

NUTRITION FOR PEOPLE WITH REDUCED KIDNEY FUNCTION



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What do kidneys do?

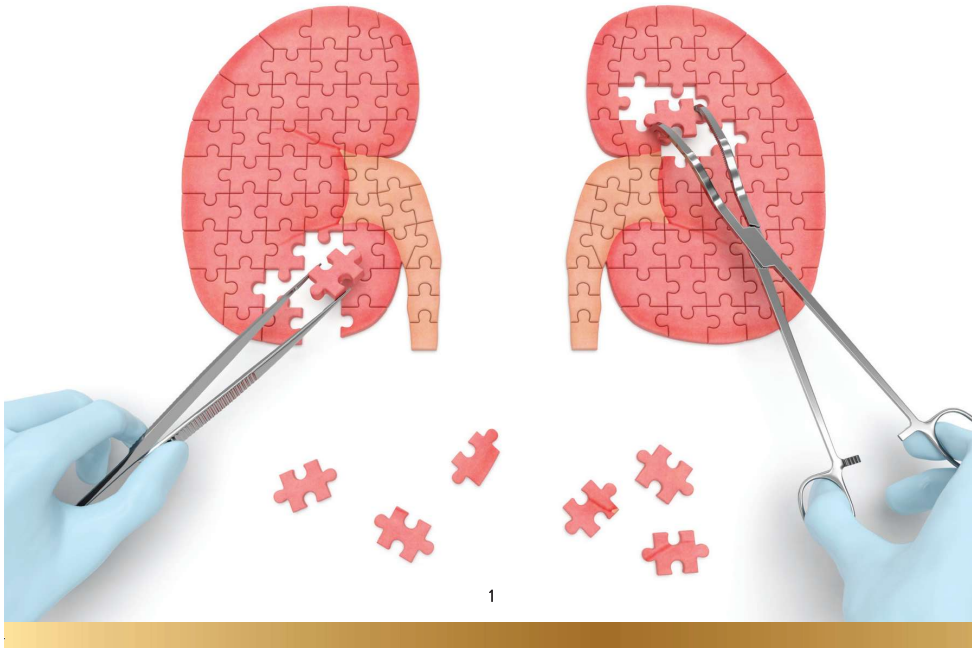
A key function of the kidneys is to remove waste products and excess fluid from the body through urine.

When the protein we eat is digested, a waste product called urea is formed.

Urea and other wastes are combined with water in the kidneys to form urine.

The kidneys also perform other important functions in the body, such as:

- Maintaining the body's balance of water, minerals (e.g. calcium & phosphorus) and electrolytes (e.g. sodium & potassium)
- Releasing hormones which stimulate red blood cell production and help regulate blood pressure
- Producing an active form of Vitamin D that helps to keep bones strong



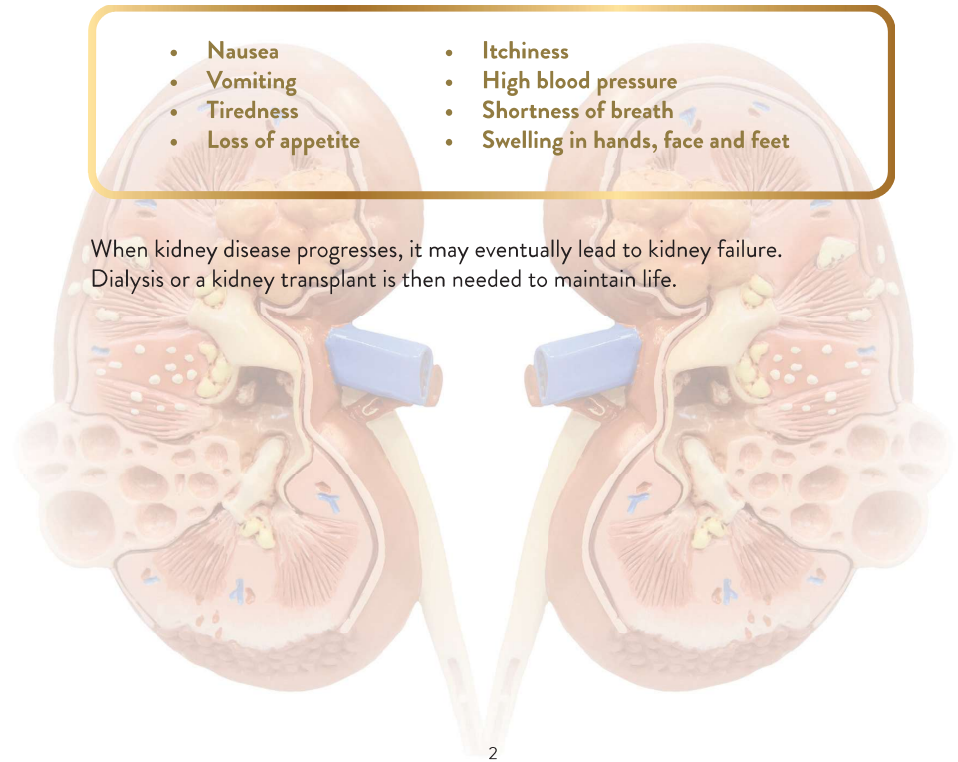
What is chronic kidney disease (CKD)?

