

**Introduction:**

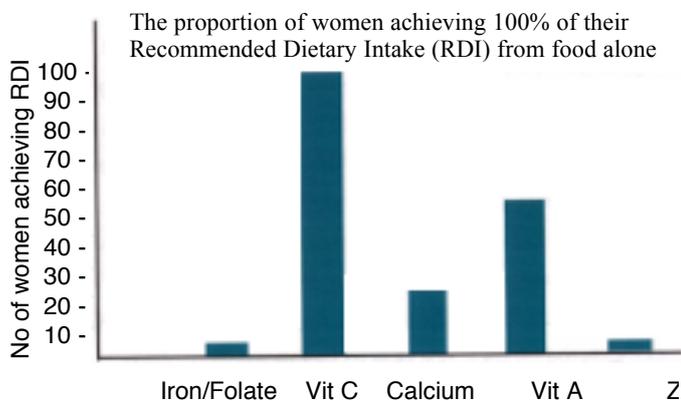
Women having babies in the 21st century and living in advanced wealthy countries such as the UK, America, Australia and most parts of Europe belong to a privileged group of women. Never in the whole of history has it been safer in childbirth for both mother and baby. This alone should give women enormous confidence when it comes to having their baby.

Pregnancy also represents an opportune time for them to learn not only about their pregnancy but also other general lifetime measures such as nutrition which will enhance not only their health but that of their family. Food is the normal source of nutrients. Food supplies energy, protein, essential fatty acids and vitamins which are essential not only for the mother but for her baby as well. A woman who is pregnant for the first time, will focus on various aspects of her care for the purposes of benefiting her baby, which she may NOT otherwise do in other circumstances. Thus, for many women, pregnancy is a captive period in their life during which they should grasp the opportunity to learn various important aspects of health which will benefit themselves and their family for the rest of their lives. One of these is the general principles of nutrition and knowledge of what constitutes nutritious foods. The aim of these notes is to provide you with information which will assist you in this regard.

**Dietary intake of pregnant women**

In Australia today, the majority of people have enough to eat and have a very broad range to choose from. However, for some, their eating habits are far from healthy and paradoxically they may even be malnourished in a way that is **not** obvious to even an experienced observer without testing. Several studies demonstrate that despite becoming pregnant most women do not change their diets in response to changing dietary needs. Many women take supplements during pregnancy to complement their dietary intake and it is likely that only through some form of supplementation will women be able to meet their RDI.

What is an RDI? How does one know if what their food intake is qualitatively satisfactory or not? The simple answer is that if one eats everything in moderation and especially meat, fish, fruit and vegetables, that is, according to the five food groups (see below) Then they will meet their body's requirements. Nutritionists have tried to quantify this and they talk of Recommended Dietary Intakes or RDI's. The RDI's remain the best indicator we have to use as a measuring stick of dietary adequacy for whole populations (see also below)



**THE FIVE FOOD GROUPS**

<p><b>Breads and cereals (preferably wholegrain):</b> 4-5 serves. Fibre, carbohydrate, thiamin and various minerals 1 serve (approx.) = 1-2 slices of bread, 1/2 - 1 cup of cereal</p>	<p><b>Milk, cheese and yogurt, calcium- fortified soy products:</b> 3 serves. Calcium, protein, riboflavin, vitamin B12 , vitamin A (retinol) 1 serve (approx.)=1 cup (250 ml) milk, 40g cheese (2 slices), 200g yogurt</p>	<p><b>Meat, fish, chicken, eggs, nuts and legumes:</b> 1-2 serves. Protein, iron, zinc, vitamin B12 1 serve (approx.)= 100g (cooked), 1/2 cup legumes (cooked)</p>	<p><b>Fruit:</b> 2-3 serves. Carbohydrate, fibre, vitamin C, vitamin A (carotene), other antioxidants (e.g. lycopenes), potassium. 1 serve (approx.) = 1 medium piece or 2 small pieces</p>	<p><b>Vegetables and legumes (dried peas and beans, including baked beans, tofu):</b> 5 serves. Fibre, vitamins C, E (and other antioxidants), magnesium, potassium. 1 serve (approx.)= 1/2 cup (cooked)</p>
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In pregnancy, women have special dietary requirements. Most of the increased nutrient needs go to nourish the growing foetus, the placenta and the expanded maternal blood volume. There is little doubt that as far as some nutrients are concerned Australian women are **not** meeting their RDI's particularly during pregnancy. For example, although the RDI for iron is 22-36 mg per day in pregnancy, it is difficult to achieve this intake from foods and without supplementation, This is confirmed by the Australian 1995 National Nutrition Survey published recently. This Australia-wide survey showed that the amount of iron consumed by all pregnant women surveyed fell short of the RDI. In addition to the 100% of pregnant women who did not meet their RDI for iron, 96% of women were below their RDI for folate and zinc, 79% below the RDI for calcium and 47% below the RDI for vitamin A. (see graph above) Clearly then, many Australian pregnant women do not meet all their nutritional requirements from food alone.

The association of diet and disease in adults has been well known for years. However, what is not so well known are the global benefits of optimising nutrition during the pregnancy. There are now several studies that show that the weight and size of the baby at birth (after correcting for the size of the parent) are predictive of later health outcomes such as diabetes and heart disease. Furthermore, even in childhood there are benefits. In a recent report from America demonstrate that negative academic and psychosocial outcomes are associated with family-level food insufficiency and provide support for public health efforts to increase the food security of American families. (5) There is no reason to doubt that this may also apply to Australians of poor background. There are many factors which influence people's choices about food. These include their socio-economic status and the money available for food, the pressures of changing life styles, appetite, personal likes and dislikes, family eating habits, peer group pressure, fashionable eating places, and the pressures of food advertising.

As with everything else, one cannot be dogmatic when it comes to eating and Australia being a multicultural society offers its people, a variety of styles of food and cooking, the majority of which are healthy providing there is no overindulgence. However, there are general principles which apply to all cultures and should be available for all to learn. With foresight and knowledge, one is able to reflect on their acquired habits and change them for the better especially during pregnancy.

One's first pregnancy is an opportune time to study and observe the many factors which influence people's choices as mentioned in the last paragraph and to modify these choices according to what they perceive as being best for themselves and their family. It is with this in mind, that the following information has been compiled and written.

