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Cardiff and Vale University Health Board

Cystic Fibrosis Related Diabetes Carbohydrate Awareness Information Pack

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Cystic Fibrosis Related Diabetes

What is cystic fibrosis related diabetes (CFRD)?

Diabetes mellitus is a condition in which the body is no longer able to control blood sugar (glucose) levels and subsequently blood glucose levels rise too high. When you eat carbohydrates your body breaks this food down (digestion) in your gut into smaller sugars that are then absorbed in to your bloodstream. Normally an organ called the pancreas releases a hormone called insulin in to the blood stream that controls the level of glucose. The most common types of diabetes are type 1 (no insulin production) and type 2 (reduced insulin production and insulin resistance (when insulin is produced but does not work efficiently to control glucose levels adequately).

CFRD is neither type 1 nor type 2 diabetes but has features of both (reduced insulin production and insulin resistance). CFRD is a condition that affects around 30% of adults with CF.

What Causes CFRD?

Most people with CF have a damaged pancreas resulting in inadequate production of digestive enzymes. However although insulin is normally produced in the pancreas not all of these people develop CFRD. Currently it is unclear why some people develop CFRD whilst others do not.

How can I control my CFRD?

If your CFRD is poorly controlled (high blood glucose levels) you may experience symptoms such as;

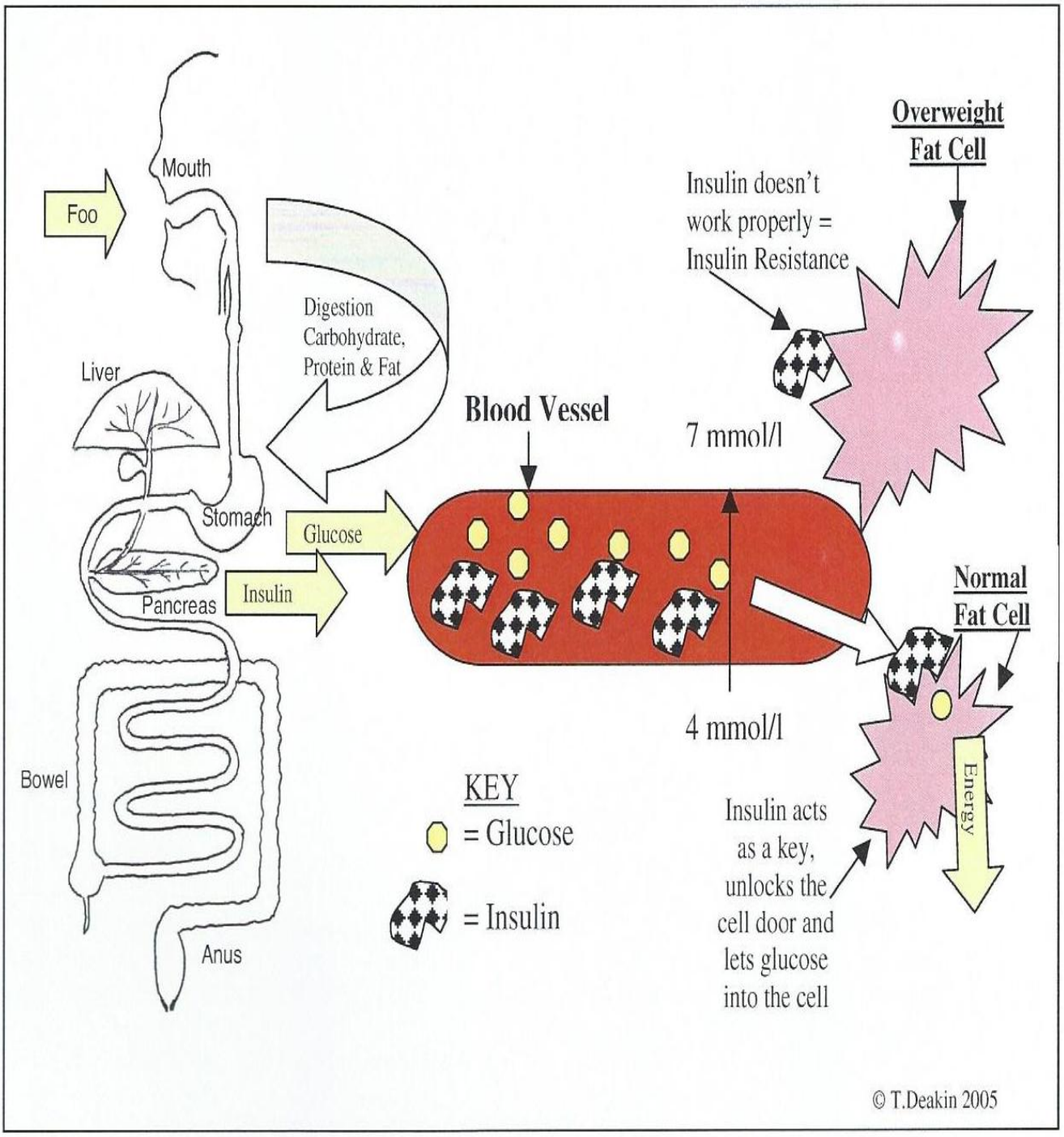
- More frequent respiratory infections
- Increased thirst (polydypsia)
- Frequent urination (polyuria)
- Tiredness
- Weight loss
- Blurred vision
- Increased risk of thrush