Chronic kidney disease (CKD) refers to a gradual loss of kidney function. Damaged or diseased kidneys do not filter enough waste products from the blood, causing them to build up in the blood and act like poison. People with CKD may also develop complications like high blood pressure, anemia, weak bones, poor nutritional status and nerve damage. CKD also increases the risk of having heart and blood vessel diseases over time.

Common causes of CKD include diabetes, high blood pressure, glomerulonephritis (inflammation and damage to the kidney's filtering units) and hereditary kidney diseases. Individuals can lose more than half their normal kidney function before they start to notice symptoms of kidney disease. Some of these symptoms are:

- Nausea
- Vomiting
- Tiredness
- Loss of appetite
- Itchiness
- High blood pressure
- Shortness of breath
- Swelling in hands, face and feet

When kidney disease progresses, it may eventually lead to kidney failure. Dialysis or a kidney transplant is then needed to maintain life.



Know the stages of CKD

There are 5 stages of kidney disease, based on the presence of kidney damage and level of kidney function (as measured by glomerular filtration rate, GFR). As CKD progresses, the GFR number decreases.

Stage	Description	GFR (mL/min/1.73m ²)
1	Kidney damage (e.g. protein in urine) with normal GFR	≥90
2	Kidney damage with mild decrease in GFR	60-89
3	Moderate decrease in GFR	30-59
4	Severe reduction in GFR	15-29
5	Kidney failure	<15

Source: NKF KDOQI guidelines

Consult your doctor if you have any questions about your stage of kidney disease.

It is important that you know which stage of CKD you are at, in order to better manage your condition.

Slowing the progression of CKD

Although CKD is generally progressive and irreversible, there are steps you can take to slow its progression and reduce risk of complications.

- **Control blood pressure**

High blood pressure is both a cause and complication of CKD. Uncontrolled high blood pressure can accelerate the loss of GFR.

- **Reduce albuminuria**

When the kidneys are damaged, albumin passes from the blood into the urine. Lowering your urine albumin levels may help reduce risk of CKD progression.

WHAT IS ALBUMIN AND WHY IS IT IMPORTANT?

Albumin is a type of protein in the blood. On a regular basis, your albumin level will be measured. Low albumin levels in patients with CKD have been associated with poor health outcomes. Consult your doctor to find out what your target albumin level should be and talk to your dietitian about nutritional options to help you reach that target.

- **Manage blood glucose levels**

If you have diabetes, managing your blood glucose levels can help slow progression of the disease. Try to keep your glucose level within recommended target range as advised by your healthcare professional.

Diet is a key component of these steps to help slow the progression of CKD. For instance, limiting sodium intake may improve blood pressure, while limiting excessive dietary protein intake may decrease albuminuria. Learn more about diet and nutrition in the following pages.

The important role of diet and nutrition

Eating right is a crucial part of living well with reduced kidney function. People with reduced kidney function need to be mindful of their food intake to prevent excess wastes and fluid from building up, as their kidney function decreases.