## NUTRITIONAL REQUIREMENTS

The body's requirements for individual nutrients are directly related to three physiological processes:

- 1. Energy production:** from the macro nutrients carbohydrate, protein and fat (alcohol also produces energy). Micro nutrients (vitamins, minerals etc.) generally operate as cofactors (e.g. in enzymes etc).
- 2. Cellular construction and maintenance:** involves protein and certain lipid and carbohydrate components.
- 3. Biochemical processes of metabolism:** requires a very wide range of macro- and micro- nutrients. Some common clinical situations that affect nutrient requirements: Infection, burns, chronic obstructive pulmonary disease, trauma and fever: raise the metabolic rate and thus requirements for energy and cofactor micro nutrients such as thiamine. Cancer, trauma (including surgery), haemolysis, endurance sports: increase the rate of catabolism, tissue turnover or repair, which may increase the need for protein and some micro nutrients such as vitamin C (connective tissue), vitamin A (epithelial integrity), iron, zinc, folate and B12 (red cells). Various factors can increase nutrient needs for biochemical synthesis and metabolism: e.g. alcohol excess (thiamine and magnesium), toxins, smoking and many forms of stress (antioxidants), drug-nutrient interactions (various). Malabsorption and increased excretion: require more nutrients to be consumed to produce the same tissue status. Common clinical situations include use of laxatives and diuretics, upper gastrointestinal disease, renal disease, diarrhoea and fever (sweating).

## RECOMMENDED DIETARY INTAKES

**What are they?** Recommended dietary intakes (RDIs) are the amount of a specific nutrient that, if consumed on an average daily basis, is considered likely to meet the needs of the large majority of healthy people. (2)

**How are they set?** Most RDIs are derived from data on nutrient balance and/or controlled studies on the amount of nutrient that is needed to prevent the development of the established deficiency state (e.g. scurvy). A safety margin is then added to these minimum amounts to allow for variations in the absorption and requirements of the healthy population.

**What are they useful for?** Assessing the contribution that a particular food may make towards meeting the needs for a particular nutrient: (what does a glass of milk contribute towards daily calcium requirements, or a piece of meat towards those for iron?) – e.g. on food labels and packaging. Assessing a diet for nutrient adequacy: e.g. a dietician reviewing a nursing home menu plan. To provide a benchmark in assessing an individual's dietary intake – but this is very approximate unless several day's intake is looked at. Assessing a supplement or nutritional support product: many vitamin and mineral supplements contain nutrients in doses many times the RDI.

**What are their limitations?** They are **NOT** designed to assess the nutrient needs of patients with clinical illness or whose environment significantly raises nutrient requirements. They are only estimates – for some nutrients where relevant data is scanty they are really only educated guesses. They are about *minimum* intakes required to prevent deficiency diseases, not about ideal intakes for *optimum* health. In the case of some of the antioxidant vitamins, for example, there is considerable evidence that intakes well in excess of RDI are beneficial for health (though controversy about whether this applies only to food or also to supplements). They are not about food. *People eat food*, not isolated nutrients. To translate nutrient requirements into food terms, you can use the Five Food Groups concept and the Australian Dietary Guidelines (see later section).

The table below represents the overall picture of RDI's in different age groups for both men and women. For Women in particular, the appropriate columns have been bolded. Each of the Vitamins and minerals are discussed further later in this essay. **Principle 6**

Recommended dietary intakes for adults (Expressed as mean daily intake)						
	Men	Men	Women	Women	Women	Women
	19-64 yrs	64+ Yrs	19-54 yrs	54+ yrs	Pregnant	Lactating
Vitamin A						
( $\mu\text{g}$ retinol equivalents)	750	750	<b>750</b>	<b>750</b>	<b>0</b>	<b>450</b>
Riboflavin (mg)	1.7	1.3	<b>1.2</b>	<b>1</b>	<b>0.3</b>	<b>0.5</b>
Niacin (mg niacin equivalents)	19	16	<b>13</b>	<b>11</b>	<b>2</b>	<b>5</b>
Vitamin B-6 (mg)	1.3-1.9	10-1.5	<b>0.9-1.4</b>	<b>0.8-1.1</b>	<b>0.1</b>	<b>+0.7-0.8</b>
Total folate ( $\mu\text{g}$ )	200	200	<b>200</b>	<b>200</b>	<b>200</b>	<b>150</b>
Vitamin B-12 (mg)	2	2	<b>2</b>	<b>2</b>	<b>1</b>	<b>0.5</b>
Vitamin C (mg)	40	40	<b>30</b>	<b>30</b>	<b>30</b>	<b>45</b>
Vitamin E	10	10	<b>7</b>	<b>7</b>	<b>0</b>	<b>2.5</b>
(mg alpha tocopherol equivalents)						
Zinc (mg)	12	12	<b>12</b>	<b>12</b>	<b>4</b>	<b>6</b>
Iron (mg)	7	7	<b>12-16</b>	<b>5-7</b>	<b>+10-20</b>	<b>0</b>
Iodine ( $\mu\text{g}$ )	150	150	<b>120</b>	<b>120</b>	<b>30</b>	<b>50</b>
Magnesium (mg)	320	320	<b>270</b>	<b>270</b>	<b>30</b>	<b>70</b>
Calcium (mg)	800	800	<b>800</b>	<b>1000</b>	<b>300</b>	<b>400</b>
Phosphorus (mg)	1000	1000	<b>1000</b>	<b>1000</b>	<b>200</b>	<b>200</b>
Selenium ( $\mu\text{g}$ )	85	85	<b>70</b>	<b>70</b>	<b>10</b>	<b>15</b>
Sodium (mmol)	40-100	40-100	<b>40-100</b>	<b>40-100</b>	<b>0</b>	<b>0</b>

## General Principles:

**Principle 1. A Healthy Weight Range.** Tables exist for ranges of weight according to one's height. One way of calculating a healthy weight range is to determine one's **Body Mass Index (BMI)**. The table below only applies to adults over the age of 18 years. This may be done as using the following formula:

a. **BMI = Weight (kg)/ Height <sup>2</sup>** (With a healthy range of 20 to 25)

b. **Weight for height for men & women aged 18 years & over.**  
(Based on the BMI in the range of 20 to 25)

### Health and Physical Activity

Men and women of all ages benefit from a moderate amount of daily physical activity. The same moderate amount of activity can be obtained in longer sessions of moderately intense activities (such as 30 minutes of brisk walking) as in shorter sessions of more strenuous activities (such as 15-20 minutes of jogging, swimming or sport) Additional health benefits can be gained through greater amounts of physical activity, up to a point. There are greater risks of injury with higher levels of physical activity

The important health benefits associated with physical activity can be gained through activity of moderate intensity - such as walking. This activity can be accumulated through bouts as short as 10 minutes, towards the recommended total of 30 minutes or more on most days. Encouraging physical activity whether in play, sport, exercise or as part of daily activities is likely to lead to greater health, fitness and enjoyment of being physically active in adulthood.

