



[Kids In Control OF Food]
Theory booklet

Name: _____

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Introduction



KICK-OFF will teach you how to look after your diabetes so that you can eat what you want, when you want and have good blood glucose control.

This booklet is to remind you of the key messages learnt on the KICK-OFF course.

There are some quizzes at the end of chapters to test your knowledge and space for you to make your own notes.

Contact numbers:

What is diabetes?



Definition

'Diabetes Mellitus has an ancient meaning of 'flowing through' (diabetes) and 'sweet as honey' (mellitus)'.

It is a condition that causes high levels of glucose in the body.

Doctors used to taste the urine to diagnose diabetes, which is how they knew it was sweet.

Thankfully today we have special equipment!

The energy in our bodies comes from the food we eat. The main food group is called carbohydrate. When carbohydrate foods are eaten the body breaks it down to simple sugar called glucose. Carbohydrate foods can be sugary or starchy. Sugary foods include sweets, cakes and sugary drinks. Starchy foods include rice, bread, pasta, potatoes. When the carbohydrate in a meal is broken down into glucose it passes into our body cells with the help of insulin. It is then used for energy or stored in the liver and muscle cells.

To understand diabetes it is important to know about:



Insulin (symbolised by a key)



Glucose (symbolised by a sugar cube)

Insulin is a hormone

A hormone is a messenger. Insulin is made by the pancreas. This is a small organ that sits behind the stomach. The pancreas should be able to produce exactly the right amount of insulin that is required to keep the blood glucose levels normal. This goes wrong when you develop diabetes.

Insulin acts like a key – it allows the glucose from the blood to enter the cell where it is used to supply the cell with energy.



Glucose is a type of sugar

Glucose comes from some of the foods we eat. Any extra glucose is stored in the muscles and liver until needed.

Normal blood glucose levels are between 3.5 - 7 mmol/L



What is diabetes?



Fact

Within our bodies we have millions of different cells all doing important jobs to keep us healthy.

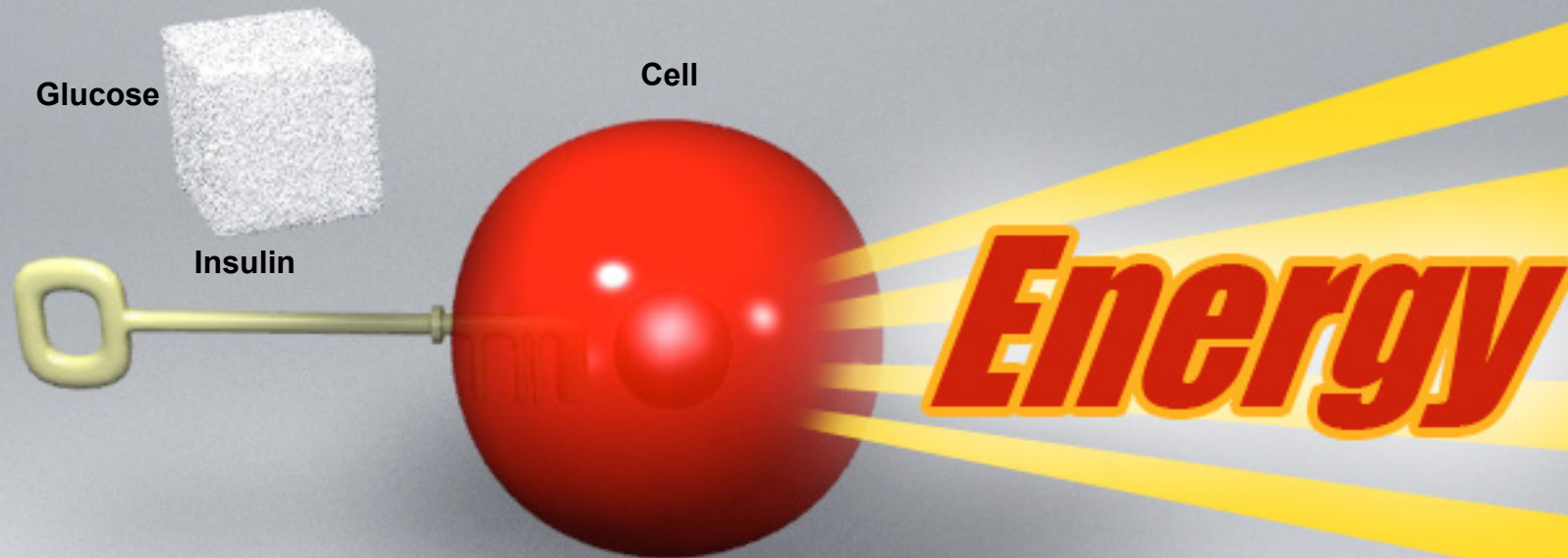
To work properly these cells need the right environment. They need a supply of energy. Glucose is one of the important sources of energy but when you develop diabetes this starts to go wrong.

You cannot catch diabetes from anyone and there is no cure but, with the right treatment, people with diabetes can lead a healthy life.



Remember!

Our cells release energy from glucose. They cannot do this without insulin. Insulin opens the cell door to allow the glucose to enter. Glucose is then used to release energy or is stored.



Quiz



1. Can you catch diabetes?

Yes

No

2. Where does the body's main source of energy come from?

3. Where is insulin produced?

4. Who can develop diabetes?

5. Draw a picture or describe what job insulin has in the body.

Types of diabetes



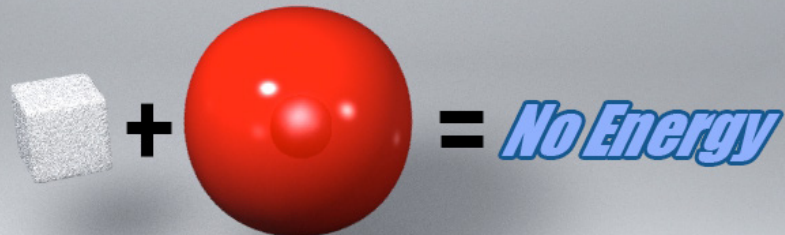
There are 2 types of diabetes:

Type 1 - Insulin dependent diabetes mellitus

Type 2 - Non-insulin dependent diabetes mellitus

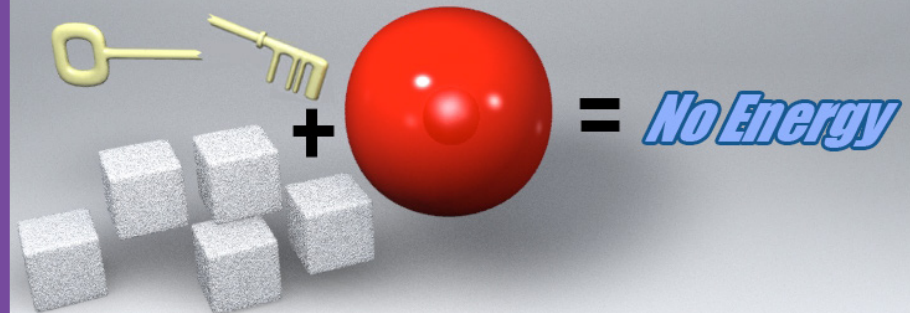
Facts - Type 1 Diabetes

- Type 1 diabetes affects at least 20,000 young people under 16 years in the UK. It is increasing by 3% each year in Europe
- People with this type of diabetes cannot make insulin
- It is an autoimmune disorder. This means that for some reason the body attacks and destroys certain cells. In type 1 diabetes the body attacks the beta cells in the pancreas that produce insulin
- It is not known why this happens. It is more common in young adults and children
- You cannot catch diabetes
- The blood glucose level rises because there is not enough insulin in the body
- Insulin is the only treatment for type 1 diabetes. At the moment it can only be given by injection
- Insulin is needed every day and forever unless there is a cure



Facts - Type 2 Diabetes

- Type 2 diabetes usually affects older people but more young people are being diagnosed
- Insulin is still being made but it does not do its job properly, therefore the glucose level rises in the blood
- Treatment is needed to help the insulin to do its job
- There are a number of ways of treating type 2 diabetes



Remember!

There are different types of diabetes. Having diabetes means the level of glucose in the body is too high. This happens because of either a complete lack of insulin or the insulin cannot do its job properly. The treatment for diabetes depends on the type.

Quiz



1. What are the two types of diabetes?

2. Which type do you have?

3. What is the only treatment for type 1 diabetes?

4. When will the treatment stop?

5. People with type 1 diabetes cannot make

6. Diabetes is diagnosed when the level of _____ in the blood is too _____ due to a low level of _____.

7. The only treatment for type 1 diabetes is to give _____ back to the body.

8. Does eating too many sweets cause diabetes?

Yes No

9. Can stress cause diabetes?

Yes No

10. Why do you think you have diabetes?

Signs and symptoms



The level of glucose in the blood stream should be between 3.5 - 7 mmol/L. The pancreas should produce enough insulin to allow glucose into the cells to be used or stored.

If there is too much glucose in the blood stream a person may feel one or more of the following signs and symptoms:

Feeling tired

The body is lacking insulin therefore glucose does not enter the cell to release energy.

Passing large amounts of urine

The kidneys will try to get rid of the extra glucose by allowing it to spill out into the urine. So a person will need to go to the toilet more often.

Feeling very thirsty with a dry mouth

If a person goes to the toilet more often, more fluid is lost from the body and they will feel thirsty.

Losing weight

Glucose is the best fuel for energy. If it cannot be used then body fat is broken down and used.

This causes 2 major problems:-

1. Weight loss
2. Acids called ketones are made. Weight loss is also due to losing large amounts of water in the urine. This is called dehydration.

A urine or blood test which shows glucose and ketones may be a sign of diabetes. In type 1 diabetes all these signs and symptoms are due to a lack of insulin.

Vomiting, stomach ache, breathlessness, infection

Large amounts of ketones in the body may cause stomach ache and/or vomiting. The body will try to get rid of ketones in the urine and through the lungs by breathing quickly.

A high level of glucose allows bugs to grow, which may lead to an infection.

Loss of appetite

High levels of glucose and/or ketones in the body may cause a loss of appetite.

Quiz



1. List 3 common signs and symptoms of a high blood glucose level:

2. A lack of insulin means the body uses _____ instead of _____ for energy.

3. What may be found in the urine when there is not enough insulin? _____ and _____.

4. Can you remember when you got diabetes? What signs and symptoms did you have?

Insulin and the KICK-OFF course



Fact

For people with type 1 diabetes insulin injections are the only way of giving insulin back to the body. These are given into the fatty layer under the skin.

Fact

In 1922 the first injection of insulin was given. The scientists removed the insulin from the pancreas of cows and pigs (they called it animal insulin). Today they can make it without using the pancreas from animals, it is known as human insulin and is very similar to the insulin produced in the body.

What is the aim of the KICK-OFF course?

- To learn how to work out how much insulin to give with foods containing carbohydrate
- To learn how to be more flexible; to be able to eat what you want, when you want to
- To gain more control of your diabetes

Which type of insulin is the best?

On the KICK-OFF course a basal bolus or intensive insulin regimen is taught. Two different types of insulins are used and the aim is to copy what the body does naturally in people without diabetes.

There are several drug companies which make insulin. Some insulins will do a similar job but have a different brand name, just like clothes designers have their own labels. Some insulins work quickly, others more slowly and some will be a mixture of both.

Your diabetes team will discuss with you the types of insulin best suited for you and your lifestyle.

A slow acting insulin is used to give a constant background level of insulin (this is also called the basal insulin). This means a small amount of insulin is in the body all the time. This should help to keep the blood glucose level within the target range when not eating and when asleep.

A quick acting insulin dose (this is the bolus insulin) is given to match the carbohydrate content of the meal or snack. This is to keep the blood glucose level within the target range after eating.

Sometimes blood glucose levels will stray out of the target range so quick acting insulin may also be used to bring down a high blood glucose. This is called a “correction dose.”



Insulin and the KICK-OFF course



The following information gives a summary about the different types of insulin available and those which may be used on the KICK-OFF course. Insulin action isn't very precise and the same insulin will act differently in different people or in different conditions such as when you are exercising, varying injection sites or in extreme hot or cold temperatures.

The following information gives an outline about the different types of insulin and how they work.

Quick acting (bolus, QA) insulin

For the KICK-OFF course this insulin is used with each meal or snack or when the blood glucose level is too high and needs bringing back into the target range.

There are 2 types:

Quick insulin:- Actrapid, Humulin S.

These may take up to 30 minutes to start working so should be injected 30 minutes before eating. This type of insulin peaks at 2 - 4 hours and ends about 5 - 7 hours after the injection.

Very quick:- Humalog, Novorapid, Apidra

This type of insulin will start working in less than 15 minutes and may be given just before, during or straight after a meal/snack. This type of insulin peaks at 1.5 – 2.5 hours and will end approximately 2 - 5 hours after the injection.

Background (basal, BI) insulin

This insulin is only given once or twice a day and is used to make sure that there is always a small amount of insulin in the body at all times (day and night).

There are 2 types:

Insulatard, Humulin I (peak action time)

After injection they take between 4 - 8 hours to be fully absorbed into the blood stream (called peak action time) and may keep working for 12 hours or longer.

Glargine, Levemir (steady action time)

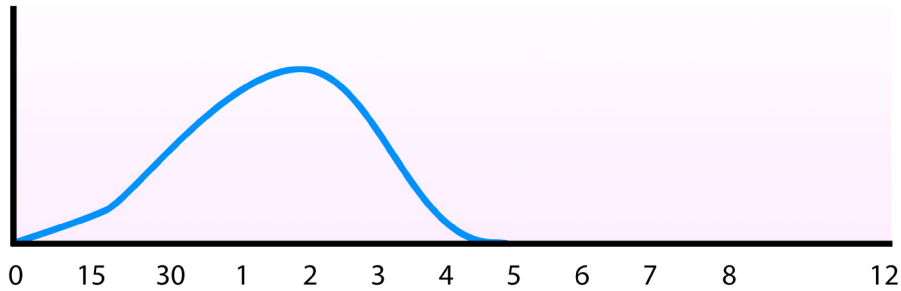
These are background insulins that do not have a peak action time (see diagram). They may be given once a day but some people find their blood glucose control is better giving it as 2 injections, 12 hours apart. Once injected, they give a steady level of insulin in the body for approximately 18 - 20 hours.