For people with reduced kidney function who are not on dialysis, good nutrition can help to:

- Provide the energy needed to carry out daily activities
- Minimize loss of muscle mass
- Maintain a healthy body weight
- Support the immune system to reduce the risk of infections
- Preserve existing kidney function and slow down the progression of CKD

Nutrition and reduced kidney function: a basic guide

The dietary needs of people with reduced kidney function vary depending on factors such as body size, activity level, stage of CKD and blood test results. If the individual is following a diet plan for diabetes or other health conditions, he or she has to continue on it as well.

To reduce risk of malnutrition, it is crucial for people with reduced kidney function to obtain enough calories and sufficient, but not excessive, protein from their diet. Sometimes, the use of a specialized kidney nutrition supplement may be helpful.

It can be challenging for people with reduced kidney function to manage their diet, hence they are strongly encouraged to consult a dietitian for personalized guidance on food intake.

Dietary goals at a glance



Calories

You have to eat enough calories to supply your body with the energy to function properly and carry out daily activities.



Protein

People with reduced kidney function who are not on dialysis need to watch their protein intake. Eating less protein helps to preserve kidney function and prevent additional stress on the kidneys.



Potassium

High potassium levels in the blood can cause irregular heartbeat or a heart attack. Foods which are high in potassium, such as certain type of fruit and vegetables may need to be limited or avoided. Soaking and cooking these food items with extra water and draining it off, may help lower potassium content as well.



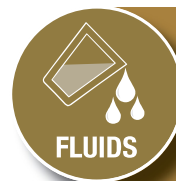
Phosphorus

The build-up of phosphorus in the blood can draw calcium out of your bones, making them weak. Foods high in phosphorus such as dairy products, organ meats, fish with edible bones, whole-grains and beans may need to be reduced.



Sodium

Consuming too much sodium can lead to fluid retention, causing swelling of the legs and feet and increasing blood pressure. Restriction of sodium intake can help to maintain normal fluid balance.



Fluids

You do not need to limit the amount of fluids you drink at early stages of CKD. However, as your kidney function decreases to reach advance stages of CKD, you may need to restrict your fluid intake to prevent your body from being overloaded with fluid as urine output decreases. Getting the right amount of fluid will help you feel your best. Consult your doctor, dietitian or nurse about your daily fluid allowance.

Calories

You need to have sufficient calories in the diet to supply your body with energy to function properly and carry out daily activities. If too few calories are consumed, the body may break down muscles for energy and also utilize dietary protein as an energy source. This is not desirable as protein then cannot perform the valuable function of building body tissues. Such can also lead to weakness and potentially cause damage to the kidneys.

To help make up your daily calorie needs, you need to eat your prescribed diet, which includes approved food items from each of the food groups. Adding more fat and sugar (such as margarine, oils, honey and jam) to the diet can help you increase energy intake. Discuss with your dietitian on how you can ensure adequate calorie intake while making appropriate food choices. This is especially important if you have diabetes and need to maintain good sugar control (see section on “Reduced kidney function and diabetes”).



Protein

Your protein intake may need to be limited. This is because as CKD progresses, the kidneys gradually lose its ability to remove waste products that are formed when protein is ingested. The build-up of waste products in the blood will lead to discomfort like nausea, loss of appetite, vomiting and weakness. Eating less protein helps to preserve kidney function and prevent additional stress on kidneys.

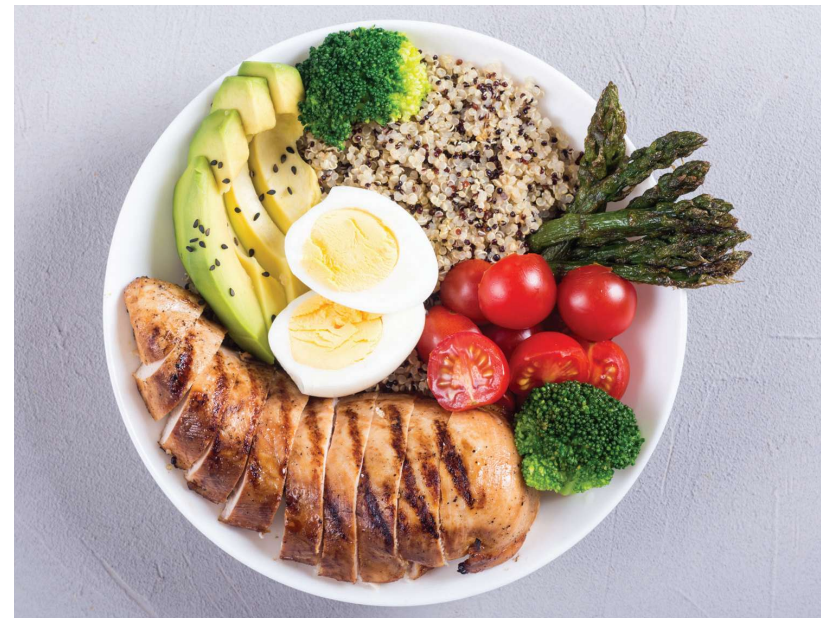
Protein is found in both animal and plant foods:

