

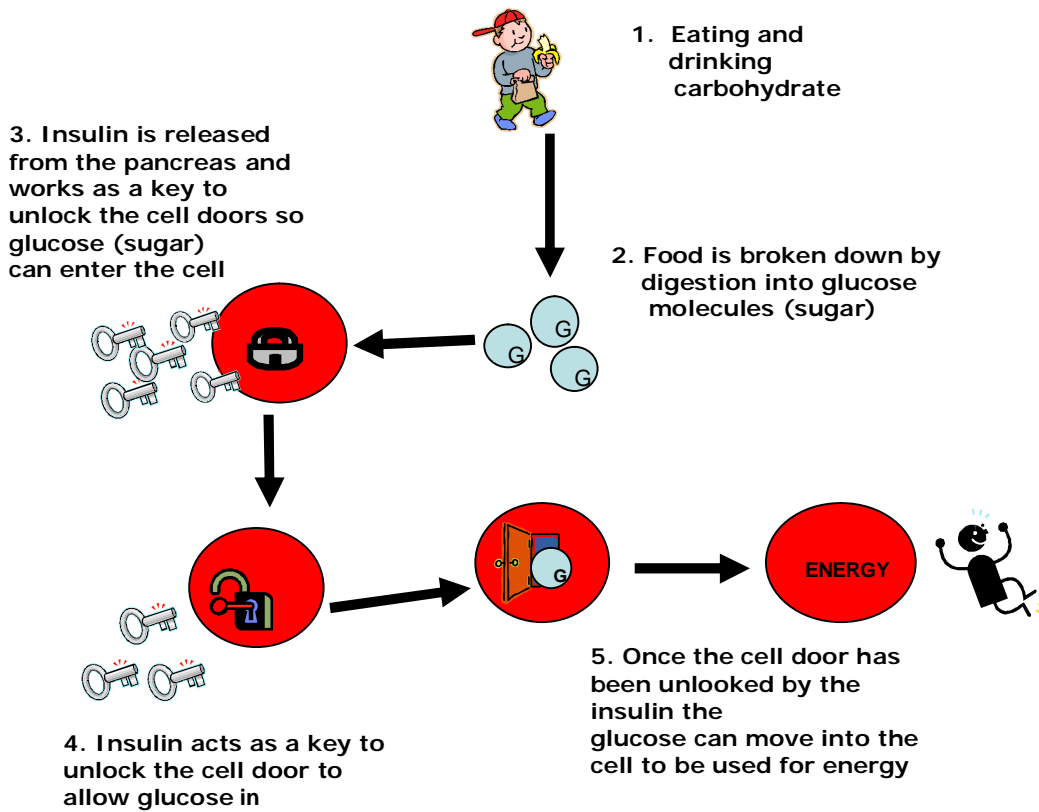
National Severe Insulin Resistance Service

Carbohydrates

Carbohydrate foods affect your blood glucose levels after eating and are therefore an important focus in the diet for people with severe insulin resistance.

Carbohydrates are included in many foods but the main sources are foods such as: potato, bread, rice, pasta, breakfast cereals, crisp-breads, fruit, milk, yoghurt, cakes, biscuits, sweets, chocolate and sugar.

When carbohydrate foods are eaten, they are broken down in to glucose (sugar) and blood glucose levels rise. The hormone insulin normally regulates blood glucose levels within the range 4-8 mmol/L. It does this by moving glucose (one of the body's fuels for energy) from the bloodstream into parts of the body where it is either stored or used for energy. Blood glucose is measured in units of millimoles per litre (abbreviated to mmol/L). Usually the body produces just the right amount of insulin to allow the glucose to enter the cells, bringing the glucose levels back into the normal range in the blood stream. See diagram below.



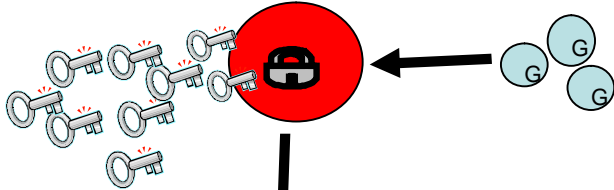
When you have severe insulin resistance it means the insulin you produce or inject does not work as effectively at moving the glucose from the bloodstream into the cells resulting in glucose levels remaining too high. This will prevent the glucose that comes from the carbohydrate foods to be taken up by the cells. See diagram below. Because of this insulin resistance a larger dose of insulin is needed to do the job.

