diabetes australia

Position Statement

Low carbohydrate eating for people with diabetes

August 2018

ABOUT THIS POSITION STATEMENT

This position statement draws on the latest evidence and provides practical advice and information for people with diabetes considering a low carbohydrate eating plan.

Diabetes Australia has developed this statement in response to enquiries from people with diabetes, health professionals and the general public.

What is low carb eating?

Low carbohydrate (low carb) eating refers to diets or eating patterns that restrict carbohydrate intake, principally in processed and packaged foods and drinks such as cakes, lollies, chocolate, chips, ice cream and sugary drinks; as well as breads, cereals, grains, potatoes, fruits and sugar. Usually, when restricting carbohydrates, people eat a higher proportion of protein and fats such as those found in meat, chicken, eggs, oily fish, avocados, nuts, oils and butter. Some people choose to bulk up meals with low carb vegetables, such as cauliflower and zucchini.

When it comes to low carb eating, there is no particular diet or standard approach.

The Australian Dietary Guidelines provide general healthy eating advice and are a good starting point for people wanting to improve their eating habits. However, there is no one-size-fits-all approach to living well with diabetes. Everybody is different.

In recent years, low carb eating has gained popularity within the general population. Some people have found it useful for achieving weight loss. Low carb diets are popular because they are relatively easy to follow and heavily promoted in the media.

Low carb eating has also gained interest for some people with diabetes as one option to help lose weight and to assist in managing their blood glucose levels.

Key points

1. For people with type 2 diabetes, there is reliable evidence that lower carb eating can be safe and useful in lowering average blood glucose levels in the short term (up to 6 months). It can also help reduce body weight and help manage heart disease risk factors such as raised cholesterol and raised blood pressure.
2. For people with type 1 diabetes, a number of recent studies are reporting benefits of lower carb eating, however these studies are limited in their size and design and do not provide strong evidence of benefit. Diabetes Australia believes high quality, large scale, longer-term studies are necessary to further establish the effectiveness and safety of low carb eating for people with type 1 diabetes.
3. All people with any type of diabetes who wish to follow a low carb diet should do so in consultation with their diabetes healthcare team.
4. People with diabetes who commence low carb eating should monitor their blood glucose levels and, if necessary, talk to their doctor about the need to adjust their diabetes medication to reduce the risk of hypoglycaemia (low blood glucose).
5. People with diabetes considering low carb eating are encouraged to seek personalised advice from an Accredited Practising Dietitian experienced in diabetes management. There are some practical considerations that need to be taken into account to ensure the eating plan is safe and enjoyable, provides adequate nutrition for general health, is culturally appropriate and fits into the person's lifestyle.

6. People with diabetes considering low carb eating should be aware of possible side effects (such as tiredness, headaches and nausea) and seek advice from their health care team if concerned.

7. Low carb eating may not be safe and is not recommended for children, pregnant or breastfeeding women, people at risk of malnutrition, people with kidney or liver failure, or those with a history of disordered eating or some rare metabolic conditions.

8. People with type 1 diabetes may experience sudden drops in blood glucose levels and be at a higher risk of hypoglycaemia when following a low carb eating plan. They should talk with their diabetes healthcare team before starting low carb eating.

9. All Australians, including people who choose to follow a low carb eating plan, should be encouraged to eat foods proven to be beneficial to good health. These include whole fruit and vegetables, wholegrains, dairy foods, nuts, legumes, seafood, fresh meat and eggs.

10. All Australians should be encouraged to limit their intake of foods that are high in energy, carbohydrate or salt, including processed foods such as sugary drinks, chips, cakes, biscuits, pastries and lollies.

1. Introduction

Media coverage and public awareness have helped promote the popularity of various approaches to low carb eating in recent years.

Healthy eating for people with diabetes can encompass a wide range of eating approaches. Healthy eating should assist a person with their diabetes management, provide adequate nutrition for a healthy life, be safe and enjoyable, culturally appropriate, sustainable and fit into the person's lifestyle.

Diabetes Australia does not promote or encourage any single diet or eating plan or any particular "diabetes diet". Every person with diabetes needs a personalised approach and support to have the healthiest eating plan and this may change over their lifetime with diabetes.