(See the following graphs)

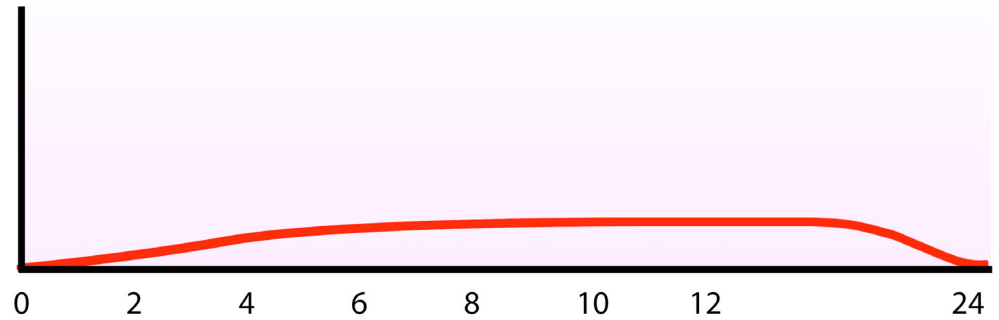
Insulin and the KICK-OFF course



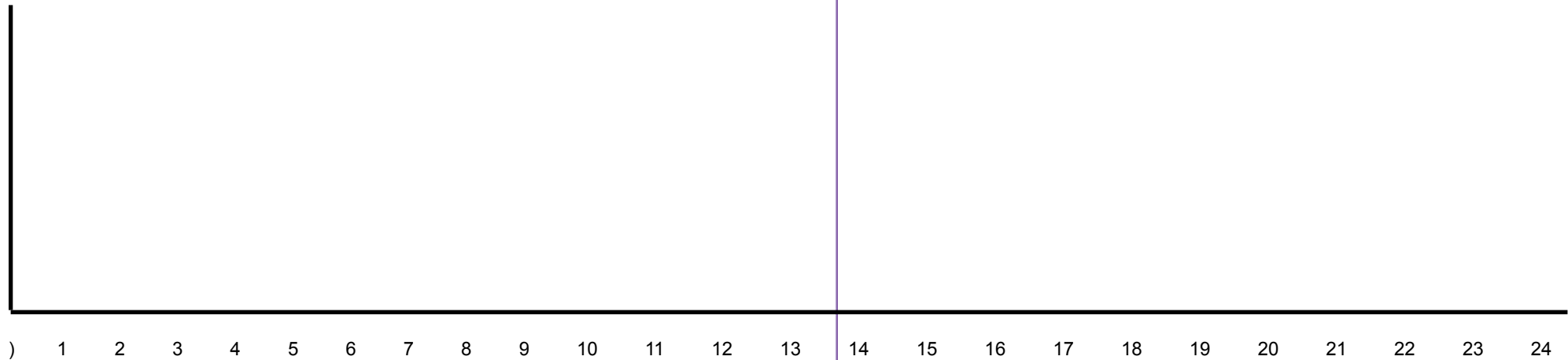
Very quick:- Humalog, Novorapid, Apidra



**Steady action time background insulin:-
Glargine, Levemir**



Draw in your own insulin action times



Insulin to carbohydrate ratios (ICR)



How much QA insulin is needed with food containing carbohydrate?

The KICK-OFF course teaches how much insulin is needed with meals and snacks. The starting amount may be:

1 unit of QA insulin per 10g carbohydrate

This is known as the ratio (amount) of insulin needed for every 10g carbohydrate that is eaten (see page 16 for ICR calculator cards)

BUT some people may find, with time and practice, that more insulin is needed at different times of the day to keep the blood glucose within the target range. The aim is to find out which ratio suits your needs.

This ratio changes the insulin dose for every 10g carbohydrate

½ unit QA insulin/10g carbohydrate	(½ : 10g ratio)
¾ units QA insulin/10g carbohydrate	(¾ : 10g ratio)
1 units QA insulin/10g carbohydrate	(1 : 10g ratio)
1½ units QA insulin/10g carbohydrate	(1½ : 10g ratio)
2 units QA insulin/10g carbohydrate	(2 : 10g ratio)
2½ units QA insulin/10g carbohydrate	(2½ : 10g ratio)
3 units QA insulin/10g carbohydrate	(3 : 10g ratio)

This ratio changes the carbohydrate amount per 1 unit of QA insulin

1 units QA insulin/20g carbohydrate	(1 : 20g ratio)
1 units QA insulin/15g carbohydrate	(1 : 15g ratio)
1 units QA insulin/10g carbohydrate	(1 : 10g ratio)
1 units QA insulin/7g carbohydrate	(1 : 7g ratio)
1 units QA insulin/5g carbohydrate	(1 : 5g ratio)
1 units QA insulin/4g carbohydrate	(1 : 4g ratio)
1 units QA insulin/3g carbohydrate	(1 : 3g ratio)

Name the QA and BI that you are on as you start the course:

QA

BI



Remember!

Everyone needs insulin in the body.

The correct amount of insulin is needed in the body at all times. On the KICK-OFF course QA insulin is given with every meal and snack (if it is 10g or more of carbohydrate) except when the snack is given to treat a hypo. BI is given once or twice a day to make sure there is enough insulin in the body between meals.

Insulin should be given at the correct time and in the right amount for each meal and snack.

Different people need different amounts of insulin. There is no "correct dose."

Quiz



1. What are the two types of insulin that are used on the course?

2. When is a quick acting insulin used?

3. What does the insulin to carbohydrate ratio mean?

4. What is an insulin peak action time?

Insulin to carbohydrate ratio practise



Using the following ratio, calculate how much QA insulin is required. Answers on page 80

Example 1

1 unit QA insulin : 10g carbohydrate

Date	Time	8am	1pm	4pm	6 pm	Comments
	Grams	22g	74g	8g	47g	
	QA					
	BI					
Date	Time	8am	1pm	4pm	6pm	Comments
	Grams	39g	81g	14g	58g	
	QA					
	BI					
Date	Time	8am	1pm	4pm	6pm	Comments
	Grams	25g	67g	24g	88g	
	QA					
	BI					

See opposite for help with working out ratio

$\frac{1}{2}$: 10 ratio ($\frac{1}{2}$ unit QA insulin per 10g CHO)											
Grams	5	10	20	30	40	50	60	70	80	90	100
Insulin	0	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5

1 : 10 ratio (1 unit QA insulin per 10g CHO)											
Grams	5	10	20	30	40	50	60	70	80	90	100
Insulin	$\frac{1}{2}$	1	2	3	4	5	6	7	8	9	10

$1\frac{1}{2}$: 10 ratio ($1\frac{1}{2}$ unit QA insulin per 10g CHO)											
Grams	5	10	20	30	40	50	60	70	80	90	100
Insulin	$\frac{3}{4}$	$1\frac{1}{2}$	3	$4\frac{1}{2}$	6	$7\frac{1}{2}$	9	$10\frac{1}{2}$	12	$13\frac{1}{2}$	15

2 : 10 ratio (2 unit QA insulin per 10g CHO)											
Grams	5	10	20	30	40	50	60	70	80	90	100
Insulin	1	2	4	6	8	10	12	14	16	18	20

$2\frac{1}{2}$: 10 ratio ($2\frac{1}{2}$ unit QA insulin per 10g CHO)											
Grams	5	10	20	30	40	50	60	70	80	90	100
Insulin	$1\frac{1}{4}$	$2\frac{1}{2}$	5	$7\frac{1}{2}$	10	$12\frac{1}{2}$	15	$17\frac{1}{2}$	20	$22\frac{1}{2}$	25

3 : 10 ratio (3 unit QA insulin per 10g CHO)											
Grams	5	10	20	30	40	50	60	70	80	90	100
Insulin	$1\frac{1}{2}$	3	6	9	12	15	18	21	24	27	30

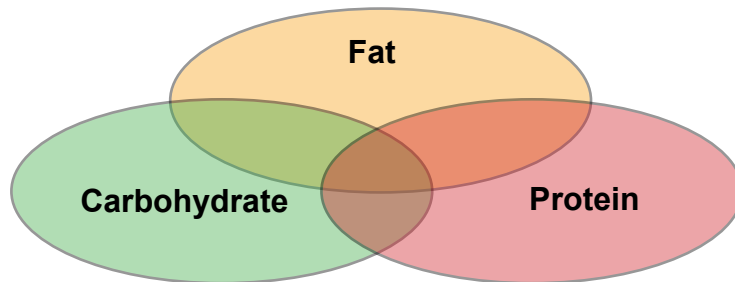
Food, diabetes and KICK-OFF

KICK-OFF

KICK-OFF aims to help **you** keep good blood glucose control and allows **you** to make your own choices about what **you** eat at a time that suits **you**.

What foods do we eat?

Everyone likes to eat different types of food. It is important to know what is in the food and which foods contain carbohydrate.



There are 3 main food groups: -

- **Carbohydrate**
- **Fat**
- **Protein**

All 3 groups are part of a healthy diet if taken in the right amounts (see chapter on healthy eating page 73 for more information).

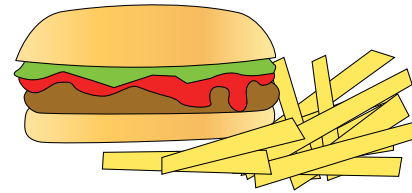
Carbohydrate and fat provide energy. However carbohydrate is the body's main source of energy.

Protein foods are needed for growth, to build muscle and to help repair body tissues. Your body also requires different vitamins and minerals.

Carbohydrate

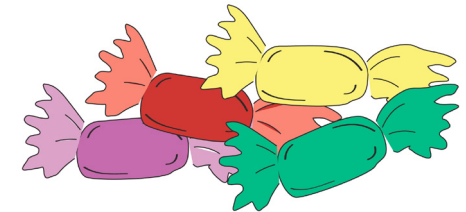
This food group can be split into two types:-

Starchy carbohydrate



Starchy foods include bread, potatoes, rice, pasta

Sugary carbohydrate



Sugary foods include sweets, cakes, sugary drinks and some fruit

After a meal the carbohydrate is digested in the gut and broken down into glucose (simple sugar) which then passes into the blood stream.

Different carbohydrates affect blood glucose levels in different ways. Some carbohydrate foods will raise the blood glucose levels higher and quicker than others.

The Glycaemic Index (GI) is a measurement of how quickly a carbohydrate is digested and absorbed into the blood stream. (See page 21 for more details).

A meal containing a mixture of fat, protein, and carbohydrate will raise the blood glucose slowly.

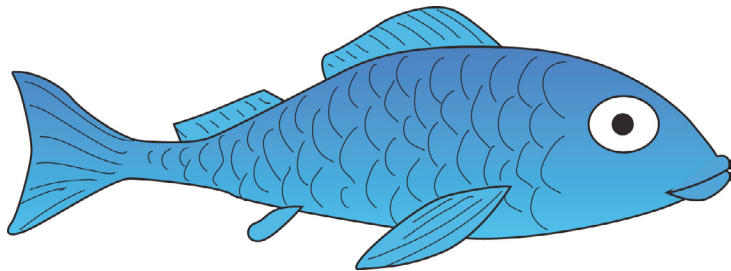
Food, diabetes and KICK-OFF



These food groups do not significantly affect the blood glucose level:

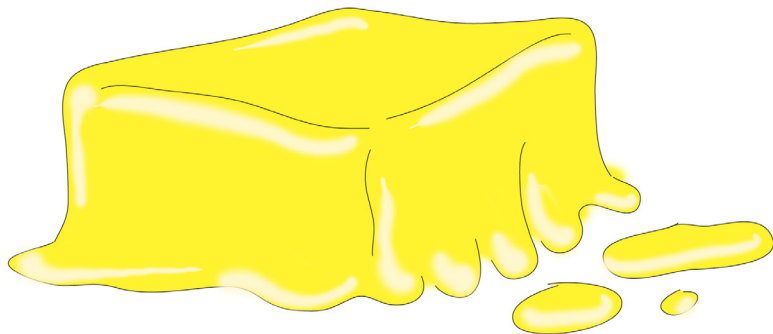
Protein

Protein can be found in eggs, cheese, meat, fish and nuts



Fat

Foods containing fat include butter, cream and oil



Note: Pulses e.g. beans and lentils, are a mixture of protein and carbohydrate, so will raise the blood glucose level. They do this very slowly.

Many foods are a mixture of fat, protein and carbohydrate.



Remember!

Everyone will eat many different types of food, all of which have an important part to play in staying healthy.

The most important source of energy comes from carbohydrate containing foods. The more carbohydrate in the meal the greater the rise in the blood glucose level but this can be controlled by giving the correct amount of QA insulin.

Healthy eating means having a good mixture of all the food groups. This is important for everyone, with or without diabetes.

Quiz



1. Name the 3 main food groups (put your answers next to numbers 1 - 3 below)

2. Name 4 food items belonging to each of these food groups:

1	2	3
_____	_____	_____

3. What are carbohydrate foods broken down into by the body?

4. Name a food which raises the blood glucose level quickly?

Counting grams of carbohydrate



It is important to learn about how much carbohydrate is in the food you eat. The amount of carbohydrate in food is measured in grams (g).

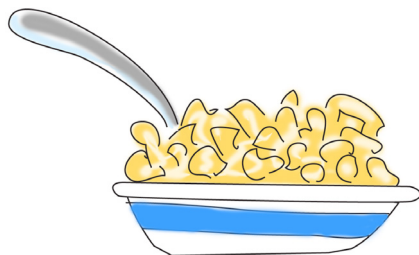
Some food packets e.g. on cereal bars, will tell you the exact amount of carbohydrate they contain. You may then need to decide whether to round up or down before working out the insulin dose, for example:

- 12g carbohydrate = 10g carbohydrate
- 17g carbohydrate = 15g carbohydrate
- 22g carbohydrate = 20g carbohydrate

For larger meals or snacks (with different types of carbohydrate), add up the total amount of carbohydrate first before working out the insulin dose.

Some foods are taken from a large packet or tin e.g. rice, pasta or cereals, so you will have to work out how much carbohydrate is in the portion you are eating. For example:

Look at the label, which will say: '100g weight of cornflakes has 84g carbohydrate'.



Weigh out your normal portion of cornflakes e.g. 45g
(This is the weight of the portion not the amount of carbohydrate)

Typical value per 100g	
Energy	371 Kcal
Protein	7g
Carbohydrate:	84g
of which sugars	8g
of which starch	76g
Fat	0.9g

Note: Only look at the total carbohydrate amount (highlighted here in red) not the "of which sugars" amount.

To work out how much carbohydrate is in your weighed out 45g portion first you need to find out how much carbohydrate is in 1g (weight) of cornflakes. Then multiply this sum by your portion size (example below).

$$84 \div 100 = 0.84g$$

This is how much carbohydrate is in 1g (weight) of cornflakes.

$$0.84 \times 45 = 37.8g$$

This is the total amount of carbohydrate in a 45g (weight) portion.

Summary

For every 100g weight of cornflakes eaten there will be 84g of carbohydrate. You only want to eat 45g weight of cornflakes. So you have to divide 84 by 100 to give how much carbohydrate is in 1g weight of cornflakes which equals 0.84g. Multiply the 1g weight (0.84g) by the weight in grams (45g) of what you want to eat. This gives you the total amount of carbohydrate in a 45g weight portion which equals 37.8g.

If there are no labels on the food you are eating you can use the KICK-OFF carbohydrate portion list or other carbohydrate counting booklets. These booklets will either give you the number of grams of carbohydrate per portion or per 100g of weight. If it gives the amount of carbohydrate per 100g of weight you will have to work out your portion size as explained above.

Counting grams of carbohydrate



Glycaemic index (GI)

The Glycaemic Index is a measure of how quickly carbohydrate food is digested releasing glucose into the bloodstream, and therefore how quickly the blood glucose rises after eating. It is given a score out of 100 and placed in one of the 3 groups: fast, medium or slow.

- Carbohydrate foods that turn into glucose quickly have a high GI score and are called fast acting carbohydrates
- Those that turn into glucose more slowly have a lower GI score and are called slow acting carbohydrates. They help you to feel fuller for longer
- There are some carbohydrates that fall between the fast and slow foods. These are called medium acting carbohydrates

The GI score is given when these foods are eaten on their own. If they are mixed with other foods in a meal the GI score of that meal will be different. For example, if the rest of the meal is very high in fat and or protein the blood glucose will rise more slowly than if the meal doesn't contain lots of fat and or protein.

