C: Food and Diabetes

C1: What can I eat?

There is no special diet for children or young adults with diabetes. The food you eat should be based on healthy eating principles that can be enjoyed by all your family and friends. There is no need to buy any special diabetic products. The following information will explain why food is important in managing your diabetes. The dietitian will be able to answer any other questions you might have. However, it is important to remember that food choices such as regularly eating fatty, sugary or processed foods can make diabetes much harder to manage.

Why is food important?

Food is important to give us energy, so that we are able to do everyday activities like thinking, walking, running, playing, and to grow properly. Food also contains many nutrients like vitamins and minerals that do lots of little jobs in our body that keep us healthy. It is important to eat the right amount of food for age, size and level of activity. When people are first diagnosed with diabetes, they often feel very tired, weak and may have lost some weight; this is because their body wasn't able to use the energy in the food that they were eating.

How do bodies use energy?

Some of the food that we eat is broken down into ***glucose*** by our body. This glucose goes into the blood stream and travels around waiting to be let into our cells where it can be used as energy. Insulin is a hormone, produced by tiny cells in your pancreas, which acts as a key that opens the cells and lets the glucose in so that it can be used as energy. Insulin also allows us to store energy in our muscles and liver.

In diabetes the tiny cells in the pancreas stop producing insulin, so the glucose in the blood cannot be used. This causes high blood glucose levels *(hyperglycaemia)* which can make you feel tired, thirsty and unwell. This is why insulin is needed.

Blood glucose

There are three main macronutrients or food groups:

- Carbohydrate
- Protein
- Fat

Carbohydrate foods are really important as they provide energy and allow us to grow. Carbohydrate foods are broken down by the body into glucose. Glucose is our brain and body's favourite source of fuel. Glucose helps us to learn, play and be active. Carbohydrate foods will have the biggest effect on blood glucose of all the food groups.

There are two types of carbohydrate:

- Complex or *starchy* carbohydrate
- Simple carbohydrate

Complex/Starchy Carbohydrate
This type of carbohydrate are found in the following examples of food:

Bread, potatoes, rice, pasta, couscous, quinoa, grains, chapatti, naan bread, plantain, porridge and flour.

These types of carbohydrates cause a steady rise in blood glucose over a long period of time. The glucose in these foods is joined together in long chains, which are what causes them to be 'complex':

Every link in the complex chain must be broken before the glucose is released into the blood. Different foods are broken down into glucose at different rates. The rate at which food is broken down depends on their composition, fibre content and preparation. However, some foods are known to be broken down more slowly than others (e.g. beans, peas, lentils, yoghurt and milk). These are known as foods with

a low ***glycaemic index (GI)*** and cause a slower rise in blood glucose, which is helpful for managing diabetes. This is discussed in more detail later on.

Starchy carbohydrate foods are low in fat and help to fill you up. They should be included as part of every meal and snack *(if you need them)* and spread evenly throughout the day. This is important to help keep your blood glucose within an ideal range.

Sugary Carbohydrate

This type of carbohydrate are found in the following examples of food:

Sugar, honey, jam, fizzy drinks and cordial, energy drinks, milkshakes, fruit juice, smoothies, sweets, chocolate, sugar-coated cereals, cakes, biscuits and puddings.

The glucose in sugary carbohydrates is not linked together in chains:

These foods are broken down more easily which causes your blood glucose to rise quickly. Sugary foods can be included occasionally as part of your normal eating pattern. However, they are best eaten occasionally, in small quantities, and as part of a meal e.g. as a pudding rather than a snack between meals. Ask your dietitian for more advice about how to include your favourite foods.

Normal fizzy drinks, table sugar, honey, jam and fruit juice should be avoided as they have a big effect on your blood glucose and it is difficult for insulin to match their effect. There are sugar free alternatives that can be chosen e.g. sugar-free cordial, diet/zero fizzy drinks; but as they still damage your teeth, they should always be consumed as part of a balanced diet.

Natural sugars: these are found in milk and yoghurt (lactose) and fruits (fructose). Natural sugars will affect your blood glucose and will need to be matched with insulin but the foods they are found in are healthy and should be included, as they

contain other good nutrients. Milk products contain calcium and protein; fruits contain vitamins, minerals and fibre.

How does food and insulin fit together?

Blood glucose will always increase after food due to digestion and absorption. Glucose levels usually peak one to two hours after eating. The amount of glucose and fibre in foods will affect how quickly the food is broken down and therefore will affect the rise in blood glucose. It is better for you to have a small rise in blood glucose after meals, rather than a big spike.