1. Animal protein- meat, poultry, fish and other seafood, eggs, milk and milk products
2. Plant protein - beans and bean products (e.g. tofu), nuts, lentils, bread and rice

Remember!

You will still need to consume **adequate** protein in your diet. Consult your dietitian to find out the amount of protein that is right for you.

Protein from animal sources is the best in quality, which means they are efficiently used by the body and so should make up most of the protein in the diet.



Protein Exchanges

Each food in the protein exchange list below contains 7g of protein. Protein exchange helps provide variety in choosing suitable protein sources in your diet.

Please consult your dietitian to learn more and find out the number of protein exchanges you require in a day.

ANIMAL PROTEIN:		
	Egg	1 (medium)
(Cooked)		
	Fish	30g or 1 matchbox size
	Chicken	
	Mutton	
	Beef	
	Pork	
	Prawn	4 (medium)

MILK & MILK PRODUCTS [†] :		
	Fresh Milk or UHT	1 cup (200ml)
	Milk Powder	4 tablespoons (150g)
	Yoghurt	1 small tub (150g)
	Cheese*	1½ slice (30g)

LEGUMES [†] :		
	Beans/Lentils (cooked)	½ cup (120g)
	Taukua	½ square firm (60g)
	Tofu	½ large block soft (150g)

NUTS/SEEDS [†] :		
	Nuts and Seeds	½ cup (30g)
	Peanut Butter	2 dessert spoons (30g)

* High in sodium

† High in phosphate

USEFUL TIP

Spread out the intake of protein evenly throughout the day for better utilization by the body.

Potassium

Potassium is a mineral that helps your nerves, muscles and heart work properly. For people with CKD, the kidneys can no longer remove excess potassium.

Choose foods which are low or moderate in potassium more frequently and consume in moderation. Foods which are high in potassium should be limited or avoided.

Fruits – limit to 2 servings per day

Low < 150mg potassium per serving		Medium 150 – 250mg potassium per serving		High > 250mg potassium per serving	
Apple	1 small	Cherry	10 medium	Apricots	4 small
Blueberries	½ cup	Chiku	1½ medium	Avocado	1 medium
Cranberries	100g	Duku	10 medium	Banana	1 small
Durian	2 seed	Langsat	10 medium	Custard apple	1 medium
Dragon fruit	½ fruit	Lychee	6 medium	Dates	2 pieces
Grapes	10 small	Orange	1 small	Figs	2 small
Grapefruit	½ fruit	Papaya	1 slice	Honeydew	1 slice
Guava	½ fruit	Passion fruit	3½ medium	Jackfruit	2 seed
Lemon	1 small	Peach	1 medium	Kiwi	1 medium
Lime	1 whole	Persimmon	1 medium	Mango	½ medium
Longan	10 medium	Plum	2 small	Nectarine	1 medium
Mangosteen	4 medium	Pomelo	3 segment	Pomegranate	½ medium
Pear	1 small	Raspberries	1 cup	Prunes	4 pieces
Pineapple	1 wedge	Strawberries	1 cup	Rockmelon	1 slice
Rambutan	4 medium	Tangerines	1 medium	Soursop	1 slice
Water apple	4 medium	Dried fruit	20g		
Watermelon	1 wedge	e.g. Raisins			
Canned fruit (juices drained)	½ cup				

