DIABETES MELLITUS

This information is brought to you by many of the Australian nutrition professionals who regularly contribute to the Nutritionists Network (‘Nut-Net’), a nutrition email discussion group.

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The following questions and answers address some of the relationships between diet, lifestyle, diabetes and health.

What is 'diabetes'?

'Diabetes' is the abbreviated term for a condition known as 'diabetes mellitus'. There are two main forms of diabetes in the general population, type 1 and type 2. A third type, known as 'gestational diabetes' is associated with pregnancy. All forms of diabetes involve a reduced ability of the body to handle blood glucose (the type of sugar transported in the blood).

In normal health, blood glucose is maintained at a fairly constant level, although it does fluctuate slightly. Blood glucose level is controlled largely by the action of insulin, a hormone produced in the pancreas. Insulin stimulates the uptake of glucose, amino acids and fat (in the form of triglycerides) from the blood into the tissues for use. Insulin also promotes the storage of blood glucose in the liver and muscles. Thus insulin prevents the glucose level becoming too high in the blood. If insulin production is too low, or the insulin does not have its usual effect, blood glucose can climb to dangerous levels (a condition known as 'hyperglycaemia'). When blood glucose levels are high over long periods of time, damage to cells within the body can result. For example, nerve and vascular damage are common.

Type 1 diabetes, previously known as 'juvenile-onset' or 'insulin-dependent diabetes mellitus' (IDDM), involves destruction of the cells of the pancreas that produce insulin, so people with type 1 diabetes have a deficiency of insulin. As a result, injections of insulin are required.

Type 2 diabetes, previously known as 'adult-onset' or 'non-insulin-dependent diabetes mellitus' (NIDDM), does not usually involve a deficiency of insulin production (at least not in the initial stages), rather, the body becomes resistant to the effects of insulin. While type 2 diabetes is at this early stage, lifestyle changes (discussed in detail below) such as diet and exercise diet may be enough to control blood sugar levels with no (or minimal) need for medication. However, type 2 diabetes may progress to the stage where regular medication is also needed. In some cases, as diabetes progresses, a combination of treatments may be required. This could mean an altered diet, lifestyle changes, regular medication and insulin injections may all be necessary.
Gestational diabetes is usually only a temporary condition, affecting about 3% of pregnant women. Individuals who experience gestational diabetes have greater risk of developing type 2 diabetes in the future.

Because the vast majority (more than 90%) of people with diabetes have type 2, and its incidence is growing in epidemic proportions, this FAQ will address mainly type 2 diabetes.

**How does having type 2 diabetes affect someone's health?**

Diabetes, unless treated appropriately, greatly increases the risk of a range of diseases, including heart disease, blindness, gangrene (leading to the need for limb amputations) and kidney disease. It is estimated that the risk of having a heart attack among people with type 2 diabetes is equal to that of someone without diabetes who has already experienced a heart attack.

But diabetes greatly increases these risks only if it is not treated effectively. With proper management, including appropriate alterations to diet and lifestyle as described below, the vast majority of people with diabetes can lead full and satisfying lives.

**How widespread is type 2 diabetes?**

Just as the developed world is undergoing an epidemic of obesity, so too the incidence of type 2 diabetes is rapidly increasing. This is not a coincidence—obesity is the major risk factor for type 2 diabetes. From the early 1980s to 2000 there was a doubling of the rate of obesity in Australia. Paralleling this, the diabetes rate has at least doubled, and may even have trebled in the past 20 years. The relationship between obesity and diabetes is at least as strong as that between smoking and lung cancer—that is, if you carry substantial excess of body fat, your chances of developing type 2 diabetes are increased by more than ten times compared to someone in the healthy weight range.

According to a press release issued by International Diabetes Institute in May 2000, it is estimated that about 7-8% of Australian adults (over the age of 25) now have type 2 diabetes, and 16% have its precursor, impaired glucose tolerance. But many people who have only recently developed diabetes are not yet aware of their condition. In fact it is estimated that in Australia 50% of sufferers are undiagnosed. This is a potentially dangerous situation, because of the complications of diabetes previously described. In 2000, the Federal Minister for Health called diabetes a 'time bomb' for public health in Australia, as the seventh highest leading cause of death.