Insulin

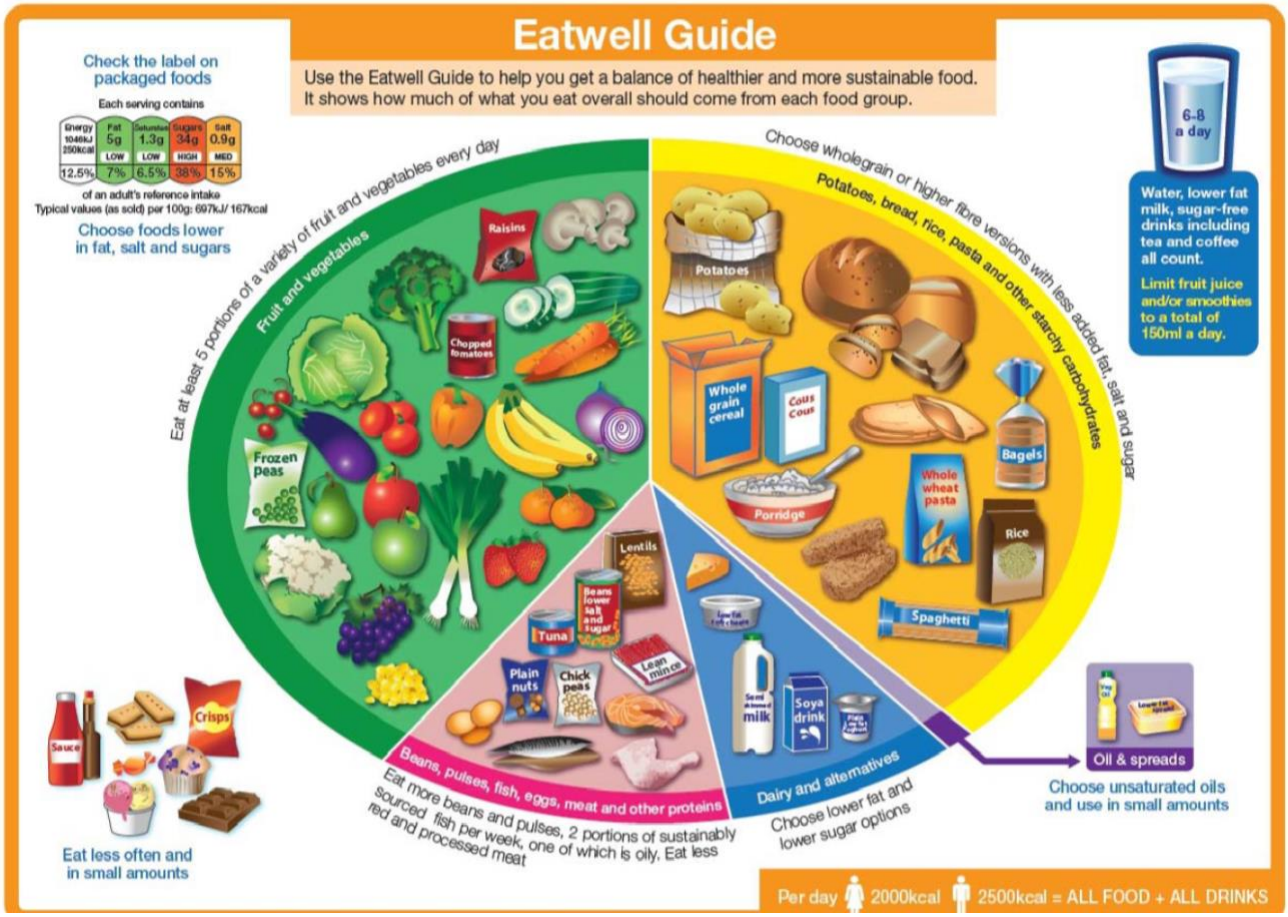
Insulin is needed when food is eaten. It should always be taken before food, ideally fifteen minutes before eating. As the food is digested and absorbed from the gut, it causes a rise in blood glucose and insulin is required to counteract that. The amount needed depends on how much carbohydrate you have eaten and your **insulin to carbohydrate ratio (I:C ratio)**. This is usually expressed as the amount of carbohydrate in grams requiring 1 unit of insulin. This may vary from 1 unit of insulin to 30 grams of carbohydrate (in younger children) to 1 unit of insulin to 5 grams of carbohydrate (teenagers in their growing phase). You will be advised on your own insulin to carbohydrate ratio. You can see that the amount of insulin you take with food will increase with age and how long you have had diabetes.

