

Low Protein Diet for Phenylketonuria (PKU)

A healthy diet contains protein for growth and repair, carbohydrates and fats for energy, activity and growth, and essential fats, vitamins and minerals to keep us healthy and well. Protein is made up of building blocks called amino acids.

Phenylketonuria (PKU) is a condition in which the body is unable to break down one of the protein building blocks from the diet; the amino acid called phenylalanine (phe).

In PKU the phe cannot be metabolised normally and builds up in the blood and tissues. Infants with this condition are started on a low protein (phe) diet from birth and this should be followed for life.

Phe is an essential amino acid which means some is needed for growth and to make the body's protein, but only in small measured amounts. This ensures normal growth and development while keeping the blood phe level in a 'safe' range.



Protein Supplement

People without PKU get all the protein they need from the food they eat.

Because protein intake is low in the diet for PKU, a protein supplement is needed to make up what is missing from not eating foods high in protein. For people with PKU the protein supplement is essential. It provides all the essential amino acids (except phe), tyrosine, vitamins, minerals and trace elements.

A variety of protein supplements are available in Australia. Protein supplements are made to suit the nutritional needs of people at different ages, and are available in various forms to suit different lifestyles and preferences. Your dietitian will advise which protein supplements are suitable for you or your child.

The protein supplement should be taken with meals and evenly spread over the day. This helps to keep the phe levels steady throughout the day.

Dietary Protein (phenylalanine)

- Depending on how much protein is in a food, food in the PKU diet is either:

Free (uncounted) Counted or Avoided

Counting protein

Traditionally in Australia, the phe in the diet for people with PKU has been counted as units, 1 unit being equal to 15mg of phe.

With greater food knowledge and an improvement in commercial food labelling, another method of counting phe has been developed (Reference 1).

This diet counts the grams of protein in food, remembering that phe is one of the building blocks of protein. 1 gram of dietary protein is equal to 50mg phe.

It is also best to spread the protein allowance over the day and try to avoid a big protein load at one meal.

As well as counting how much protein you or your child eats it is important to make sure enough energy (Calories) is eaten. If the energy intake is too low the body breaks down its own protein stores (i.e. muscle) to use as an energy source. This can cause the phe levels in the blood to rise.

The steps in a low protein diet for PKU

Step 1 – Include low protein and protein free foods at each meal.

Step 2 – Count the amount of protein in higher protein foods, so that each day you or your child has the amount of protein prescribed. Try and spread this protein throughout the day.

Step 3 – Make sure the protein supplement is taken throughout the day.

Step 4 – Talk to your child about the special diet from a young age, so that he/she learns about it and gradually takes responsibility for it.

Use this food list, along with food labels on commercial foods to count your daily protein intake.

Reference 1: "Dietary protein counting as an alternative way of maintaining metabolic control in Phenylketonuria"

Sweeney, A. L., Roberts, R. M., and Fletcher, J. M. (2012)

JIMD Reports, 3, 131-139, doi: 10.1007/8904_2011_31

Commercial foods

The nutritional panel on the packet of food can help you count the protein in commercial foods.

See pages 47 - 51 of the PKU Handbook (2005) for more information.

Ingredient list on Food Packages

By law the ingredients must be listed in a certain order.

The one that is present in the largest amount will come first, followed by the one in the next largest amount and so on. The only exception is water, which can be listed last, no matter how much is added.

This list of ingredients can be used to tell if a food is free of phe. If all the ingredients listed are free of phe then the food will also be free of phe.

Special note about additives:

All additive numbers are free **except** additive numbers- **951** (Aspartame) and **962** (Acesulphame-Aspartame) which contain phe. NutraSweet, Equal, Canderal are other names used.

Some ingredients that you may not be familiar with that do contain phe are:

- > Carob
- > Calcium caseinate
- > Gelatine
- > Hydrolysed protein
- > Nutrasweet
- > Sodium caseinate
- > Wheatgerm
- > Whey
- > Yeast

Reading nutrition panels

If a food contains less than or equal to 0.3g protein per serve it does not need to be counted. You will need to check that the serve size and the quantity you eat is the same as the packet to be able to accurately count the protein.

Round any values to the nearest half gram i.e. 2.3 rounds up to 2 ½ grams and 1.2 rounds down to 1 gram of protein.

Do not count ¼ grams of protein.

