Food, diet and diabetes
what's hot and what's not?

The balance of protein, carbohydrate and fats in the diet has special significance for people with diabetes because of their particular concerns regarding cardiovascular risk and glycaemic control.

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In the 1960s, portions of carbohydrate were strictly controlled and fatty foods were free. In the 1980s, lots of complex carbohydrate was the rage, simple carbohydrates like sugars were out and fat was dangerous. Now, in the 2000s, protein is in, low glycaemic index (GI) guides carbohydrate choice and sugar is OK. These diets cannot all be right.

GPs are well placed to advise patients on healthy eating, particularly those looking to reduce their weight. This article comments on current nutrient recommendations and discusses the particular significance for patients with diabetes of the balance of protein, carbohydrate and fat in the diet, specifically mentioning two popular high protein diets used for weight reduction. Hopefully it will help you guide your diabetic patients towards a healthy diet.

The points to dot

The key message for achieving a healthy lifestyle, which is the cornerstone of diabetes management, is 'Eat less, walk more'. Even small changes in diet and activity levels can result in weight loss and improved control of blood glucose, lipids and blood pressure.

Eating the equivalent of one slice of bread less each day and walking the equivalent of one block extra each day is achievable for most people with diabetes. For the average 80 kg, 1.7 m-tall Australian with type 2 diabetes, this would equate to an energy deficit sufficient to lose about 5.5 kg in one year.

To imporove diet, target reducing the consumption of high energy and low satiating foods first: these are fatty foods and alcohol, and foods and drinks containing high amounts of added sugars,

IN SUMMARY

- **Eating patterns in Australia are close to those recommended but Australians are eating more than needed for energy balance and are getting progressively fatter. Associated with this increasing weight gain is the 'diabesity epidemic'.**
- **Adequate protein is essential but animal protein is often associated with saturated fat. Although unrefined carbohydrate is generally recommended, high carbohydrate diets may increase triglyceride levels. High fat diets may increase body fat; saturated fats and trans fats increase cholesterol, but cis unsaturated fats can improve the lipid profile.**
- **High protein diets have theoretical disadvantages, particularly adverse effects on bone and mineral metabolism, renal function and cardiovascular and cancer risks.**
- **The CSIRO diet, which promotes only moderately higher protein and lower carbohydrate than conventional diets, seems more appropriate for people with diabetes and also the general population than the very high protein, very low carbohydrate Atkins diet.**
- **Restricted carbohydrate diets can put patients with diabetes who are taking insulin or insulin secretagogues at increased risk of hypoglycaemia.**
- **The recommended maximum alcohol intake for patients with diabetes is the same as for the general population. Those trying to lose weight or who have hypertension or dyslipidaemia should only drink occasionally.**

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respectively. While a lot of these foods can be limited (such as crisps, pies, sweet biscuits and confectionery), many others are now available in no or low fat and no or low added sugar varieties (such as low fat cheeses, milks, salad dressings and crispbreads, and sugar free or artificially sweetened soft drinks, fruit juices and lollies). Alternatives can be used, such as lemon juice instead of oil in salad dressings, and unsweetened fruit salad as dessert. Grilling and dry frying cooking methods reduce the use of fat in cooking.

To increase activity, set concrete objectives that can be fitted into the everyday schedule. Walking suits most people, and walking with a companion (human, canine or media) can make it more enjoyable. Also encourage extra incidental activity. For example, when parking take the first space you see and walk, don't cruise and look for closer ones; cancel the milk and paper orders and walk to the shop instead; take the stairs not the lift, and walk up and down the escalator.

PHOTOLIBRARY

What have we got?

The 'good' fats

Saturated fats have molecules with no double bonds and a straight chain of carbon atoms. Unsaturated fats have double bonds, some of which bend the chains: if the bonds are 'trans', the fatty acid chain remains fairly straight; if the bonds are 'cis', the chain has significant bends.

The 'good' fats are the monounsaturated and polyunsaturated fats with bends (cis bonds) at particular positions on the carbon chain (i.e. omega-3, 6 or 9). (Omega refers to the end of the chain, as opposed to the beginning or alpha end, which has the –COOH acid group; 3, 6 and 9 refer to the position of the first double bond from the omega end, i.e. between the third and fourth, sixth and seventh, and ninth and tenth, carbon atoms, respectively.) Omega-3 and omega-6 fatty acids are essential fatty acids (that is, they cannot be synthesised by the body and must be obtained from the diet) and are polyunsaturated with cis bonds; omega-9 fatty acids are nonessential fatty acids and are monounsaturated with cis bonds. The cis fats are associated with favourable lipid profiles whereas the saturated and trans fats are associated with adverse lipid profiles.