Diabetes Australia relies on strong scientific evidence before making specific health and nutrition recommendations for people with diabetes or those at risk. Evidence is usually based on the National Health and Medical Research Council (NHMRC) hierarchy of evidence.[1]

Diabetes Australia believes that people with diabetes should make their own, informed choices about their diabetes management (including eating plans) in consultation with their diabetes healthcare team.

We recognise that long-term studies can take years to be designed, conducted and published and, in relation to low carb eating for people with diabetes, we will continue to review and update our advice based on new evidence as it becomes available.

Diabetes Australia regards healthy eating as a key issue for people with diabetes that requires more research. We have developed this position statement based on current evidence and in response to enquiries from people with diabetes, the general public and health professionals.

For people with type 1 diabetes, there is not yet enough evidence to recommend low carb eating for everyone. Low carb eating is not recommended for children (anyone under the age of 18) or for people with specialised nutritional requirements, as outlined in section 5 of this position statement. We recognise that some people with type 1 diabetes may choose to follow a low carb eating approach and they should be supported in this. We encourage these people to consult their diabetes healthcare team.

For people with type 2 diabetes, recent evidence has shown that, in the short term (up to 6 months), lower carb eating can help with the management of type 2 diabetes. However, this benefit is no longer evident after 12 months.[2,3] In addition to promoting weight-loss, reducing carbohydrate intake can provide health benefits that include lowered average blood glucose levels and reduced risk of heart disease. Some benefits can be achieved independent of the amount of weight-loss achieved.[2,4]

2. Carbohydrates and diabetes

What are carbohydrates?

Carbohydrates are parts of food our body breaks down into glucose which it uses for energy. They include starches, such as those found in bread, potatoes and rice; as well as sugars, such as those found in fruit, milk and yoghurt, sugary drinks, cakes, biscuits, pastries, icecream and lollies.

Carbohydrates/sugars are the major source of energy for the body. However proteins and fats also provide a source of energy.

When carbohydrates are digested, they are broken down into a sugar called glucose, which provides energy for every cell in the body – cells in the muscles, the brain, the heart and other organs. Glucose allows all our cells and organs to grow and work as they should.

Dairy foods (such as milk and yoghurt), fruit, wholegrains and starchy vegetables are all nutrient-rich sources of carbohydrate and provide some protein, fat and fibre as well as vitamins and minerals. The body uses these other nutrients to stay healthy and perform at its best.

Carbohydrates/sugars added in the making of foods or drinks are generally less healthy. There is often added sugar in foods and drinks – and in some cases, a lot of added sugar. This includes sugary drinks, cordials, lollies and many processed foods. While these foods are also sources of carbohydrate, they provide little, if any, nutritional value.

Healthy carbs

Less healthy carbs

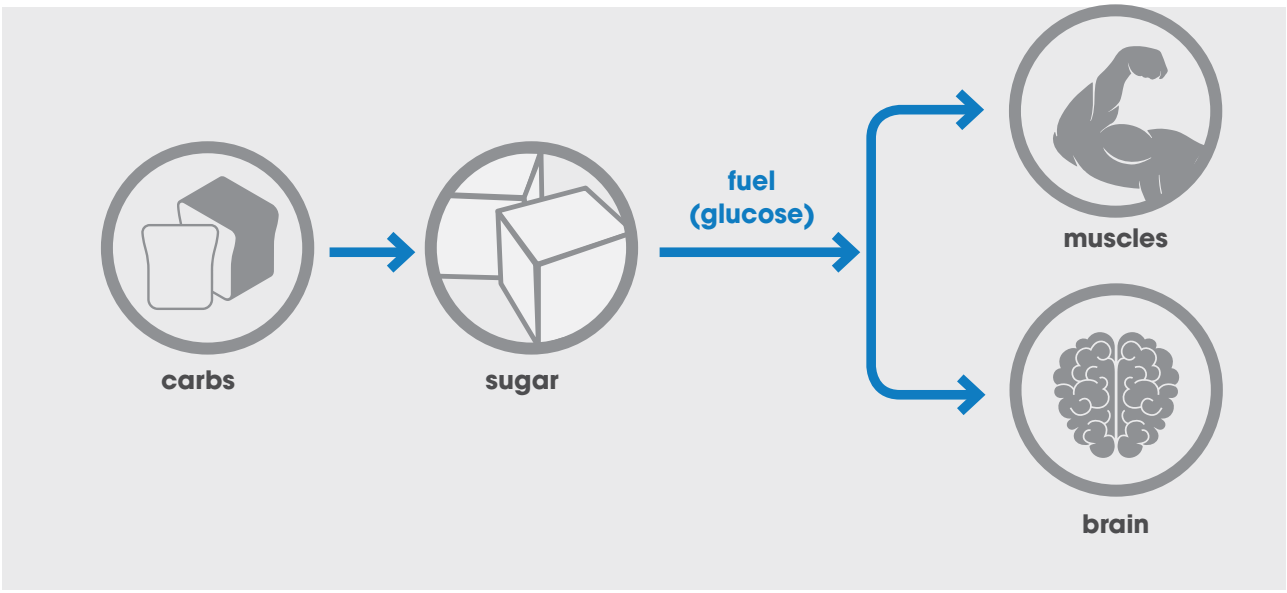
What is a sugar?