The following guide may help:

| | |
|-----------|------------------------|
| 0.0 - 0.3 | negligible |
| 0.4 - 0.7 | ½ gram |
| 0.8 - 1.2 | 1 gram |
| 1.3 - 1.7 | 1½ grams |
| 1.8 - 2.2 | 2 grams |
| 2.3 - 2.7 | 2½ grams |
| 2.8 - 3.2 | 3 grams of protein etc |

Weighing versus using household measures

The following lists give the protein content for average serve sizes as well as the amount of food that contains 1 gram of protein. Weighing is likely to be more accurate than household measures.

Standard metric measures are used and all measures are level:

1 teaspoon = 5 ml

1 cup = 250 ml

Note:

in Australia 1 tablespoon = 20 ml

in New Zealand 1 tablespoon = 15ml

How to use the food list

- > The following lists contains information about the protein content of foods that do not have a nutritional panel or have a label e.g. potato.
- > Use the nutritional panel on commercial foods whenever possible to calculate the amount of protein in food.
- > When counting protein in foods or from food labels always round to the nearest $\frac{1}{2}$ gram of protein
- > As with commercial foods do not count in $\frac{1}{4}$ grams of protein. Counting in $\frac{1}{2}$ grams is accurate enough. Values in tables have been rounded to $\frac{1}{2}$ gram.
- > Round any values you have calculated to the nearest $\frac{1}{2}$ gram: i.e. 2.3 rounds up to $2\frac{1}{2}$ grams and 1.2 rounds down to 1 gram of protein.
- > The higher a food is in protein the more accurate you need to be in measuring the food. Weighing is likely to be more accurate than measuring with household measures.
- > The protein value is listed in 2 ways:
 - o The value given under the "protein per serve" column is the number of grams of protein in an average serve, rounded up or down (shown under "SERVE").
 - o The size of the average size in grams or mls is given under "SERVE SIZE".
- > In the case of fruits and vegetables the serve size is expressed as "EDIBLE WEIGHT". This is the weight of the fruit or vegetable that you actually eat e.g. for a banana it does not include the weight of the skin. Where possible with fruits and vegetables the weight with skin and other non-edible parts is included underneath in small print.
- > The value given in the "WEIGHT CONTAINING 1 G PROTEIN" is the most accurate value to use if you are weighing food. It is the amount that exactly contains 1g protein.

Special note about fruit and vegetables

- > Fruit and vegetables do not contain as much phe per gram of protein as do other foods. Therefore the values for fruit and vegetables have been adjusted to account for this so the protein count for fruits and vegetables are called 'protein equivalents' 1 protein equivalent (PE)" = 50mg phe - use the chart exactly as it is.
- > Where you may find some difference is in label reading.
 - o If the food is a 'pure' fruit/vegetable e.g. canned pears use the information as per the diet chart.
 - o If the fruit/vegetable is part of a group of foods e.g. fruit bar use the value as per the packaging.
- > You will notice in this food list a lot of the fruit and vegetables have negligible protein content and therefore do not need to be counted.
- > But do remember that some fruit and vegetables do contain protein so may need to be counted if eaten in larger quantities. Talk to your dietitian if you eat a lot of a particular fruit or vegetable if it is not listed on pages 7 - 9.

Basic Principles of the diet for PKU

People with PKU get some of the protein they need from the protein supplement. The remaining protein, which includes the essential amount of phe the body needs for growth and functioning, comes from food.

The diet for PKU consists of:

- > Fruit and vegetables
- > Low protein foods- e.g. low protein flour, bread, pasta and rice
- > Small amounts of cereal based foods- e.g. breakfast cereals, crackers and biscuits
- > Fat and sugar

Foods such as red meat, chicken, fish, eggs, milk, yoghurt, cheese, nuts and legumes (e.g. lentils, chick peas, kidney beans) are too high in protein to include in a diet for a person with PKU.

The amount of phe needed and tolerated by each person with PKU is quite different. The grams of protein are adjusted according to blood phe levels and are likely to vary from time to time. Your dietitian will guide you.

There are commercial low protein products which contain very little protein and may be eaten freely, unless indicated otherwise. Along with many of the fruits and vegetables they form the basis of the diet low in phe.

Other foods, such as fats and sugars, are also free of counted protein; however they contain a large amount of energy and if eaten often in large amounts may cause you or your child's weight to increase excessively.