Trans fats are good fats turned bad. They are formed when cis fats, usually omega-6s, are hydrogenated (i.e. partially saturated) by heating, either incidentally during cooking (as in frying) or purposely as part of food processing to make them more solid and/or aid shelf life by preventing them going rancid. Although most trans fats present in food are formed during food processing or cooking, trans fats do occur naturally in small quantities in dairy products and meat from ruminanats.

Nutrition recommendations

The NHMRC nutrient reference values advise the following nutrient intakes for all Australian adults, expressed as the percentage of the total energy intake, to reduce the risk of chronic disease (Figure 1):[1]

- fat, 20 to 35% of energy, with a focus on reducing saturated and trans fat intakes
- protein, 15 to 25% of energy
- carbohydrate, 45 to 65%.

For patients with diabetes, regular eating and spreading the intake of carbohydrate over the day are recommended to stabilise glycaemia, particularly for those taking insulin or insulin secretagogues.

Australian eating patterns

Australians with diabetes generally eat a similar range of foods as Australians without diabetes. Although our macronutrient intake appears to be on target, we are eating more than we need for energy balance (Figure 1). We are eating more and walking less than we should. As a result, Australians are getting fatter each year. Although the prevalence of overweight (BMI, 25 to 29.9 kg/m^2) has not increased much in the last decade or so,

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the prevalence of obesity (BMI equal to or above 30 kg/m^2) has increased considerably, as shown by data collected as part of the South Australian Health Omnibus Survey (Figure 2). While all age groups are getting fatter, of particular concern are young Australians, who now rival Americans in fatness.

The parallel rise of diabetes and obesity has made the 'diabesity epidemic' a health priority for Australia and many other nations, both developed and developing.

Food – what's the right shot?

Recommendations regarding diets are legion. Every week there is a new and supposedly highly successful diet: more protein, more monos, more omega-3s…; less animal protein, low carbohydrate, low fat, low GI…

The key features of a healthy diet are:

- variety – eating a variety of foods will provide the necessary variety of nutrients; each nutrient has its pros and cons (Table 1)
- moderation – a greater intake of one nutrient type needs, in principle, to be balanced by a lower intake of another.

For people with diabetes, there is a third key point:

- routine – diabetes thrives on routine: change eating or activity level, and blood glucose will change.

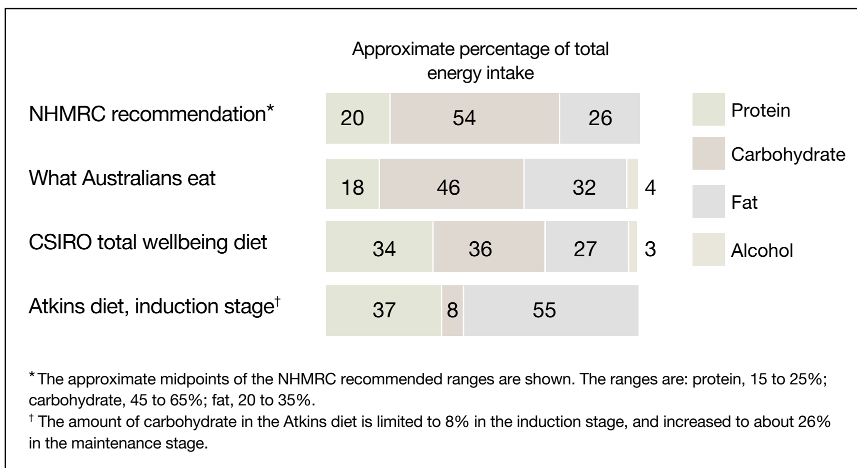

Figure 1. Macronutrient balance in various diets.