**Who is at greatest risk of developing type 2 diabetes?**

Until recently, type 2 diabetes was considered as the 'adult onset' form—that is, it was rarely seen other than in middle-aged and older people. However, it is now affecting younger people as well. For example, one recent study found that nearly 5% of children in the United States have early signs of type 2 diabetes. But it is still true that the risk increases with age. Some population groups are also at special risk including: Aboriginal and Torres Strait Islanders, Pacific Islanders, people from the Indian Subcontinent, and people of Chinese origin (in each case the risk increases...
substantially from age 35 on); People of any race or background over 45 years who have high body fat levels and/or high blood pressure ('hypertension'); Women with polycystic ovary disease; Women with previous gestational diabetes; People 55 years and over; and People 45 years and over with a family history of type 2 diabetes.

If I don't have diabetes, what can I do to reduce my chances of developing it?

There is a strong relationship between a group of metabolic conditions known as the 'metabolic syndrome' or 'syndrome X' and risk of diabetes. The components of metabolic syndrome include obesity, high blood levels of triglycerides and 'LDL' (the 'bad' cholesterol), low blood 'HDL' (the 'good' cholesterol) and high blood pressure. These are also among the major risk factors for heart disease, so dietary and lifestyle advice for avoiding diabetes is pretty much the same as for reducing the risk of heart disease. In summary, the advice includes:

- follow the dietary guidelines (see Appendix 1 for those guidelines that are most relevant to avoiding diabetes);
- reduce body weight (if overweight or obese--see Appendix 2 for definitions);
- increase physical activity (if previously sedentary or only slightly active).

As recommended in the first dietary guideline shown in Appendix 1, eating plenty of wholegrain cereal foods (e.g. wholegrain bread, rice, pasta), legumes, vegetables and fruits is one of the most beneficial aspects of diet for reducing the risk of diabetes (and many other diseases). Reducing intake of total fat and, in particular, saturated fat (second guideline in Appendix 1) is also very important.

Because reducing body weight is associated with improvement in all components of the metabolic syndrome, losing some weight (if you have excess body fat) is also very important. This is illustrated by studies conducted in the US and Finland, which found a significant reduction in progression from 'impaired glucose intolerance' (the condition that predisposes to diabetes) to actual diabetes in those people who lost weight.

The effect of obesity on diabetes risk is also graphically illustrated by recent results from the US, where nearly 20% of children are obese, and one quarter of these children have impaired glucose tolerance.

But physical activity is probably just as important as diet and weight control (and impacts beneficially on the latter). For general health, (including reducing the risk of developing type 2 diabetes) Active Australia recommends a minimum of 30 minutes of planned moderately-vigorous activity each day, with some vigorous activity as well. This planned activity is in addition to any incidental activity. Companion FAQs in this series provide more information on appropriate types and levels of activity for general health, for weight control, and for physical fitness.

Because type 2 diabetes (and obesity) are increasing in young people, encouraging children to be more active is especially important in reducing the risk of later development of diabetes. Turning off the television and the computer, and sending the children outside to play (under safe conditions, of course) may be one of the most health-promoting influences parents can have on their children. Allowing them to
walk short distances—or better still, walking with them—rather than driving them also promotes metabolic fitness and weight control.

**If I have diabetes, how should I adjust my diet and lifestyle to help keep it under control?**

First, always seek (and take) advice from your doctor and/or dietitian. Because no two people have identical metabolism, food preferences, cultures or nutritional requirements, personalised professional advice is essential. So the advice provided in this answer applies only generally—if you have diabetes, alterations to your diet and lifestyle need to be tailored by your health professional to your individual needs.

The overall goal in treating diabetes is to maintain health and quality of life. The main dietary and lifestyle elements of this strategy will be:

1. keep blood glucose levels in the range 4-8 mmol/L, and as stable as possible—continually high blood glucose levels increase the risk of complications including heart disease, blindness, kidney disease, and limb amputations;
2. lose some body weight (if overweight or obese; see Appendix 2 for definitions);
3. optimise blood lipid levels (i.e. blood cholesterol, triglycerides);
4. maintain (or regain) normal blood pressure;
5. quit smoking (if you are a smoker); and
6. take part in plenty of moderately-vigorous physical activity.

The remainder of this FAQ is devoted to examining how these components may be put into effect.

**Maintain stable blood glucose levels**

Contrary to popular opinion, people with diabetes should not severely restrict their intake of all carbohydrate foods. A certain amount of carbohydrate is necessary for the normal functioning of organs that do not have a ready alternative source of energy (e.g. the brain). But the carbohydrate foods eaten should be high in fibre: suitable foods are wholemeal and multigrain breads, brown rice, pasta, vegetables (including beans, peas and other legumes), fruits and low- or reduced-fat milk products.

