Sodium Claims on Food Labels	
Claim	Explanation
"Sodium-free"	Less than 5 mg sodium per serving
"Salt-free"	Meets requirements for "sodium-free"
"Low-sodium"	140 mg sodium or less per serving
"Very low sodium"	35 mg sodium or less per serving
"Reduced sodium"	At least 25 percent less sodium when compared with the regular version
"Light in sodium"	50 percent less sodium per serving; restricted to foods with more than 40 calories per serving
"Unsalted, no added salt"	No salt is added during processing; the product it resembles and substitutes for is normally processed with salt; the label bears the statement "not a sodium-free food" or "not for control of sodium in the diet"

Source: American Dietetic Association, Complete Food and Nutrition Guide, RL Duyff, 1998.

Potassium

Potassium is a mineral found in many fruits and vegetables like bananas, potatoes, avocados, and melons. It keeps the heart beating regularly and muscles working right. Your child's health care team will routinely check your child's blood tests to make sure that the potassium level stays in the normal range. If your child's potassium begins to rise, talk with your child's health care team about ways to limit the amount of potassium in your child's diet. Your child may need to avoid some fruits and vegetables. The number and portion sizes of fruits and vegetables may need to be reduced as well. You can reduce the potassium content of potatoes and beans by soaking them in water for several hours before cooking.

Potassium Content of Foods	
High-Potassium Foods	Lower-Potassium Alternatives
Oranges and orange juice	Apples and apple juice
Melons	Cranberry juice
Apricots	Canned fruit
Banana	Strawberries, blueberries, raspberries
Kiwi	Plums
Potatoes	Pineapple
Tomatoes	Cabbage
Sweet potatoes	Cauliflower
Cooked spinach	Mustard greens
Beans (baked, kidney, lima, pinto)	Broccoli

Source: United States Department of Agriculture (USDA) National Nutrient Database for Standard Reference, Release 17-1 (www.nal.usda.gov/fnic/foodcomp/Data/SR17/wtrank/sr17a306.pdf; accessed October 13, 2005)

Phosphorus

Phosphorus is a mineral found in many foods, particularly those high in protein. When your child's blood phosphorus level is too high, it pulls calcium from the bones, making them weaker and more likely to break. Too much phosphorus may also make your child's skin itch and cause redness of the eyes. High protein foods such as dairy products, meat, dried beans, peas, colas, nuts, and peanut butter are high in phosphorus. Talk with your child's health care team about how much phosphorus your child should have in his or her diet.

As kidney disease progresses, it may be necessary to take a phosphate binder with meals such as calcium acetate (PhosLo), calcium carbonate (Caltrate, Children's Maalox tablets, Oscal, Tums), or sevelemer hydrochloride (Renagel) to lower the concentration of phosphorus in the blood. These medications act like sponges to soak up, or bind, phosphorus while it is in the stomach. Because it is bound, not all of the phosphorus gets into the blood. Instead, some of it is passed out of the body in the stool.

Phosphorus Content of Foods	
High-Phosphorus Foods	Lower-Phosphorus Alternatives
Dairy foods (milk, cheese, yogurt)	Liquid non-dairy creamer
Beans (baked, kidney, lima, pinto)	Sorbet
Nuts and peanut butter	Pasta, rice
Processed meats (hot dogs, canned meat)	Rice and corn cereals
Cola	Popcorn
Canned iced teas and lemonade	Green beans
Bran cereals	Lemon-lime soda
Egg yolks	Root beer
	Powdered iced tea and lemonade mixes

Source: United States Department of Agriculture (USDA) National Nutrient Database for Standard Reference, Release 17-1 (www.nal.usda.gov/fnic/foodcomp/Data/SR17/wtrank/sr17a305.pdf; accessed October 13, 2005)

Fluids

Early in kidney disease, your child's damaged kidneys may produce either more or less urine than normal. If your child makes only a small amount of urine, swelling or high blood pressure may develop. If the kidneys produce too much urine, your child is at risk of dehydration. Tell your child's health care team if you notice that your child is making either more or less urine or if you notice any swelling in the face, legs, arms, or abdomen.

Once your child's kidneys fail and your child begins dialysis, you may need to limit how much your child drinks. The amount people drink is often related to the amount of sodium they eat. If thirst is a problem, you need to speak with your child's health care team about ways to control excess thirst.

Special Problems in the First Year of Life

Because infants grow so quickly, your child's health care team will need to follow your child more closely during this critical time. Often a child will need special formulas with extra supplements (calorie enhancers) to be sure that your child gets the right amount of fluid and nutrients. Sometimes an infant can't drink the amount of formula he needs to grow, and your physician may suggest that he be fed by tube. While this may sound drastic, experience has shown that tube feeding is often the best way to be sure that your child gets the full supply of fluid and nutrients he needs to promote growth and development. While feeding tubes are most often used in infants, there are situations when older children and adolescents benefit from them as well.

Keep Track of Test Results

If your child has CKD, your child's health care team will order regular blood tests. Many patients find that keeping track of test results helps them see how well they are doing. Ask your child's doctor for copies of the laboratory reports and ask to have them explained. Note any results that are out of the normal range. When you learn how to read your child's reports, you will see how the foods your child eats can affect laboratory results. Talk with your child's health care team about making healthier food choices. You may ask for a laboratory report card from your child's health care team on a regular basis.

National Kidney and Urologic Diseases Information Clearinghouse

3 Information Way
Bethesda, MD 20892-3580
Phone: 1-800-891-5390
Fax: 703-738-4929
Email: nkudic@info.niddk.nih.gov
Internet: www.kidney.niddk.nih.gov

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About the Nutrition for Chronic Kidney Disease Series

The NIDDK Nutrition for Chronic Kidney Disease Series includes three fact sheets:

- Nutrition for Early Chronic Kidney Disease in Adults
- Nutrition for Later Chronic Kidney Disease in Adults
- Nutrition in Children with Chronic Kidney Disease

For free single printed copies of this series, please contact the National Kidney and Urologic Diseases Information Clearinghouse.

For More Information

Kidney & Urology Foundation of America
152 Madison Avenue, Suite 201
New York, NY 10016
Phone: 1.800.633.6628
Fax: 212.629.5652
Internet: www.kidneyurology.org

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