Source: National Kidney Foundation, Singapore

Vegetables – limit to 2 servings per day

1 serving = 100g (¾ cup) cooked; 100g raw non-leafy; 150g raw leafy

Low < 200mg potassium per serving	Medium 200 – 350mg potassium per serving	High > 350mg potassium per serving
Bean sprouts	Asparagus	Bamboo shoot
Brinjal	Chinese cabbage	Broccoli
Cabbage	Cauliflower	Mustard green/Chye sim
Capsicum	Carrot	Chick peas
Carrot (frozen/boiled)	Celery	Fern shoot (pucuk paku)
Cucumber	Chives	Fresh mushroom
French bean	Chili (green/red)	Kale (Kai Lan)
Gourd – all types	Ladies finger	Lotus root
Kangkung	Leeks	Petai
Lettuce	Lentils (boiled/dhal)	Potatoes
Long bean	Lima bean	Seaweed
Mushroom	Peas (raw/dried)	Spinach
– Canned, drained	Snow peas	Sweet potato
– Dried, soaked and drained	Pumpkin	Sweet potato leaves
Onion	Sweetcorn (frozen/boiled)	Tomato (paste/puree)
Peas (frozen/boiled)	Tomato (raw, canned)	Water chestnut
Spring onion		
Turnip		
Winter melon		

Source: National Kidney Foundation, Singapore

Beverages

Low	Medium	High
Syrup-based drinks	Barley Chinese tea Non-cola beverage Sugar cane juice	Strong coffee or tea All fresh/canned fruit & vegetable juice Herbal medicine drinks Cocoa & malted beverage Milk Wine

USEFUL TIP

- To remove some of the potassium from vegetables:
 - Cut vegetables into smaller pieces
 - Soak vegetables in water for 1-2 hours
 - Drain water before cooking
- Drain juice or syrup from canned fruits and vegetables
- Use whole rather than ground spices

Phosphorus

In kidney disease, the body cannot keep a balance between calcium and phosphorus. The result is too little calcium and too much phosphorus in the blood. A high serum phosphate level tends to attract calcium from the bones, making them weak and brittle. It also results in the deposition of hard calcium phosphate salts in the soft tissue, leading to conditions like skin itchiness, joint pains and eye irritation.

Phosphorus is mainly found in animal foods and dairy products. Some plant food such as whole-grain and nuts contain high phosphorus as well.

FOODS HIGH IN PHOSPHORUS

Milk	Fish with edible bones (sardines)
Yoghurt	Organ meat (e.g. liver, kidney)
Cheese	Egg yolk
Legumes (e.g. tofu, soybean milk)	Extracts (Marmite/Bovril)
Nuts and products (e.g. peanut butter)	Anchovies (ikan bilis)
Seeds and products (e.g. sesame oil)	Dried prawn
Coconut and products (e.g. coconut milk)	Dried fish
Cola drinks/dark colored soda	Dried mushroom
Malted and cocoa-based drinks	Seaweed
Cheese, nut and chocolate-based biscuits	Oats
Chocolate	Muesli/Weet-Bix
Keropok (fish and prawn cracker)	Brown rice
Bones (chicken wing or feet soup stocks)	Wholemeal/Wholegrain bread/biscuits

Source: National Kidney Foundation, Singapore

USEFUL TIP

Don't forget to take phosphate binders (e.g. calcium carbonate) with meals! If prescribed, these pills bind phosphate from food and prevent their absorption into the blood. Taking them without a meal makes them ineffective.

Sodium

Sodium is a major part of table salt and can be commonly found in sauces, condiments, preservatives, preserved foods and canned foods. Too much sodium increases thirst and causes fluid build-up in the body, which increases blood pressure and can hurt your heart.

Here are some steps to help reduce your sodium intake.

1. Most sodium come from processed food and is present in many different forms. Read the ingredient labels. The product is likely to be high in sodium if the first three ingredients contain any of these:
 - Sodium chloride/table salt
 - Monosodium glutamate (MSG)
 - Rock/sea/iodized salt
 - Baking powder
 - Sodium nitrite
 - Sodium benzoate
2. Avoid the use of lower sodium salts as they usually contain potassium.