The measure of appropriate weight for height for adults is body mass index (BMI) This can be calculated as weight (kg)/height (m)<sup>2</sup> The desirable body mass index range for adults is between 20 and 25 kg/m<sup>2</sup>. Overweight is defined as a BMI between 25 and 30 kg/m<sup>2</sup>, while obesity is defined as a BMI greater than 30kg/m<sup>2</sup>. BMIs below 20 kg/m<sup>2</sup> are defined as underweight

The newest figures from the World Health Organisation are as follows: Calculate your own BMI from this information

Desirable or normal body mass index range for adults is a BMI between 18.5 and 24.99

Grade 1 overweight is defined as a BMI between 25 and 29.99

Grade 2 overweight is defined as a BMI between 30 and 39.99

Grade 3 overweight is defined as a BMI equal to or above 40

This index is not appropriate for children. Children should be compared with reference growth charts which indicate the normal range for weight, height and weight-for-height by sex and age. This can be done by a general medical practitioner, dietician or child health nurse

A healthy eating pattern and an active lifestyle are most beneficial to health.

**Principle 2. Three main meals a day. Breakfast, Lunch, Dinner.** **Breakfast** is an important meal. 12 - 14 hours will have usually lapsed between meals & hence the need to **break” the “fast”**. The body needs fresh supplies of energy for the morning's work.

**Principle 3. The Nutrients:**

a. **Minerals:** Minerals are important as building & functional components of bones, muscles & teeth. These include Sodium, Potassium, Calcium, Iron, Zinc, Phosphorus, Magnesium & Selenium.

b. **Vitamins:** **Vitamins** are essential for various chemical reactions to occur in the body. There are 13 known Vitamins present in the foods and all are essential to life and health, but only in very small quantities. Vitamin deficiencies do occur in Australia but are rare and on the other hand Vitamins taken in excess can also be toxic.

c. **Carbohydrate (CHO)** This nutrient should make up about **64%** of one's daily intake. Foods such as breads, cereals and grain foods (including rice and pasta), fruits, vegetables, milk legumes and sugar all contain CHO's. These occur in 3 groups as:

1. Simple CHO's (**Sugars** - Glucose, Sucrose, Fructose, Lactose and Maltose)

2. Complex CHO's (**Starches** - Processed cereals, whole grains, pasta, vegetables and unripe fruit)

3. Dietary fibre (**Cellulose** and other complex substances) See under Dietary Fibre below)

d. **Proteins:** This nutrient should make up about **16% of one's daily intake**. Proteins are made of different amino acids. There are 9 essential amino acids and 13 non-essential amino acids. The human body is only able to make the non-essential amino acids and therefore the essential amino acids must be obtained from the diet. They are found mainly in protein derived from animal origin and to a lesser extent from plant derived foods. Proteins are used for building, repairing due to injury or surgery for example and keeping healthy all body tissues such as muscles, skin, hair, nails, blood cells, nerves and glands. Protein is needed to make enzymes, needed for basic body functions, antibodies to help fight foreign substances in the body and hormones which control a variety of body functions. During periods of growth such as childhood, adolescence, pregnancy and lactation, the need for protein is high. Once the body's needs are met, any extra protein is used for energy or converted to body fat.

e. **Fat:** This nutrient should make up about **20% of one's daily intake**. Fats or lipids provide more than twice as many kilojoules (or Calories) as either Proteins or Carbohydrates. Most Australians have too much fat in their diet. All Fats contain fatty acids some of which are essential in the diet. Fats also provide a protective layer around the body's vital organs such as the kidneys, heart and liver. A layer of fat underneath the skin provides insulation for the body against environmental temperature changes and retains the body's heat. Some fats supply fat soluble Vitamins such as A, D, E and K. The Fats are classified as Saturated, Mono-unsaturated or Poly-unsaturated, however, whatever their nature, it is advisable to use only small amounts. (See page 13 for Practical ways to reduce saturated fat in the diet)

Ht (cm)	Wt (kg)
140	39-49
142	40-50
144	41-52
146	43-53
148	44-55
150	45-56
152	46-58
154	47-59
156	49-61
158	50-62
160	51-64
162	52-66
164	54-67
166	55-69
168	56-71
170	58-72
172	59-74
174	61-76
176	62-77
178	63-79
180	65-81
182	66-83
184	68-85
186	69-86
188	71-88
190	71-90
192	74-92
194	75-94
196	77-96
198	78-98
200	80-100

f. **Water:** Water is the most important nutrient or constituent of our daily food and fluid intake and is widely found in our bodies. It actually makes up at least 70% of our body weight. Everyday, depending on one's activities and the climate, at least 1.5 litres are lost from the body from the lungs, the skin, the sweat and the urine. About 300 mls is produced from the usual body processes and the rest comes from our food and beverages. At least 6 to 8 glasses of beverages are required by the body each day in addition to that obtained in the food and produced by the body and more if one's physical exercise is more. Water is required by our bodies for nearly every body process. It is important for carrying nutrients between cells in our body and exchanging oxygen and carbon dioxide in the air we breath. It is also required to excrete waste products in our urine.

**Principle 4.                      USEFUL                      CONVERSION FORMULAS:**

**FAT**                                      1g = 37kj (8.8 Cal)  
**PROTEIN**                              1g = 17kj (4.0 Cal)  
**CHO**                                      1g = 16kj (3.8 Cal)  
**BMI**                                      = WT (kgs)/HT (Metres squared). Healthy range = 20 - 25

**1kj = 4.18 Cal (See below)**

**Principle 5.                      Energy: Intake and Output**

**Intake:** The basic function of food is to provide energy. It comes from the fats, proteins, carbohydrates and alcohol in our food and drink.

**Output:** Everybody needs energy for:

- a. Basic metabolism (the activities that take place in the body continuously to sustain life such as breathing, blood circulation and maintenance of muscle tone and body temperature. Even during sleep the body requires energy.
- b. Physical activity and growth during childhood, adolescence and pregnancy.