Sugar is a type of carbohydrate. The most common sugars are sucrose (from sugar cane), fructose and glucose. Glucose is the form of sugar that is used by the body for energy. Glucose is carried around the body in the blood.

To use glucose as energy in the cells, we need insulin to help transport the glucose from the blood supply into the cells.

In people with type 2 diabetes, the insulin does not work as well as it should and often the body does not make enough insulin. As a result, some of the glucose stays in the blood causing high blood glucose levels. About one in every four people with type 2 diabetes need insulin injections.

In people with type 1 diabetes, an autoimmune reaction destroys the cells that produce insulin. All people with type 1 diabetes need insulin either by multiple daily injections or by an insulin pump, so that the glucose can be used by their body.



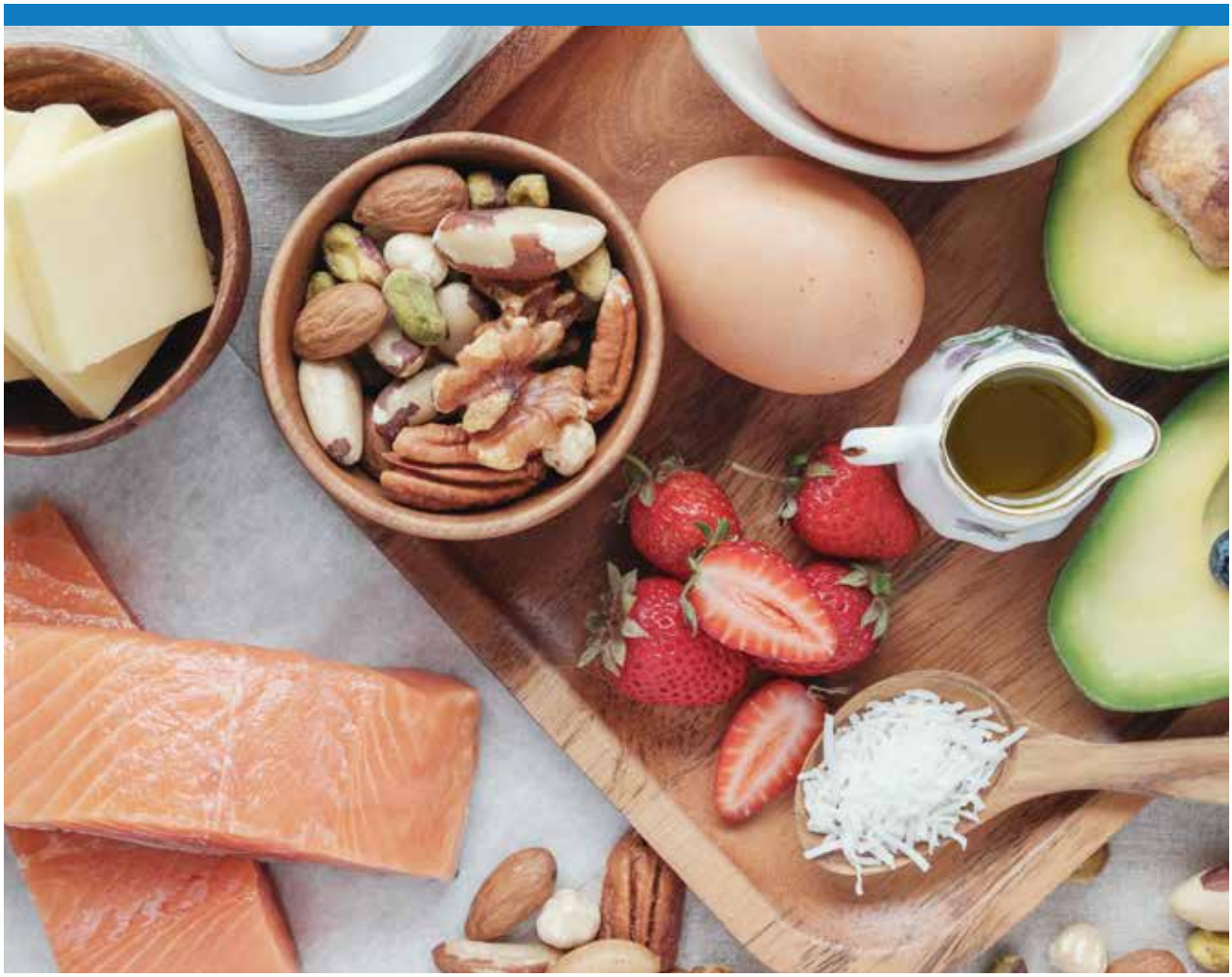
3. Common definitions of low carb

Studies looking at the effect of low carb diets on diabetes use varying definitions of carbohydrate content. Common definitions of carbohydrate intake used in scientific literature are shown in table 1 below.

Table 1: Common definitions of carbohydrate intake [2,4]

Carbohydrate content	Grams/percentage of daily intake
High carbohydrate	More than 225g of carbohydrate daily/ more than 45% of total daily energy intake
Moderate carbohydrate	130g–225g of carbohydrate daily/ 26%–45% of total daily energy intake
Low carbohydrate	Less than 130g of carbohydrate daily/ less than 26% of total daily energy intake

NOTE: Gram values are based on a 2,000 calorie diet



4. Evidence

4.1 Type 1 diabetes

There are very few studies investigating the long-term safety and effectiveness of low carb eating for people with type 1 diabetes.

A 2018 review revealed some studies which showed improvements in HbA1c while others showed no effect. This review concluded that more, high-quality studies were needed to determine the overall impact of low carb diets on blood glucose management in individuals with type 1 diabetes.[5]