USEFUL TIPS

- Limit sodium-rich processed food such as luncheon meat or hot dogs and choose fresh vegetables, poultry and meat.
- When cooking at home, use whole spices, lemon juice or natural seasonings such as shallots, onions, garlic and parsley to spice up your cooking instead of adding table salt.
- Only add salt or sauces sparingly after cooking. Taste the food before salt is added.
- Avoid having pickles, sambal belachan, papadum or chutneys with your meal.
- Minimize the number of times you eat out as most food sold outside is highly salted.
- When dining out, ask for less gravy, avoid drinking the soup and limit preserved foods such as 'ikan bilis'. Remember to request for freshly cooked items without salt, MSG or soy sauce.
- When purchasing foods, choose foods that have the 'Healthier Choice' symbol or those labelled in 'Low In Sodium' or 'No Added Salt'.
- Read food labels to compare similar foods per 100g and choose the lower sodium version.

Fluids

As your kidney function decreases to reach advance stages of CKD, you may need to restrict your fluid intake. Consumption of too much fluid may cause:

- Shortness of breath
- Increase in blood pressure
- Heart problems, e.g. fast pulse, weakened heart muscles and an enlarged heart

Sources of fluid include liquids like water, tea, coffee, cordial drinks, milk and soup. Other food items can contribute fluid too, such as porridge, jelly, ice cube, ice cream and ice kacang.

Here are some ways to help control your fluid intake:

- Measure the fluid allowed for the day in a jug. Each time you consume any fluid, pour out the same amount from the container. When it runs out of water, you know you have reached your daily allowance.
- Suck on an ice cube to moisten dry mouth (the fluid content should be accounted for).
- Rinse mouth with water but do not swallow it.
- Limit salty food so you will feel less thirsty.

Fluid Content Of Common Measures

Item	Volume (ml)
1 tablespoon	15
1 Chinese soup spoon	30
1 ice cube	20
1 Chinese bowl of porridge	100
1 tea cup	150
1 cup	250

Reduced kidney function and diabetes

If you have diabetes, your doctor may adjust your medication to help optimize blood sugar control. Diet management also becomes even more important.

Carbohydrate foods affect blood sugar the most, so your carbohydrate intake would need to be adjusted to help manage your blood sugar levels. Carbohydrates include both starchy foods like rice, bread, noodles and fruits, as well as sugary foods like candies and sweet desserts.

Consult your dietitian to find out the type and amount of carbohydrates that is sufficient to meet your needs and the type of carbohydrate foods to eat.



What you need to know about dialysis

When CKD progresses to reach end stage renal failure, you will be advised to go on dialysis.

What is dialysis?

Dialysis is an artificial filtering procedure which acts like the normal kidney to remove extra water from the body and waste products that have built up in the body.

There are two kinds of dialysis – hemodialysis and peritoneal dialysis.

Hemodialysis (HD)

HD is the process of removing toxins and excess fluid from the body by continually circulating the blood through a filter called a dialyzer. This filter is used with a dialysis machine 3 to 4 times a week.

Peritoneal Dialysis (PD)

In PD, the abdominal cavity is filled with a cleansing solution called dialysate. The walls of the abdominal cavity are lined with a membrane called peritoneum, which allows waste products and extra fluid to pass from the blood into the dialysate. The dialysate typically stays in the peritoneum for 4-5 hours, before it is drained and replaced.

Your nutrition requirements will change when you go on dialysis. For instance, due to protein loss from dialysis sessions, you will need to take more protein than previously in order to replenish the protein loss. Consult your doctor, nurse or dietitian to find out more about your dietary requirements.

WHEN YOU NEED A NUTRITION BOOST...

Following a diet suitable for a patient with Chronic Kidney Disease (CKD) is hard. 65-81% of CKD patients have protein intake above the goal¹.