Look at the following table to see which food is in the fast group and which is in the slow group - there may be some surprises!

* Indicates that these foods are high in fat and should be eaten in moderation as part of a healthy diet, not used for treating a hypo.

A detailed list of foods can be found on the website at:
www.glycaemicindex.com

Carbohydrate food groups	Fast acting carbohydrates High GI (70 and above)	Medium acting carbohydrates Medium GI (55 -69)	Slow acting carbohydrate Low GI (less than 55)
Cereals	Cornflakes, Coco pops, Rice Crispies, Muesli, Wheat Biscuits, Shredded Wheat, Puffed Wheat.	Shreddies, Sustain, Cheerios, Fruit and Fibre type, sultana bran type.	All Bran, porridge oats.
Breads, biscuits and cakes	White or brown bread, french stick, bagel, crumpet, rice cakes, crisp bread, water biscuits, Morning Coffee biscuits.	Muffins, Grainy Bread, Ryvita, pies*, oat biscuits*, Muesli bars*, flapjack*, croissants*, digestive biscuits*, jam doughnuts*, sweet pastries*.	Rye bread, heavy grain bread e.g. granary / multi-grain, wholemeal pitta bread, chapatti, fruit bread, banana cake*, sponge cake*.
Potatoes	Mashed, jacket.	New, boiled, chips*.	Yams, sweet potatoes.
Pasta, rice and grains	Instant rice, brown or white rice, tapioca.	Macaroni, cous cous, cornmeal, millet.	Noodles, pasta, basmati, pilau rice, buckwheat, bulgar wheat.
Legumes and pulses		Lentil soup	Baked beans, chickpeas, barley.
Fruit and vegetables	Very ripe / stewed / dried fruit, watermelon, parsnip, pumpkin, swede, broad beans.	Banana, sultanas, raisins, pineapple.	Apple, apricot (dried and fresh), orange, pear, peach, plum, kiwi fruit, carrot, peas, sweet corn.
Sweets and snacks	Jellies, boiled sweets, Jelly Babies, Jellybeans, some chocolate bars*, taco shells.	Crisps*, some chocolate bars*.	Chocolate*, popcorn, peanuts*.
Glucoses	Glucose, dextrose tablets.	Honey, sucrose.	Fructose, lactose.
Milk / Dairy		Full fat ice cream*.	Low fat ice cream, milk, yoghurt.
Drinks	Lucozade, cola, lemonade.	Orange juice (pure concentrate).	Fresh orange juice.

Counting grams of carbohydrate



Remember!

The actual weight of a food (measured or given in grams) **is not** the same as the carbohydrate amount that a food contains (also measured or given in grams).

You may have to work out the amount of carbohydrate you are going to eat from a large packet of food by weighing out your portion, reading the label then using the equation explained in this chapter. Make a note of the answer in your food diary.

The GI table only shows how fast the food raises the blood glucose level if eaten on its own. As soon as you mix it with other food this alters the time it takes to get into the bloodstream. For example, the fat in chocolate means that the glucose is absorbed slowly. So if you are to treat a hypo it will take longer to recover with chocolate than with Lucozade. It is not recommended that chocolate is used to treat a hypo.

Quiz



1. Where can you find the carbohydrate content on a packet of food?

2. On the packet of food it gives the total carbohydrate amount and 'of which sugars.' Which one should you use to work out your insulin dose?

3. What does GI stand for?

4. Name a low, medium and high GI food:

5. What is a better hypo treatment; chocolate or Lucozade and why?

Guidelines for eating snacks



What is meant by a snack?

A snack is the food you eat between your main meals.

Generally for a snack the 1:10g carbohydrate ratio is used.

10g carbohydrate increases the blood glucose by 2 - 3 mmol/L

However some people to continue to use their previous meals insulin carbohydrate ratio for their snack. You have to see which ratio works best for you and the size of snacks you eat.

Snacks that contain 10g carbohydrate or more may need quick acting insulin

Do not give quick acting insulin, with sugary drinks for exercise or to treat a hypo.

If you eat more than 1 snack, each less than 10g carbohydrate, before your next meal you will need to give extra insulin. Look at the following information and on page 25 to decide when to give the extra insulin:

- If it is over 1 hour before your next meal give the QA insulin needed to cover all the snacks straight away
- If 1 hour or less before the next meal add up the carbohydrate value of the snacks and add it into the carbohydrate amount for the meal before working out the insulin dose. Do not give a correction dose
- If you do a blood test before a snack and it is outside of the blood glucose target range, do not give a correction dose as you may then be at risk of a hypo. But this may change if you are unwell. Then you must follow the sick day rules on page 48
- If you wake up late and have missed breakfast, check your blood glucose as you may then need to do a correction dose

Guidelines for eating snacks



The following chart should help you decide what to do

Does the snack contain 10g carbohydrate or more?

YES:

Quick acting insulin is needed.
Think about when the snack is to be eaten. See below for options:

1. You plan to eat a snack within 2 hours of your last meal?

Do not include the insulin for this snack with the meal (you may change your mind and not eat the snack)
In this instance QA insulin should be given with the snack

2. 1 hour or less before a meal?

Take extra QA insulin for the snack or add to the next meal but do not add any correction doses. (See note below)

3. More than 1 hour before next meal?

Take extra quick acting insulin with the snack.

NO:

Do nothing, background insulin will cover it but if you have a second small snack you will need to give quick acting insulin for both snacks. (see opposite for when to give insulin)

Note: If eating a snack close to meal time, add the carbohydrate of the snack to the meal carbohydrate to work out how much insulin to take. Do not add correction doses for a high blood glucose level.

A correction dose as well as the insulin for the snack may cause an unnecessary hypo.

Your snack ratio is:

Quiz



1. Do snacks that contain 10g carbohydrate or more require QA insulin?

2. When should you not take QA insulin with your snack?

3. If you ate 4 snacks containing less than 10g carbohydrate e.g. 7g carbohydrate each, over a 2 hour period, what would you do?

High blood glucose levels (Hyperglycaemia) correction doses



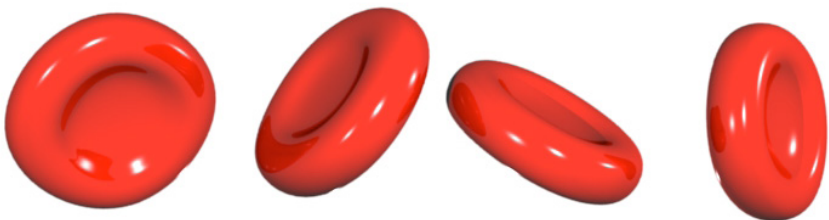
What does it mean to have a high blood glucose level?

People without diabetes have a glucose level of between 3.5 and 7 mmol/L, so anything higher than this is abnormal. For people with diabetes their blood glucose level might go much higher. This may occur when the wrong insulin dose is given or during times of illness. It is healthier for the body to keep the blood glucose level as near to the normal level as possible.

Does a high glucose matter?

Yes: Over many years high glucose levels may damage the vessels that carry the blood around the body. This may cause problems with the heart, eyes, kidneys and nerves. These are often called “diabetes complications.” (See the chapter on complications for more information, page 43.) Keeping the glucose levels within the suggested target range, most of the time, reduces the chance of having “diabetes complications” in the future.

Sort your blood glucose levels out now for a healthier future!



What is a good blood glucose level to aim for?

The KICK-OFF course suggests the following:-

Between 4 and 7 mmol/L before breakfast
Between 4 and 7 mmol/L before meals
Between 5 and 8 mmol/L at bedtime and overnight

Tips to help you achieve these levels:

- Try to do a blood test before each meal and before bed
- Every time insulin is given for food, ask yourself the following questions:
 1. How much carbohydrate am I going to eat?
 2. Do I need to give QA insulin at this time?
 3. What is my insulin:carbohydrate ratio for this time of day?
 4. What is my blood glucose level before the meal?
 5. Do I need a correction dose with my food insulin?
 6. If blood glucose is 14 mmol/L or more check for ketones. If ketones present follow sickday rules advice on page 48. If no ketones are present give a correction dose.



What are correction doses?

A "correction dose" is the extra QA insulin given to bring the blood glucose level down to within the target range before a meal or if unwell.

As a guide:

1 unit of QA insulin usually drops the blood glucose by about 2-3 mmol/L

but you will need to find out what works for you.

Look at the following examples of how to work out how much insulin is needed and how to record an insulin dose for each meal injection. Assume that 1 unit of QA insulin brings the blood glucose level down by 3 mmol/L (remember this may not be the same for everyone, find out how it affects your blood glucose levels).

Note: Carbohydrate is symbolised as CHO

Example 1

It is lunchtime:

Blood glucose result is.....13 mmol/L
The meal contains30g CHO
Ratio at lunch time is.....1 unit : 10g CHO

So you need 1 unit for every 10g CHO you eat.
Therefore divide your total CHO meal by 10g, to work out your insulin dose
e.g. $30 \div 10 = 3$ units

And.....you need to bring your glucose down from 13 mmol/L to less than 7 mmol/L, which is a drop of approximately 6 mmol/L.
1 unit of QA insulin brings the blood glucose levels down by 3 mmol/L
e.g. $6 \div 3 = 2$ units

So the total QA insulin dose for lunch is:-
3 units for food + 2 units correction dose = 5 units (write 3+2 in your diary.)

Example 2

It is tea time:

Blood glucose result is.....6.2 mmol/L
The meal contains.....50g CHO
Teatime ratio is.....1 unit : 10g CHO

So you need 1 unit for every 10g CHO
Therefore divide your total CHO meal by 10g, to work out your insulin dose
e.g. $50 \div 10 = 5$ units

Andas your glucose is within the target range you don't need a correction dose.

Write down meal dose first followed by correction dose if any i.e.
5 (meal dose) + 0 (correction) = 5 units (write 5+0 in your diary.)

Here's one for you to work out! (Answers at bottom - no cheating!!)

It is breakfast time:

Blood glucose result is.....9 mmol/L
The meal contains.....70g of carbohydrate

Ratio at breakfast is 1 : 10g CHO

How much QA insulin is needed for food?.....÷.....=

What correction dose is needed?.....=

So how much insulin is to be given in total?.....

What are correction doses?



Using the examples below calculate the QA insulin required to cover the carbohydrate meal then work out the correction dose needed to achieve blood glucose level within your personal target range. Use 1 unit QA insulin to bring down blood glucose by 3 mmol/L.

Example 1

1 unit QA insulin : 1 Carbohydrate

Date	Time	8am	1pm	6pm	10pm			Comments
	Grams	20	70	50	10			
	BG	10.3	4.4	12.1	7.9			
	QA							
	BI							
Date	Time	11am	3pm	7pm				Comments
	Grams	40	30	60				
	BG	12	5.2	12.1				
	QA							
	BI							
Date	Time	10am	2pm	4pm	8pm			Comments
	Grams	2	60	10	80			
	BG	9.2	11.1	4.5	7.9			
	QA							
	BI							

Quiz



1. At what level is a blood glucose level too high?

2. How does a high blood glucose level affect the body if not treated?

3. What is a correction dose?

4. How much will 1 unit of insulin usually bring the blood glucose down by?

Managing high blood glucose levels



Blood glucose readings always seem high?

3 blood tests in a row, at the same time of the day, which are above the target range means you are not having enough insulin.

Note: If your blood glucose is over 14 mmol/L check for ketones. If you have ketones go to the “sick day rules” chapter page 48.

Think about:

- Are you feeling unwell?
- Are your injection sites lumpy?
- Have you been adding up the food carbohydrates correctly?
- Have you been having extra snacks without QA insulin?
- Do you need to increase your meal time ratio i.e. the amount of insulin you need for each 10g carbohydrate (insulin : carbohydrate ratio)?
- Are you having enough background insulin?
- Are the correction doses working for you?

What should you do?

Look at when the blood glucose levels are high and then use the following tables to help you decide what to do.

Only make one change at a time and wait for 2-3 days to see if it has been sorted out.

Dont ignore high blood glucose tests. Do something about them!

(See chapter on insulin to carbohydrate ratio to remind you about what this means, page 14)

Time of high glucose	Which insulin is working?	What can you do?
Before breakfast	Background insulin	<ol style="list-style-type: none"> 1. Check blood glucose before bed to make sure it is within the target range. 2. Check a blood glucose at 3 a.m. If this is over 5 mmol/L increase the evening dose of BI by 1-2 units. If it is too low (less than 5 mmol/L) or you are hypo, then reduce the evening dose by 1-2 units or 10-20% and recheck blood glucose for next 2 nights at 3 a.m.
Before lunch	Breakfast meal insulin	<ol style="list-style-type: none"> 1. Are you eating more carbohydrates for breakfast than you worked out? Try weighing out your portions 2. Do you need higher insulin : Carbohydrate ratio in morning? Try increasing by ½ unit/10g carbohydrate
Before tea	Lunchtime meal insulin	<ol style="list-style-type: none"> 1. Is your lunchtime carbohydrate correct? Try adding up again 2. Are you having insulin for your snacks? Anything over 10g carbohydrate should have QA insulin 3. Do you need higher insulin:carbohydrate ratio at lunchtime? Try increasing ratio by ½ unit/10g carbohydrate 4. Do you need more background insulin? Increase morning dose by 10-20%
Before bed	Teatime meal insulin	<ol style="list-style-type: none"> 1. Is your teatime carbohydrate correct? Try adding up again 2. Are you having insulin for your snacks? Anything over 10g carbohydrate should have QA insulin 3. Do you need higher insulin : carbohydrate ratio at teatime? Try increasing ratio by ½ unit/10g carbohydrate

Quiz



1. If you have 3 blood tests above 7 mmol/L at the same time of day, what should you do?

2. You have a high blood glucose level and ketones, but do not feel unwell. What should you do?

3. What are some of the things you should think about before changing your insulin dose?

4. If you make a change to your insulin how long should you wait before making any further changes?

Testing

Why, when and what are we testing for?



Blood tests are taken for you, not the clinic!

Why is testing the blood glucose level so important?

- To help you to choose the correct insulin dose with food
- To help you decide whether a correction dose of insulin is needed before you eat
- During times of illness blood glucose levels may rise, therefore you may need extra insulin
- It will confirm a hypo or not

What are you aiming for?

Think about your target range before each meal.
You should aim for:-

- 4 – 7 mmol/L before breakfast
- 4 – 7 mmol/L before other meals
- 5 – 8 mmol/L before bed and during the night

Why is it important to have blood glucose levels within the target range?

- To feel as well as possible
- To prevent low blood glucose levels (hypos)
- To avoid high blood glucose levels. This may lead to diabetic ketoacidosis (DKA)
- To help prevent damage to the eyes, kidneys and blood vessels in the body
- To avoid infections, which are more likely if you have a high blood glucose level

When should you test your blood?

Suggested times to test are:-

- Before breakfast – to check your background (BI) dose is OK overnight
- Before each meal - to decide on a correction dose and check the previous meals QA Insulin carbohydrate ratio
- To help recognise and avoid a hypo
- To check that blood glucose levels are within your target range
- Before, during and after exercise
- During times of illness
- Before bed

Testing

Why, when and what are we testing for?



Does keeping a record of your results help?