**The excess energy is transformed into fat and deposited in the adipose or fatty tissue below the skin or around the vital organs.** The amount of energy needed each day depends on various factors and include Age, Growth, Physical activity, size of the person, sex and individual variation.

**A CHART TO HELP YOU CALCULATE YOUR DAILY ENERGY EXPENDITURE**

**Energy Expenditure:**

Approximate expenditure by a 70 kg person.

Conversion: **1kJ = 4.18Cals**

Life Cycle and Age Groups	Energy Need (in kJ)	Energy Need ( in Cals)
<b>Women (19-60)</b>	7,200 to 11,300	1,720 to 2,700
<b>Pregnant Women</b>	8,100 to 10,900	1,940 to 2,600
<b>Breastfeeding Women</b>	9,200 to 12,300	2,200 to 2,940

ACTIVITY	Kj/30 mins	Cals/30 mins
Resting	170	40
Sitting	210	50
Driving a car	250	60
Standing	290	70
Housework	376	90
Leisure Walking/biking	440	105
Gardening	460	110
Golf	520	125
Bowling	565	135
Fast walking	630	150
Swimming	630	150
Dance/volleyball,/skates	730	175
Tennis	880	210
Skiing	1255	300
Squash, touch football	1255	300
Biking fast	1380	330
Jogging (10 Kph)	1630	390
Running (16 Kph)	1880	450

## THE RELATIVE REQUIREMENTS OF FAT, PROTEIN AND CARBOHYDRATE FOR THIS ENERGY EXPENDITURE

The first Table below represents the average daily requirements of Energy (kj's & Cals), Protein, CHO and Fat for females in the different age groups. Use this with the formulas above in Principle 4 as well as the tables following which give the sources of these.

RECOMMENDED DIETARY INTAKE (RDI)					
SEX and AGE GRP	Total kj's	Total Cals	Prot g (16% of diet)	Fat g (20% of diet)	CHO g (64% of diet)
FEMALE (19-54) WT 58KG	7600	1816	58	62	270
PREGNANT WT 66KG	6400	1530	66	52	210
LACTATING WT 58KG	10900	2605	78	88	395

## THE FOLLOWING PORTIONS OF FOOD WILL ACHIEVE THIS ENERGY EXPENDITURE

Number of daily sample serves needed to achieve a healthy diet

	Energy Need (i n kJ)	Bread, Cereals, Rice, Pasta, Noodles	Vegetables, legumes	Fruit	Milk, Yoghurt, Cheese	Red Meat, Fish, Poultry, Eggs, Nuts, Legumes Extra Foods	Extra Foods
Women 19-60	7,200 to 11,300	4 to 9	5	2 to 3	2 to 3	1 to 1.5	0 to 2.5
Pregnant women	8,100 to 10,900	4 to 5	5 to 6	4	4	1.5	0 to 2.5
Breastfeedin g Women	9,200 to 12,300	5 to 7	7	5	2	2	0 to 2.5

## Principle 6. VITAMINS AND MINERALS

### Life cycle and Nutrition

Understanding the concept of the different phases of life is very helpful in monitoring your nutrition. Although we need all the essential nutrients throughout life, certain nutrients assume particular significance at particular stages of life. Not only does this help prevent deficiencies, but it can be a useful focus to initiate discussion of healthy diet more broadly with your doctor. The main reasons why nutrient needs change through the lifecycle are gender, body weight, growth and activity levels. Some specific issues worth knowing relate to:

**Children** Infancy is a period of particularly rapid growth. On a mg/kg basis, infants require more protein, but also need more iron and Calcium. There is a particular risk of iron deficiency around the ages of 6-18 months in those children who are weaned onto foods low in iron. Calcium is needed for skeletal formation and growth.

**Adolescence:** The two main nutrients to focus on are iron (particularly in girls) and calcium. There is a sharp jump in the RDI for calcium for both males and females (e.g. in boys from 800 mg at age 8-11 years to 1200 mg at age 12-15 years). Dairy foods are the richest source of bioavailable calcium in the Australian diet. Non-dairy sources include calcium-fortified soy drink, fish (e.g. canned sardines, salmon – but only if you eat the small bones), some nuts (e.g. almonds) and legumes (peas and beans).

**Pregnancy and lactation** RDIs for many nutrients are increased in both pregnancy and lactation, including a doubling of the RDI for folate and significant increases in calcium. The RDI for iron is doubled in pregnancy, but not in lactation.

**NB:** For the full set of RDIs plus the background scientific rationale, see [www.health.gov.au/nhmrc/publications/diet/n6index.htm](http://www.health.gov.au/nhmrc/publications/diet/n6index.htm)

## PROTEIN PROTEIN RICH FOODS

It is recommended that one to two servings of a protein rich food be eaten each day. A main meal serving is equivalent to 75-100 g cooked lean meat, poultry or fish, or 1 cup of cooked legumes. Large servings of meat are not necessary. Too much meat can mean that the diet is high in fats.

**MEAT.** Lean meat is an excellent source of protein and also constitutes Iron, Zinc and B Vitamins. Liver, kidneys and heart are especially rich in Iron, Zinc, Vitamins A and B. They are low in fat but high in cholesterol. The fat on meat should be removed preferably before cooking because it is high in saturated fat and kilojoules (or Calories). Even lean meat contains some fat so it is better not to have large portions of meat. There is little point in choosing lean meats if fats and oils are added during cooking. Try to grill, bake or BBQ on a rack and make casseroles without added fat and oils. If meat is cooked for too long, some B Vitamins can be destroyed. Meat extracts and stock cubes have negligible food value as the protein and most of the other nutrients remain in the meat. They are high in Sodium however. Protein is also found in **Dairy foods, breads cereals and cereal products such as tofu and nuts as well as POULTRY, FISH & SEAFOODS, EGGS, LEGUMES or PULSES.**

PROTEIN RICH FOOD (Most to Least)	Amount g or ml	Protein avge	Kj's	Cals
Meat cooked lean	100	28	476	1990
Fish cooked	100	21	357	1492
Milk	600	20	340	1421
Yoghurt plain	200	11	187	782
Soya beans cooked 1/2 cup	100	11	187	782
Milk modified (Shape or HiLo)	250	10	170	711
Milk 1 cup or Skim milk 1 cup	250	8	136	568
Milk powdered skim 2 tablespoons	22	7	119	497
Nuts shelled	30	7	119	497
Egg 1	55	6	102	426
Dried beans Lima or Haricot cooked 1/2 cup	100	6	102	426
Milk powdered full cream 2 tablespoons	18	5	85	355
Cheese	20	5	85	355
Oatmeal cooked 1 cup	250	4	68	284