What is HbA1c?

HbA1c is measured with a blood test and reflects a person's average blood glucose level over a period of 8–12 weeks.

Diabetes Australia acknowledges the anecdotal feedback and views from some people with type 1 diabetes that low carb eating is beneficial for them. Diabetes Australia calls for more research and studies to investigate the long term effectiveness and safety of low carb eating for people with type 1 diabetes.

Table 2 outlines the key methods and findings of three studies investigating the effects of low carb diets on glucose management in people with type 1 diabetes.

Table 2: Summary of type 1 diabetes and low carb studies [6,7,8]

Authors	Number of participants	Intervention		Duration	Findings		Limitations
		Prescribed carb intake	Education		HbA1c	Other	
Nielsen et al. (2005)	22	70–90g per day	16 hours of dietary education plus regular clinic visits	12 months	1.1% decrease over 12 months	Reduced hypos Reduced triglycerides	No control group to compare results with Hard to determine whether other factors, apart from diet, also reduced HbA1c e.g participants taught to self-adjust insulin
Nielsen et al. (2012)	45	75g per day	A one-day education session followed by 4 x 2-3 hour education sessions over 4 weeks	4 years	1.3% decrease in the first 3 months; 0.7% decrease after 4 years	Only 27% of participants were considered to have maintained the diet for 4 years	No control group to compare results with
Krebs et al. (2016)	10 (5 per group)	50-75g per day for the study group (actual intake ~100g per day), standard diet for the control group (actual intake ~200g per day)	Carbohydrate counting course for both groups (4x 1-1.5 hour sessions over 4 weeks) plus access to phone support from dietitian and diabetes educator	12 weeks	0.7% decrease in 3 months	Reduced body weight (5.2kg)	Small number of participants Short study duration Weight reduction can reduce HbA1c independent of diet

Each of the studies in Table 2 reported that low carb diets had positive impacts on HbA1c but these studies had limitations.

