

Carbohydrates

A guide to carbohydrate containing foods for people with diabetes



This information is designed to help you to understand how carbohydrates affect your blood glucose levels.

It looks at how to improve your diabetes control and increase the flexibility of your day-to-day management by looking at the carbohydrate content of your diet.

You may wish to work through the activities in the book to help you to understand how carbohydrates affect your blood glucose.

A Healthy Diet

It is important for all of us to have a healthy balanced diet whether we have diabetes or not.

Studies from around the world show that people who eat a diet that includes plenty of wholegrain's and fibre (in things like bread and cereal) fruit, vegetables and is low in saturated fat are healthier and have lower rates of heart disease and diabetes.

The Balance of Good Health below shows what your healthy diet would look like if you divided your shopping trolley into the different food groups. You should aim to get about a third of your dietary intake from potatoes, bread, rice and other cereals (like pasta and breakfast cereals) and a third from fruits and vegetables. Choosing low fat, "slimmers" and healthy eating options when it comes to dairy and meat products helps to keep your diet low in fat. Treats like cakes, biscuits and crisps should take up very little space in your "trolley"!

Activity 1

Balance of Good Health

Look at the plate and write down what foods or food groups you think will have an affect on your blood glucose levels after you have eaten them.

Fruit and Vegetables

Bread, other cereals and potatoes



Meat, fish and alternatives

Foods containing fat and foods containing sugar

Milk and dairy foods

What is Carbohydrate?

Sugary and starchy foods all contain carbohydrates.

Carbohydrates are made up of chains of the smallest type of sugar, called glucose. Carbohydrates are a group of substances with varying lengths of chains of glucose joined together in different ways.

When we digest or break down foods that contain carbohydrate in the gut, these chains are broken and the glucose is released into the blood. You may be familiar with the term “blood glucose” which is the same as blood sugar. Some types of glucose chain in carbohydrate foods are easier to break than others.

Laboratory studies show that foods that contain carbohydrates increase blood glucose levels once they have been digested or broken down in the gut.

Foods that mostly contain fat and protein do not increase blood glucose following digestion.

Activity 2

Do all carbohydrate-containing foods have the same affect on your blood glucose levels? YES NO

If your answer is no, how do they affect your blood glucose differently?

Do all carbohydrate-containing foods have the same affect on blood glucose?

Fairly recent work has looked at how quickly different foods raise blood glucose levels straight after a meal. Studies found that different foods containing the same amount of carbohydrate can raise blood glucose more quickly or slowly.

The term used to describe this is **Glycaemic Index**.

As you might expect the more carbohydrate you eat in one go the higher your blood glucose will be afterwards.

What may surprise you is that a portion of table sugar will have a very similar effect as the same sized portion of starch.

So it's the amount rather than the type of carbohydrate that's important.

Why is this?

How quickly a carbohydrate-containing food will raise your blood glucose depends on a few different things.

The main points are:

- The more work your body has to do to breakdown or digest the food the longer it will take for the glucose from that food to get into your blood. Remember that digestion starts with chewing.

Consider the difference between how long it might take to eat and digest 2 oranges compared to drinking a small glass of orange juice? Foods containing sugar take longer than drinks containing sugar!

- This means that drinks that contain sugar or starch (even natural sugars found in fruit juice) will raise blood glucose very quickly-ideal if your blood glucose is low (hypo).
- Foods that contain a lot of protein or fat as well as carbohydrate take longer to breakdown, so the glucose will take a while to get into your blood. So things like chocolate, milk and cake take longer-not so good if your blood glucose is low (hypo).
- Some foods contain lots of soluble fibre this is very slowly broken down in the gut. These are foods like beans, peas lentils and sweet corn the common name for them is pulses and legumes. The affect on blood glucose is very slow and gradual. This means that you would not usually need to give insulin to “match” the increase in blood glucose caused by these foods.

Quick carbohydrates = the best Hypo treatments

Lucozade
Lemonade
Cola
Jellied sweets
Boiled Sweets
Dextrose Tablets
Fruit Juice

Very slow carbohydrates = no insulin required

Lentils, beans and pulses of all kinds
Barley
Cherries
Grapefruit
Nuts
Fructose

Why are carbohydrates important in diabetes?

Learning about how carbohydrates affect blood glucose can help you to control your diabetes. It is possible to work out what affect a meal or snack will have on your blood glucose if you can work out roughly how much carbohydrate it contains.

Generally speaking similar amounts of carbohydrate will raise your blood glucose by similar amounts.

Carbohydrate and insulin

Carbohydrates **raise** blood glucose and insulin **lowers** blood glucose.

Twice per day insulin regimens (mixtures and cloudy insulins)

If you use pre-mixed insulin e.g. Humulin M3 or Novomix or a medium acting (cloudy) insulin e.g. Humulin I or Insulatard, you can improve your blood glucose control by keeping to similar amounts of carbohydrate at mealtimes. For instance if you sometimes find that your blood glucose is high following a meal it may be because you have eaten more carbohydrate than usual. If you do not change your dose of insulin then sometimes the amount of carbohydrate you eat will raise your blood glucose by more than your insulin can lower it. So it's about finding a balance.

If you try to stick to the same amount of carbohydrate then your insulin dose should usually match this and your blood glucose will be less variable.

Basal bolus Insulin regimens

(Quick acting insulin with food plus long acting or cloudy insulin)

If you are taking a dose of quick acting insulin at mealtimes e.g. Actrapid or Humalog plus long acting insulin e.g. Insulatard or Glargine, you can adjust your dose of quick acting insulin according to how much carbohydrate you are about to eat.