## IRON (Fe)

**IMPORTANCE OF IRON:** Iron is needed for the formation of Haemoglobin in red blood cells. Haemoglobin carries the oxygen from the lungs to every cell in the body. If there is not enough iron in the diet, the level of iron in the blood will fall, less oxygen will reach the tissues and tiredness and anaemia may result. The body normally conserves iron and body losses are usually small. However, in menstruating women, there are larger losses and over many years, particularly if they are heavier than what is considered the normal (80 mls per period), anaemia will inevitably result in some women. During pregnancy, the mother's requirements for Iron are high. In the 2nd and 3rd Trimester of pregnancy (12 to 40 weeks) the Recommended Dietary Intake (RDI) cannot be met by diet alone an Iron supplement is necessary. It has been estimated that an additional 6 mg of Iron is needed per day during pregnancy. This amount can be absorbed from a supplement that provides 30 mg of Iron per day. (That is 150 mg ferrous gluconate, 90 mg of ferrous fumarate or 250 mg ferrous gluconate) Iron absorption becomes less efficient at higher doses. For example, 6 mg is absorbed from a 30 mg supplement, but less than 10 mg from a 120 mg supplement. The exception of course is in anaemia. **Liver, kidney, mussels oysters and scallops** are especially rich in Iron. **Lean meat, Sardines, Eggs, whole grain (+/-) enriched cereals, wholemeal bread legumes, dried fruit, nuts and green vegetables** also provide Iron. The Iron present in animal tissues are generally better absorbed than from the plant foods and eggs. However, more Iron is absorbed if a food containing **Vitamin C** is eaten at the same meal.

RECOMMENDED DIETARY INTAKE (RDI) for IRON	
SEX and AGE GRP	Fe (mg)
FEMALE (19-54) WT 58KG	12-16
PREGNANT WT 66KG	22-36

IRON RICH FOOD (Most to Least)	Amount g or ml	Iron avge
Liver and kidney	100	8
Mussels	100	7.7
Oysters 12	100	6
Scallops	100	3
Sardines canned	100	2.9
Green leafy vegetables (Eg Spinach) 1/2 cup	100	2.8
Lamb or beef roast	100	2.5
Dried beans cooked 1/2 cup	100	2
Prunes dessert 6 medium	50	1.6
Veal steak grilled	100	1.5
Tuna or salmon canned	100	1.4
Oatmeal cooked 1 cup	250	1.3
Chicken roast	100	1
Egg 1	55	1

**DIETARY FIBRE: RDI = 30 - 40 g per day**

**IMPORTANCE OF DIETARY FIBRE** As mentioned under Nutrients above, Dietary Fibre consists of Cellulose and other complex substances. These are remnants of the cell wall from plant foods which pass through the small intestine without being hydrolysed (being broken down) by the alimentary (digestive) enzymes. In the large intestine, some types of dietary fibre are digested by bacteria and the products are absorbed to provide energy. The remainder provide roughage which helps to remove waste products from the body. It exists in many forms and includes Pectin, lignin, cellulose and various gums and all have different properties. Dietary fibre plays many important roles in the body. It slows down the emptying of the stomach, it causes waste materials to move more quickly through the large intestine and some types make the faeces bulkier and softer and help prevent constipation. Pectin for example, a type of fibre found in Apples and other fruits, may influence the levels of cholesterol in the blood. Certainly, various bowel disorders may be prevented by having adequate quantities of dietary fibre regularly in the diet.

Although there is no RDI for dietary fibre, most authorities agree that 30-40 g's per day would be safe and beneficial for the majority of adolescents and adults living in Australia. This amount coming from a variety of sources will ensure that most people have an easy bowel motion each day. It is important that no one type of dietary fibre should be consumed in excess. An adequate water intake is also important particularly when Bran or Bran based cereals are eaten.

## Fibre and Constipation

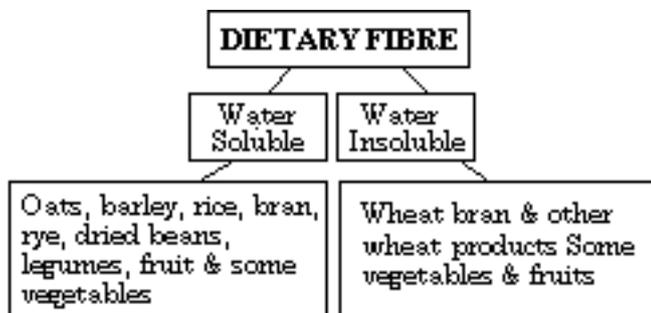
Remember, not all fibre is alike. Insoluble fibre is the main laxative form of fibre, whereas soluble fibre modulates upper GIT digestion and absorption. Generally speaking insoluble fibre is more often in cereal foods and soluble fibre in fruits and vegetables, although this is by no means a universal rule. Just eating more wholegrain cereals will not usually provide enough fibre on its own to treat significant constipation. So, although it is good dietary practice to substitute wholegrain for refined cereals and bread products, fibre added foods (e.g. some breakfast cereals and wholegrain breads) may be required. Fibre in itself is not enough. Plenty of fluids (approximately 2 litres/day) are required to enable the fibre to work properly. 8

## CALCIUM (Ca)

**IMPORTANCE OF CALCIUM** Calcium is needed for the development and growth of bones and teeth, the normal clotting of blood and the functioning of nerves and muscles. Calcium is required throughout life, but especially in pregnancy and lactation where an extra 33% is needed.

Up to 75% women between the ages of 18 and 30 years do not receive the RDI for Calcium and even more in pregnancy despite double the absorption in the pregnant state. Therefore, during pregnancy, women are likely to lose some of their calcium, at the expense of the fetus especially if there is a lack of Calcium intake, exposure to Sunlight for Vit D which is required for Calcium absorption and a reasonable amount of exercise which can increase the loss of calcium. This is especially so in the last 10 weeks of the pregnancy as most of the Calcium deposition in the fetus will occur during this time at a rate of 200 to 300 mg per day. This phenomenon is seen in certain cultures especially if they are poor and already have a poor Calcium intake, where women cover themselves up and/or are exposed to little light at times such as winter. Indeed, there have been case reports of intrauterine rickets in areas where vitamin deficiency is endemic and where maternal exposure to sun is limited. 9. (See also Vitamin D under Vitamins below)

Bones are in a very active phase of growth from birth until approximately 20 years and therefore calcium is important in infancy, childhood and adolescence. Although growth may stop at the age of 20 years, bone density may increase until 30 to 35 years and after the menopause calcium is important to prevent osteoporosis.