For example, two of the three studies included in the table above did not include a control group.[6,7] A control group is used as a benchmark with which to compare results. The control group does not receive the treatment. Without a control group, it is impossible to conclude how much of the improvement in HbA1c was the result of the low carb eating and how much could be contributed to other factors such as the regular dietary education provided to participants or just participating in a study.

The study by Krebs et al. (2016) only had 10 participants in total, which is too small to represent all people with type 1 diabetes. Additionally, some of the improvement in blood glucose levels that was seen may have been due to participants losing weight (5.2kg in 12 weeks), not because they followed a low carb eating plan.

In summary, while new evidence continues to be published, not enough large-scale, long-term, high-quality studies have been completed to demonstrate the effect of following a low carb diet on managing blood glucose levels in large populations of people with type 1 diabetes. Diabetes Australia supports the prioritisation of studies looking at the effectiveness and safety of low carb diets for people with type 1 diabetes.

4.2 Type 2 diabetes

There has been more research into low carb diets for type 2 diabetes although the lack of a standard definition for what is a low carb diet makes it difficult to compare studies.

Table 3 outlines the key methods and findings of three meta-analyses investigating the effects of low carb diets on glucose management in people with type 2 diabetes. Meta-analyses are the combined analysis of multiple randomised controlled trials and are the highest level of evidence in research.[1]

In these three meta-analyses, published in 2017–18, lower carb diets (less than 45% daily energy from carbs) compared to higher carb diets (more than 45% daily energy from carbs) showed:

- a greater reduction in HbA1c in the short term (up to 6 months); [2,3,4]
- a greater reduction in body weight in the short term (up to 12 months); [2,4]
- a greater reduction in the risk factors for heart disease (triglycerides, HDL cholesterol and blood pressure) up to 2 years. [2,4]

In summary, this research indicates that lower carb diets are more effective at reducing blood glucose levels in the short term (three to six months) than higher carb diets and appear to be at least as effective as higher carb diets for long term blood glucose management (12-24 months) and weight loss.

Table 3: Summary of type 2 diabetes and lower carb studies [2,3,4]

Authors	Number of participants	Carbohydrate intake	Duration	Findings – HbA1c	Findings – other
Meng et al. (2017)	734 participants (from 9 studies)	Less than 26%* (130g per day)	3 months to 2 years	0.44% decrease compared to high carb diet	Reduced triglycerides and increased HDL cholesterol compared to high carb diets. No association between low carb diets and reduced LDL cholesterol or total cholesterol. Greater weight loss (1.2kg) than high carb diets but only in the short term (less than 12 months).
Snorgaard et al. (2017)	1,376 (from 10 studies)	Less than 45%* (225g per day)	12 months	0.34% decrease at 3 and 6 months compared to traditional diet. No difference in HbA1c from 12 months onwards compared to traditional diet. Lower carb diets (less than 26% daily energy) produced the greatest reductions in HbA1c	No differences between low carb diets and traditional diets in: • waist circumference • BMI and body weight • total and LDL cholesterol. Greater reduction in diabetes medication through the duration of the studies on low carb diets compared to high carb diets/ traditional diets.
Sainsbury et al. (2018)	2,412 (from 25 studies)	Less than 45%* (225g per day)	3 months to 2 years	0.19% decrease at 3 and 6 months compared to traditional diet. No significant difference in HbA1c from 12 months onwards compared to traditional diet. Lower carb diets (less than 26% daily energy) produced the greatest reductions in HbA1c	Reduced triglycerides and increased HDL cholesterol, and reduced blood pressure compared to high carb diets. No differences between low carb diets and traditional diets in total and LDL cholesterol. Greater weight loss at 3 months on low carb diets (less than 26% daily energy intake) than moderate or high carb diets. Greater weight loss at 12 months on moderate carb diets than high carb diets. Greater reduction in diabetes medication through the duration of the studies on low carb diets compared to high carb diets/ traditional diets.