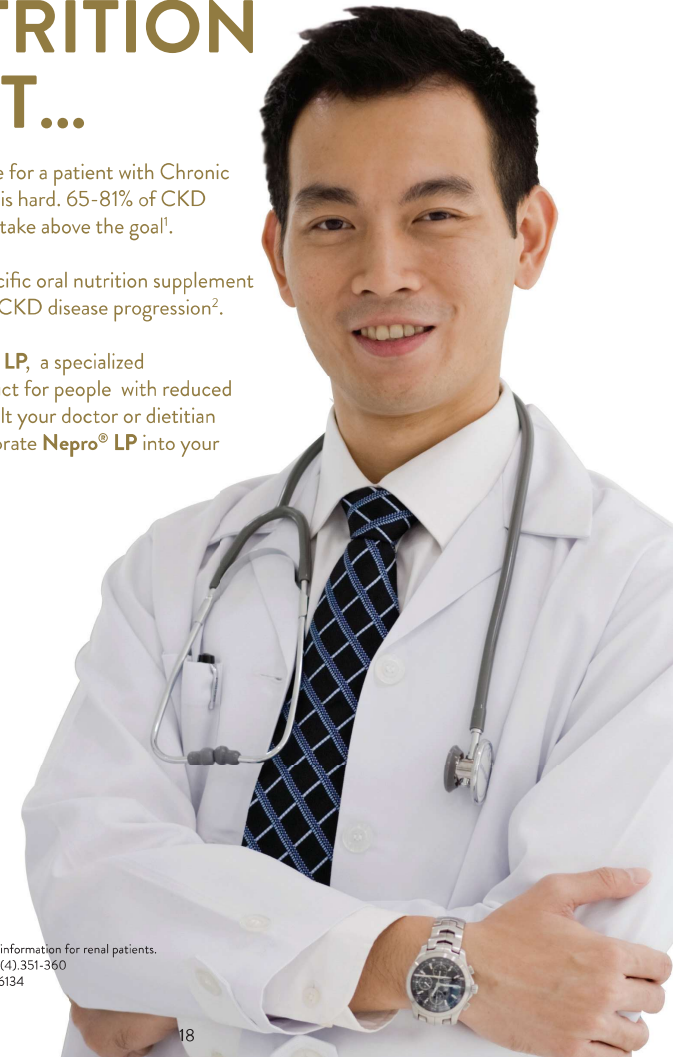
A low protein renal specific oral nutrition supplement may help to slow down CKD disease progression².

Consider using **Nepro® LP**, a specialized medical nutrition product for people with reduced kidney function. Consult your doctor or dietitian on how you can incorporate **Nepro® LP** into your daily diet.

This section contains product-specific information for renal patients.

¹ Betz M et al. J Ren Nutr. 2021 Jul;31(4):351-360

² Yan B et al. 2018 Nov 7;13(11):e0206134



Nepro® LP supports nutritional needs of people with reduced kidney function



* European Best Practice Guidelines (EBPG), European Society for Clinical Nutrition and Metabolism (ESPEN), National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (KDOQI®), Kidney Disease: Improving Global Outcomes (KDIGO®) guidelines - when used as sole source of nutrition

* 44.2% less protein v.s. Nepro® HP per serving (9.94g VS 17.82g)

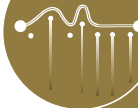
OTHER FEATURES OF NEPRO® LP

401 kcal

Rich in calories
To meet energy needs (401kcal/bottle)

REDUCED WATER
162 ml

Reduced water content
(162ml/220ml bottle)



Suitable for people with Diabetes
Advanced, slow-digesting, low Glycemic Index (GI) carbohydrate complex



Contains Omega-3
& monounsaturated fatty acids (MUFA)

Nepro® LP has low Glycemic Index of 44, which makes it also suitable for people who have both reduced kidney function and diabetes.



How to incorporate Nepro® LP into your diet?*

✓ 1-2 servings/day*



YOUR WEIGHT STATUS

UNDERWEIGHT

NORMAL WEIGHT, OVERWEIGHT

HOW TO ADD NEPRO® LP TO YOUR DAILY DIET

SUPPLEMENT between main meals

TOTAL / PARTIAL REPLACEMENT of ONE meal

MANY WAYS TO ENJOY NEPRO® LP

Customize serving temperature

- Warm
- Chilled
- Frozen

Flavor by blending with chosen powder

- Sesame
- Green tea
- Cocoa

Add texture

- Set with agar-agar, gelatin, or cornstarch
- Add fruit or berries

Add variety to your diet with Nepro® LP recipes.