Commercial low protein products

There are a number of low protein commercial foods available directly from the companies. Ask your dietitian for an order form.

Most of these products have label information on protein and phe; some products may say for e.g. 0.8g protein per serve but are only counted as 0.5 gram of protein as they contain less phe per gram of protein.

| SHS (Nutricia) Products | Protein content |
|---|------------------------|
| Loprofin pastas, rice and all-purpose baking mix | FREE |
| Loprofin part baked bread rolls, bread, breakfast cereals | FREE |
| Loprofin sweet biscuits, crackers, duobar | FREE |
| Loprofin egg white replacer | FREE |
| Milupa Ip-drink, prepared as per directions, 250mls (1 cup) | 0.5g |
| Loprofin PKU milk (1 x 200ml tetra pak) | 0.5g |

| VitaFlo Products | Protein content |
|--|------------------------|
| *Prozero milk substitute | FREE |
| Vita Bite chocolate flavoured bar | FREE |
| Fate All Purpose Mix and Fate Cake Mixes | FREE |

(*Prozero milk substitute (VitaFlo) is available on prescription, talk to you dietitian or doctor.)

You may also find other low protein products in the supermarket or health food shop. e.g. Orgran low protein pasta, which is free of protein. See pages 103-106 in the PKU handbook (2005) for more information.

Fruit

Healthy eating guidelines for Australians recommend at least 2 serves of fruit per day.

Most fresh, frozen, dried or canned fruit do not need to be counted in a low protein diet for PKU, as in normal quantities most fruits only contain a small amount of phenylalanine. If eaten in very large quantities they may cause the blood phe to rise.

Exceptions:

- > Dried fruit including banana chips - it is easy to eat more of dried fruits and banana chips than the equivalent amount of the fruit fresh so check the list below. If large amounts of amounts of dried fruit and banana chips are eaten it will need to be counted.
- > Only a few of the fruits need to be counted as these contain more phe when compared with other fruits. You do not need to count them if less than the following amounts are eaten. See below table for protein count:
 - o Banana - ½ small
 - o Mulberry - ½ cup
 - o Pomegranate - 1-2 teaspoons

If you buy foods in which a free fruit is mixed with another ingredient – such as custard, cereal or breadcrumbs, use the value for the protein on pack. For example:

- > Canned apple is free but baby canned apple with cereal or baby canned apple with custard needs to be counted using the protein value on the pack
- > Fruit slice biscuits need to be counted using the protein value on pack.

| Fresh fruit | Type | Serve | Edible weight g | Protein equivalent (PE) per serve | Weight containing 1 PE |
|--|-------|---------|-----------------|-----------------------------------|------------------------|
| Banana common, sugar (weight with skin:110g) | fresh | ½ large | 70 | 1.0 | 60 |
| Mulberry | fresh | 1 cup | 130 | 1.5 | 77 |
| Pomegranate | fresh | ½ fruit | 120 | 1.5 | 87 |

| Dried fruit | Type | Serve | Edible weight g | Protein equivalent (PE) per serve | Weight containing 1 PE |
|--------------|-------|--------------|-----------------|-----------------------------------|------------------------|
| Apricot | dried | 10 halves | 50 | 1.0 | 55 |
| Date | dried | 1 cup | 104 | 1.0 | 84 |
| Fig | dried | 3 figs | 45 | 1.0 | 47 |
| Mixed Fruit | dried | ½ cup | 88 | 1.0 | 84 |
| Raisin | dried | 2 tablespoon | 70 | 1.0 | 73 |
| Sultana | dried | 4 tablespoon | 80 | 1.0 | 80 |
| Banana chips | dried | ¼ cup | 25 | 0.5 | 45 |

Vegetables

Healthy eating guidelines for Australians recommend at least 5 serves of a variety of vegetables each day.

Many vegetables (see below for exceptions) do not need to be counted in a low protein diet for PKU, if eaten in usual serves as they only contain a small amount of phe. For example artichoke, beetroot, bok choy, cabbage, capsicum, carrots, celery, cucumber, eggplant, leek, lettuce, onion, parsnip, tomato and zucchini are all low in phe. If eaten in very large quantities they may cause the blood phe to rise; talk to your dietitian if you eat large serves.