*Percentage of total daily energy intake from carbohydrates based on 2,000 calorie diet

5. Low carb eating is not for everyone

Low carb eating is not recommended for children, pregnant or breastfeeding women, or people with certain medical conditions or histories.

- Low carb eating should not be recommended for children (under 18 years)[9] because it can affect their growth and cardiovascular risk factors (total cholesterol).[10] There is no evidence to suggest low carb eating is beneficial to children with diabetes, and it may contribute to an unhealthy relationship with food.[10]
- Low carb eating should not be recommended to people needing additional energy (kilojoules) and nutrients, such as vitamins and minerals. These groups include:
  - pregnant and breastfeeding women
  - people at risk of malnutrition (such as elderly people with type 2 diabetes).

    This is because low carb eating can be restrictive in energy content and can contribute to nutrient deficiencies if not well planned.[11,12] Some of these nutrient deficiencies can increase the risk of poor health, such as infections, cancer, heart disease and osteoporosis.[13,14]
- Low carb eating should not be recommended for pregnant women due to potential folate deficiency resulting in an increased risk of birth defects. [15]
- Low carb eating should be not recommended for:
  - people with kidney or liver failure
  - people with a current or past history of disordered eating
  - people who take SGLT2 inhibitors (an oral diabetes medication) as this may increase the risk of diabetic ketoacidosis.[16]

6. Practical considerations

There is no 'one-size-fits-all' approach to living well with diabetes. Everybody is different. This impacts on how people manage their eating/diet, medication and physical activity/exercise. The best diabetes management approach is one developed by the person with diabetes in partnership with their diabetes healthcare team and in consideration of the best evidence.

Low carb eating can work for some people with diabetes but not for everybody. In fact, sudden changes to eating patterns/diet, including reduced carbohydrate intake, can cause problems for some people. This is why health professional advice and oversight is important.

People interested in trying low carb eating to help manage their diabetes are strongly encouraged to speak with a dietitian, their doctor or other health professional to obtain individualised dietary advice and work through an approach that is suitable for them.

There are several practical considerations that need to be taken into account.

If not carbohydrates, then what?

When carbohydrate intake is reduced less energy is consumed. Generally some of this is replaced with energy from proteins and fats. When replacing carbohydrates with fat, it is important to consider the type of fat, given its link with heart disease.

6.1 Ensure good nutrition

- All Australians, including people with diabetes, should eat fewer high carb, nutrition-poor 'treat' foods and drinks, such as sugary drinks, cakes, muffins, biscuits, lollies, chocolate, potato chips, pastries, ice cream and hot chips.[17] These types of high carb 'treat' foods either have no nutritional value at all, such as sugary drinks, or contain very few nutrients, and can make it difficult for people with diabetes to manage their blood glucose levels.

- Include fresh fruit and vegetables, wholegrains, dairy foods (such as milk, yoghurt and cheese) to help prevent against possible nutrient deficiencies. These deficiencies could include vitamin C, folic acid, B group vitamins, vitamin E, potassium and calcium.[11,12]
- Include a range of high fibre foods such as vegetables, legumes, fruits and wholegrains to help maintain a balance of healthy gut bacteria[18] which help reduce the risk of other conditions such as inflammatory bowel disease, cancer, allergies and mood disorders.[19] Diets rich in fibre from a variety of different sources, such as wholegrains, fruits, vegetables and pulses, have been shown to be protective against bowel cancer and heart disease.[17,20]
- Include mostly healthy unsaturated fats/ oils found in avocado, olive oil and nuts to help protect against heart disease. [21]

What about fats?

Unsaturated fats are those found in what are generally considered to be heart-healthy foods, such as avocado, oily fish, olive oil, nuts and seeds.

Saturated fats are less healthy fats that are typically solid at room temperature. Examples include the visible fat on meat and chicken, fat in dairy products, such as cheese and butter, and ingredients used in biscuits, pastries and cakes, such as coconut oil and palm oil (often simply called vegetable oil).