For example, if you are having a bowl of pasta this will contain more carbohydrate than if you chose a meal with just a couple of small potatoes. Your blood glucose will be higher after the pasta than after the potatoes. You will need different amounts of insulin for the two meals.

Estimating carbohydrate

An easy way to estimate the amount of carbohydrate in food is to use portions. If you think of 1 portion as 10g-12g of carbohydrate it makes the maths easier! The **Carbohydrate Portions List** booklet shows common foods and how many 10g portions of carbohydrate they contain.

Activity 3

*Using the **Carbohydrate Portions List**, try to work out the number of portions of carbohydrate you had at each meal yesterday.*

Meal	Number of Carbohydrate Portions
Breakfast	
Lunch	
Dinner	
Snacks	

Using carbohydrate portions to adjust doses on basal bolus insulin regimens

Activity 4

Alongside your calculation of the number of carbohydrate portions in activity 3 write down the number of quick acting units of insulin you had with each meal

Meal	Units of quick acting insulin	Number of Carbohydrate Portions
Breakfast		
Lunch		
Dinner		
Supper		
Snack		
Snack		

Blood Monitoring

You can use your blood glucose monitoring results to decide what changes you need to make to your insulin doses. It is useful, and easier to interpret, if you write your results down in a table such as the diaries provided by your diabetes care team.

If your quick acting insulin is Novorapid or Humalog then testing before a meal and again 2 hours after that meal is useful. These insulins have done most of their "work" by about 2 hours. If you have given the correct dose for the amount of carbohydrate you have eaten then the 2 results should be about the same.

So if your test is higher 2 hours after the meal than it was before, the insulin that you gave was not enough. In other words you are trying to match the amount that the carbohydrate will raise your blood glucose by the amount that the insulin will lower your blood glucose.

Activity 5 Novorapid & Humalog

If you had a lower blood glucose result 2 hours after your meal than it was before your meal what does that tell you about the dose of insulin you gave?

If your quick acting insulin is Actrapid or Humulin S then these take around 4-6 hours to do most of their "work". If your test before each meal is about the same then you have got the dose of insulin for the amount of carbohydrate right.

So if your test before lunch is higher than your test before breakfast then you have not given enough insulin for the amount of carbohydrate in your breakfast.

In other words you are trying to match the amount that the carbohydrate will raise your blood glucose by the amount that the insulin will lower your blood glucose.

Activity 6 Actrapid & Humulin S

If you had a lower blood glucose before your evening meal than it was before your meal at lunch what does that tell you about the dose of insulin you gave at lunchtime?

What if I eat more or less than normal?

Activity 7

Look at the table that you completed for Activity 4. Can you work out how many units of insulin you had per 1 portion of carbohydrate for each meal? e.g.

Meal	Units of quick acting insulin	Number of Carbohydrate Portions
Breakfast	6	3

The example shows that the person had a total of 6 units of quick acting insulin and 3 portions of carbohydrate. This means that for each 1 portion of carbohydrate they had 2 units of insulin.

If you know how many units of insulin you need for 1 portion of carbohydrate then you can work out how many units you will need if you choose 3, 7 or even 12 portions at a meal. In fact you will know how much to give for any amount of carbohydrate!

This way of talking about how many units of insulin you need per 1 portion of carbohydrate is called a ratio. This is the ratio of units of insulin to 1 portion of carbohydrate. The example above shows a 2:1 ratio - 2 units of insulin for 1 portion of carbohydrate. You may need different ratios for breakfast lunch and evening meal.

Using your before and/or after meal tests will help you to know if your ratios are right for you. Your Diabetes Specialist Nurse or Dietitian can help you to look at your results and decide what to do.

Twice per day insulin regimens

Using carbohydrate portions to adjust doses on twice per day insulin regimens

Activity 8

Alongside your calculation of the number of carbohydrate portions in activity 3 write down the number of units of insulin you had with each meal

<i>Meal</i>	<i>Units of insulin</i>	<i>Number of Carbohydrate Portions</i>
<i>Breakfast</i>		
<i>Lunch</i>		
<i>Dinner</i>		
<i>Supper</i>		
<i>Snack</i>		
<i>Snack</i>		

Your blood glucose monitoring record will help you to make changes to your diet and insulin so that you can improve your control.

Activity 9

Look at your record book

Is there a pattern of high results at a certain time of the day?

How could you modify your carbohydrate intake to help with this?

If you are always high after a particular meal you could try to reduce the number of portions of carbohydrate you have at that time. Remember be sensible! Carbohydrate is a healthy source of energy for your body you should not cut carbohydrates out altogether. You should also consider whether you need to increase your insulin dose, your Diabetes Specialist Nurse or Dietitian can help you with this.

Activity 10

Look at your record book

Are you sometimes high and sometimes low at a particular time of the day?

This may be because the amount of carbohydrate you eat varies from one day to the next.

You may find it helpful to keep a record of your carbohydrate portions along with your blood glucose record for a few days.

If you try to have a similar number of portions at the same meal each day your blood glucose levels will vary less. This does not mean having the same food each day but using a type of "swap" system. For example three egg-sized potatoes contain the same amount of carbohydrate as two medium slices of bread. One day for lunch you may have a sandwich and the next day you may choose a hot dish with three small potatoes.

By doing regular testing as advised by your diabetes team you can see how well the changes you have made are working.

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