The aim of treatment is to keep your blood glucose levels as normal as possible thereby relieving these symptoms. Most people with CFRD require insulin injections tailored to their carbohydrate intake to help control blood glucose levels. However it is important that people with CF choose a high calorie diet and this is no different if you have CRFD.

Being ‘carbohydrate aware’ will help you control CFRD and thereby feel better.

CFRD: what is it?

What is Diabetes?



CFRD: a Guide to Carbohydrates

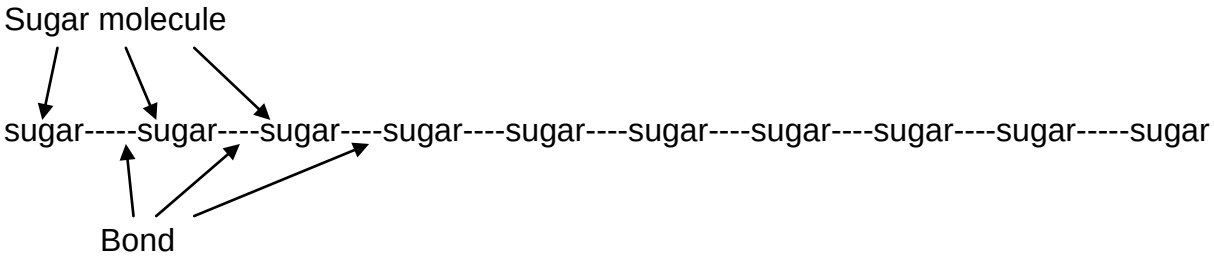
Different types of carbohydrates:

There are 2 main types of:

Starchy carbohydrates:

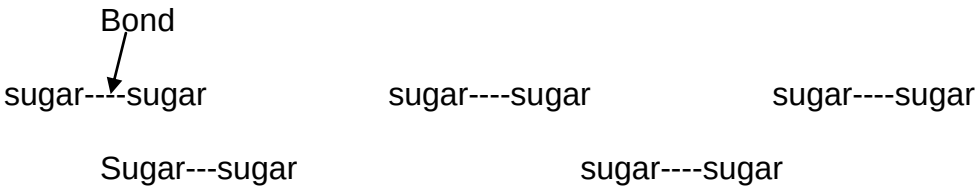
Eg bread, pasta, cereals, potatoes, couscous, rice, yams.