YES You should look back on your test results so that you can make any necessary changes. These changes are aimed at achieving better blood glucose control. Some meters will download results onto a computer spread sheet each week.

What is an HbA1c blood test?

It is a small sample of blood taken to check your glycosylated haemoglobin (HbA1c for short).

It measures the glucose that sticks to the red blood cells and tissues in the body. The more glucose in your blood, for the last 2-3 months, the higher the HbA1c result.

For people with diabetes it is recommended that you aim for < 58 mmol/mol (< 7.5%).

If this result stays above 58 mmol/mol for a long time, there is a higher risk of the excess glucose causing damage to the eyes, kidneys and tiny blood vessels in the body.

If the average result is too low then you may have more hypos.

Any improvement in a high HbA1c result will help to prevent further damage to your body.



Remember!

Regular testing is important. It allows you to make the right decisions about your diabetes.

The clinic test (HbA1c) taken every 3 months, helps to show you how you are managing your diabetes.

If it is higher than you would like, the clinic will help.

Any reduction in your HbA1c level helps to prevent damage to your body. Ideally you should aim for < 58 mmol/mol.

**EVERYONE NEEDS ADVICE SOMETIMES.
PLEASE ASK FOR HELP IF YOU ARE STRUGGLING.**

Quiz



1. List 3 reasons for having good blood glucose control:

2. What blood glucose level should you aim for before meals?

3. Glycosylated haemoglobin (HbA1c) measures the _____ that sticks to the _____ and tissues in the body. The recommended HbA1c level for people with type 1 diabetes is _____

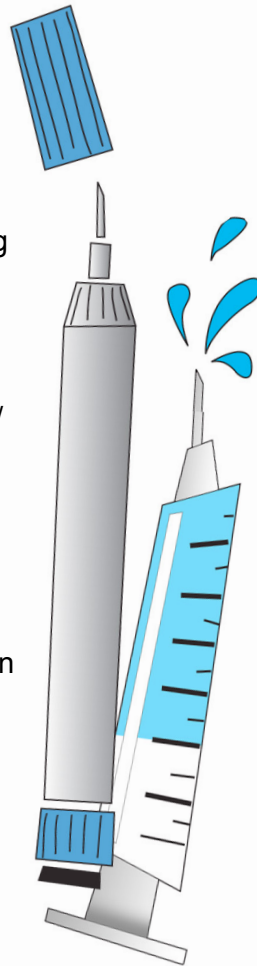
4. Who are the blood tests taken for?

Tools of the trade

KICK-OFF

Injecting insulin

- The body needs some insulin in it at all times. More quick acting insulin is needed at meal times and during times of illness
- Insulin can be given with a pump, insulin pen and/or syringe
- Insulin pens and syringes use 2 types of insulin: quick acting (with meals and times of raised blood glucose) and slow acting (to provide a small amount of insulin to the body all the time)
- Pumps only use quick acting insulin (to provide background/ basal insulin as well as bolus insulin for meals)
- It is important to choose a device that is easy to use and to carry around
- Think about places you go all the time i.e. school, youth clubs and think how and where you will be taking your insulin



Insulin pumps

- Pumps only use quick acting insulin
- A small needle or plastic cannula (tube) is inserted under the skin which is then attached by a thin tube to an insulin pump
- The needle or cannula has to be changed every 2 days
- You have to wear the pump all of the time
- The pump is set up to deliver small amounts of insulin during the day and night
- When a meal containing carbohydrate (CHO) is eaten you work out how much CHO there is then, press a button to deliver the correct amount of insulin
- For more in depth information please refer to your diabetes team and the insulin pump manual

Tools of the trade



There are 3 different ways of giving insulin:

1. Insulin pump
2. Insulin pen
3. Insulin syringe

Which device should you choose? See the chart below to help you decide.

Whichever device you choose please make sure that you have been shown how to use it correctly!

Question	Cost of device	Batteries	Type of insulin	Injecting insulin	Number of blood tests	Memory of last dose?	Download to computer	Calculate insulin dose	Gain better control	Do you have to wear it all the time?	Can you prevent giving too much insulin?
Pump	You may have to pay for consumables	Yes	Only quick acting	No Delivered by a pump. But a cannula is inserted every 2 days	At least 4-5/day.	Yes And previous doses	Yes All information about insulin dose and carbohydrate eaten	Yes Some meters can calculate the insulin dose when the carbohydrate amount is entered	Yes If used correctly	Yes Except for certain sports	Yes The pump may be set to prevent giving too much insulin
Insulin Pen	Free	No	Quick acting and slow acting	Yes New needle each time	At least 4-5/day.	Yes By using a certain pen top	No	No	Yes If used correctly	No	No
Insulin syringe	Free	No	Quick acting and slow acting	Yes New syringe each time	At least 4-5/day.	No	No	No	Yes If used correctly	No	No

Tools of the trade



Points to remember, when giving insulin

- Always check that the insulin is in date. The insulin you are using will last for 1 month if kept out of the fridge
 - Spare insulin may be stored in the fridge. It is OK to keep it there until the expiry date
 - If using an insulin pen or syringe make sure you have the correct length of needle (see chart page 39)
 - Remember to do an air shot before giving insulin with a pen
 - Insulin should be injected at 90°, into the fatty layer under the skin
 - Injections of insulin may be given in the upper outer thigh, abdomen (1 inch away from the tummy button) and upper outer area of the arm or in the bottom. During the KICK-OFF course you will discuss preferred injection sites
 - You may need to pinch up the area to be used, to prevent injecting too deep. (Deeper injections may hurt more and your insulin will start working sooner)
 - Insulin injected into the abdomen or an exercising limb, e.g. injecting into the thigh before a run, is absorbed quicker
 - Always injecting into the same place will cause a lump. Lumps stop insulin from being absorbed smoothly. Avoid this area and the lump will disappear if not used for a few weeks
- Cloudy insulin, for the background dose, needs mixing first by tipping the pen or cartridge 10 times before injecting
 - Remember to change the cartridge or disposable pen when the bung reaches the thick coloured line
 - Always carry a spare cartridge with you
 - Always dispose of sharps carefully
 - Do not use any devices for giving insulin if they are faulty. It may mean not giving enough or too much insulin
 - Always carry some form of ID to identify you have diabetes and take insulin

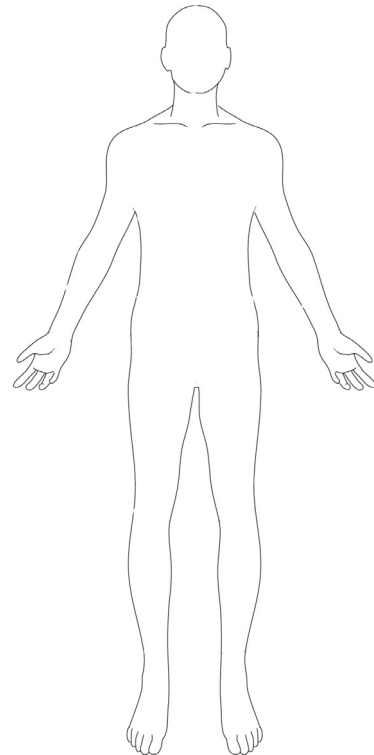
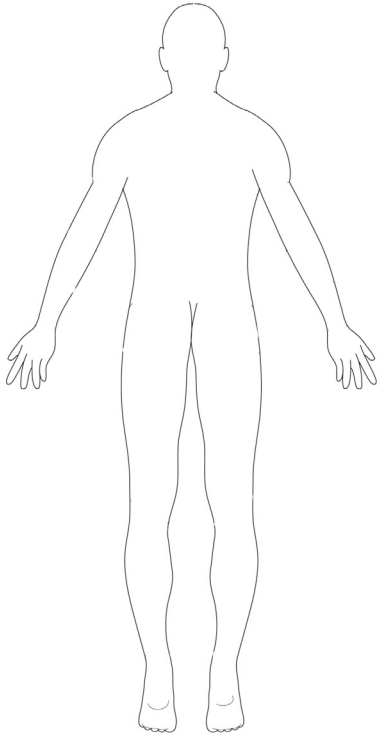
Tools of the trade



Pen needle sizes

5mm, 6mm, 8mm, 12mm lengths are available.	Most people will use either the 5mm, 6mm or 8mm length needle.	A needle clipper disposes of the needle safely.
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It is better to prevent lumps from happening. Make a note here about where and how you have been advised to do an injection. (Shade the injection site.)



Syringe needle sizes

1ml syringe	0.5ml syringe	0.3ml syringe
6mm, 8mm, 12mm length needle	6mm, 8mm, 12mm length needle	6mm, 8mm length needle

Notes

Tools of the trade



Blood glucose meters

At least 4 blood tests a day will be taken during and after the KICK-OFF course, so it is important to choose the right meter.

Think about:

- Size of meter. Does it fit into your bag or pocket so that you can do a test at any time?
- Does it store your results? If so how many?
- Does it connect to an insulin pump?
- Do you want your meter to check for blood ketones as well?
- Do you want it to download information onto your computer?
- Do you want the test strip to be built into the meter or do you prefer to carry a separate pot of strips? Where will you store extra strips?
- Do you need to put a code into the meter for each new pot of strips?
- Do you need batteries?
- Is it easy to clean?
- Do you want to be able to put other messages into the meter e.g. how much carbohydrate you have eaten?
- Blood glucose meters come with a finger pricker; it is important to have one you like, that can be carried around safely

Points to remember



Always wash your hands before doing a test.

Washing in warm water helps the blood flow to the tips of your fingers, as well as washing away anything that may affect your blood test result.



Use the side of your finger not the middle.

This will make it more comfortable.



Change the lancet after each test.

Using the same lancet each time will cause more pain.



Dispose of the lancet safely.

Empty cans are a good way of getting rid of old lancets. Make sure the can is sealed when full before throwing away.

Tools of the trade



Ketostix and blood ketone strips

They detect ketones in the urine or blood.

They are used during times of illness or to check for ketones if the blood glucose level is 14 mmol/L or more.

Ketones can make you very sick and are a sign that you may not have enough insulin in your body. (See chapter on sick day rules for more information, page 48.)

- Do not forget to check the expiry date on the urine ketostix bottle
- Bottles should not be used if they have been opened for more than 6 months
- The bottle must be stored in a cool, dry place (not the fridge)
- You can get more supplies from your GP or diabetes clinic
- If you have ketones in your urine follow the “sick day rules advice”
- Some meters have different strips to measure ketones in the blood. This method picks up a change in ketone levels in the blood quicker than it is detected in the urine



Remember!

Always remember to take your insulin on time.

Rotate your injection sites to prevent lumps.

Change your pen needles after each injection.

Choose the insulin delivery device and meter that is right for you.

Always have a pot of ketostix or blood ketostix at home to check for ketones if you are ill.

Blood glucose meters will prompt you to check for ketones if the blood glucose is too high. It does not mean you have ketones but you should check for them.

Ketones are a warning sign DO NOT IGNORE THEM!

Quiz



1. How long does insulin last when kept out of the fridge?

2. Where in the body can you inject insulin?

3. What happens if you repeatedly inject into the same place?

4. Will lumps disappear?

5. When should you test for ketones?

6. What should you do before taking a blood test?

Diabetes complications

What does this mean?



Warning!

High blood glucose levels over many years e.g. 10-15 years may cause damage to parts of the body such as the eyes, kidneys, nerve endings, heart and blood vessels.

Good News

The good news is that a research group in America proved that keeping blood glucose levels in single figures, most of the time, reduces the chance of getting problems.

This is why taking blood tests every day is important.

There will always be times when the blood glucose level goes too high. As a guide the blood test taken in clinic every 3 months will help to show how your diabetes is being controlled.

- This is called the HbA1c. (See chapter on why, when and what are we testing for, page 33)
- Your clinic will tell you which level you should be aiming for but in general a level of less than 58 mmol/mol (7.5%) indicates that diabetes control is good

Some people may never get any diabetes complications and some people may be more at risk because that is how their body is made.

We do not know who is at greater risk of getting these problems therefore the same advice is given to everyone.

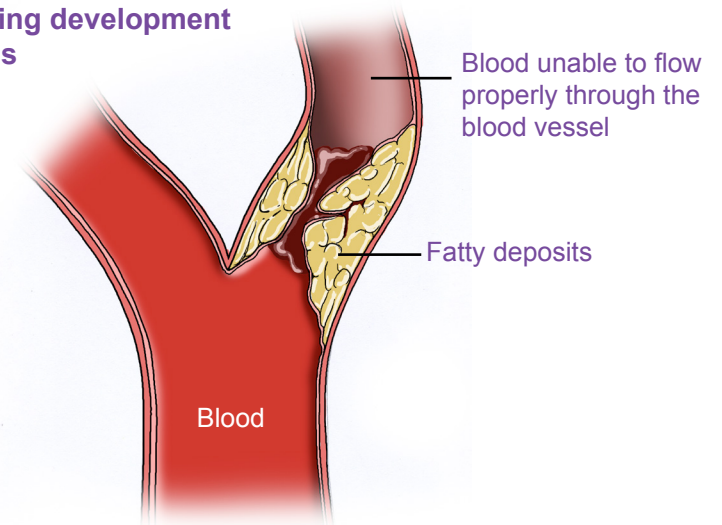
The following gives you some information about what may happen if the blood glucose level is too high for too long

Blood vessels

Problem – Macro & Microvascular Disease

High blood glucose levels may cause damage to the blood vessels around the body. This can cause problems to the tiny blood vessels (these are called microvascular complications) such as in the eyes, kidneys and nerves. Damage to the larger blood vessels is called macrovascular complications and can result in a higher risk of heart attacks or “hardening of the arteries” (atherosclerosis). A diet high in fat also adds to this problem, so a low fat diet is recommended.

Illustration showing development of atherosclerosis



Diabetes complications

What does this mean?



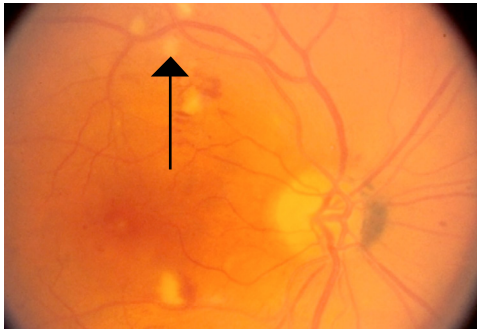
Eyes

Problem – Retinopathy

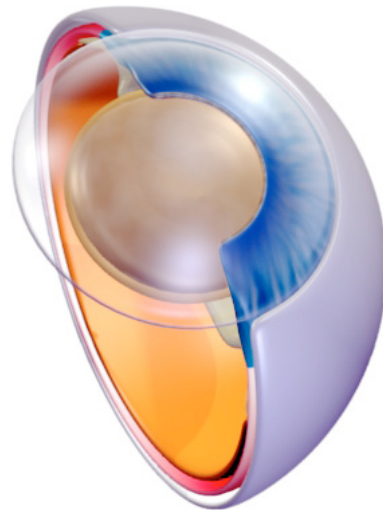
The retina is the inner lining of the eye and the area which receives all the visual messages. Diabetes may cause damage to the tiny blood vessels in the retina which can affect the vision.

If a problem is found early, treatment can be given to try and prevent permanent damage.