Exceptions:

The following vegetables usually **need to be counted** unless only having 'tastes'. See page 9

- > Potato
- > Peas
- > Sweet corn
- > Broccoli
- > Cauliflower
- > Pumpkin
- > Spinach
- > Sweet potato
- > Avocado

If the following vegetables are eaten in small amounts and used in dishes such as stews, stir fries, salads, sauces etc. you do not need to count if less than the following amounts are eaten. Check the table on page 9 if large amounts are eaten at one time.

- > Asparagus - 2 spears
- > Brussel sprouts - 1 sprout
- > Mushrooms - 3 small
- > Celeriac - ¼ vegetable
- > Snow peas - 6 pods

If you purchase foods in which a free vegetable is mixed with another ingredient such as counted vegetable, rice, pasta or breadcrumbs, use the value for protein on pack. For example:

- > Canned carrots are free, but canned carrots with rice or couscous needs to be counted using the protein value on pack.
- > Frozen carrots are free but a frozen mix of corn, carrots and peas should be counted using the protein value on pack if you count corn and peas.
- > Sun-dried tomatoes are free but a sun-dried tomato pesto with pine nuts and parmesan is counted using the protein value on pack.

Dried beans and lentils are too high in protein for most people with PKU and should be avoided e.g. baked beans, dried beans, lentils, chick peas. See page 17.

Ideas for including fruit and vegetables in the diet:

- > Serve fruit at breakfast
- > Serve snacks of fruit (fresh, canned, dried or frozen) or raw vegetables (carrot and celery sticks, capsicum and cucumber slices, and tomato wedges)
- > Serve a salad for lunch or include salad ingredients in sandwiches
- > Serve at least 3 different vegetables at the main meal and finish with fruit for dessert
- > Use readymade pasta sauce as a base for meals (see sauces section page 11)
- > Make up vegetable soups and casseroles.

| Vegetable | Type | Serve | Edible weight g | Protein equiv. per serve | Wt. containing 1 protein equivalent |
|---|---|----------------------------|-----------------------|--------------------------|-------------------------------------|
| Asparagus | raw, boiled, canned | 5 spears | 70 | 1.0 | 65 |
| Avocado | raw, flesh only | ½ avocado | 80 | 1.0 | 75 |
| (weight of whole avocado with skin and seed: 240g = 2.0g protein) | | | | | |
| Bean sprouts (mung) | raw | ½ cup | 45 | 1.0 | 53 |
| Broccoli | raw, cooked | 1 cluster | 45 | 1.5 | 37 |
| Brussel sprout | raw, cooked | 4 sprouts | 75 | 1.0 | 65 |
| Cauliflower | raw, boiled | 1 cluster | 70 | 1.0 | 60 |
| Celeriac | raw, boiled | ½ veg | 120 | 1.0 | 95 |
| Corn | | | | | |
| Corn baby | canned | 8 spears | 130 | 2.0 | 70 |
| Corn creamed | canned | ¼ cup | 65 | 1.0 | 55 |
| Corn kernels | canned, frozen boiled | ¼ cup | 44 | 1.0 | 40 |
| Corn on the cob | raw, frozen, boiled | 1 cobette or ½ med. cob | 100g i.e. 10cm cob | 2.0 | 43 |
| Mushroom common | raw, sliced | 1 cup | 80 | 1.5 | 60 |
| Peas, green | raw, frozen, cooked | 2 tablespoons | 27 | 1.0 | 25 |
| Snow peas, sugar snap peas | raw | 8 pods | 26 | 0.5 | 55 |
| Potato | | | | | |
| Potato | peeled, raw, boiled, or baked in jacket | 1 medium or 2 small | 120 | 2.5 | 50 |
| Potato | roasted in oil | 1 medium | 100 | 2.5 | 40 |
| Potato chips | take away, oven fried* | 1 cup | 95 | 3.5 | 30 |
| Potato hash brown | fried* | 2 cakes | 110 | 2.0 | 53 |
| Potato salad | commercial* | 1 cup | 180 | 2.5 | 67 |
| Potato scallop | fried* | ½ scallop | 48 | 2.0 | 23 |
| Pumpkin all types | raw, boiled, peeled | ½ cup | 70 | 1.0 | 70 |
| Pumpkin | baked | 1 small piece | 30 | 0.5 | 60 |
| Spinach | frozen, boiled | ¼ cup | 45 | 1.5 | 33 |
| Spinach english | raw | 1 cup | 35 | 1.0 | 42 |
| Sweet potato orange | raw boiled peeled | 1 small piece | 50 | 1.0 | 50 |
| Sweet potato orange | roasted in oil | 1 small piece | 40 | 1.0 | 41 |
| Sweet potato white | raw boiled peeled, baked | ½ cup | 120 | 2.0 | 70 |

*check packets

Flours, grains, pasta and cereals

Most flours, grains, pasta and foods made from them are quite **high in protein** and need to be counted or avoided.