They are made up of many sugar molecules joined together to create very long chains. These chains need to be broken down (digested) in the gut before the sugars can pass into the blood circulation. It can take a long time to break down all the bonds of starchy carbohydrates therefore the sugars are released slowly into the blood circulation.



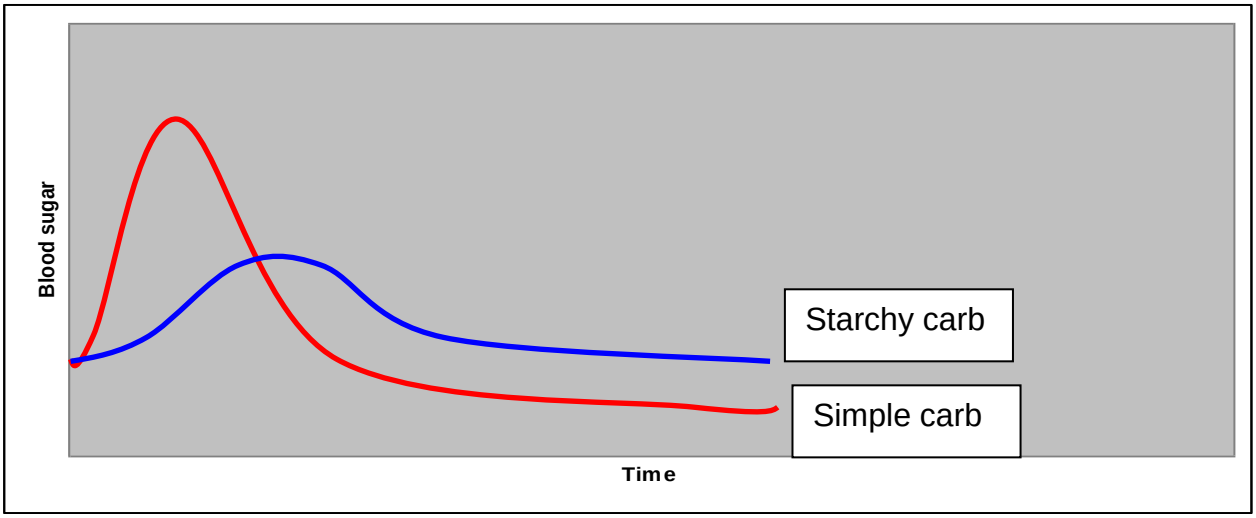
Simple carbohydrates;

Eg sugar, sugary sweets, sugary drinks (including energy drinks), cakes, sweet biscuits



Because these foods are made up of much smaller sugar structures often having only 1 bond they are digested much faster and therefore are absorbed into the blood much faster causing a rapid rise in blood sugar levels.

Effect of different types of carbohydrates on blood sugar levels



CFRD: a Guide to Carbohydrates

Both types of carbohydrate are usually okay to include in your diet however depending on how well controlled your blood sugar levels are your dietitian / doctor may advice that you reduce your intake of simple carbohydrate foods and drinks. Other helpful tips include;

- Include starchy carbohydrates at every meal
- Spreading out sugary foods across the day
- If you do eat sugary foods try to include them with or after meals

Fats and Protein in your Diet:
It is still very important to eat a high calorie and protein diet in order to minimise the risk of weight loss. Therefore choosing foods high in fat and protein will help. Additionally making sure meals are rich in fats and protein will also slow down the release of sugars in to the blood-stream.

FOODS HIGH IN SUGAR	SUITABLE ALTERNATIVES
Sugar, glucose, dextrose	Sweeteners (eg canderel, nutrasweet, hermestas, sweetex, saxin, splenda))
Sugary drinks (eg lucozade, cola, energy drinks eg red bull, monster)	Sugar free/low drinks, No added sugar drinks, unsweetened fruit juice
Jam, marmalade, honey, treacle, syrup	Pure fruit spreads, reduced sugar jams, savoury spreads
Sweets, chocolate	Fresh fruit, sugar free sweets
Cakes, sweet pastries, sweet biscuits	Crackers, crispbreads, fruit, plain biscuits (eg digestives, fig rolls, rich tea, marie, hobnobs, garibaldi), scones, tea bread, maltloaf
Puddings and desserts high in sugar (eg jelly, trifle, custard, cheesecake)	Desserts high in fat (eg thick and creamy yoghurts, Ice-cream)
Tinned fruit in syrup	Tinned fruit in natural juice
Sugar coated breakfast cereals (eg frosties, sugar puffs, crunchy nut cornflakes, coco pops)	Porridge, branflakes, weetabix, shredded wheat