It is very important that people with diabetes have a yearly eye check. This is usually done by having a photograph taken using a special camera or by a doctor looking directly at the back of the eye with a torch (an ophthalmoscope). Make sure you get your eyes checked every year.



Signs of retinopathy



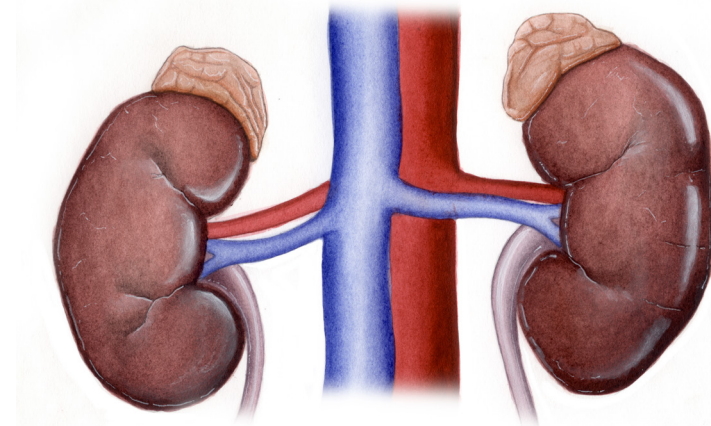
Kidneys

Problem – Nephropathy

The urine is tested for a protein called albumin. Early damage to the kidneys may cause increased amounts of albumin to leak into your urine. This is called micro-albuminuria. We know that levels of albumin can vary so don't worry if you have one sample with a raised level. It often settles down but to make sure, your clinic will probably ask you to do more samples.

Your kidneys also help control your blood pressure so this is also checked. If your blood pressure is high and you have micro-albuminuria your doctors may talk to you about starting treatment to help reduce the chance of kidney problems getting worse.

Yearly urine and blood pressure checks are needed to detect the first signs of kidney problems.



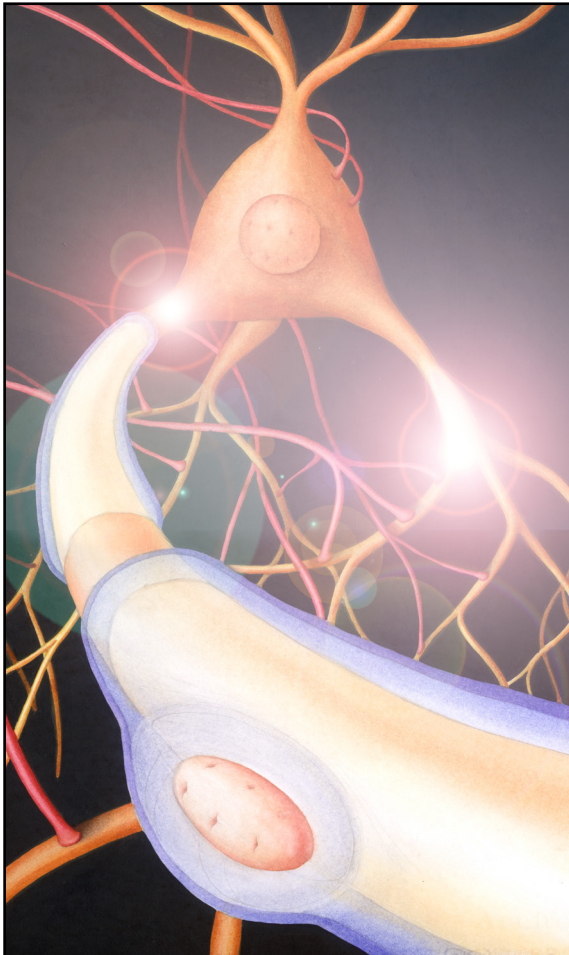
Diabetes complications

What does this mean?



Nerve endings

Problem - Neuropathy



High blood glucose levels can damage the nerve endings all over the body.

“Pins and needles” or shooting pains that do not go away, in the feet and lower leg, are usually the first signs.

Damage to the nerves in other organs, for example the stomach and the heart, can also happen.

Illustration of a nerve cell

Health checks in diabetes clinic

Once a year the following health checks should be done. This helps you and the diabetes team ensure you are as healthy as possible. You should attend your clinic every 3 months and during the year the following checks will be done.

- **Eye check** – you may have to go to another clinic for this
- **Blood pressure check** - a raised blood pressure may be a sign that the blood vessels are not as healthy as they should be
- **Urine sample** (usually collected first thing in the morning). This checks how healthy your kidneys are
- **Two blood tests** are taken to look for **Thyroid** and **Coeliac diseases**. Both these conditions are known as autoimmune conditions and cannot be prevented but they can be treated. The symptoms of these conditions may go unnoticed which is why a blood test is taken
- **Thyroid disease** Affects the balance of a hormone. If this hormone is low the symptoms may include feeling very tired, constipated and may affect growth and weight control. If the hormone is too high the symptom may be weight loss and shakiness. Thyroid disease can be treated
- **Coeliac disease**. This is due to a reaction to gluten in your diet. The bowel wall becomes damaged and cannot absorb food. The treatment is to have a gluten free diet. If untreated it may also affect growth, weight and diabetes control

Diabetes complications

What does this mean?



- **Height and weight** are checked every 3 months. This is because young people are growing and changing all the time and diabetes affects this. Too much insulin and a poor diet may cause weight gain and not enough insulin slows the growth rate down
- **Feet** are checked to make sure you are looking after them. They may be ok now, but if your blood glucose control is not as good as it should be, this affects the flow of blood and damages the nerve endings. This means the feet do not get the oxygen and nutrients they need to be healthy. This can cause sores and areas of loss of feeling in the toes. So let's not allow this to happen; by keeping good blood glucose control, regularly looking at our feet so any early problems can be picked up and treated, know how to cut toe nails correctly and wear good fitting shoes



Remember!

THE GOOD NEWS IS:

Healthy eating, plenty of exercise, keeping blood glucose levels in the normal range and not smoking will reduce the chance of diabetes complications in the future.

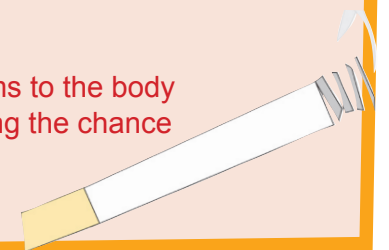
By attending diabetes clinic regularly throughout the year you will be able to discuss your diabetes care.

IT IS UP TO YOU TO DECIDE WHAT YOU DO!!

WARNING

Smoking cigarettes can cause similar problems to the body as high blood glucose levels therefore doubling the chance of damaging the blood vessels.

So say NO to smoking!!!



Quiz



1. Name 4 parts of the body that can be damaged by long term high blood glucose:

2. What are the checks your diabetes clinic should be doing throughout the year?

3. What can further increase your risk of damaging the blood vessels in your body?

4. What can you do to try to prevent diabetes complications?

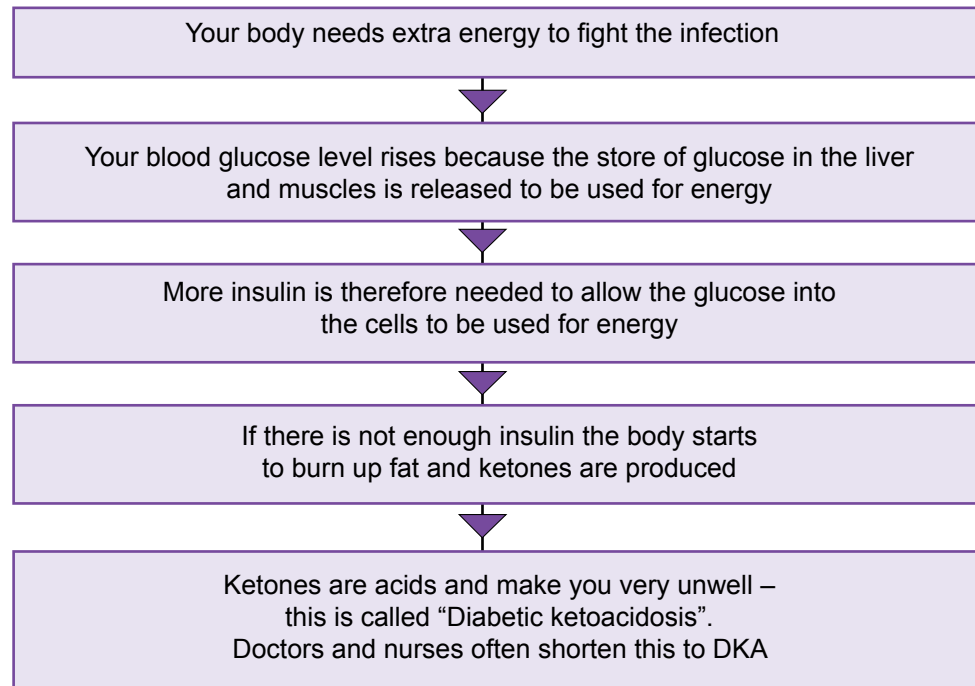
Sick day rules



Diabetes when you are ill - 'sick day rules'

Even a minor illness can be a problem when you have diabetes.

What happens during most illnesses?



Do blood glucose levels always rise during illness?

No - for example, if you get a tummy bug your glucose may fall.

What should you do for this?

- Give your usual insulin if your blood glucose is over 5 mmol/L
- Have your carbohydrate as sugary drinks if you don't feel like eating
- If blood glucose is less than 5 mmol/L - give background insulin only and have 20g carbohydrate as a sugary drink
- Check blood glucose levels every 1 - 2 hours
- If you struggle to keep your blood glucose level over 5 mmol/L, reduce next background insulin dose by 20-50% (upto half normal dose)
- If you have not eaten for a while you may get some ketones. If your blood glucose level is in the normal range, do not worry

If you are not sure what to do, contact your diabetes team

What happens if you get Diabetic Ketoacidosis (DKA)?

- When blood glucose is high - you are thirsty and start weeing lots. This makes your body very dry (dehydrated)
- Your body makes ketones
- Ketones can make you vomit
- Ketones can give you stomach ache
- Ketones make you breathless
- People can smell ketones on your breath - it smells like pear drops!
- Ketones make you drowsy and may sometimes lead to unconsciousness

Sick day rules



DKA is a very serious problem which can make you very ill; you may need to be looked after in hospital.

By using the guidance on the next few pages you may be able to avoid a hospital admission

If you feel unwell and/or have a raised blood glucose level 14 mmol/L or more with negative or traces of ketones, use the following advice:

- Check blood glucose level before every meal and at bedtime
- Check your urine or blood, for ketones if feeling unwell or your blood glucose is 14 mmol/L or more
- Keep checking for ketones with every blood glucose test 14 mmol/L or more or until you feel better
- Give your current background insulin dose
- Use normal QA insulin carbohydrate ratio with meals
- If you are not eating, have your usual carbohydrate meal as sugary drinks. This will give you some energy. You should also have at least 1 glass of sugar free juice or water every hour
- If you have a hypo give usual hypo treatment. (Remember not to give extra insulin when treating a hypo)

- Use correction doses every 2 hours if blood glucose out of the target range with negative or trace of ketones

A "correction dose" is the extra insulin given to bring the blood glucose level down to within the target range before a meal. Always use quick acting insulin for this.

As a guide:
1 unit of QA insulin drops the blood glucose level by about 2 - 3 mmol/L but you will need to find out what works for you.

- If you have 3 insulin correction doses and there is no change in your ketone or blood glucose level or don't know what to do, contact your diabetes team

Sick day rules



Feeling unwell and blood glucose is 14 mmol/L or more

TEST YOUR URINE IMMEDIATELY FOR KETONES



Remember!

Ketones can build up in your blood and urine within a few hours

- Always give your normal background insulin at the usual times
- Drink plenty of water or sugar free drinks during the illness (at least 1 glass per hour)
- You will need extra quick acting insulin straight away

Choose one of the following boxes to decide how much insulin you will need.

If you have small or moderate ketones (+ or ++ or 1.1 - 2.9 blood ketones)

Follow 10% rule

If you have large ketones (+++, 3.0 or more blood ketones)

Follow 20% rule

10% rule – If you have small or moderate ketones +, ++ or 1.1 - 2.9 blood ketones

1. Work out 10% of your usual total daily insulin dose by dividing total by 10 (see example in red below)
2. Give this amount as quick acting insulin – Humalog or Novorapid (you can also use Actrapid)
3. Repeat your blood and urine tests every 2 hours
4. If blood glucose drops to less than 14 mmol/L and you still have small/moderate ketones, have the extra QA insulin AND also have 10-20g carbohydrate as a sugary drink to help prevent a hypo
5. Repeat the extra 10% insulin dose EVERY 2 HOURS until your ketones reduce to negative or a trace
6. When ketones are negative/trace (< 0.6) and the blood glucose < 14 mmol/L use correction doses 2 hourly. When the blood glucose level is within target range return to your usual insulin plan

How to work out 10% of a Total Daily Dose:

Add up all the insulin doses taken on a normal day or the day before the illness started.

Example: The usual insulin is 12 units a day of BI and QA with meals – previous day's insulin; 4 units with breakfast, 6 units with lunch and 8 units with tea.

The total daily dose is

$$12+4+6+8 = 30 \text{ units}$$

$$10\% \text{ of } 30 \text{ units is } 30 \div 10 = 3 \text{ units}$$

3 units is 10% of the daily dose to be given every 2 hours

Sick day rules



20% rule – If you have large ketones +++ or 3.0 or more blood ketones

- Work out 20% of your usual total daily insulin dose by dividing total by 5 (see example in blue text below)
- Give this amount as quick acting insulin – Humalog or Novorapid (you can also use Actrapid)
- Repeat your blood and urine tests **every 2 hours**
- If blood glucose is less than 14 mmol/L and you still have large ketones, have 10-20g carbohydrate as a sugary drink as well as the extra 20% quick acting insulin
- Do not give even more insulin for the sugary drink as this drink is to prevent a low blood glucose
- Repeat the extra insulin dose EVERY 2 HOURS until your ketones reduce to small or moderate (blood ketones < 2.9). Then follow 10% rule

How to work out 20% of a Total Daily Dose?

Add up all the insulin doses taken on a normal day or day before the illness started

Example: The usual insulin is 12 units of BI and QA with meals – previous days insulin; 4 units with breakfast, 6 units with lunch and 8 units with tea.

The total daily dose is:

$12+4+6+8 = 30$ units

20% of 30 units is $30 \div 5 = 6$ units

Contact the diabetes team/hospital

tel:.....

if you are:

- Vomiting
- There are still large ketones (+++ or over 3.0 blood ketones) after 3 extra doses of insulin
- Looking ill (e.g. dry mouth, sunken eyes, sleepy, breathless)
- Worried



Remember!