On multiple daily injections, three or more of these injections will go with food (bolus) and another one or two provide background insulin (basal) which is unrelated to food. The diabetes team will explain how the insulin you have works. Remember you may also need insulin with snacks as insulin is not restricted to meal times.

Sometimes rapid acting insulin can be taken to correct a high blood glucose value, even without eating.

The Eatwell Guide

This is a useful guide to help you manage your diabetes and food. There is no special diet for people with diabetes. The model is based on healthy eating principles and therefore can be used for the whole family.



You need a variety of foods from each of these groups to stay healthy, and give you the right balance of nutrients, vitamins and minerals that you need.

Fruit and Vegetables

These foods are good sources of vitamins, minerals and fibre.
'5 a day' - It is recommended that you should aim for 5 portions of fruit and vegetables every day to give you all the vitamins and minerals your body needs. Vitamins and minerals are protective against the damage that higher blood glucose can do to blood vessels. Due to the sugar content of fruit, they should be limited to 2-3 portions per day. However, you can never have too many vegetables!

Children often prefer raw vegetables to cooked ones which are also great as a snack between meals (e.g. slices of cucumber, sliced carrot, celery sticks, sugar snap peas, chopped peppers, olives).

Some children may struggle to include fruit, and may manage smaller amounts (e.g. half a banana, slices of apple and orange or smaller fruit i.e. strawberries, grapes or tinned fruit). These can be included as snacks between meals or as a pudding.

The following are some more ways to incorporate more fruit and vegetables in the diet:

- Add chopped or dried fruit to breakfast cereals.
- Add extra chopped vegetables to casseroles, curries, bolognaise chilli and stews.
- Cook vegetables and blend into a homemade soup.
- Add salad to sandwiches.
- Choose fruity desserts, e.g. fresh fruit salad, baked apples, tinned fruit and yoghurt with extra fruit added.

Meat, Fish and Alternatives

These foods give you protein, which is necessary to help the body grow and repair body tissues. Children that are choosing two foods from this group each day will be having more than enough protein for growth. New guidelines advise everyone to eat more beans and pulses as well as two portions of sustainable fish per week, one of which is oily (e.g. salmon, trout, tuna, mackerel, anchovies). We should all be reducing the amount of red meat in our diet and avoiding processed meat.

Protein foods include:

- Pulses e.g. baked beans, red kidney beans, lentils, chickpeas, mung beans, butter beans, hummus
- Soya, Quorn, TVP, Tofu
- Nuts
- Eggs
- All types of meat, poultry and fish - fresh and frozen

For older children, try to choose lean meats, and grill or bake foods rather than fry them in order to cut down on fat.

Milk and alternative milk products

Milk, yoghurt, cheese, and alternative milk products are all good sources of calcium. Calcium is important for healthy bones and teeth. You should aim to consume at least a pint of milk or the equivalent amount of calcium each day *(1oz of hard cheese or 1 pot of yoghurt provides the same amount of calcium as one third of a pint of milk)*.

Milk products such as yoghurts or milky puddings often contain sugar. Try to choose products that have no added sugar or contain a sweetener. Alternative milks such as oat, soya, almond, rice, pea, coconut, cashew and hazelnut generally have calcium added. However, some brands do not and therefore it is important to check the label and ensure they contain at least 120mg calcium per 100ml. However, due to the low nutritional value of some alternative milks only oat and soy milk are recommended for children and young people.

Choose reduced fat products for children over the age of two years e.g. low fat yoghurts, semi-skimmed milk, reduced fat cheeses. Children under the age of two years should be given full fat milk as they need the energy in this to grow. After the age of two years, semi-skimmed milk may be given. Skimmed milk should not be introduced before the age of five years, unless advised by a health care professional.

Vegetarian and Vegan diets

The reasons some people choose to follow a vegetarian or vegan diet are varied. When well planned, balanced and nutritionally complete, these diets can be very healthy. As with any diet, it is important to make the right choices. If you are following a vegetarian or vegan diet or considering starting one, please discuss this with your dietitian and diabetes team. We would be happy to support you and ensure you are getting everything you need.

Eating Out

Eating out can be intimidating when first diagnosed with diabetes but that does not mean that you cannot enjoy a meal out with family and friends - it is just a question of being prepared. Restaurants, particularly chains, will often have nutritional information on their websites or app. However, please be aware that the food's carbohydrate quantity displayed on a company's website is not assured by healthcare professionals. Therefore, it is important that it is used with caution.