CFRD: a Guide to Glycaemic Index

What is Glycaemic Index?

Glycaemic index (GI) is a number given to carbohydrate foods in relation to how fast the food releases its sugars into the bloodstream. The faster the carbohydrate food releases its sugars the higher its GI number.

Therefore in order to try to control your blood sugar levels it can be helpful to choose foods that release their sugars slowly into the bloodstream and hence have a lower GI number, although it is okay to have higher GI foods occasionally.

Including fatty foods with high GI foods can help because the fat slows down sugar release into the bloodstream therefore effectively lowering a foods GI number.

See page 7 for a list of common foods and their GI number.

CFRD: Glycaemic Index of Common Foods

Very high Try to avoid	Ok- keep to a minimum High GI – (over 70)	Better Intermediate GI (55-70)	Best Low GI (under 55)
Sugar (GI 100)		Honey	
	Corn flakes, Rice krispies	Mini-wheats, Museli, Weetabix	Porridge, Oat based cereal, All bran, Special K, Sultana bran
	Bagel, White bread, Puffed crispbreads, Water biscuits/ crackers, White French stick/ baguette	Pitta bread, Wholemeal bread, Crumpet, Ryvita, croissant	Granary bread, Rye bread, Fruit bread/loaf, Apple muffin, Banana cake
	Long-grain (brown/white) rice, Jacket potatoes, Oven chips, French fries, Instant potato	Taco shell Basmati rice Boiled new potatoes Couscous	Pasta, Noodles, Buckwheat, Bulgar wheat
	Broad beans Swede Parsnip	Sweetcorn Beetroot	Carrots, Sweet potato, Peas, Baked beans, Butterbeans, Chickpeas, Harricot beans, Kidney beans, Lentils, Soya beans
Dates	Watermelon	Banana, Cantelope melon, Mango, Papaya Pineapple, Raisins, Sultanas	Apple, Apricot, Cherries, Grapefruit, Grapes, Kiwi fruit, Orange, Peach, Pear, Plum
		Ice cream	Semi-skim milk custard, yoghurts (no added sugar types), macaroni
		Rich tea or digestive biscuits,	Oatmeal biscuits, crisps, chocolate
	Sugary fizzy drinks		Fruit juice (orange/ pineapple/ tomato/ grapefruit/ apple), Full fat milk

CFRD: a Guide to Food Labels

What does the food label tell me?

Energy;
The amount of energy (calories) that a food provides. Calorie content on a food label is represented by the abbreviation kcals.

Protein;
Protein is needed for growth and tissue repair. Protein is measured in grams (g).

Carbohydrate;
The total amount of carbohydrate in a food, including sugars and starches.

Of which sugars;
The amount of carbohydrate that is purely from sugars, both natural and added.

Fat;
The total amount of fat in a food.

Of which saturates;
The total amount of fat that is saturated (eg from animal source)

NUTRITIONAL INFORMATION		
	Per 100g	**Per 25g serving**
ENERGY	1560 kj 367 kcals	390 kj 92 kcals
PROTEIN	7.3g	1.8g
CARBOHYDRATE	**82.7g**	**20.7g**
Of which sugars	8.9g	2.2g
FAT	0.8g	0.2g
Of which saturates	0.3g	0.1g
FIBRE	3.6g	0.9g
SODIUM	1.1g	0.3g

- When adding up your carbohydrate content at a meal or snack it is important to take into consideration the ***TOTAL* carbohydrate** content and not just sugar content.