- Ketones can appear even when you have a mild illness
- More care is needed to control blood glucose levels during times of illness
- **DKA is a very serious problem and will need hospital treatment**
- You can prevent DKA by following the advice and asking for help if it is not working

During times of illness

- ALWAYS give your insulin. (The dose may change depending on how the illness affects your blood glucose levels)
- Test your blood glucose level before every meal or every 2 hours depending on the advice you are following
- If your blood glucose is 14 mmol/L or more test urine for ketones
- If blood glucose is 14 mmol/L or more and you are not vomiting follow the advice on page 50 and 51
- Drink plenty of glucose free drinks (at least 1 glass of water per hour)
- If you have a blood glucose 14 mmol/L or more but a trace of ketones use correction doses to manage blood glucose levels but keep checking for ketones to ensure they do not go above a trace

If you are vomiting or find it difficult to control your blood glucose: **don't wait - phone the diabetes team/hospital.**

Sick day rules



A chart to work out quick acting insulin dose for the 10% and 20% sick day rules

Total Daily Dose	10% Sick Day Dose	20% Sick Day Dose
6-10	1	2
11-15	1.5	3
16-20	2	4
21-25	2.5	5
26-35	3	6
36-45	4	8
46-55	5	10
56-65	6	12
66-75	7	14
76-85	8	16
86-95	9	18
Over 96	Call your diabetes team	Call your diabetes team

Quiz



1. List 4 signs or symptoms of having diabetic ketoacidosis:

2. How often should you test your...

a. Blood glucose level if it is 14 mmol/L or more but negative ketones?

b. Urine or blood for ketones if you are ill?

3. When would you follow...

a. The 10% rule?

b. The 20% rule?

4. When do you use correction doses?

5. What should you do if you feel drowsy, start to vomit or still have ketones after 3 doses of QA insulin?

Hypoglycaemia



What does hypoglycaemia mean?

HYPO (low)
GLYC (glucose)
AEMIA (blood)

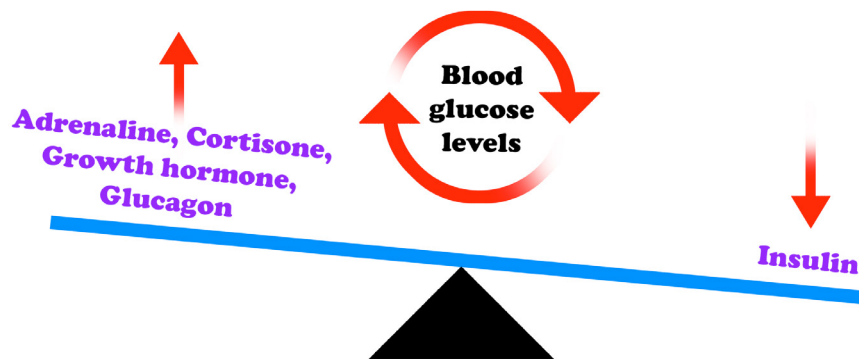
Hypoglycaemia (hypo) is the term given to a blood glucose level which is too low, less than 4 mmol/L.

“4 is the floor”

How does the body control the glucose level in a person who does not have diabetes?

The blood glucose level should always be between 3.5 mmol/L – 7 mmol/L. It is controlled by messengers called hormones. They respond to the level of glucose in the blood.

One hormone will lower a high blood glucose level (insulin) whilst another group will raise a low blood glucose level (adrenaline, glucagon, cortisone and growth hormone). They work together like a see-saw (see diagram below).



Extra glucose is stored in the liver and muscles as GLYCOGEN.

If glucose is needed quickly, glucagon releases the glycogen stores from the liver but not the muscles. This is trapped there to provide fuel for exercise.

A person without diabetes does not have to think about their blood glucose level; the hormones do the job automatically for them.

How does a person with type 1 diabetes control their blood glucose level?

A person with diabetes does have to learn how to control their blood glucose levels when it is affected by food, illness and stress etc.

As the blood glucose level rises the correct amount of insulin needs to be injected.

If the blood glucose level falls quickly for some reason (see page 55 'what causes a hypo') the other hormones do not act quickly enough. This can cause a hypo and needs prompt treatment.

Fast acting carbohydrate should be eaten to treat the hypo.

If unable to eat and drink then an injection of glucagon called Glucagen® may be given. This will raise the blood glucose level.

Hypoglycaemia



What causes a hypo?

- Too much insulin
- Insulin taken at the wrong time
- Unplanned activity
- Alcohol
- An error counting the carbohydrate content of the food
- Hot weather
- Food not absorbed during illness i.e. vomiting and diarrhoea

An occasional mild hypo is normal and harmless - but it is still important to think about why the hypo happened.

What are the signs and symptoms of a hypo?

As the blood glucose level falls, warning signs (mild hypo signs) are felt so that you have time to act.

If the glucose level falls too low the brain will give out warning signs which other people will notice (moderate/severe hypo).

Signs and symptoms will vary from person to person and they may change when you have had your diabetes for some time. If blood glucose levels are usually too high, people may feel hypo when their blood glucose level falls a bit but is still above 4 mmol/L. As your diabetes control improves you may find your hypo warning symptoms start at a lower blood glucose level.

There are 3 stages to a hypo. You probably have had some of the following symptoms. Hopefully you will be able to spot the mild symptoms and treat your hypo before it becomes moderate or severe.

Mild hypo

Shaky
Sweaty
Dizzy
Hungry
Headache

Moderate hypo

Confused
Feel aggressive
Have difficulty with speech
Lose concentration
Blurred vision

Severe hypo

Loss of consciousness
Extreme confusion
Convulsion

Other people may notice that you look pale and/or confused.

Hypoglycaemia



How to prevent a hypo:

- Give correct insulin dose for the amount of carbohydrate to be eaten
- Be aware that exercise may lead to a hypo either during or after the activity. Therefore insulin doses around planned activity need to be reduced and/or a carbohydrate snack taken
- Take regular blood tests. This shows you whether or not your insulin dose is correct
- Be aware that during hot weather your blood glucose level may fall
- Be aware that alcohol may cause a fall in blood glucose
- Let your diabetes team know if you regularly drop to a blood glucose level of < 3 mmol/L before feeling hypo

Write down your signs and symptoms of a hypo and how you treat it:

How low is your blood glucose level when you start to feel hypo?

What should you eat/drink to treat a hypo?

Hypo symptoms will start at a different level in everyone but as a rule anything less than 4 mmol/L is classed as a hypo and needs treatment. Remember to treat your hypo immediately. Do not wait. Carbohydrate containing foods are needed to raise the blood glucose level.

There are two types called fast acting and slow acting carbohydrate foods.

1. Fast acting carbohydrate

This form of carbohydrate is the best treatment for a hypo.

You will need 15-20g carbohydrate, for example:

- Lucozade original 90-120mls/half a tea cup
- Fruit Juice 150-200mls
- Lemonade 215-290mls
- Ribena 200ml carton
- Coca Cola (not diet) 150-200ml, small can
- Lucozade or dextro energy tablets; 4-6 tablets
- GlucoTabs (4g per tablet); 4-5 tablets
- 1½-2 tubes of glucose gel (called Glucagel)

NOTE: If your symptoms do not improve within 5 -10 minutes, recheck blood glucose level. Repeat the hypo treatment if necessary before having slow acting carbohydrate. Decide if you need slow acting carbohydrate when your blood glucose level is > 4 mmol/L.

Hypoglycaemia



2. Slow acting carbohydrate

There are foods which contain a lot of glucose but, because the glucose is in a more complicated form or is mixed with fat or protein, the glucose takes a long time to get into the blood stream. These foods do not work fast enough to treat a hypo.

As you start to feel better, you may need to take an extra 10 - 20g of slow acting carbohydrate. This will help to keep your blood glucose level up until your next meal, especially if the hypo occurs during the night.

Try not to over treat a hypo as this will lead to unnecessary high blood glucose levels.

NOTE: Chocolate, milk and biscuits etc. are slow acting carbohydrates and should not be used for the treatment of a hypo.

Blood testing is important to determine how to treat a hypo. The following chart explains what action to take:

If hypo occurs:	Action to be taken:
Within one hour of next meal	15 - 20g of rapid acting carbohydrate
1 - 2 hours until next meal	15 - 20g of rapid acting carbohydrate + 10g of slow acting carbohydrate
More than 2 hours until next meal	15 - 20g of rapid acting carbohydrate + 20g of slow acting carbohydrate

Note:

If hypo immediately before a meal - treat the hypo with quick acting carbohydrate and reduce the meal insulin dose by 1 unit.

Suggestions for preventing further hypos

Time of low glucose	Which insulin is working?	What can you do?
Before breakfast	Background insulin	<ol style="list-style-type: none"> 1. Check blood glucose before bed to make sure it is within the target range. 2. If blood glucose low on waking <i>Reduce the evening background dose by 2 units (10 - 20% of dose) and check your blood glucose at 3 a.m. for next 2 nights.</i>
Before lunch	Breakfast meal insulin	<ol style="list-style-type: none"> 1. Are you counting carbohydrates correctly at breakfast? <i>Try weighing out your portions</i> 2. Do you need lower insulin : carbohydrate ratio in morning? <i>Try decreasing by ½ unit/10g of carbohydrate</i>
Before tea	Lunchtime meal insulin Or possibly morning background, if you have a dose then	<ol style="list-style-type: none"> 1. Are you counting carbohydrates correctly at lunch? <i>Try adding up again</i> 2. Are you having too much insulin for your snacks? <i>Anything under 10g of carbohydrate should not have QA insulin</i> 3. Do you need lower insulin : carbohydrate ratio at lunchtime? <i>Try decreasing ratio by ½ unit/10g of carbohydrate</i> 4. Do you need less background insulin? <i>Decrease morning dose by 10 - 20%</i>
Before bed	Teatime meal insulin	<ol style="list-style-type: none"> 1. Are you counting carbohydrates correctly at teatime? <i>Try adding up again</i> 2. Are you having too much insulin for your snacks? <i>Anything under 10g carbohydrate should not have QA insulin</i> 3. Do you need lower insulin : carbohydrate ratio at teatime? <i>Try decreasing ratio by ½ unit/10g carbohydrate</i>
During night	Background insulin in evening	<ol style="list-style-type: none"> 1. Check your blood glucose before bed. Is it within the target range? 2. If the hypo occurs 2 - 3 hours after your supper meal insulin - did you count your supper carbohydrates correctly? <i>If the hypo happens around 3 a.m. you need to reduce your background insulin by 10 - 20% the following night. Continue to check the blood glucose at 3 a.m. for next 2 nights until blood glucose is above 5 mmol/L at 3 a.m.</i>

NOTE: If it is over 4 hours since your last quick acting insulin dose consider reducing background insulin

Hypoglycaemia



Remember!

During the night

If the blood glucose level is less than 5 mmol/L during the night the insulin dose has to be altered for the following night, **do not wait**. Monitor blood glucose for next 2 nights until you are sure a hypo is not occurring.

During the day

If a hypo occurs during the day wait a further 24 hours. Only alter the insulin dose if it keeps happening at the same time of day.

1 or 2 mild hypos per week are a normal part of diabetes.

Also, remember exercise has an effect on blood glucose levels for over 24 hours after the exercise has finished. Go to the chapter on exercise for guidance on how to alter insulin doses, page 62.

See information sheet on page 61 for summary on how to manage low blood glucose levels and insulin dose.

What do you do for a severe hypo?

A severe hypo happens when the blood glucose level has dropped so low that your brain cannot work properly. You may pass out or have a convulsion (fit).

This may never happen to you, but if it does, you need help from a friend or adult.

This is what they need to know:

- Do not force anything into your mouth
- You should be placed on the floor, on your side, in the recovery position.
- An injection of glucagon needs to be given, in the same way that insulin injections are given
- This takes up to 10 minutes to work
- If you do not wake up or the person with you cannot do the injection, they must call for an ambulance. The paramedics can give you the glucagon injection
- When you do wake up you need to take a sugary drink or 20g fast acting carbohydrate. Then, when feeling better, have 40g slow acting carbohydrate
- Think about why the hypo happened. Your diabetes team may want you to discuss it with them
- When you have had a severe hypo your body has used up its glycogen stores. It takes time to build them up again and there is a bigger risk of another severe hypo. Rebuild by eating meals containing slow acting starchy carbohydrate
- Reduce your background insulin dose by 10% for the next few days and watch your blood glucose levels carefully

Hypoglycaemia

KICK-OFF

How to reduce a background insulin dose by 10 or 20%:

If the background insulin dose is 35 units:

10% of 35 units is:

$$35 \div 10 = 3.5 \text{ units}$$

$$\text{Subtract } 3.5 \text{ from } 35 = 31.5 \text{ units}$$

This is the normal background insulin dose (35 units) minus 10% (3.5)

If the background insulin dose is 35 units:

20% of 35 units is:

$$35 \div 5 = 7 \text{ units}$$

$$\text{Subtract } 7 \text{ from } 35 = 28 \text{ units}$$

This is the normal background insulin dose (35 units) minus 20% (7)



Remember!

4 IS THE FLOOR

If you rarely have hypos this is probably a sign that your blood glucose level are usually too high

- If you are not sure of your signs of a hypo – do a test
- Always carry some form of hypo treatment with you
- Always treat a blood glucose level of less than 4 mmol/L as a hypo
- Think about preventing a hypo e.g. after exercise
- Always carry some form of identification in case you need help
- Be aware that improving your blood glucose levels may change how your hypo feels

Hypo kit suggestions:
Coca Cola 200ml (small can)
Lucozade tablets (fast acting)
Cereal bar (slow acting)
ID card
Emergency contact number
Blood testing kit

Quiz



1. Where in the body is extra glucose stored?

2. What is it stored as?

3. List 3 examples of

a. Fast acting carbohydrates

b. Slow acting carbohydrates

4. If a hypo happens during the night when do you change your insulin dose?

5. At what blood glucose level should you start to treat a hypo?

6. Do you give extra insulin with the hypo treatment?

7. How much fast acting carbohydrate do you give when hypo?

8. If it is 1-2 hours before your next meal how much slow acting carbohydrate do you need after having the fast acting carbohydrate?

9. If you have a severe hypo what should you do once you are able to eat?

Hypoglycaemia information sheet



Low blood glucose levels and insulin adjustment

Before adjusting insulin consider the causes of a low blood glucose:

- Have you had too much insulin?
- Have you made an error in counting the carbohydrate content of the food?
- Have you done any unplanned exercise?
- Have you had any alcohol?

There could be no known cause.

If insulin needs to be reduced, then either:

Reduce the previous quick acting insulin dose, before the hypo occurred, by $\frac{1}{2}$ ratio OR reduce the previous background insulin dose by 10 – 20%

For hypos that happen during the day

Adjustments to insulin can be made after a further 24 hours of monitoring. If the hypo occurs again the following day, and there is no obvious cause, then less insulin is needed.

Before making changes think about:

- When is the hypo happening and
- Which insulin (background or quick-acting) needs altering?



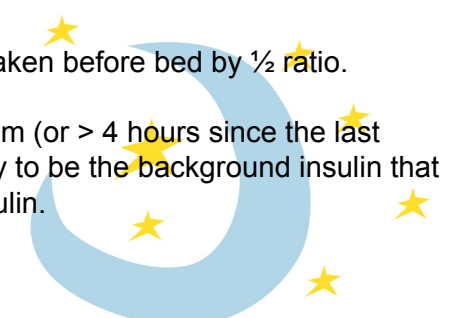
If hypos occur during the night

The dose should be reduced for the following night and a blood glucose checked at 3 a.m.

Reduce the background by 10-20% or

Reduce the ratio of quick-acting insulin taken before bed by $\frac{1}{2}$ ratio.

Note: If the hypo occurs at around 2-3 a.m (or > 4 hours since the last quick acting dose) or later it is more likely to be the background insulin that needs adjusting, not the quick-acting insulin.