If the information is not available or if you are unsure, trust your instinct and refer to the Carbs and Cals book or app. If there is no information available, think about the usual size portion you would have at home and estimate it from that.

Takeaways

Take away foods generally contain a good deal of fat combined with large quantities of carbohydrate. This combination may cause a spike in blood glucose for a sustained amount of time and may require an extra correction dose following the meal. Takeaway meals can be enjoyed as part of a balanced diet but should be eaten no more regularly than fortnightly.

Cultural or Religious Festivals

If you require any advice around cultural or religious holidays or festivals, our diabetes team is always happy to support you and answer any questions you may have.

C2: Carbohydrate counting

Carbohydrate counting means calculating the amount of carbohydrate you are eating so that you can give a matching insulin dose to help control blood glucose levels. The amount of insulin needed varies between different people and your diabetes team will advise you on how much you need. The dose may vary between meals, depending on what you are eating, and you will need to use fast-acting insulin e.g. Novorapid, Humalog, Fiasp.

Carbohydrate foods have the greatest effect on blood glucose. Protein foods, most vegetables and fats have less immediate effects on blood glucose and are not usually included in insulin calculations. Protein foods and vegetables are important for other nutrients and should be eaten regularly.

Your dietitian will take you through the principals of carbohydrate counting however, below are ideas to help you.

What foods need to be counted?

- Those containing starchy carbohydrate:

Bread, potatoes, pasta, rice, chapattis, breakfast cereals, noodles, bread products and things containing flour, couscous, quinoa, bulgur wheat, yams, cassava, plantain, squashes, sweet potato, parsnips, pastry, crackers, pulse vegetables (beans, peas, chickpeas, lentils, dhal, baked beans, mushy peas), *****oat milk.

***** *sweetened versions of alternative milks will contain more carbohydrates than unsweetened versions*.

- Those containing natural sugars:

  - All fruits, fruit juice, fruit smoothies, dried fruit (contain the sugar ***fructose***)
  - Milk, yogurt, fromage frais, drinking yoghurt, milkshakes, custard, rice pudding (contain the sugar ***lactose***)

- Those containing added sugars (***sucrose***):

  - Biscuits, cakes, muffins, cookies, brownies, doughnuts
  - Sweets, chocolate, chocolate biscuits
  - Ice cream, mousse, trifle, cheesecake, other desserts
  - Sweet cereals
  - All foods containing “added sugar”

How to Count Carbohydrates

How to Calculate the Carbohydrate Content of Your Food using 'per 100g' values on labels

$$\frac{\text{The amount of carbohydrate in 100g of food}}{100} \times \text{Your portion weighed on scales in grams} = \text{Grams of carbs in your portion}$$