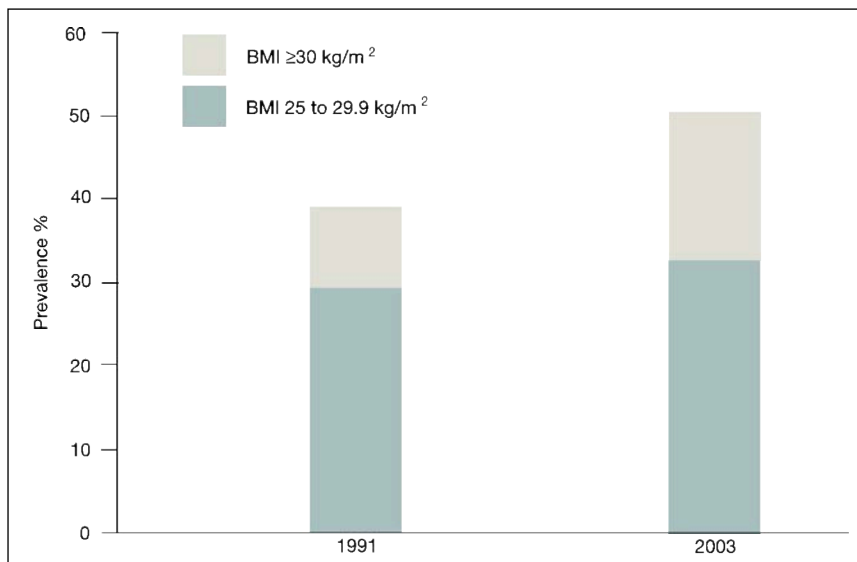

Figure 2. The big get bigger – the prevalence of obesity has increased more than the prevalence of overweight. (From data collected as part of the South Australian Health Omnibus Survey.)

Balance of protein, carbohydrate and fat

The balance of macronutrients in the diet should have special significance for people with diabetes, in whom cardiovascular risk and glycaemic control are major considerations.

Adequate protein is essential to maintain somatic and visceral protein. Although it provides the same energy as carbohydrate (4 cal/g), it is thought to be more satiating and therefore more satisfying for the same energy content. Animal protein is often associated with saturated fat, highlighting the importance of choosing low fat, lean sources. High protein intakes may have adverse effects on calcium balance and renal function.

It is generally accepted that unrefined, low GI, high fibre carbohydrate-based foods are preferable. However, there are concerns that high carbohydrate intake may worsen hypertriglyceridaemia, which is the dominant dyslipidaemia in type 2 diabetes. For energy balance, carbohydrate is usually the major energy source, with the proportion depending on culture and routine. Low GI foods, because of their slow release of glucose, may reduce postprandial hyperglycaemia. It should be remembered that unrefined or high fibre does not necessarily equal low GI; indeed, many high fibre, wholegrain foods – some wholemeal breads, some breakfast cereals and rice, for example – have a high GI.

Fats are currently the 'bad' nutrient. Their high energy content (9 cal/g), high palatability and ease of ingestion increase fatness, and because they are often saturated or trans they can increase cardiovascular risk. While the 'bad' saturated and

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Table 1. The pros and cons of eating carbohydrate, fat and protein

Nutrient	Pros	Cons
Carbohydrate	Generally associated with no or low fat; satiating when associated with high fibre	May worsen hypertriglyceridaemia; excessive amounts may worsen glycaemia; nonsatiating if low GI or low fibre
Fat	Satiating	High energy content
– saturated and trans fats	None	Increase LDL cholesterol
– monounsaturated fats	Reduce cholesterol	Can become trans fats on heating
– polyunsaturated fats	Reduce cholesterol	Can become trans fats on heating
– omega-3 fats*	Lipid benefits	Easily destroyed; supplements not regulated; can become trans fats on heating
Protein	Satiating	Animal protein often associated with saturated fat; suggested ill effects on calcium balance (bone metabolism) and renal function

* Omega-3 fats are one of the essential fatty acids, and are cis polyunsaturated fats.

trans fats increase LDL cholesterol and cardiovascular risk, the 'good' cis mono- and polyunsaturated fats, including omega-3 and omega-6 fatty acids, may improve the lipid profile and decrease cardiovascular risk. Omega-3 fats are often lacking in the diet (rich sources include oily fish, oils derived from flaxseed, canola, walnut and soybean and green leafy vegetables) and the supplements that are available are not subject to the same quality control as pharmaceutical products and may not have the expected contents or effects. Saturated and trans fats are found in high amounts in fried fast foods, baked goods such as pastries, and cookies, chips and many convenience foods. Also, some margarines are high in trans fats.

Protein – a lot

High protein diets

Energy-restricted high protein diets vary considerably in the amounts of protein, carbohydrate and fat they promote. Those that are more extreme, promoting unlimited protein and very restricted carbohydrate, are controversial as they are associated with high saturated fat and low dietary fibre and micronutrient intakes.