The following can be used freely in cooking

- > Arrowroot
- > Cornflour
- > Custard powder
- > Sago
- > Tapioca
- > Potato flour (see below for large serves)
- > Baking powder, baking soda, cream of tartar
- > Yeast from the low protein flour mix
- > Egg replacer (see pages 92 and 106 of PKU handbook)
- > Bean thread vermicelli (check food labels)

Note: low protein alternatives are recommended, see page 6.

If these foods are used check the food label.

| | Type | Serve | Weight of serve g | Protein g per serve | Weight containing 1g protein |
|---|------------|-----------------|-------------------|---------------------|------------------------------|
| Barley, pearl | raw | 2 tablespoons | 30 | 3.0 | 10 |
| Barley, pearl | boiled | ½ cup | 90 | 3.0 | 30 |
| Bulgur | boiled | ½ cup | 133 | 4.0 | 32 |
| Bulgur (cracked wheat) | dry | ¼ cup | 40 | 4.5 | 9 |
| Coconut | desiccated | ½ cup | 40 | 2.5 | 15 |
| Couscous | dry | ¼ cup | 46g | 6.0 | 8 |
| Couscous | cooked | ½ cup | 70g | 2.5 | 28 |
| Flour white, wholemeal, plain, self-raising | raw | ½ cup | 70 | 7.5 | 9 |
| Oat bran unprocessed | Raw | 1 tablespoon | 11 | 2.0 | 6 |
| Pasta white, wholemeal | boiled | ½ cup | 75 | 3.0 | 25 |
| Pasta white, wholemeal | raw | ¼ cup | 26 | 3.0 | 9 |
| Noodle, rice stick boiled | boiled | ½ 160g dry pack | 300 | 5.0 | 60 |
| Polenta | raw | ¼ cup | 38 | 3.0 | 12 |
| Potato flour | raw | 2 cups | 300 | 1.0 | 333 |
| Quinoa | raw | ¼ cup | 43 | 5.5 | 8 |
| Rice brown | boiled | ½ cup | 100 | 3.0 | 35 |
| Rice brown | raw | 1 tablespoon | 20 | 1.5 | 14 |
| Rice white | boiled | ½ cup | 100 | 2.0 | 47 |
| Rice white | raw | 1 tablespoon | 20 | 1.5 | 15 |
| Rice flour | raw | ½ cup | 83 | 5.0 | 17 |
| Rolled oats | raw | ¼ cup | 24 | 3.0 | 8 |
| Semolina | dry | 1 tablespoon | 20 | 2.0 | 9 |
| Wheat bran | raw | 1 tablespoon | 6 | 1.0 | 7 |
| Wheat germ | dry | 1 tablespoon | 10 | 1.5 | 5 |

Seasoning, stocks, sauces and condiments

The following are low in protein and do not usually need to be counted in normal amounts, but labels need to be checked for some products as brands do vary in protein content

- > Salt, pepper, herbs and spices
- > Vinegar
- > Flavouring essences and food colourings
- > Tomato, Barbeque and Worcestershire sauce
- > Curry powder and pastes (check food labels)
- > Salad dressings e.g. French, Italian, coleslaw dressing, 1000 island dressing, mayonnaise (check food labels)
- > Fruit chutney, mustard pickles (check food labels)
- > Mustard (check food labels)
- > Gravy powder and ready-made gravy (check food labels) – do not make gravy with pan drippings
- > Ready-made pasta and casserole sauces (check food labels)
- > Stock cubes and stock (check food labels for the lowest) - do not make stock from bones or meat
- > Coconut milk can add a nice flavour to dishes, check the label as may need to be counted if large amount used.

These foods are not recommended unless on a high protein intake.