Vegetable Soup in Bread Bowl

Servings: 2

Ingredients:

- 1 bottle vanilla Nepro® LP (220ml)
- 40g of broccoli
- 40g of cauliflower
- 40g of onion
- 40g of mushrooms
- 40g of carrots
- 40g of butter
- 2tbsp cornstarch
- 420ml water
- pinch of black pepper
- 1/4 tsp salt
- round french loaf (approx. 200g)



Nutrition Facts

Amount per serving

Kcal	677
Protein	15 g
Carbohydrate	85 g
Fat	29 g
Sodium	905 mg
Potassium	532 mg
Calcium	163 mg
Phosphorus	246 mg

Directions:

1. Cut open the top of a round bread loaf and hollow the middle, leaving the bread crust intact. Set aside to use as soup bowl.
2. Blanch chopped broccoli, cauliflower, onions, mushrooms and carrots in boiling water to remove potassium content.
3. Stir fry blanched vegetables in heated saucepan with butter. Once cooked, add in boiling water.
4. Add cornstarch to water and mix thoroughly. Add mixture to boiling vegetable soup to thicken, and remove from stove. Set aside to cool. Once cooled, add Nepro® LP and mix well.
5. Pour soup into bread bowl and season with black pepper. Serve hot.

*Note:

Suggestion only, consult your dietitian to ensure Nepro® LP is used appropriately and aligned with your specific nutritional needs and treatment plan.

Nutrition Millet Porridge

- Servings: 2
- Ingredients:
- 1 bottle vanilla Nepro® LP (220ml)
 - 80g of millet
 - 420ml of water
- Directions:
1. Wash the millet clean. Add millet and water into the electric rice cooker to cook. Once cooked, add Nepro® LP and mix thoroughly. Serve warm.



Nutrition Facts	
Amount per serving	
Kcal	352
Protein	9 g
Carbohydrate	50 g
Fat	12 g
Sodium	90 mg
Potassium	204 mg
Calcium	84 mg
Phosphorus	186 mg

Strawberry Smoothie

- Serving: 2
- Ingredients:
- 1 bottle vanilla Nepro® LP (220ml) (chilled)
 - ½ cup frozen strawberries
 - 4 tbsps water
- Directions:
1. Combine the ingredients in the jar of a blender.
 2. Blend on 'high' until smooth.
 3. Serve immediately.



Nutrition Facts	
Amount per serving	
Kcal	213
Protein	5 g
Carbohydrate	24 g
Fat	11 g
Sodium	98 mg
Potassium	202 mg
Calcium	87 mg
Phosphorus	81 mg

Your Meal Plan

Consult your dietician for a personalized CKD-friendly meal plan tailored to meet your nutritional needs.

Meal	Time	Food Item/portion	Remark
Breakfast			
Snack			
Lunch			
Snack			
Dinner			

Talk to your dietitian on what your daily nutrition targets should be.

Calories

Target calories per day _____

Protein

Target grams per day _____

Phosphorus

Target milligrams per day _____

Potassium

Target milligrams per day _____

Fluids

Target milliliters per day _____

Dry Weight

Target kilograms per day _____

Ask your dietitian how you can include Nepro® LP in your daily meal plan.

Your Health Chart

Name: _____ Date of Birth: _____

Height: _____ cm Gender: Male/Female

			Date of Examination		
Key measurements	Units	Range	/ /	/ /	/ /
Weight	kg				
BMI		18.5 - 23			
Blood Pressure (BP)	mmHg	120/80			
Renal Profile					
Potassium	mmol/L	3.5-5.5			
Sodium	mmol/L	135-150			
Chloride	mmol/L	96 - 108			
Bicarbonate	mmol/L	>20 <24			
Pre Creatinine	Variable on body mass and gender				
Post Creatinine	µmol/L	442			
Pre Urea	mmol/L	>20 <40			
Post Urea	mmol/L	< 6.67			
Bone Profile					
Calcium	mmol/L	2.2-2.60			
Phosphate	mmol/L	< 1.18			
Lipid Profile					
Total Cholesterol	mmol/L	< 6.1			
Triglycerides	mmol/L	< 2.3			
HDL-cholesterol	mmol/L	1.0-2.0			
LDL-cholesterol	mmol/L	< 3.334			
Albumin	g/L	> 35g			
Endocrine Function					
HbA1c	%	4.6-6.4			
Glucose Random	mmol/L	4.0-9.0			

NOTES 笔记

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Date of Examination					
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