For the most part, the carbohydrate foods should also be relatively low in 'glycaemic' (also spelled 'glycemic') index (GI). The GI of a food is a measure of how quickly it is digested and the carbohydrate is absorbed into the bloodstream. In other words, how quickly and to what extent blood sugar levels will rise. In brief, foods such as beans and other legumes, oats (e.g. porridge), pasta, wholegrain foods and dairy products have relatively low GI, while potatoes, white bread and rice are among those carbohydrate foods that have relatively high GI. Recent research has shown that low GI diets can improve blood glucose control. But this does not mean that some relatively high GI foods—e.g. wholemeal bread, rice and potatoes—are unsuitable; as mentioned in the previous paragraph, there are other reasons why these foods are valuable components of the diet for people with diabetes. To assist people in making better food choices, GI is now included on some food labels in Australia.
To maintain stable blood glucose levels it may also be better for some people to eat small meals or snacks frequently (i.e. five or six times per day), rather than three large meals. This may help with improving blood lipid levels too. Check with your doctor and/or dietitian to see if it might be worthwhile for you to try this eating pattern.

While sugar itself does not contain any nutrients other than carbohydrate, there is no need to totally avoid it. As research into the glycaemic continued it became apparent that the old idea that sugar is especially inappropriate for people with diabetes is no longer current, as it is now known that sugar (sucrose) doesn't raise blood glucose levels as much as glucose and some starchy foods.

However, blood glucose control is not the only dietary consideration. People with diabetes need to ensure that their diet promotes appropriate body weight (e.g. weight loss if overweight), is low in overall GI (as mentioned above), low in saturated fat, and rich in dietary fibre and essential nutrients. Therefore, small to moderate amounts of sugar found in foods such as flavoured milk (preferably low- or reduced-fat), high-fibre breakfast cereals, and stewed or canned fruit are unlikely to compromise dietary quality. It is best to avoid foods that have high concentrations of carbohydrate (sugar or starch) with no or few other nutrients (e.g. foods such as soft drinks, confectionery, highly-sugared breakfast cereals, sweet biscuits and cakes), especially between meals.

If your doctor and/or dietitian agree that you should try eating five or six light meals per day, you will have to be especially careful about regularly cleaning your teeth to minimise the risk of tooth decay.

Also, artificial sweeteners can be used to replace some sugar, e.g. for sweetening hot beverages and soft drinks.

Finally, alcohol--although not a necessary part of anyone's diet--can safely be taken in moderation. A maximum of one or two drinks per day is acceptable (but check with your doctor to see if any prescribed drugs you are taking are incompatible with alcohol). Also, drinking alcohol on an empty stomach may lead to low blood glucose levels ("hypoglycaemia") in people with diabetes who require insulin injections. A carbohydrate containing food should be eaten just before (or with) the alcoholic drink to minimise the risk of hypoglycaemia.

**Lose some body weight (if overweight or obese)**

Along with increasing physical activity (and related to it), losing weight is one of the most beneficial changes people can make if they are overweight and have diabetes. Advice on diet and lifestyle changes for weight reduction is provided in companion FAQs in this series. In brief, a small reduction in total food intake and an increase in moderately vigorous physical activity are recommended to safely reduce body weight, while also maintaining muscle mass. Although getting your weight down to the 'healthy weight range' (see Appendix 2) would be ideal, you will also derive significant health improvements with a weight loss of just 5-10% of your initial weight.

If you are above the healthy weight range it is also important to take into account where on your body you are carrying the extra fat. Fat in the abdominal area (e.g. the 'beer gut' that many Australian men so fondly cultivate) is associated with much greater risk of diabetes than fat on the hips and thighs (which is more common in women). Men should have a waist circumference (at the level of the navel,
immediately after breathing out) of no more than about 100 cm. For women, the recommended maximum waist circumference is about 90 cm.

**Optimise blood lipid levels (i.e. blood cholesterol, triglycerides)**

The aim should be to reduce to (or maintain at) low levels both your blood cholesterol (especially the 'bad' cholesterol component, LDL) and blood triglycerides. Of course your doctor is the best person to advise you on the safety and effectiveness of the available medical treatments for this, taking into account all your circumstances (including current blood lipid levels, body weight, blood pressure, need for medication, and so on), but to assist in achieving long term dietary change it is also desirable to see a qualified dietitian.