If used check the food label.

| | Type | Serve | Weight of serve g | Protein g per serve | Weight containing 1 g protein |
|---------------|---------------|--------------|-------------------|---------------------|-------------------------------|
| Marmite | | 1 teaspoon | 6 | 1.0 | 6 |
| Marzipan | | 1cm slice | 15 | 1.0 | 14 |
| Mustard | dry | 1 tablespoon | 8 | 2.5 | 3 |
| Mustard | made-up paste | 1 tablespoon | 22 | 1.5 | 17 |
| Peanut butter | | 1 tablespoon | 25 | 7.5 | 3 |
| Soy sauce | | 1 tablespoon | 24 | 1.5 | 19 |
| Vegemite | | 1 teaspoon | 6 | 1.0 | 5 |

Sugar, desserts, confectionary and snack foods

Sugar is naturally low in protein but other ingredients can increase the protein content of lollies and desserts. For example jelly beans and jelly snakes can vary from 0 to 6g protein per 100g.

Sugar free lollies and chewing gum may contain aspartame- check the label

The following contain very little protein and maybe used freely:

- > Sugar (all types)
- > Jam, honey, golden syrup, maple syrup, marmalade, treacle
- > Jelly thickened with vegetable gum (not gelatine) Check the ingredient list: the numbers 406, 407, 410, 412, 413, 414, 415, 416 are vegetable gums. Ready-made jellies (in the refrigerator cabinet) are usually set with vegetable gum. These are low in protein- 1 or 2 are free, but if more than 3 in one day, count as 0.5g protein
- > Lollies without chocolate, gelatine, ice cream, milk, or nuts – check the labels of barley sugar, boiled lollies, toffee, jelly beans, pastilles, jelly lollies, candy floss, fairy floss
- > Low protein chocolates (see page 6)
- > Ice blocks without ice cream or milk e.g. icy poles
- > Ice cream toppings, 100's and 1000's sprinkles
- > Ice-cream cones are low in protein but most need to be counted, check the label usually 0.5grams per cone
- > Some ice-creams in small amounts as a treat can be suitable, check the food label
- > Home-made popcorn can be a good snack for older children but needs to be counted
1 cup= 1.5 g protein (11g = 1 gram of protein) check the label for flavoured popcorn.

Frequent eating of high sugar foods can cause tooth decay. Clean teeth regularly with fluoride toothpaste, check that your water supply is fluoridated and take your child regularly to the Dentist

See chapter 13 of the PKU Handbook (2005) for more information on 'Dental care and PKU'.

Fats and oils

Most fats and oils are very low in protein but cream contains moderate amounts and may need to be counted (see below)

Some reduced fat versions of butter and margarine may also be higher in protein so check the label.

The following contain very little protein, and do not need to be counted

- > Butter, margarine, milk-free margarines
 - > Copha
 - > Cooking fat
 - > Ghee
- > Oil
 - > Aerosol or whipped cream with less than 0.3g protein per serve
 - > Bacon fat, no rind or bacon meat

Creams

Cream, sour cream, imitation cream contain some protein (see table) but are lower than many alternatives. Reduced fat creams are higher in protein, and may need to be counted, check the nutritional panel.

Creams in small amounts do not need to be counted, try and use the full fat creams as these are lower in protein. If used in large amounts check the food label or use the table below.

| | Type | Serve | Weight of Serve g | Protein g per serve | Weight containing 1g protein |
|---------------|--------------------------------|----------------|-------------------|---------------------|------------------------------|
| Coconut cream | canned | ¼ cup | 62 | 1.0 | 65 |
| Cream | sour, light (~18% fat) | 1 tablespoon | 20 | 1.0 | 26 |
| Cream | sour, full fat | 2 tablespoons | 40 | 1.0 | 43 |
| Cream | rich or double thick | 3 tablespoons | 60 | 1.0 | 63 |
| Cream | thickened, pure, UHT (35% fat) | 2 tablespoon | 40 | 1.0 | 43 |
| Cream | thickened, reduced fat (~18%) | 1 ½ tablespoon | 30 | 1.0 | 33 |
| Cream | whipped, aerosol (~28% fat) | 1/3 cup | 17 | 0.5 | 30 |

Drinks

The supplement is a vital part of the management of phe blood level, it is important the prescribed amount is drunk each day.

Other drinks can include water (best choice), substitutes for milk and limited amounts of juice, soft drink and cordials.

Juice, soft drinks and cordial can dull a child's appetite for food and can cause tooth decay.