HIGH FIBRE FOOD (Most to Least)	Amt g or ml	Dietary Fibre avge
Baked beans 1 small can	130	9.5
Bran Cereal (Eg All Bran) 1/2 cup	30	7.5
Prunes dates or dried apricots	50	6.5
Peas green	100	5.3
Corn kernels	100	4.7
Spaghetti wholemeal cooked 1/2 cup	100	4.2
Broccoli or Kidney beans	100	4.1
Banana	100	3.4
Rolled Oats or oatmeal cooked 1 cup	250	3.3
Bran 2 level tablespoons	7	3
Carrot	100	2.8
Wheat breakfast biscuits 2	30	2.4
Muesli natural 2 heaped tablespoons	30	2.2
Wholemeal bread 1 slice	30	2

RECOMMENDED DIETARY INTAKE (RDI) for CALCIUM	
SEX and AGE GRP	Ca mg
FEMALE (19-54) WT 58KG	800
PREGNANT WT 66KG	1300
LACTATING WT 58KG	1400

CALCIUM RICH FOOD (Most to Least)	Amt g or ml	Calcium avge
Milk	600	670
Sardines canned	100	500
Milk modified (Shape) 1 cup	250	390
Yoghurt natural	200	380
Milk modified (HiLo) 1 cup	250	340
Milk skim 1 cup	250	290
Milk 1 cup	250	280
Tahini 1 tablespoon	20	180
Figs dried	50	140
Molasses 1 tablespoon	25	125
Salmon canned with bones	100	95
Broccoli	100	75
Haricot or Lima beans cooked 1/2 cup	100	50
Parsley	10	30

**VITAMINS** Vitamins, as mentioned above, are essential for various chemical reactions to occur in the body and act as catalysts. There are 13 known Vitamins present in the foods and all are essential to life and health, but only in very small quantities and do not, of themselves, provide energy. Vitamin deficiencies do occur in Australia but are rare and on the other hand Vitamins taken in excess can also be toxic. They are classified into two major groups:

**1. Water Soluble:** [the 8 B Vitamins, commonly known as the B complex] and Vitamin C (Ascorbic Acid)

The B complex are: B1 (Thiamine), B2 (Riboflavin), B3 (Niacin), B5 (Pantothenic acid) B6 (Pyridoxine), B12 (Cyanocobalamin), B-T (Carnitine), B15 (pangamic acid) & B17 (amygdalin) Water solubility means that they dissolve in water and easily lost in cooking. In excess, they are also excreted in the urine. Most are not stored in the body to any extent and need to be replenished.

**2. Fat Soluble:** They are: A,D,E & K. These are found in the fats of foods and because of their solubility, are stored in the body's fat. This means that a regular supply is not so crucial as with the water soluble vitamins. They are also not so easily lost in cooking.

## RETINOL (Vit A)

**IMPORTANCE OF VIT A** Vitamin A is needed for normal growth development. It is also important for the maintenance of epithelial tissues, that is, to keep the lining of the various organs moist and strong to resist infection. It is particularly important for the lining in the eye called the retina and is necessary for night vision. Several months supply are stored in the body and deficiencies are rare in Australia.

**CAUTION:** In its recommended dose, no risks are imposed upon the pregnancy, but excesses may cause abortion or fetal malformation. For this reason, it is important to avoid eating **LIVER** during pregnancy as **TOO MUCH** Vitamin A is present in liver, well beyond the daily requirements and may be harmful to the baby.

RECOMMENDED DIETARY INTAKE (RDI) for VIT	
SEX and AGE GRP	VIT A (µg)
MALE (19-64) WT 70KG	750
FEMALE (19-54) WT 58KG	750
FEMALE (54+) WT 54KG	750
PREGNANT WT 66KG	750
LACTATING WT 58KG	1200

VIT A RICH FOOD (Most to Least)	Amount g or ml	VIT A (µg)
Liver (avge of lamb, chicken & calf livers)	100	16000
Carrots	100	2000
Yellow sweet potato Silver beet or spinach	100	1200
Broccoli or pumpkin	100	400
Rockmelon 1/2 small melon	100	350
Persimmon 1 medium	120	325
Mango 1 small	100	310
Apricots 3 medium	100	250
Milk	600	240
Kidney. cooked	100	200
Table margarine. 1 tablespoon	20	200
Butter. 1 tablespoon.	20	170
Nectarines yellow. 2 medium	100	160
Pawpaw, 1/4 medium	100	130

## THE B VITAMIN COMPLEX:

Of the B Vitamins only the following have been selected for the purposes of this information catalogue. These are B1 (Thiamine), B2 (Riboflavin), B3 (Niacin), B6 (Pyridoxine), B12 (Cyanocobalamin). Folic Acid has been added as well because it is closely linked with Vit B12.

### VITAMIN B1 (THIAMINE):

**IMPORTANCE OF VIT B1 (Thiamine)** The body's enzyme systems need Thiamine to convert carbohydrates to energy. Physically active people need more Thiamine than the RDI. Thiamine is important for growth in the digestive, nervous systems and heart. Deficiencies are rare in Australia and are common mainly in heavy drinkers. In general however, about 25% of the Thiamine is lost during cooking with the greatest losses being from meats or vegetables. Adding bicarbonate of soda or sulphur containing preservatives, usually enhance the loss of Thiamine.