CFRD & Blood Sugar Monitoring

Why should I Monitor?

High blood sugar levels will not always be obvious to you, however high blood sugar levels will increase the risk of:

- More frequent and longer lasting chest infections, possibly resulting in more hospital admissions and a greater need for IV antibiotic treatment
- Increased risk of weight loss
- Eyes and kidneys may be damaged irreversibly

How Often Should I Monitor My Blood Sugars?

- Blood sugar levels should be checked up to 4 times per day especially if diabetes is poorly controlled eg;
    - Fasting (before the first food of the day)
    - Before each subsequent meal
    - Before bed
    - As part of regular testing occasionally check 2 hours after a meal (or bolus feed if tube feeding)

Should I Do Any Additional Checking?

- You may need to do additional blood sugar checks if you are unwell aiming for 4 checks per day.
- If you think you are experiencing a hypo (see below).
- Before and after exercise (see next section).
- Nine hours after taking steroid medication (eg prednisolone)

Do I Need To Keep Changing My Injection Site?

Injecting insulin into the same site can cause lipohypertrophy (lumps under the skin caused by accumulation of fat) therefore it is better to rotate injection sites to minimise the risk.

Common injection sites include the abdomen, buttocks, thighs and upper arms.

(If you have any queries please ask you CF team or diabetic team for further advice).

CFRD & Hypoglycaemia

Hypoglycaemia or ''hypo' means that your blood sugar level is too low (less than 4mmol/l)

Causes;

- Missing a meal or snack
- A change in timings of meals or snacks
- Having less starchy food than usual
- More exercise than usual
- Too much insulin
- Any combination of the above
- Excessive alcohol, especially on an empty stomach

Common Symptoms;

- Sweating
- Hunger
- Faintness
- Shaking
- Tingling around the mouth, hands or feet
- Blurred vision
- Anxiety and irritability
- Poor concentration
- Going pale

If you think you are experiencing the symptoms of a hypo immediately check your blood sugar levels and if below 4 mmol/l you need to follow the advice below;

Treating a Hypo;

- Take 3 or more glucose tablets
- Small glass(100ml) of lucozade or other sugary drink
- 5 sugary sweets eg barley sugar, mini chocolate bar
- A glass of fruit juice

The simple sugars you took initially should raise your blood sugar levels to over 4 mmol/l however it is important that you eat some starchy carbohydrate rich foods (see below) soon after in order to prevent your blood glucose dropping again.

- Eat a meal if it one due making sure the plate contains starchy carbohydrate
- A sandwich
- Bowl of cereal
- 2-3 biscuits with a glass of milk
- Cereal bar
- Scones

CFRD & Exercise

Regular exercise is important and can help you stay healthy in many ways in both body and mind. Circulation, lungs and mood can all benefit.

During exercise you will use up more carbohydrate than usual as your muscles use carbohydrates faster. The duration and intensity of exercise you do will affect how much carbohydrate your muscles use. This can increase the risk of hypoglycaemia or hypo (low sugar event), therefore you may find the following information helpful to reduce the risk:

- Check your blood glucose level before exercising (see table below)
- Try to avoid injecting insulin into muscles you will be exercising as insulin will be absorbed more quickly in active muscles and may cause a hypo.
- If you are planning to exercise after a meal then add extra starchy carbohydrate to your meal eg extra potatoes, rice, pasta, bread.
- Always carry quick acting carbohydrate foods/ drinks with you when exercising eg sugary drinks and/or glucose tablets to treat a hypo.
- Your blood sugars may dip lower than usual through the night after exercising therefore it can be helpful to eat an extra carbohydrate snack before bedtime.
- Take ID information and let someone know where you are going and how long you'll be gone.