Deleted: ¶

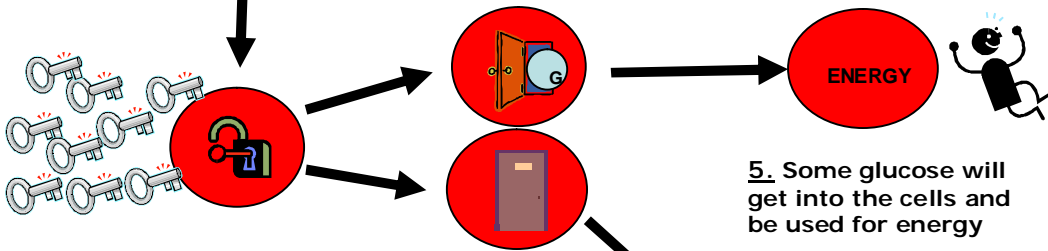
3. Lots of insulin (keys) are released from the pancreas to try and move the glucose into the cells. But it is either not working very well or not recognised by the cell. For example like have a number of the keys not fitting the lock



1. Eating and drinking carbohydrate

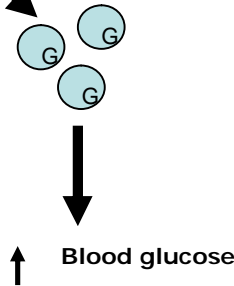


2. Food is broken down by digestion into Glucose molecules (sugar)



5. Some glucose will get into the cells and be used for energy

4. Therefore, less doors are unlocked and glucose (sugar) is left in the blood stream.



6. Increase in blood glucose levels causing your blood sugar level to rise. High levels of glucose in the blood will then cause damage to your blood vessels. Other symptoms will be excess thirst, tiredness, passing water regularly.

Carbohydrate type:

The more processed the carbohydrate is the faster the rise in blood glucose levels will be and the harder it is to keep in the normal range. This is also referred to as Glycaemic Index (GI). GI is a way of measuring the effect individual carbohydrate foods has on blood glucose levels. It recognises that not all carbohydrates affect blood glucose in the same way. Foods are given a GI number according to their impact on blood glucose levels. Glucose is used as the standard reference (GI 100) and other foods are measured against this. The GI of a food is determined by how quickly it is digested, which is influenced by many things. Processed and cooked foods tend to have a higher GI. Some types of fibre will lower the GI of foods.

- ü Low GI carbohydrates are digested more slowly so they stay in the system longer causing a slower, steadier rise in blood glucose levels. Including more foods with a low GI in meals can reduce post meal peaks in blood glucose levels and help keep blood glucose more even over the day.
- ü Low GI foods give a feeling of fullness for longer meaning hunger pangs don't return so quickly and can help when trying to lose weight.
- ü Studies show that low GI foods can improve the body's sensitivity to insulin and can help improve blood fat levels such as "good" cholesterol. Research shows that people who have an overall low GI diet have a lower incidence of heart disease.
- ü Although many vegetables and some fruits have little effect on blood glucose levels, the fibre in them will reduce the GI of any foods they are eaten with. Therefore adding vegetables, in particular, to meals will help reduce the GI of meals eaten with.

The table below shows a list of refined carbohydrates (High GI) to avoid and options lower in GI and fat to try instead. Portion sizes are discussed on the following pages.

Refined carbohydrates to avoid High GI	Try instead Lower GI
<p>White breads: sliced, rolls, pitta, naan, baguette, croissant, chapattis, paninis. White bagel, crumpet.</p> <p>White flour based foods: Cakes, biscuits, Cream crackers, water biscuits, Ritz, Tuc, rice cakes. Sweet breakfast bars & cereal bars.</p> <p>Yorkshire pudding, dumplings, Pizza, Pastry – pies, pasties, quiche, sausage rolls, spring rolls. Rich tea biscuits</p> <p>Breaded and battered foods, for example fish fingers, battered fish.</p> <p>Low fibre and sugar coated breakfast cereals: Cornflakes, Rice Krispies, Special K, Sugar Puffs, cheerio's, Cocoa Pops, sweetened Muesli.</p> <p>Rice and pasta: No types need to be avoided.</p> <p>Processed potato products: Oven chips, French Fries, Smiley faces, waffles, Croquettes, frozen roast potatoes, instant potato, ready meals with instant potato topping for example Shepherds Pie, cottage pie. Mashed potato, jacket potato</p> <p>Processed savoury snacks: Hula Hoops, Quavers, Pringles, Monster Munch, French Fries, Skips, baked crisps</p> <p>Cold drinks: Fruit juices and smoothies Full sugar squash and fizzy drinks Lucozade.</p> <p>Sugar: Sugar, glucose, maltose, dextrose</p> <p>Preserves: Jam, marmalade, Honey, Lemon curd, maple syrup, chocolate spread, treacle and syrup.</p> <p>Desserts/Sweets: sweets, chocolates, mints Sweet puddings and Ice cream, Sweetened yoghurt / "fromage frais", tinned fruit in syrup Condensed, evaporated milk</p> <p>Ready meals/stir in sauces/take away: Some ready meals and sauces contain significant amounts of sugar, for example sweet and sour sauces, jar or packet Chinese sauces. Chinese takeaway. Tomato soup, Baked Beans Bed-time and Malted drinks such as Ovaltine, Horlicks, drinking chocolate. Dried fruit</p>	<div data-bbox="1252 271 1522 300" style="border: 1px solid black; padding: 2px; float: right;">Deleted: ¶</div> <p>High fibre breads: Wholewheat, granary and multi-grain varieties of breads. Oat enriched bread. Rye bread Digestives, Hobnobs, Hovis biscuits (one at a time only) Oatcakes, whole-wheat crackers and crisp-bread, for example Ryvita, Cracker wheat. Cous cous, noodles</p> <p>High fibre cereals: Weetabix, Shredded Wheat, Shreddies, Branflakes, porridge, All-bran. Some people find their blood glucose is better when they use basmati or brown rice and wholewheat pasta instead of white varieties. Home cooked potatoes. Eg new potato, sweet potato.</p> <p>Ryvita snacks, plain or salted popcorn or Cracker wheat. Oaty bakes</p> <p>Sugar free squash, Sugar free carbonated drinks. Water.</p> <p>Splenda, Sweetex, Hermesetas, Nutrasweet, Candarel. Some people tolerate very thin scrapes of pure fruit spread or reduced sugar jams/marmalade, though generally not at breakfast Fresh fruit, tinned fruit in natural juice (juice drained off), sugar free Jelly, Sugar Free Angel Delight. Low fat natural yoghurt/diet fruit yoghurts / "fromage frais"(no more than 10-15g total carbohydrate / pot). Tomato-based pasta sauces. Tomato-based/dry curries. Reduced sugar baked beans (drain off sauce).</p> <p>Cadbury's Highlight, Ovaltine Options, cocoa powder. Fresh fruit.</p>