RECOMMENDED DIETARY INTAKE (RDI) for VIT B1	
SEX and AGE GRP	VIT B1 (mg)
FEMALE (19-54) WT 58KG	0.8
PREGNANT WT 66KG	1
LACTATING WT 58KG	1.2

VIT B1 RICH FOOD (Most to Least)	Amt g or ml	Vit B1 mg
Wholemeal pasta, raw weight	100	0.99
Brown rice, raw weight	100	0.59
Pork, leg steak cooked	100	0.59
Rolled oats, raw weight	100	0.5
Brazil nuts, 50 g	100	0.5
Cracked wheat raw weight	100	0.48
Wholemeal flour	100	0.47
Peanuts, 50 g	50	0.45
Sweet potato, white	100	0.4
Dried yeast, 10 g	100	0.4
Ham, cooked or canned	100	0.38
Kidney, cooked	100	0.38
Pasta, raw weight	100	0.36
Peas, 100g	200	0.31

### VITAMIN B2 (RIBOFLAVIN):

**IMPORTANCE OF VIT B2 (Riboflavin)** Riboflavin is important for protein and carbohydrate metabolism. It is partly responsible for the growth and repair of tissues especially those of the skin and the eyes. Riboflavin is easily destroyed by light and therefore, milk for example, should not be left in sunlight. With the use of cardboard cartons, this is not a problem but may be with bottled milk. Losses also occur in boiling water. Excesses of Riboflavin are not common as any excess is excreted in the urine. Indeed, the yellow-green colour seen in the urine in those who take multivitamin preparations are the excesses of Riboflavin being excreted.

RECOMMENDED DIETARY INTAKE (RDI) for VIT B2	
SEX and AGE GRP	VIT B2 (mg)
FEMALE (19-54) WT 58KG	1.2
PREGNANT WT 66KG	1.5
LACTATING WT 58KG	1.7

VITAMIN 2 RICH FOOD	Amount g or ml	Vit B2 mg
Liver, cooked	100	4.2
Kidney, cooked	100	2.6
Yeast extract	5	0.85
Yoghurt	200	0.55
Almonds	50	0.46
Breakfast cereal, fortified	30	0.4
Milk	250	0.4
Eel, cooked	100	0.4
Dried yeast, 10g	10	0.4
Mackerel, cooked	100	0.38
Sardines, canned	100	0.36
Pork steak, cooked, 100 g	100	0.32

### IMPORTANCE OF VITAMIN B3 (NIACIN):

Niacin is needed for the metabolism of Proteins CHO's and Fats for every body cell. Without Niacin, tissues begin to degenerate. It is also involved in the synthesis of some fatty acids & steroids. Unlike other Vitamins, the human body is only partly dependent on dietary sources as the amino acid tryptophan is partly converted to Niacin in the body but needs Vit B6 for this. Because of this the amount of Niacin needed in the diet is affected by the amount and kind of protein in the diet.

RDI for VIT B3 (NIACIN)	VIT B3
SEX and AGE GRP	(mg)
FEMALE (19-54) WT 58KG	12-14
PREGNANT WT 66KG	14-16
LACTATING WT 58KG	17-19

VIT B3 RICH FOOD (Most to Least)	Amt g or ml	Vit B3 mg
Lamb liver, cooked	100	14.5
Tuna, canned	100	12.9
Calf liver, cooked	100	12.3
Veal kidneys, cooked	100	9.2
Pigeon, cooked	100	8.9
Chicken breast, cooked	100	8.7
Mackerel, cooked	100	8.7
Rabbit or Turkey cooked	100	8.5
Sardines, canned	100	8.2
Peanuts	50	8
Beef cooked	150	7
Salmon, fresh/canned	100	7
Pork steak cooked	100	6.9
Wholemeal pasta, raw wt	100	6.2

### VITAMIN B6(PYRIDOXINE):

#### (IMPORTANCE OF VITAMIN B6 (PYRIDOXINE):

This Vitamin is essential in the chemical reactions that involve protein. That is, it takes part in the reactions that incorporate amino acids into body tissues. It is also involved in the transmission of impulses in nerves and muscles and is important in the production of red blood cells. As mentioned above in Vit B3 (Niacin) Vit B6 is essential in the conversion of Tryptophan to Vitamin B3. During cooking there are some losses of Vit B6 and microwave or steaming has a better retention than boiling in water. Overcooking of meats especially roasting or cooking also results in some losses. Some situations require need more Vit B6. These include those with excessive thyroid function, or a rare condition known as homocysteinuria and those requiring antituberculous drugs. Vit B6 is said to be useful in morning sickness in pregnancy and pre-menstrual syndrome.

RDI for VIT B6	VIT B6 mg
(PYRIDOXINE)	1
SEX and AGE GRP	0-1
FEMALE (19-54) WT 58KG	0-1
PREGNANT WT 66KG	1
LACTATING WT 58KG	1-2

VIT B6 RICH FOOD (Most to Least)	Amt g or ml	Vit B6 mg
Liver, cooked	100	82
Kidney, lamb, cooked	100	80
ox	100	31
Oysters, I dozen	100	18
Rabbit, cooked	100	12
Salmon or tuna, canned	100	5
Liverwurst	50	4
Duck, cooked	100	3
Pork, cooke	100	3
Beef, grilled	150	3
Fish cooked	150	3
Lamb chops, 2 cooked	100	2
Turkey, cooked	100	2
Chicken, cooked	200	1

### IMPORTANCE OF VITAMIN B12 (CYANOCOBALAMIN):

This Vitamin has a role in the production of DNA including the formation of the nucleus of red blood cells. It also helps to form the fatty material in nerve cells. It is absorbed from the stomach only with the presence of 'intrinsic factor', a substance secreted by the stomach. It is a rare phenomenon to not have 'intrinsic factor', but those who lack this factor, cannot absorb dietary Vit B12 and become anaemic. It is a particular type of anaemia called pernicious anaemia and severe cases of this leads to nerve damage affecting the spinal cord sometimes causing paralysis. Since this Vitamin only occurs in animal products, those who are Vegetarians are at risk of diminishing their stores of Vit B12. Most people have about 5 years of stores and therefore this is the reason for the rareness of this condition. Vit B12 losses in cooking are minimal.

RDI for VIT B12	VIT B12
SEX and AGE GRP	(mg)
FEMALE (19-54) WT 58KG	2
PREGNANT WT 66KG	3
LACTATING WT 58KG	3.5

VIT B12 RICH FOOD (Most to Least)	Amt g or ml	Vit B12 mg
Liver, cooked, 100 g	100	82
Kidney, lamb, cooked, 100 g	100	80
ox	100	31
Oysters, I dozen	100	18
Rabbit, cooked, 100 g	100	12
Salmon or tuna, canned, 100 g	100	5
Liverwurst, 50 g	50	4
Duck, cooked, 100 g	100	3
Pork, cooked, 100 g	100	3
Beef, grilled, 150 g	150	3
Fish cooked, 150 g	150	3
Lamb chops, 2 cooked, 100 g	100	2

## FOLACIN (Folic Acid)

Folacin is the name given to all substances with folic acid properties. These include folic acid and folinic acid. Some forms of folacin are more easily absorbed than others. Such conditions as coeliac disease may not absorb well and drugs including alcohol may also affect absorption.