Remember that when you change an insulin dose you should continue to check your blood glucose levels, to make sure you have solved the problem.

If in doubt ask for help

Exercise and diabetes

KICK-OFF

Everyone should exercise regularly, including people with diabetes

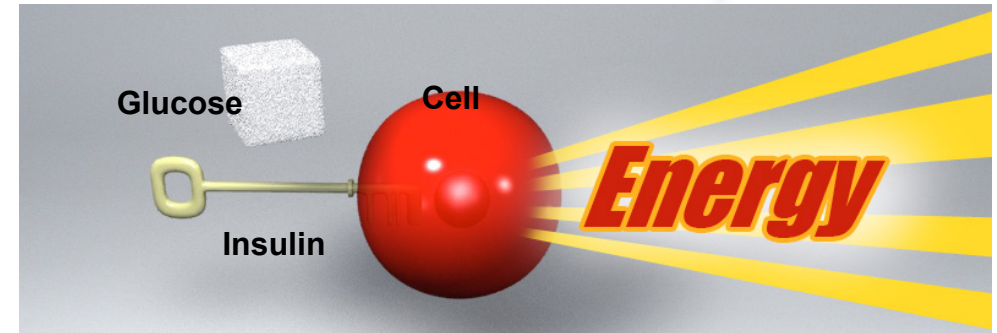
Why should everyone exercise?

- Keeps us fit
- Keeps the heart healthy
- Helps to control weight
- It can make you feel good about yourself
- Meet new friends
- It's fun!

What are the benefits for people with diabetes?

All of the above and:

- Exercise increases absorption of insulin from injection sites
- Exercise encourages the muscle cells to take up more glucose without needing extra insulin
- Blood glucose levels may improve
- Exercise lasting longer than 1 hour may lower the blood glucose more than shorter periods of activity



Exercise requires lots of energy

During exercise the right balance of glucose and insulin is needed in the body.

Glucose is stored in the liver and muscles as glycogen.

Muscles use up their glycogen stores first. Insulin allows glucose from the blood stream to enter muscles to release energy.

Too much insulin increases the risk of a hypo.

Exercise can also cause the blood glucose level to rise (see next page for more information)

Try and keep the blood glucose level around 7 - 8 mmols/L before and during exercise.

Look at the following information for help in deciding how to manage diabetes during exercise.

Exercise and diabetes



Exercise and a low blood glucose level

Blood glucose levels may fall quickly during or for up to 24 hours after exercise has finished.

Consider the following when planning any exercise:

Before exercise	During exercise	After exercise
<ol style="list-style-type: none"> 1. Check blood glucose level before exercise. 2. If 7 mmol/L or less treat with rapid acting carbohydrate. 3. Consider when the last dose of quick acting insulin was taken. Is it still working or has it run out? 4. When was the last carbohydrate-containing meal/snack? Will the food still be raising the blood glucose level? 5. How long will the exercise last and how hard will it be? <p>NOTE: the longer the activity lasts and the more intense it is, the more chance there is of a hypo during or up to 24 hours after the exercise.</p> <ol style="list-style-type: none"> 6. Where was the last injection given? <p>NOTE Avoid injecting into thighs if the exercise involves using your legs e.g. running, biking, and karate.</p> <ol style="list-style-type: none"> 7. Make sure someone with you knows how to treat a hypo. 	<ol style="list-style-type: none"> 1. Always carry hypo treatment and extra carbohydrate during and after exercise. 2. If the exercise is over a long time check your glucose level regularly 3. Make sure someone with you knows how to treat a hypo. 	<ol style="list-style-type: none"> 1. Test the blood glucose after the activity finishes. 2. Be aware that hypos are more likely after exercise. 3. Muscles need to replace the glucose that they used during exercise. 4. Extra carbohydrate snacks after exercise may be needed 5. Check a blood glucose before bed. If 8 mmol/L or less there is increased risk of a hypo. A bedtime snack is needed (without QA insulin). 6. The next insulin dose may need to be reduced if the exercise session was very intense or lasted a long time e.g. a days hike, a football / tennis / netball tournament or an evening of dancing.

Exercise and high blood glucose levels

Why can exercise sometimes cause the blood glucose level to rise?

If insulin levels are low at the time of exercise there will be insufficient insulin to allow the glucose in the blood to pass into the muscles. The body may also release extra glucose stores and the blood glucose levels will therefore rise. This will happen if the previous quick acting (QA) insulin and or background insulin (BI) doses have run out (e.g. before breakfast or your evening meal).

What should you do if the blood glucose level is 14 mmol/L or more before exercise?

Think about whether it is high due to a recent snack/meal containing carbohydrate.

Check urine or blood for ketones.

If ketones are negative consider taking 1 or 2 units of QA insulin. This will allow the muscles to use the glucose.

If they are positive delay your exercise, as it is a sign that you do not have enough insulin in your body and follow the chapter on sick day rules for advice, page 48.

Exercise and diabetes



Exercise advice chart

Blood glucose level	Action
Less than 7 mmol/L	Take 20-40g carbohydrate depending on how strenuous the exercise is or how long it lasts.
7 – 13 mmol/L	Take 10-20g carbohydrate depending on how active or long the exercise is.
14 mmol/L or above	No extra carbohydrate needed. Consider: When the last meal/snack was? Is the insulin running out? Test for ketones: a) If negative take 1 - 2 units of quick acting insulin (depending on how high the blood glucose level is) Carry extra carbohydrate for exercise lasting longer than 45 minutes b) If present, postpone exercise and take extra quick acting insulin as per sick day rules (page 50 and 51). Wait until ketones disappear and blood glucose is 14 mmol/L or less

Important note:

Exercise affects everyone in different ways. These tables are only a guide when deciding how to make changes to insulin doses and meal/snacks. Monitor the blood glucose levels before, during and after exercise and work out the changes that are needed. If you go hypo even after following advice reduce the insulin further

Suggestions on how to manage diabetes during different types of activities if the starting blood glucose level is < 14 mmol/L

If the exercise is planned the insulin dose may need to be reduced according to the type and duration of the activity

Type or intensity of exercise	Example	Adjustments
Gentle or less than 20 minutes	Walk to shops, slow bike ride	Test blood glucose • carry extra carbohydrate
20 – 40 minutes of moderate exercise	Bike ride, game of badminton, swimming, dancing	Test blood glucose • eat/drink additional 10-20g carbohydrate
Intense or longer than 1 hour	Aerobic class, game of tennis / football / netball. Long cycle 1 - 4 hours. Night of dancing	<ul style="list-style-type: none"> • Reduce quick acting insulin by 30 – 50 % for the meal prior to exercise (if within 3 hours of meal) • Extra carbohydrate may also be needed • Extra carbohydrate and or less quick acting insulin after exercise
Prolonged exercise or longer than 3 - 4 hours	Day hiking, tennis/ football / netball tournament. Dancing show	<ul style="list-style-type: none"> • Reduce background insulin by 20% and quick acting insulin before exercise by upto 50%. • Reduce any insulin taken with meals during exercise by upto 50% • Reduce insulin doses after exercise by 30 - 50% depending on how long/active the exercise was • Consider reducing background insulin that night and next morning by 20% • Extra carbohydrate snacks may be needed e.g. flapjack, chocolate, jelly, sweets, breads, cakes

Exercise and diabetes



Types of quick acting carbohydrate for short intensity and longer activity exercises

Short intensity exercise

Sprinting:

Choose foods from the high glycaemic index list e.g. banana, fruit juice, dried fruit.

Longer activity/less intense

Football, hiking, swimming, netball, horse riding:

Choose foods from the low glycaemic index list e.g. flap jack, pasta.

Post exercise

If you have done 60 mins or more exercise during the day you will need to replace the glucose stores in the liver to prevent a hypo overnight.

Example of a suitable snack at bedtime:

- milkshake and fruit
- crumpets with peanut butter
- cereal and milk

Drinks for sport

It is important when you are being active that you have plenty to drink.

- Drink 200-300 ml water or dilute sugar free squash, before any exercise
- Try and drink 100 ml every 10-15 mins during exercise
- For exercise lasting an hour or more, sports drinks will provide the fluid and extra carbohydrate you need
- If exercising for less than 1 hour, water is fine to drink, if you have had a carbohydrate snack. Sports drinks may be used for extra carbohydrate needed during extended exercise.

General advice

1. Having type 1 diabetes should not stop anyone from doing an activity or sport
2. Always test the blood glucose level before, during and after exercise
3. Always carry hypo treatment and extra carbohydrate snacks
4. It is important that someone nearby knows how to treat a hypo and if possible wear some form of ID especially during an activity that is new or dangerous e.g. parachuting or a water sport
5. Do not forget that exercise has a different effect on everyone
6. If the blood glucose level is 14 mmol/L or more, without ketones give 1 - 2 units QA insulin – If ketones present follow sick day rules advice, delay the activity until less than 14 mmol/L and negative ketones
7. Check blood glucose level before bed due to risk of a hypo during the night. If 8 mmol/L or less have a snack without QA insulin or half the correct insulin dose. You may need to check your blood glucose during the night if you have been doing very strenuous prolonged exercise during the day

Further information from:

Diabetes, Exercise and Sports Association

www.diabetes-exercise.org • www.runsweet.com • www.kidsexercise.co.uk

Quiz



1. List 5 benefits of exercise:

2. A hypo may still happen for up to _____ hours after strenuous exercise.

3. What do muscles need to stock up with after exercise?

4. Ketones in your body should not stop you exercising: True / False

Alcohol and diabetes



What is the law?

- It is illegal to buy alcohol if you are under 18
- The police can take alcohol off anyone under 18, who is drinking in a public place
- The police can arrest you for being drunk or drinking alcohol in the street, no matter how old you are!

If you decide to drink alcohol you need to be aware that it can affect your diabetes and can be risky.

What is alcohol?

- Each type of alcoholic drink contains a different amount of alcohol and glucose
- All alcoholic drinks are measured in units (see table page 69)

How does it affect the body?

- Alcohol affects how clearly we think and how we make decisions
- It enters the blood stream very quickly and affects all parts of the body
- Alcohol is broken down by the liver and removed from the body in the urine and sweat
- The more you drink, the longer it will stay in the body
- Alcohol affects everyone differently

Alcohol has more effect ...

- If a person is not used to drinking alcohol
- If a person drinks a lot or very quickly
- When strong spirits like gin, vodka or fizzy alcohols such as alcopops/ sparkling cider are drunk
- If a person is small or thin
- When alcohol is drunk on an empty stomach

Fact

If the body is overloaded with alcohol it can lead to alcohol poisoning, unconsciousness or coma. It can be fatal

About 1000 young people are admitted to hospital with alcohol poisoning each year in the UK.

Alcohol and diabetes



These safety guidelines are only for adults:



Remember!

Alcohol units are not the same as insulin units

**Men should have no more than 3 – 4 units per day
(21 units per week and 2 alcohol free days per week)**

**Women should have no more than 2 – 3 units per day
(14 units per week and 2 alcohol free days per week)**

Adults staying within these limits are unlikely to harm their bodies but as soon as they drink above the daily limit, they risk damaging their health! Young people can become drunk on **much less alcohol** than adults and be at risk of alcohol poisoning

The immediate risks of alcohol with diabetes are:

Delayed hypos for up to 24 hours

Explanation:

- This is because alcohol stops the liver from releasing stored glucose
- Alcohol also reduces the warning signs of a hypo

Too much alcohol causes a hangover – headache, feeling sick or vomiting, feeling dizzy and tired. It can last 48 hours, or longer!

Too much alcohol may lead to:

- Damage to the liver, bones, blood, in fact every part of the body that it comes into contact with
- Depression
- Damage to the muscle fibres needed for activity; many football managers are banning their players from drinking alcohol!

How strong is the alcoholic drink?

- Some alcoholic drinks have more glucose and some have more alcohol
- It is not possible to tell how much alcohol there is in a drink just by its taste
- All drinks will affect diabetes control differently

The best way of knowing how the alcoholic drink affects blood glucose levels is to do a blood test

Alcohol and diabetes



By law alcoholic drinks should state how much alcohol they contain.

- It should be shown as % ABV (alcohol by volume)
This shows the percentage of the drink that is pure alcohol.
The higher the percentage number the stronger the drink is e.g. 5% ABV is stronger than 3% ABV.
- We can compare different alcoholic drinks in terms of units
- 1 unit of any drink contains the same amount of alcohol

Alcoholic Drink	% ABV	Alcohol units by volume	Carbohydrate
Wines: red, white and champagne (dry, medium)	9 - 14% (many are 11 - 14%)	1 unit per 125ml of 9% ABV wine	None / trace
Sweet wine	13 - 16%	1½ - 2 units per 125ml	5g per 125ml glass
Sweet martini or sherry	13 - 16%	1 unit per 50ml	5g per 50ml
Spirits e.g. gin, vodka, whisky, brandy	40%	1 unit per 25ml pub measure of 40% ABV	None

Alcoholic Drink	% ABV	Units by volume	Carbohydrate
Standard beer, lager/ bitter	3.5%	1 unit per half pint	10g per pint
Extra strength lager	5%	1.7 units per half pint	15g per pint
Extra strength ale	5%	1.7 units per half pint	15g per bottle (287ml)
Stout e.g. Guinness or Murphys	4%	1½ units per pint	10g per pint
Cider Dry cider Sweet cider	4 - 8%	1 unit per half pint of 4% ABV	10g per pint 20g per pint
Alcopops e.g. Vodka mule, Bacardi breezer, Wkd.	5%	1.7 units per 330ml bottle	15-20g per bottle
Liqueurs: Baileys Tia Maria Contreau /Drambuie Port	17% 26% 40% 16%	1½ units per 50ml measure 1½ units per 50ml measure 1 unit per 25ml measure 1 unit per 50ml measure	10g per 50ml 15g per 50ml 7½g per 25ml 5g per 50ml
Low alcohol lagers	None	None	5g per pint
Full sugar mixers	None	None	30g per ½ pint

Alcohol and diabetes



Note!

- Even if the ABV is low, you will still be drinking a lot of alcohol if drinking a large volume, e.g. beer is the lowest ABV, but more than a couple of pints still has lots of units of alcohol
- Drinks poured at home tend to be larger measures compared to a standard pub measure

Don't mix alcohol and other medicines

Alcohol can prevent medicines e.g. antibiotics, from working properly.

Stop when you've
had enough!

A word of advice!

- Remember alcohol can damage your health
- Do not take insulin for alcohol
- Alcohol affects everyone differently and will affect diabetes control if you drink too much
- Eat a good meal of carbohydrate before going out and before bed have some supper e.g. cereal and toast. Do not take any insulin with supper
- Drink slowly and have something to eat. This will slow down the rate that alcohol is absorbed
- Check blood glucose before and after drinking alcohol or ask a friend to do it. Also check blood glucose before bed and next morning
- Alcohol and exercise increases the risk of a hypo for up to 24 hours after the last drink
- Have a soft drink or water for every alcoholic drink
- Agree amongst your friends that you'll look after each other
- Make sure you carry some ID which shows you have diabetes. The police will smell alcohol and think you are drunk when you may be hypo
- If despite eating extra carbohydrate your blood glucose still falls over night, next time reduce the background insulin by 20%

Alcohol and diabetes



Help

For confidential help and advice about your own or someone else's drinking call:

- Drink line:
Free phone **0800 9178282**

The following organisations offer help or support to young people who live with someone who has an alcohol problem:

- Al-Anon family groups UK:
Tel. **020 74030888** (10 a.m. – 10 p.m.).
- The National Association for Children of Alcoholics:
Free phone **0800 3583456**, www.nacoa.org.uk

Other numbers you can call for advice:

- Childline:
Free phone **0800 1111**
- NSPCC:
Free phone **0808 8005000**, text phone **0800 0560566**,
www.nspcc.org.uk

You can also try talking to your teacher, your GP, school nurse or local Connexions adviser.