Recent recommendations are that people with diabetes need to be vigilant about keeping blood LDL and triglycerides at low levels. In addition to any medication you may be prescribed, some simple changes to diet and plenty of moderately-vigorous physical activity will also help.

In general terms, if you are overweight, losing some excess body fat may help achieve improved levels of blood cholesterol and triglycerides. In addition, reducing intake of 'saturated' fats (such as those found in butter, full-fat dairy products, most fast foods, fatty meats--including sausages and deli meats--and in most biscuits, cakes and pastries) will promote a reduction in blood cholesterol. As mentioned above, increased consumption of whole grains, fruits and vegetables is recommended to at least partially replace these fatty foods.

But there is no need to severely restrict fat intake, either. There is good evidence that polyunsaturated fats (including the 'omega-3' fats) and monounsaturated fats, can safely and effectively be used to replace much of the saturated fat. Good sources of polyunsaturated and monounsaturated fats include fish, avocado, nuts, seeds (pumpkin, sunflower), canola oil, olive oil, sunflower oil, soybean oil, peanut oil, and margarine spreads. Eating more of these foods in place of those high in saturated fats will help achieve reduction of LDL and triglyceride levels, and reduce the tendency of the blood to clot (thereby reducing the severity of a heart attack if one does occur).

Increasing physical activity will also help improve blood lipid levels, as described below.

**Maintain (or regain) normal blood pressure**

High blood pressure is an important risk factor for heart disease and the major risk factor for stroke. Heart disease and stroke are two of the most significant complications of diabetes. Weight reduction (if overweight) will assist in reducing blood pressure. Restricting salt intake is also important because high salt intake is related to high blood pressure.

**Quit smoking (if you are a smoker)**

Smoking is associated with an increased risk of heart disease (in addition to other
nondiabetes-related conditions such as lung cancer, bronchitis, emphysema, osteoporosis and impotence. Some people are reluctant to give up smoking for fear of putting on weight. By increasing physical activity and being careful with their diet, smokers should be able to quit smoking without experiencing a weight gain. But even if there is a slight build up of bodyfat, this will be outweighed by the health benefits of quitting. Giving up (or better still, never having taken up) smoking is vital for people with diabetes if they are serious about managing their condition.

**Take part in plenty of moderately-vigorous physical activity.**

There is overwhelming evidence that increased physical activity will assist in several aspects of the management of diabetes (and also with promoting good health in general). Taking part in regular, moderately-vigorous activity (preferably also with some vigorous activity) increases HDL, the 'good' fraction of blood cholesterol. It also helps with weight control, reduces blood pressure and assists in keeping blood glucose under control.

In summary, advice for prevention and treatment of diabetes is generally similar to that for general health and fitness--follow the dietary guidelines; maintain (or regain) the healthy weight range if you can, but at least lose some weight if you are above the healthy weight range; quit smoking (if you are a smoker); and take part in plenty of moderately-vigorous (and some vigorous) physical activity.

In addition to the advice for prevention of diabetes, treatment of diabetes involves (if your doctor and/or dietitian approve) eating five or six small meals (or snacks) rather than three large meals; emphasising foods that provide fibre and/or are low in GI; and increasing the intake of foods rich in unsaturated fats at the expense of saturated fat.

**Appendix 1. Australian Dietary Guidelines relevant to the prevention and treatment of diabetes:**

- Eat plenty of breads and cereals (preferably wholegrain), vegetables (including legumes) and fruits;
- Eat a diet low in fat and, in particular, low in saturated fat;
- Maintain a healthy body weight by balancing physical activity and food intake;
- If you drink alcohol, limit your intake;
- Eat only a moderate amount of sugars and food containing added sugars; and
- Choose low salt foods and use salt sparingly.

**Appendix 2. The Body Mass Index and healthy weight range**

The Healthy Weight Range is defined as a body mass index (BMI) in the range 18.5 - 24.9, where BMI is calculated as weight (in kilograms) divided by height squared, where height is measured in metres.

- A BMI below 18.5 is defined as 'underweight'
- A BMI of 25.0 - 29.9 is defined as 'overweight'
• A BMI of 30.0 and above is defined as 'obese'

Disclaimer: This material is provided on the basis that it constitutes advice of a general nature only. It is not intended to replace the advice of a physician or a diettian.