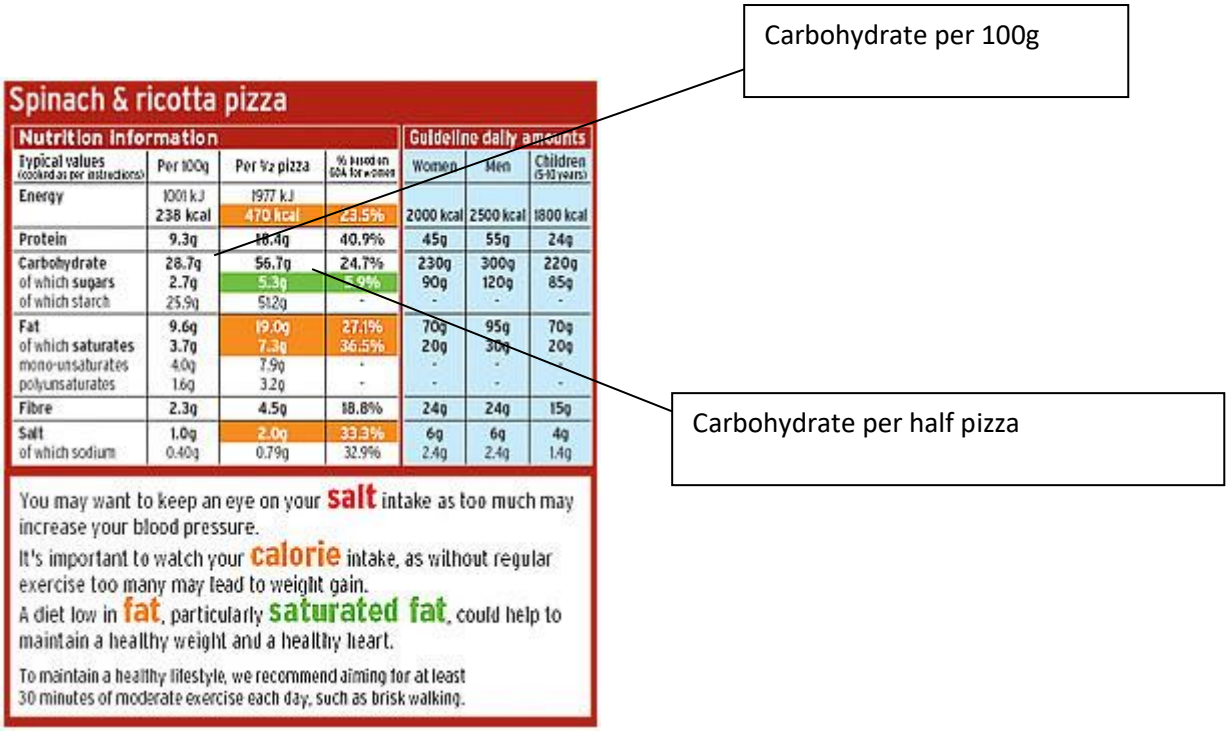
Example for cornflakes

$$\frac{85g}{100} \times \text{My portion } 45g = 38g$$

Practical ideas

- **Food labels**

Use the nutritional labels on a product, giving values per 100g and/or per portion. **You need to use the 'total carbohydrate' figure NOT the 'of which sugars'**. The 'traffic light' labelling on the food packaging only gives the sugars value.



If you are weighing food, you can use the 'per 100g' figure. The 'per portion' value is useful for quantities you can easily count e.g. per slice of bread, per biscuit, per fish finger etc.

Supermarket websites often have nutritional information of labelled products if you have thrown the packaging away.

- **Carbs and Cals (approved resource for Diabetes)**

Use **Carbs and Cals book or app** to estimate carbohydrate portion size; remember to take it with you on holiday. A better way to use this book at home is to weigh your portion size and compare with the same weighed portion in the book. Your dietitian can show you how to do this.

Be wary of using other apps for carbohydrate values of food, as their information may be unreliable.

- **Weighing foods**

This is the most accurate way to count carbohydrate in foods without labels or when the portion size varies. Foods that are good to weigh include pasta, rice, potatoes (roast, mashed, chips, and jacket), couscous, noodles, quinoa, plantain, grains, breakfast cereals, porridge oats, home-made recipes and fruits.

A pair of **digital scales** and some maths will help you work out how many carbohydrates are in the food. **Remember**: the actual weight of a food measured on scales, is NOT the same as the amount of carbohydrate that food contains. To calculate this, please see the above calculation (How to Calculate the Carbohydrate Content of your Food).

Once you have weighed a portion, keep a record of the portion sizes of different foods to save you doing it each time. However, children's portion sizes change as they grow, so re-weigh portions every 3-6 months to check the new carbohydrate contents.

Is your insulin to CHO ratio enough?

Different people need different amounts and this may change as you get older. To check if you have enough mealtime insulin do the following:

1. Do a blood glucose test before eating.
2. Calculate the carbohydrate and give the amount of insulin you think you need.
3. Do another blood glucose test about two hours after eating.
4. Your blood glucose should be approximately the same as before the meal +/- 3mmol/L.

This works best on potato or bread based meals. If you are much higher two hours after and this is happening regularly, speak to the nurse or dietitian as you may need

more mealtime insulin. Remember your ratios may differ at each of your main meals particularly during growth spurts.

C3: Snacks

These are some suggestions for snacks that you may need between meals. Snacks might be for an activity, or because you are hungry. It is not always necessary to snack if you are eating meals regularly.

Some people need insulin with snacks, especially snacks that contain carbohydrate. Discuss with the team whether you need insulin or not. Snacks may have lots of fat even if they are low in carbohydrate, so try and eat a variety of snacks including some of the healthy ones.