Potential advantages

High protein diets have several potential advantages. They result in greater loss of weight and abdominal fat (also known as visceral or central fat) than conventional diets in the short term.[2] This loss of abdominal fat is thought to improve the cardiovascular risk profile by reducing blood glucose and lipids and blood pressure. Longer term studies have not shown greater weight loss than conventional diets at 12 months in obese people with hyperinsulinaemia or type 2 diabetes.[3,4] It has been suggested that high carbohydrate intake might increase triglyceride levels, which are the dominant dyslipidaemia in type 2 diabetes. The high protein diets have less carbohydrate than the usual Australian intake and are associated with a greater reduction in triglyceride levels than the recommended conventional diet.[5-7]

High protein diets are said to be more satiating and easier to adhere to than conventional diets. Despite this, dropout rates are much the same for these and conventional diets – consistently high.[3-5,8]

Another possible advantage of high protein diets is that they may help patients with insulin resistance and hyperinsulinaemia. 'Are carbs killing us?' is a question sometimes asked of high carbohydrate diets, because carbohydrate increases insulin levels. Remember, however, that amino acids are potent stimulators of insulin secretion as well. Certainly weight loss decreases insulin resistance,[9] but several studies have not shown any effect of macronutrient composition on insulin resistance independent of weight loss.[3,5,6,10]

Potential risks

Balancing the potential advantages are the potential risks outlined below.

Bones. Short term high protein intake (2 g/kg/day), particularly animal protein, is associated with increased renal calcium excretion, negative calcium balance and bone resorption.[11]

Kidney damage. High protein intake increases glomerular pressure and filtration rate, theoretically potentially increasing albumin filtration and excretion, and causing renal damage. There is no evidence that this occurs but it is true that pre-existing kidney disease might be worsened.[11]

Cancer risk. High (more than 160 g/day)

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Table 2. Comparison of diets: a sample day for weight reduction

	Conventional diet	CSIRO total wellbeing diet	Atkins diet (induction phase)
Breakfast	3/4 to 1 cup* high fibre breakfast cereal with 250 mL low fat milk, 1 piece fresh fruit	3/4 cup high fibre breakfast cereal with 250 mL low fat milk, 1 banana	Greek omelette (3/4 cup spinach, 50 g feta and 2 eggs), 1/2 small tomato (sliced)
Lunch	2 slices wholegrain bread filled with 1 slice low fat cheese and salad, 1 piece fresh fruit	2 slices wholegrain bread with 100 g turkey, cranberry sauce, lettuce and 1 slice low fat cheese, 1 piece of fresh fruit	Corned beef, 2 slices Swiss cheese, 1/4 cup sauerkraut and 1 slice rye bread
Dinner	1 1/2 cups cooked pasta with tomato-based vegetable sauce and 100 g chicken breast fillet, garden salad with low fat dressing	200 g chicken breast fillet (coated in Moroccan spices) fried in 2 teaspoons of canola oil, 1/2 cup steamed sweet corn, broccoli and pumpkin	Grilled sirloin steak (unlimited), cauliflower with Indian spices, 2 cups mixed green salad with blue cheese dressing
Snack	200 g low fat or diet yoghurt, 1 serve fresh fruit, unlimited vegetables (e.g. carrot and celery sticks)	200 g low fat or diet yoghurt, 1 cup low calorie soup, unlimited vegetables (any green, red, orange, and yellow vegetables and most white vegetables)	1 celery stalk with 2 tablespoons soy nut butter
Drinks	Water, teas, coffee, diet soft drinks, unflavoured mineral water	Water, diet soft drinks, unflavoured mineral water, teas, coffee, cocoa	At least eight glasses of water each day; avoid coffee, teas and soft drinks that contain caffeine

* 1 cup, Australian = 250 mL

versus low (less than 20 g/day) intake of red and processed meat has been shown to be associated with an increased risk of colorectal cancer (the mechanism for this increased risk is uncertain).[12]

Heart disease. High homocysteine levels are associated with higher cardiovascular risk, and high protein diets (more than 21% of energy intake) have been shown to increase postprandial homocysteine levels.[13]

Hypoglycaemia. Patients taking insulin or insulin secretagogues (sulfonylureas or repaglinide [NovoNorm]) have an increased risk of hypoglycaemia while following an energy-restricted high protein diet. This applies particularly to those with type 1 diabetes (who are much more prone to hypoglycaemia than those with type 2 diabetes). Patients likely to be especially at risk are those with a history of a hypoglycaemic episode where help was required from another person.

What's hot?

The CSIRO diet

The total wellbeing diet developed by the CSIRO is one of the higher protein diets stressing the benefits of protein. It recommends more protein and less carbohydrate than we currently eat (Figure 1). For our 80 kg, 1.7 m-tall example Australian, the CSIRO diet would suggest 300 g of lean meat, chicken, fish or eggs and three serves of breads or cereals each day. The conventional diet (as recommended by the *Australian guide to healthy eating*, which is based on NHMRC values) with the same energy would contain about 65 to 100 g of meat or 80 to 120 g of fish and four to five serves of breads and cereals each day (Table 2).[14] The CSIRO diet seems to realise some of the potential advantages of high protein diets, including a greater reduction in triglyceride levels than the recommended conventional diet (22% *v.* 8% at 12 months).[7]

As yet, none of the potential risks of high protein diets have been reported for the CSIRO diet. Regarding colorectal cancer risk, for our example Australian, the CSIRO diet would recommend a red meat intake of 200 g at least four times per week, giving an average of 114 g of lean red meat per day, which is below the high intake of more than 160 g/day quoted above to be associated with an increased risk of colorectal cancer. Also, the CSIRO diet recommends two to three fish meals each week, and increased fish intake is associated with decreased risk of colorectal cancer.