- > Cordials, soft drinks, mineral and soda water (plain and flavoured) contain no protein
- > Some juices contain more protein than others. Limit 100% juice to one cup a day for older children - it is better to drink water and eat fruit!
- > Remember diet drinks may contain aspartame and should be avoided (see page 3)
- > Tea, (black, green, herbal) and coffee without milk does not need to be counted for older children and adults.
- > Flavoured 'milk' drinks can be made using low protein milk substitutes (below) and low protein flavourings such as Nesquik or Sippah flavoured straws (check protein content on label)
- > Remember water is the best drink to have, apart from supplement, - offer some water after each supplement drink and often during the day.
- > See chapter 13 of the PKU Handbook for more information on 'Dental care and PKU'.

Substitutes for milk

Milk is high in protein so low protein milk substitutes are useful for cereal, to make low protein milk drinks, custards, puddings and other cooking.

If these substitutes contain more than 0.3gprotein per serve you may need to count them (check the label and use the one with the lowest protein content).

Suitable low protein milk substitutes for milk include:

- > Prozero (Vitaflo)
- > Rice or oat drinks from supermarket (long life milk section) or health food shops.
- > Mixture of cream and water (1Tbsp cream and 100 ml water)
- > Coffee creamer e.g. coffee mate mixed with water, count if more than 0.3g per serve
- > Vance's DariFree
- > Milupa Ip drink, LoProfin PKU milk (Nutricia) see page 6 for protein content if large amounts used

These drinks need to be counted. Choose low protein alternatives.

| | Type | Serve | Serve size g/ml | Protein g per serve | Wt containing 1g protein/PE |
|-------------|--------------------|---------------|-----------------|---------------------|-----------------------------|
| Cocoa | powder | 1 tablespoon | 7g | 1.5 | 5 |
| Fruit juice | Tomato, vegetable | 1 cup | 250mls | 1.0 | 237 |
| Malted milk | powder | 1 tablespoon | 10g | 1.0 | 9 |
| Milk | full cream, liquid | 1½ tablespoon | 30mls | 1.0 | 30 |
| Milo | powder | 1 tablespoon | 7g | 1.0 | 8 |
| Ovaltine | powder | 1 tablespoon | 8g | 1.0 | 9 |

Alcohol

Alcoholic drinks are **NOT** suitable for children but can be used in cooking e.g. in casseroles.

Beer and Stout need to be counted (see below). Pre-mixed drinks may contain artificial sweeteners may contain artificial sweeteners aspartame (951) or acesulphame-aspartame (962), which contain phenylalanine, check the drink label.

The following drinks have little or no protein and do not need to be counted:

- > Wine - red, white, champagne, wine coolers
- > Port
- > Sherry
- > Spirits e.g. rum, whiskey, gin, vodka

See page 112 of the PKU handbook 2005 for guidelines on responsible drinking for adults. Remember that these guidelines refer to standard drink sizes. Alcoholic drinks are often purchased in larger sizes than one standard drink so some drinks can add up to a significant and serving sizes

Beer and stout contain protein and need to be counted

| | Serve | Serve size ml | Protein g per serve |
|-----------------|----------|---------------|---------------------|
| Beer, lite beer | 1 can | 375 | 1.0 |
| Stout | 1 bottle | 375 | 2.5 |

Bread, cakes, pastry, and yeast

Low protein versions are better choices unless protein tolerance is high.

Most bread, cakes and pastry have nutrition labels on the packaging. Use the label where possible. Remember if your child gets the taste for ordinary bread and pasta they may not eat the low protein varieties.

| | Type | Serve | Weight of serve g | Protein g per serve | Weight containing 1g protein |
|--------------------|-------------------------------------|----------|-------------------|---------------------|------------------------------|
| Bread | white, wholemeal, brown, multigrain | 1 slice | 30 | 3.0 | 10 |
| Bread | lebanese | ½ bread | 55 | 5.0 | 11 |
| Bread | pumpernickel | 1 slice | 60 | 4.0 | 16 |
| Bread roll | white, small dinner roll | 1 | 35 | 4 | 9 |
| Breadcrumbs | commercial | ½ cup | 50 | 6.0 | 8 |
| Crumpet | white | 1 | 50 | 2.5 | 20 |
| Doughnut iced | commercial | 1 | 80 | 4.5 | 18 |
| Lamington | commercial | 1 | 75 | 3.5 | 21 |
| Meringue | commercial | 1 small | 25 | 0.5 | 38 |
| Muffin | english | ½ | 40 | 4.0 | 10 |
| Pastry filo | raw | 2 sheets | 27 | 2.5 | 10 |
| Pastry puff | Raw 313mg/100g | ½ sheet | 85 | 4.5 | 18 |
| Pastry short crust | raw | ½ sheet | 90 | 5.5 | 19 |
| Yeast | dried | 1 sachet | 7 | 2.5 | 3 |