SNACKS CONTAINING 10G (or less) CARBOHYDRATE

Food	Quantity	CHO (g)
Small pear, apple, orange	1 small, 80g	10
Plum, kiwi, Satsuma	1 small, 50g	5
Rich Tea, Malted Milk, Sports, Morning Coffee biscuits	2 biscuits	10
Digestive, Hob Nob, Ginger Nut biscuits	1 biscuit	10
Muller Light yogurt	1 small, 100g	8
Fromage frais	1 small	7
Frube	2	9
Box of raisins	small	10
Dried apricots	small handful	10
Cream Crackers	2	10
Breadsticks	3	10
Rice Cakes	each	3
Ryvita Crispbread	each	5
French fries, Wotsits, Quavers, Skips	small bag, 13g	9
Cereal Bar (Alpen Light, Special K)		7-10
Glass of milk	150ml	7
Highlights/Options hot chocolate powder	Made with water ***Made with milk***	6 ***13***
Oatcakes	1	5
Strawberries	10	9

SNACKS CONTAINING NO CARBOHYDRATE

Low or no fat	Contain unsaturated fat	Contain saturated fat
Pickled onions	Nuts - peanuts	Cheese
Cherry tomatoes	cashews, almonds,	Cheese strings
Cucumber sticks	pistachios, walnuts	Mini Babybel
Carrot sticks	Olives	Peperami
Raw peppers	Sunflower, pumpkin seeds	Cocktail sausages
Tuna, shellfish	Hummus	Pepperoni, salami
Cooked chicken (no skin), ham	Nut butters	
Cottage cheese	Eggs - cooked without extra fat	
Sugar free jelly	Avocado	
Sugar free ice pops		
Diet/zero drinks		

The above snacks do not need insulin when eaten between meals. They can be eaten alone or with snacks containing a little carbohydrate (e.g. hummus on an oat cake). Only 1 snack between each main meal should be eaten. More than this will require insulin. In order to stay as healthy as possible, we recommend that people eat less saturated fat, so the snacks in the first two columns should be the first choice, with the third column being an occasional snack.

C4: The Glycaemic Index (GI)

Carbohydrate containing foods are all digested by the body and release glucose into the bloodstream at different rates. This is due to many different things (e.g. the amount of carbohydrate in the food; the fat, fibre and protein content, how it is cooked, and portion size). Carbohydrate foods that are digested rapidly and release glucose quickly into the blood are described as **high glycaemic index *(high GI)*** foods. Some foods are known to be broken down more slowly (e.g. beans, peas, lentils, yoghurt and milk). Foods that are broken down more slowly are described as having a **low glycaemic index *(low GI)*** and cause a slower rise in blood glucose.

Studies have shown that diets based on **low GI** foods can improve blood glucose control, preventing a rapid rise in glucose levels after meals. This is very helpful for managing diabetes. Naturally **Low GI** foods also have the added benefit of containing higher amounts of fibre, which is really important for gut and heart health. It is therefore important to include as many low GI foods in your diet as possible.

How do I include low Glycaemic Index foods?

Cereals

Choose oat based breakfast cereals (e.g. overnight oats, porridge, Oat Bran Flakes, Oatibix, homemade granola, unsweetened muesli).

- Choose wholegrain bran cereals (e.g. Bran Flakes, All Bran).
- Choose oatmeal biscuits (e.g. Hobnobs, Oat Cakes).

Bread

- Choose granary, mixed grain or seeded breads in preference to white, brown or wholemeal bread.

Pulses

- Include beans, peas, lentils and barley in your diet (e.g. butter beans, kidney beans, baked beans, haricot beans, chick peas, soya beans, and hummus).
- Add pulses to casseroles, stews and soups. Tinned beans and lentils are available in the shops that require no soaking.
- Baked beans on toast is a good lunchtime meal.
- Adding pulses to meat dishes will make the dish go further, and add flavour
- Add beans to a salad to add texture, colour and flavour.

Pasta, grains, potato

- Use pasta or noodles to replace potatoes more often at meal times (pasta has a lower GI value than potatoes). Sweet potato and boiled new potatoes are slower acting than mashed or jacket potato.
- Quinoa (pronounced 'keenwah') can be used as an alternative to rice or couscous.
- Consider pasta salad as an alternative to sandwiches in your lunch box.

Fruit

- Apples, cherries, dried apricots, dates, figs, grapefruit, peaches, plums, oranges, grapes and pears are all low glycaemic index foods.
- Include them as a snack between meals or at meal times e.g. added to breakfast cereal, with yoghurts as a pudding.

Milk and Alternative Milk Products

- Diet / Greek-style/ Icelandic / high protein yoghurts are useful as a dessert or snack
- Use full fat natural yogurt as an alternative to milk on cereal
- A drink of milk with breakfast.

Our diabetes team is always happy to support you and answer any questions you may have relating to food.