What's not so hot?

The Atkins diet

The Atkins diet is probably the best known high protein diet worldwide. It is also one of the more extreme, with much higher levels of protein and fat than the usual intake or the current recommendations in

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Australia (Figure 1). It allows unlimited meat, cheese and eggs, and protein intakes can be as high as 3 g/kg bodyweight/day (Table 2). For our example Australian, this would be 240 g protein a day, the equivalent of 1 kg of fresh steak a day. Initial carbohydrate intake is very restricted (about 20 g/day); this is increased later to about 50 g/day for 'lifestyle maintenance'. In comparison, the current NHMRC recommendation for carbohydrate for our example Australian is 250 g/day.

The same potential advantages are cited for the Atkins diet as for the CSIRO diet. In terms of loss of weight and fat, the same short term advantages occur with the Atkins diet as with the CSIRO diet.[15,16] However, little difference has been shown between Atkins style and conventional diets at 12 months,[5,6,8] and in one study weight plateaued at six months in those individuals on an Atkins style diet whereas it had continued to be lost in those on a conventional diet at 12 months.[6]

An overview of 94 dietary interventions found that weight loss was not independently associated with reduced carbohydrate intake,[17] and most studies have shown that restricted energy intake rather than macronutrient composition determines weight loss.[2,10,18] As far as adherence is concerned, dropout rates are high for all diets, as has been noted previously.

Like the CSIRO diet, the Atkins diet results in similar changes to the total and LDL cholesterol as conventional diets but is more effective in reducing triglycerides.[5,6] The Atkins diet also increases HDL cholesterol at 12 months.[5]

The same potential disadvantages apply to the Atkins diet as to the CSIRO diet, perhaps more so, but there are no data demonstrating adverse effects for either. However, the Atkins diet does have one disadvantage compared to CSIRO diets: a greater risk of hypoglycaemia if insulin or insulin secretagogues are being taken, because of the very restricted carbohydrate intake. Patients on insulin or insulin secretagogues who experience hypoglycaemic unawareness (where hypoglycaemia can strike without warning during the day or night) should be counselled to re-consider their decision if they are contemplating following the Atkins diet and to seek advice from a dietitian if they are considering a CSIRO diet.

Alcohol and diabetes – a tot, not a lot

Although consuming small amounts of alcohol is supposed to confer cardiovascular benefits, this has not yet been clearly demonstrated. Particular issues regarding alcohol consumption for people with diabetes include the following:

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- weight gain – alcohol is high in calories (7 cal/g); one standard drink (10 g alcohol) has the same energy as the slice of bread in the 'Eat less… walk more' diabetes management message mentioned at the beginning of this article.
- hypoglycaemia – alcohol blunts the cognitive recognition of hypoglycaemic symptoms and the physiological response (gluconeogenesis), and is a particular risk for patients taking insulin or insulin secretagogues
- cardiovascular risk – there may be some benefits from small amounts of alcohol but there are clear risks; apart from causing weight gain, alcohol increases blood pressure and triglyceride levels
- medications – diabetes is associated with high medication usage, giving many opportunities for drug interactions.

For most people with diabetes, the recommendations are the general ones of a maximum of two standard drinks per day for men, and one per day for women. For those trying to lose weight or with hypertension or dyslipidaemia, the recommendation is two or one standard drinks, as appropriate, on special occasions only.

Food, diet and diabetes – what's what?

Although the balance of protein to fat to carbohydrate that Australians with or without diabetes are eating seems to be close to that recommended by the NHMRC, more food is being eaten than is needed for energy balance. Simply eating less and exercising more is a solution, but many people prefer to follow weight reducing diets. The currently popular high protein diets result in greater short term losses of weight and fat and greater decreases in triglyceride levels than conventional weight reducing diets, but more evidence is needed to determine their long term safety and effectiveness. People with diabetes should follow these diets only after careful consideration because of the potential disadvantages of adverse cardiovascular and renal effects and increased risk of hypoglycaemia as well as likely nutritional inadequacies. The CSIRO total wellbeing diet seems more appropriate than the more extreme Atkins diet. MT

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