Most people on a low protein diet will not be able to eat the following foods or only be able to include them in small amounts only. Talk to your dietitian.

| | Type | Serve | Edible weight g | Protein equiv. per serve | Wt. containing 1 protein equivalent |
|---|---------------------|--------------|-----------------|--------------------------|-------------------------------------|
| Beans and Legumes | | | | | |
| Beans baked | canned | ½ cup | 138 | 7.5 | 18 |
| Bean, broad | Raw, boiled, frozen | ¼ cup | 42 | 2.0 | 20 |
| Bean haricot | dried & boiled | ½ cup | 85 | 8.5 | 10 |
| Bean, lima | dried & boiled | ½ cup | 85 | 6.5 | 13 |
| Bean, mixed | canned, drained | ¼ cup | 50 | 4.0 | 13 |
| Bean, red kidney | canned, drained | ¼ cup | 48 | 3.5 | 13 |
| Bean, soya | canned & drained | ¼ cup | 49 | 5.0 | 10 |
| Chickpea | canned | ¼ cup | 46 | 3.0 | 16 |
| Lentil | dried & boiled | ¼ cup | 50 | 3.5 | 14 |
| Lentil | dried, uncooked | | 20 | 5 | 4 |
| Split pea | dried & boiled | ¼ cup | 49 | 2.5 | 20 |
| Nuts and Seeds | | | | | |
| Almonds, peanuts | edible portion | ¼ cup | 36 | 9 | 4 |
| Cashews, walnuts | edible portion | ¼ cup | 30 | 5 | 6 |
| Nuts mixed | edible portion | ¼ cup | 40 | 8.5 | 5 |
| Peanut butter | paste | 1 tablespoon | 25 | 7.0 | 4 |
| Pine nut | nuts | 1 tablespoon | 14 | 2.0 | 8 |
| Sesame seeds | raw | 1 tablespoon | 9 | 2.5 | 4 |
| Sunflower seeds | raw | 1 tablespoon | 11 | 3.0 | 4 |
| Tahini | paste | 1 tablespoon | 25 | 5.0 | 5 |
| Snack foods, confectionary, ice-cream and desserts | | | | | |
| Chocolate dark | dark | 6 squares | 29 | 2.0 | 16 |
| Chocolate milk | milk | 6 squares | 29 | 2.5 | 12 |
| Gelatine | regular | 1 tablespoon | 13 | 6.5 | 2 |
| Jelly crystals | gelatine based | 1 packet | 85 | 6.0 | 14 |
| Jelly made-up | gelatine based | 1 cup | 280 | 3.0 | 100 |

High protein foods

These foods are **NOT** recommended. For information only.

| | Type | Serve | Weight of serve g | Protein g per serve | Wt. containing 1g protein |
|----------------|---------|------------|-------------------|---------------------|---------------------------|
| bacon | raw | 1 rasher | 39 | 7.5 | 5 |
| beef mince | raw | ¼ cup | 60 | 12.0 | 5 |
| beef topside | raw | 1 slice | 50 | 11.0 | 5 |
| cheese | cheddar | 1 slice | 21 | 5.0 | 4 |
| cheese | ricotta | 2 tablespn | 40 | 4.0 | 10 |
| chicken breast | raw | ¼ breast | 56 | 12.5 | 4 |
| egg (whole) | raw | 1 egg | 48 | 7.0 | 7 |
| lamb leg | raw | 1 slice | 50 | 10.5 | 5 |
| pork leg | raw | 1 slice | 45 | 9.0 | 5 |
| sausage raw | raw | ½ thick | 47 | 5.5 | 9 |

Acknowledgments to:

The PKU Handbook (HGSA 2005)

Low Protein Handbook (HGSA 2007)

www.hgsa.com.au

The original and educational content of this booklet has been reviewed by specialist dietitians at the Women's and Children's Health Network, Department for Health and Ageing.

Food product and vitamin supplementation information contained in this booklet was up to date at the time of revision. If you are not sure about food, check with the manufacturer.

For more information

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