Suggested Action depending on blood glucose before exercise;

Below 6 mmol	**6-10 mmol**	**10-15 mmol**	**Over 15 mmol OR ketones in urine**
Take extra carbohydrate before activity and top up during it if activity lasts longer than 30 minutes. The amount you need will depend on the level of duration of activity	If you are just doing gentle exercise, you may not need extra carbohydrate. If exercising more than 30 minutes consider taking extra carbohydrate before and during activity	Depending on how active you are going to be you may not need any extra carbohydrate before you start	**Don't Exercise!** Exercise will cause blood glucose to rise further because you do not have enough insulin in your blood. If you have just taken insulin then give it time to take effect before exercising. If not, you should consider an additional injection of fast acting insulin before exercising

CFRD & Exercise

Snacks for Exercise;

The amount of snack you need will depend on the duration and intensity of exercise you do.

As a rough guide aim for an extra 10-20g carbohydrate for every 20 minutes of exercise, depending on how hard you work.

It is important that you monitor blood glucose levels regularly especially if you are starting a new form of exercise or activity.

Suitable Snacks for Exercise;

Suitable pre-exercise snacks		Suitable post-exercise snacks
Plain biscuits	1-2	Digestive biscuits
Ripe banana	1	Cereal and milk
Jaffa cake	2	Cereal bars
Fruit juice	1 small glass	Teacake
Dried fruit	½ - 1 tablespoon	Bread / toast
Fun size chocolate bar	1	Scones
Glucose tablets	3	Muffins
		Fruit

CFRD & Nutritional Support

Oral Nutritional Supplements;

Some patients are advised to take oral nutritional supplement drinks in order to help weight control. Often supplement drinks will contain carbohydrate therefore it is important that you take account of these when you calculate your carbohydrate intake.

Carbohydrate content of nutritional supplements can vary. If you have any queries about this or find that your supplements cause problems with your blood glucose levels then speak to your Dietitian or diabetic specialist nurse.

Common Oral Nutritional Supplements and Carbohydrate Content

Supplement	Volume	Carb content	Dietitian use
Ensure Plus milkshake	220ml	44g	
Ensure Plus Juce	220ml	72g	
Ensure Twocal	200ml	42g	
Enshake	1 sachet made up with milk	78g	
Fortisip Compact	125ml	37g	
Fortisip	200ml	37g	
Fortimel	200ml	20g	
Complan	1 sachet made up with milk	44g	
Scandishake	1 sachet made up with milk	68g	
Calshake	1 sachet made up with milk	68g	
Calogen Extra	40ml shot	0g	

Tube feeding;

Tube feeding can be very helpful for weight stability. However all tube feeds contain carbohydrates therefore it is important that you consider the amount of carbohydrate in your feed. The amount of carbohydrate will vary depending on the volume and type of feed prescribed.

If blood glucose is not well controlled then you will not get the full benefit of the feed. Therefore it is recommended that you check blood glucose levels before, during and after your feed.

If you are an inpatient it may be helpful to check your blood glucose levels more often during your feeding period as illness can upset your blood glucose levels.

Common Feeds and Carbohydrate Content

Supplement	Volume	Carb content	Dietitian use
Osmolite 1.5	1000ml	204g	
Twocal	1000ml	210g	
Vital 1.5	1000ml	184g	
Perative	1000ml	177g	
Nutrison Concentrate	1000ml	201g	

CFRD Helpful Info

Dietitian:
Meenu Rezaie, David Proud
All Wales Adult CF Centre, Llandough Hospital
Telephone: 02920715281

Diabetic Specialist Nurse:
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Telephone: 02920715116

Recommended Resources:

Internet Resources
https://www.cysticfibrosis.org.uk/media/127524/FS_Related_Diabetes_Mar_13.pdf

Written Resources
Carbs & Cals, 5th ed, Cheyette & Balolia, Chello Publishing Limited.

Carbs & Cals & Protein & Fat, 1st ed, Cheyette & Balolia, Chello Publishing Limited.

Phone Apps:
i Carbs & Cals. (available from App store)