**IMPORTANCE OF FOLACIN:** Folacin is important in the formation of new body cells and also takes part in the process whereby information about proteins is transmitted from the genes to the cells. It is therefore needed for passing on hereditary characteristics. In more recent times, folacin has been recognised as an important in the causation of Neural Tube Defects (NTD's) or Spina Bifida and this condition can be prevented if folic acid is taken as a supplement before conception. Folacin is also important in making blood cells (hence the anaemia) and plays a role in the way fats are used within the body. Requirements are considerably increased in pregnancy and lactation and this is a time when deficiency can occur. High doses of supplements however should be avoided as they may mask a deficiency of Vit B12. Its functions are highly integrated with those of Vit B12. Folacin is lost during cooking with reheating causing higher losses.

RDI for Folacin	(µg) of
SEX and AGE GRP	Folacin
	2
PREGNANT WT 66KG	3
LACTATING WT 58KG	3.5

FOLACIN RICH FOOD (Most to least)	Amt g or ml	Folacin in µg
Chicken liver, cooked	100	500
Driedyeast	10	400
Lamb or calves' liver	100	300
Endive	50	165
Kidney beans	100	130
Butter beans	100	110
Broccoli	100	110
Spring greens	100	110
Spinach	75	105
Okra	100	100
Yeast extract	5	95
Beetroot	100	90
Bmssels sprouts	100	90

## VITAMIN D RECOMMENDED DIETARY INTAKE (RDI) = 10 µg per day

Vitamin D is a fat soluble Vitamin that is important for the metabolism of Calcium and phosphate to be absorbed from the intestine into the bones. Without Vitamin D, Calcium cannot be used. A lack of Vitamin D predisposes them to weak bone that are prone to fracture. It is very rare in Australia and occurs in people who never expose themselves to sunlight. It is therefore common in some Middle Eastern countries where the women cover themselves up and some cold climate countries. Vitamin D is the most toxic of all the vitamins and taking even 5 times the daily requirement can be harmful. With excess Vitamin D, too much Calcium is absorbed and some is deposited in soft tissues such as the spleen and kidneys usually as stones. The amount of exposure to sun required is only 2 to 4 hours per week of only some part of the skin. Excessive Vitamin does not occur from excessive exposure to sunlight. Cooking losses are negligible.

VIT D RICH FOOD (Most to Least)	Amt g or ml	Vit D µg
Cod Liver Oil	20	42
Herring or Kippers	100	25
Mackerel	100	18
Salmon fresh or canned	100	13
Sardines	100	8
Tuna	100	6

## VITAMIN E

Vitamin E is a fat soluble Vitamin is found mainly in plant foods and is important as an anti-oxidant (along with Vitamins A and C) which means that it prevents damage to cells from oxygen by scavenging the free radicals. It is particularly important to prevent damage to polyunsaturated fatty acids (that compose the membranes of cells) from free radicals. These are highly reactive molecules which try to stabilise themselves by taking an electron from another molecule. Examples include Radiation, light, Iron and Copper, cigarettes, urban pollution and the presence of oxygen in the tissues can all start free radical reactions. Vitamin E also prolongs the life span of red blood cells and may be involved in the formation of Haemoglobin. Deficiency is rare as there are considerable stores in the body. Cooking losses are negligible. In addition to those listed in the chart, high levels of Vitamin E are found in Avocados.

RDI for VIT E	VIT E
SEX and AGE GRP	(mg)
	7
FEMALE (19-54) WT 58KG	7
PREGNANT WT 66KG	7
LACTATING WT 58KG	9.5

VIT E RICH FOOD (Most to Least)	Amt g or ml	Vit E mg
Wheatgerm oil	20	26.5
Sunflower oil	20	9.7
Cottonseed oil	20	7.8
Safflower oil	20	7.7
Parm kernel oil	20	5.1
Cod Liver Oil	20	4
Rapeseed oil	20	3.7
Corn oil	20	2.2
Wheatgerm 1 tablespoon	20	2.2
Soya bean oil	20	2
Muesli(more if seeds inc)	60	2
Olive oil	20	1
Processed Bran cereal	50	1
Wheat cereals	30	0.5

## VITAMIN C

RECOMMENDED DIETARY INTAKE (RDI) = 30 mg per day

The discovery of Vitamin C as being a cause of scurvy, a long standing scourge of sailors in the past, has a fascinating history. Indeed, Captain James Cook, famous in Australian History, very fortunately had a wonderful and innovative insight into the causes of scurvy (probably from the work of James Lind 1747, who discovered that citrus fruits would prevent scurvy) and prevented his sailors from getting scurvy by making them eat fresh food and the shoots of wheat. The use of Vitamin C in the prevention of scurvy was finally isolated in 1928 and identified as the agent which cured scurvy in 1932. Vitamin C is needed in the synthesis of Collagen, a protein found in connective tissue. It is important in forming a cement-like material in bones, capillaries, cartilage, gums and teeth. It is also important in the production of some proteins and hormones. It helps in the absorption of Iron and prevents infection in addition to having antioxidant properties as mentioned above along with Vitamins D & E. Because of this multitude of functions, many people believe that taking high doses of Vitamin C is a panacea for most ills. However, this is not so and indeed, excessive Vitamin C (1000 mg to 4000 mg) per day may be toxic. Vitamin C is easily lost through heat and water exposure and therefore damaged or wilted vegetables or fruits will have lost a considerable amount of their Vitamin C. Therefore in cooking vegetables, it is better to steam, microwave or stir-fry them. The body has enough stores of Vitamin C to last 3 weeks and therefore regular replacements necessary. The normal requirement is about 30 mg per day and the body's tissue is saturated at 100 mg per day.

VIT C RICH FOOD (From most to Least)	Amt g or ml	Vit C mg
Guava,	100	243
Capsicum, red,	100	172
Brussels sprouts,	100	110
Broccoli,	100	106
Capsicum, green,	100	92
Pawpaw,	150	90
Orange, I medium		76
Kiwi fruit, I medium		72
Kohlrabi,	100	71
Rambutan, 4 medium		70
Cauliflower,	100	70
Strawberries, 1 punnet,		56
Grapefruit, I medium		54
Rockmelon,	150	51
Mango, I medium		50

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