Carbohydrate portion – How much?

Irrespective of the GI of the food the larger the portion of carbohydrate eaten, the more insulin the body needs to help you absorb it to use as energy. As explained above when you have insulin resistance the body is not able to recognise the large amounts of insulin and so will not be able to effectively absorb even standard portions of carbohydrate foods.

Therefore an important part of the dietary management is to eat smaller amounts of carbohydrate and to spread the carbohydrate out over the day. This involves avoiding 'doubling up' on carbohydrate foods in one meal, for example don't have bread and potatoes or bread (e.g. sandwich and chips) and pasta together (spaghetti and garlic bread).

It is however important that some carbohydrates are included in each meal as they are an important part of your diet to provide energy. They should not be avoided completely.

The exact amount of carbohydrate that you will be able to tolerate in one meal will vary person to person. Therefore by completing a food diary along with testing your blood glucose levels we can help you work out the amount your body can tolerate. Please ask to speak to a Dietitian if you have not been given a food diary. If you would find it useful the dietitian can then give you suggested quantities of carbohydrates to have at meals and snacks. A selection of meals and snacks are listed below.

Protein foods

When protein foods are digested it does not rely so much on insulin to be used by the body. Protein is also known to help us feel fuller for longer and can therefore help with a large appetite. Therefore when cutting back on carbohydrate it is beneficial to eat additional lean protein foods.

For example

- beans and pulses (baked beans, lentils, mixed beans),
- chicken with out skin, lean pork and beef,
- Vegetable proteins such as Quorn or Tofu,
- Low fat diary such as yoghurts and cottage cheese for example.

For all this foods labels should be checked that they have **less than 3grams of fat per 100grams of the food**. Suggested snacks and meal plans are below.

Vegetables

Vegetables are high in fibre and low in both fat and carbohydrate. Exceptions to these, which should be eaten in moderation are avocados, potatoes and parsnips.

Deleted:

Fat in the diet

As well as being aware of the amount and type of carbohydrate in the diet another extremely important part of the information we suggest is following a low fat diet. A low fat diet will help alongside a reduced carbohydrate intake to help you lose weight.

To help with insulin resistance the leaner you are the better. An additional information sheet has been written to help you implement a low fat diet. If you have not been given this please ask a member of the SIR team.

Contacts/Further information

Catherine Hames – SIR Dietitian 01223 216655
Charlotte Jenkins Liu – Diabetes specialist nurse in SIR, 01223 348790
Claire Adams - Diabetes specialist nurse in SIR 01223 768625

Deleted:



We are currently working towards a smoke free site. Smoking is only permitted in the designated smoking areas.

For advice and support in quitting, contact your GP or the free NHS stop smoking helpline on 0800 169 0 169

Help with this leaflet:



If you would like this information in another language, large print or audio format, please ask the department to contact Patient Information: 01223 216032 or patient.information@addenbrookes.nhs.uk



Document history

Authors	Catherine Hames
Department	Cambridge University Hospitals NHS Foundation Trust, Hills Road, Cambridge, CB2 0QQ www.cuh.org.uk
Contact number	01223 216655
Publish/Review date	
File name	SIRcarbohydrate
Version number/Ref	