Quiz



1. Give an example of 1 unit of alcohol:

2. Why does alcohol make you more likely to have a hypo?

3. What does ABV stand for?

4. Is it illegal to drink alcohol under the age of 18 years?

5. What should you always do before/during/after drinking alcohol?

6. List 4 things that you should do to help to keep yourself safe if you decide to drink alcohol.

Healthy eating

KICK-OFF

Whilst the KICK-OFF course teaches you how to eat more freely with good diabetes control, we should all eat a healthy diet.

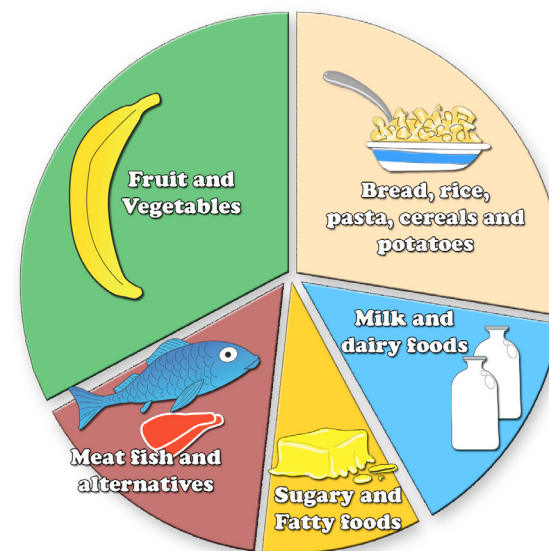
Healthy eating is for EVERYONE because it:

- Reduces the risk of heart disease
- Helps us maintain a healthy weight
- Prevents bowel problems such as constipation
- Prevents tooth decay

A healthy diet should:

- Provide our bodies with enough energy to be active
- Allow us to grow at the correct rate
- Provide the vitamins and minerals we need to stay healthy
- Provide the correct balance of carbohydrate, fats and proteins

What food should we choose?



This picture shows the sort of proportions of each food group we should be aiming to eat each day. Try to have:

- Plenty of foods which contain starchy forms of carbohydrate e.g. bread, potatoes, cereals
- Fruit and vegetables - 5 portions per day
- Low fat foods or a small amount of high fat food
- Reduced sugar foods or small amounts of sugary foods
- Moderate amounts of milk and dairy products e.g. cheese, yogurt
- Moderate amounts of meat, fish and alternatives

Healthy eating



Choosing food from each group means the essential vitamins, minerals and fibre are included for a healthy diet.

Eat reasonable portion sizes. Try not to over eat which could result in you gaining weight. A healthy diet does mean that you can occasionally have sweets and high fat foods.

Weight gain:

Everyone needs a different amount of energy from the food we eat. This depends on size, gender (male or female) and activity levels.

The energy content of all food is measured in calories - kilocalories (Kcal)

i.e.	1g CHO	= 4 Kcal
	1g protein	= 4 Kcal
	1g alcohol	= 7 Kcal
	1g fat	= 9 Kcal

Your dietitian can help you work out how many calories you should be eating each day.

Most foods are a combination of fat, protein, and carbohydrate. Be careful because you could eat a food low in carbohydrate but high in fat therefore higher in calories. For example:

- half a packet of crisps containing 10g CHO = 90 Kcal
- 1 eating apple containing 10g CHO = 40 Kcal

Although you would give the same amount of insulin for both foods the spare energy calories will be stored as body fat.

Eating what you need, most of the time, should mean you stay happy with your weight.

Sweets and treats:

We all enjoy the occasional treat but do not replace a meal with them. After eating sweets your blood glucose will rise quickly so give the correct amount of insulin with the sweet/treat to keep good blood glucose control. Remember these foods contain a lot of energy calories so the body stores any extra as body fat.

Healthy eating

KICK-OFF

Why do we need to eat 5 portions of fruit and vegetables a day? They give us essential vitamins, fibre and may protect us against heart disease and cancers.

A portion is approximately:-

- 1 medium apple
 - 1 cereal bowl of salad
 - 3 heaped tablespoons of peas
 - small glass of fruit juice/vegetable juice or smoothie
 - 2 tablespoons baked beans
- Fresh, frozen or canned fruit/vegetables also count

Remember each food portion only counts once in the day. So eat different foods.

Ideas how to include these portions in meals/snack:

- Choose fruit or chopped vegetables as a snack
- Add dried or fresh fruit to breakfast cereal
- Include salad with pizza or sandwich
- Add vegetables to casseroles
- Make your own milk shakes with fresh fruit
- Frozen fruit lollies

Experiment each day with different fruits and vegetables.



Remember!

Healthy eating is for everyone

Healthy meals and snacks can be fun to eat

A healthy and balanced diet helps to control body weight

A healthy diet allows you to make choices from all types of food

A healthy diet gives a healthy body

Your dietitian will work with you to achieve your goal

Quiz



1. What does it mean to follow a healthy diet?

2. Who should follow a healthy diet?

3. What is food energy measured in?

4. What happens if you eat more food energy than your body needs most of the time?

5. Which foods should you try not to eat too much of?

6. Name 4 ways of adding fruit and vegetables to your diet. Choose foods that you would eat at home and think of ways of making it more interesting or fun to eat.



Autoimmune disorder

The body has its own way of protecting itself against infections or diseases (immune defence) but sometimes this does not work and it can attack its own body cells and tissue.

Beta Cell

Cells in the pancreas that produce a hormone called insulin.

Carbohydrate

A chain of glucose molecules grouped together. There are different types: starchy (rice, potato, pasta etc) and sugary (sweets, sweet drinks etc).

Correction dose

The amount of quick acting insulin needed to bring the blood glucose back into the target range. This is an extra dose on top of the amount of insulin needed for meals, snacks or during times of illness.

Diabetes Mellitus

The name given to a condition whereby a person has excess glucose in their bloodstream. It comes from the ancient meaning of 'flowing through' (diabetes) and 'sweet as honey' (mellitus).

Diabetic Ketoacidosis

DKA for short. A serious condition whereby the body produces acids called ketones due to a lack of insulin. It can cause vomiting, breathlessness, stomach ache, drowsiness and sometimes unconsciousness.

Fat

Provides a secondary form of energy, but the body's first source of energy comes from carbohydrate foods.

Glucose

A simple form of sugar that the body uses, with the help of insulin, to produce energy in the body cells.

Glycosylated/glycated Haemoglobin

HbA1c for short. This is a blood test that gives an indication of the average blood glucose level over the past 10 -12 weeks.

Hormone

A hormone is a chemical messenger that travels around the body in the blood.

Hyperglycaemia

A high blood glucose level above 7.5 mmol/L.

Hypoglycaemia

A low blood glucose level less than 4 mmol/L. 'Hypo' for short.

Dictionary



Insulin

A hormone produced by the beta cells in the pancreas. It is the key which allows glucose to enter the body cells.

Insulin to carbohydrate ratio

The number of units of insulin needed for every 10 -12 grams of carbohydrate eaten.

Ketones

These are produced due to the break down of fat to fatty acids which then turn into ketones in the liver. Often present when the blood glucose level is high and there is not enough insulin. Starvation ketones occur when there is a low blood glucose level and the body needs to break down fat for energy.

KICK-OFF

Kids in Control OF Food course.

Macro Vascular Disease

Large blood vessel disease, such as heart disease.

Micro Vascular Disease

Small blood vessel disease, such as retinopathy and nephropathy.

Neuropathy

Damage to the nerve endings due to high blood glucose levels over many years. It often starts in the feet with pins and needles but may affect nerves in other organs e.g. heart, stomach.

Nephropathy

Damage to the tiny blood vessels in the kidneys due to high blood glucose levels.

Pancreas

An organ in the body that produces insulin as well as other chemicals that help to digest food.

Protein

A food group needed for growth and body repair.

Retinopathy

Damage to the retina at the back of the eye due to many years of high blood glucose levels.

Type 1 diabetes

The body cannot produce insulin.

Type 2 diabetes

Insulin is still produced but the body does not allow it to do its job properly.

Answers



What is diabetes? Page 6

1. No
2. Glucose
3. Pancreas
4. Anybody
5. Insulin is the key that opens the cell door to allow the glucose to enter.
This lowers the blood glucose level.

Types of diabetes. Page 8

1. Type 1 and Type 2 diabetes
2. Type 1 diabetes
3. Insulin
4. Never
5. Insulin
6. Diabetes is diagnosed when the level of **glucose** in the blood is too **high** due to a low level of **insulin**.
7. Insulin
8. No
9. No
10. Personal answer

Signs and symptoms of diabetes. Page 10

1. Thirsty, weeing lots, weight loss
2. A lack of insulin means the body uses **fat** stores instead of **glucose** for energy.
3. Glucose and ketones
4. Personal answers

Insulin ratios. Page 15

1. Quick acting and slow acting
2. With meals and snacks over 10g carbohydrate
3. The amount of insulin needed per 10g carbohydrate
4. The point at which the insulin is working at its' best

Answers



Insulin to carbohydrate ratio and carbohydrate practise. Page 16

Example 1

Date	Time	8am	1pm	4pm	6 pm	Comments
	Grams	22g	74g	8g	47g	No insulin given for < 10g carbohydrate
	QA	2	7.5	0	4.5	
	BI					
Date	Time	8am	1pm	4pm	6pm	Comments
	Grams	39g	81g	14g	58g	
	QA	4	8	1.5	5.5-6	
	BI					
Date	Time	8am	1pm	4pm	6pm	Comments
	Grams	25g	67g	24g	88g	
	QA	2.5	6.5	1.5	8.5-9	
	BI					

When there is a choice of QA insulin dose a decision has to be made depending on the blood glucose level.

Answers



Food, diabetes and the KICK-OFF course. Page 19

1. Carbohydrate, protein, fat
2. **Carbohydrate** - pasta, rice, bread, potato
Protein - fish, meat, eggs, cheese
Fat - butter, cream, oil, dripping
3. Glucose
4. Carbohydrate

Counting grams of carbohydrate. Page 23

1. Nutrition guide
2. Of which sugars
3. Glycaemic index
4. Check against GI list for answers
5. Lucozade. Chocolate contains fat so slows down how fast the glucose is absorbed.

Guidelines for eating snacks. Page 26

1. Yes
2. If within 1 hour of your next meal
3. Add up the total and add it to the next meal if within 1 hour or take extra insulin with snack

High blood glucose levels and correction doses. Page 29

Example 1

Date	Time	8am	1pm	6pm	10pm		Comments
	Grams	20	70	50	10		Think about BI at night and lunchtime ratio
	BG	10.3	4.4	12.1	7.9		
	QA	2+1	7+0	5+2	0		
	BI						
Date	Time	11am	3pm	7pm			Comments
	Grams	40	30	60			Think about BI at night and last QA ratio
	BG	12	5.2	12.1			
	QA	4+2	3+0	6+2	0		
	BI						
Date	Time	10am	2pm	4pm	8pm		Comments
	Grams	2	60	10	80		Think about BI at night and breakfast BI (if taken)
	BG	9.2	11.1	4.5	7.9		
	QA	2+1	6+2	0	8+0		
	BI						

Note:
When a correction dose is used think about why the blood glucose was high. If it happens again, over the next few days, the insulin regime needs altering.

Answers



High blood glucose levels and correction doses. Page 30

1. Anything outside of the target range and definitely 14 mmol/L or more
2. The signs and symptoms will return e.g. thirsty, weeing lots. Prolonged increase over years causes damage to the tiny blood vessels in the body
3. Extra QA insulin given to bring the blood glucose back into the target range
4. 2 - 3 mmol/L

Managing high blood glucose levels. Page 32

1. Look at the previous meal QA ratio and increase by half unit
2. Follow sick day rules
3. Were the carbohydrates added up correctly at the previous meal? Is the insulin ratio correct at the previous meal? Had a snack been eaten without QA insulin? Is it the BI that needs changing or the QA ratio?
4. 2 - 3 days

Testing: why, when and what are we testing for? Page 35

1. To feel as well as possible, prevent hypos, help to prevent diabetes complications
2. 4 - 7 mmol/L before meals, 5 - 8 mmol/L before bed
3. A Glycosylated Haemoglobin (HbA1c) measures the **glucose** that sticks to the **red blood cells** and the tissues in the body. The recommended HbA1c level for people with diabetes is less than **58 mmol/L (7.5%)**
4. For the person with diabetes to monitor their control

Tools of the trade. Page 42

1. 1 month
2. Legs, arms, stomach, bottom
3. Lumps appear
4. Yes if they are not used for at least 2 weeks
5. When there are 3 consecutive blood glucose readings outside of the target range or above 14 mmol/L or when unwell
6. Wash hands

Diabetes complications. Page 47

1. Eyes, kidneys, nerve endings, blood vessels
2. Blood pressure, eyes, feet, urine
3. Smoking
4. Keep the blood glucose level as near normal as possible most of the time

Answers



Sick day rules. Page 53

1. Breathlessness, pear drop smell on breath, ketones in the urine, high blood glucose level, drowsy, vomiting, thirsty, weeing a lot
2. a. Before each meal
b. Every 2 hours
3. a. Blood glucose above 14 mmol/L and small/moderate ketones
b. Blood glucose above 14 mmol/L and large ketones
4. When the blood glucose level is outside of the usual range or above 14 mmol/L with negative or trace ketones
5. Contact the diabetes team immediately. You need further help and advice. Do not wait

Hypoglycaemia. Page 60

1. Liver and muscles
2. Glycogen
3. a. Lucozade, ribena, fruit juice, lemonade
b. Chocolate, milk, crisp, biscuits
4. The next evening. Do not wait
5. Less than 4 mmol/L
6. No
7. 15-20g carbohydrate
8. 10g carbohydrate
9. Have 20g fast carbohydrates and 40g slow carbohydrates (do not give insulin)

Exercise and diabetes. Page 66

1. Weight control, keep fit, fun, make new friends, keeps heart healthy
2. 24 hours
3. Glycogen/stored glucose
4. False

Alcohol and diabetes. Page 72

1. Half pint of standard beer
2. Stops the liver from releasing stored glucose
3. Alcohol by volume
4. Yes
5. Check your blood glucose level
6. Check blood glucose before drinking alcohol, eat large carbohydrate meal, tell a friend you have diabetes and what to do if you have a hypo, have a soft drink with every alcoholic drink

Healthy eating. Page 76

1. Balanced meal containing carbohydrate, protein, glucose, fibre, minerals, vitamins, 5 fruit and vegetables a day and low fat
2. Everyone
3. Calories, Kilocalories (Kcal)
4. Gain weight
5. Fat, glucose and alcohol
6. In casseroles, with sandwich or pizza, in a drink e.g. milk shake

Authors: Julie Knowles, Dr Kath Price
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