6.2 Watch for possible side effects

- People making the switch to low carb eating may experience tiredness, headaches, dehydration, nausea and dizziness.[22] Memory and cognition can also be affected.[23] These side effects are usually temporary but it is important people talk with their health care team if they are concerned or if these side effects continue.

6.3 Be careful of hypoglycaemia

- For people using insulin, or certain diabetes medications (such as sulfonylureas), reducing their intake of carbohydrates can increase the risk of hypoglycaemia (very low blood glucose levels below 4mmol/L).
- Before a person with diabetes starts a low carb plan, it is important that they monitor their blood glucose levels and consult their doctor/diabetes team in case changes need to be made to their medication.
- A low carb diet can reduce the amount of glucose stored in the liver. In the event of hypoglycaemia, the body uses this stored glucose to raise blood glucose levels. For people following a low carb diet, a glucagon injection given to treat severe hypoglycaemia may result in a smaller rise in blood glucose.[24]

7. Summary

Diabetes Australia recognises that low carb eating can be an effective way of reducing blood glucose levels and achieving weight-loss for people with type 2 diabetes in the short term (6 months). This position is based on the current evidence outlined in this position statement.

However, low carb eating is not suitable for everyone, including children/adolescents and people with type 2 diabetes with specialised nutrition requirements. At this stage, there is not enough evidence of benefits or safety of low carb eating for people with type 1 diabetes. We encourage people with type 1 diabetes who are interested in this approach to talk to their diabetes healthcare team to obtain individualised advice. Diabetes Australia will continue to review relevant evidence as it becomes available and advocate for large scale, longer-term trials to establish the effectiveness and safety of low carb eating for people with type 1 diabetes.

The important practical considerations when thinking about starting a low carb eating plan include ensuring adequate nutrition by:

- eating foods that have been proven to be beneficial to good health, including vegetables and fruits, wholegrains, dairy, nuts, legumes, seafood, meat and eggs
- limiting high-energy, high carb, nutrition-poor foods and drinks, such as sugary drinks, chips, cakes, biscuits, pastries and lollies
- ensuring fat intake includes mostly unsaturated fat, and only small amounts of saturated fats

People with diabetes considering following a low carb eating plan should consult their health care team about whether this might have an impact on their diabetes management. People also need to be aware of the possible side effects and discuss any concerns with their healthcare team.

We recommend people seek the advice of a supportive health care team before starting a low carb eating plan. This includes the advice of an Accredited Practising Dietitian to make sure the eating plan is nutritionally complete, safe, sustainable and enjoyable.

Further information

Diabetes Australia:
www.diabetesaustralia.com.au/what-should-i-eat

Diabetes UK position statement on Low-carb diets for people with diabetes (May 2017)
www.diabetes.org.uk/professionals/position-statements-reports/food-nutrition-lifestyle/low-carb-diets-for-people-with-diabetes

Heart Foundation position statement on Dietary Fat and Heart Healthy Eating, Sept 2017:
www.heartfoundation.org.au/images/uploads/main/For_professionals/Dietary_Fats_Position_Statement_2017.pdf

Dietitians Association of Australia Hot Topics - Low carb, high fat diets for diabetes (November 2017)
https://daa.asn.au/voice-of-daa/hot-topics

Australian Dietary Guidelines:
www.eatforhealth.gov.au/sites/default/files/content/The%20Guidelines/n55a_australian_dietary_guidelines_summary_131014_1.pdf

CSIRO and Baker IDI Diabetes and Lifestyle Plan
www.csiro.au/en/Research/Health/CSIRO-diets/Diabetes-diet-and-lifestyle-plan

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The Working Group was convened by Caroline Wells, CEO, Diabetes Tasmania on behalf of Professor Greg Johnson, CEO Diabetes Australia. Additional input was provided by Taryn Black, National Policy Director, Diabetes Australia.

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- Dale Cooke, APD, Diabetes Queensland
- Caroline Clark, APD, Diabetes NSW and ACT
- Jane Robinson, APD, Diabetes Victoria
- Minke Hoekstra, APD, Diabetes Tasmania

This document has also been reviewed by a panel of people with diabetes and has undergone an external plain english review.

Disclosures: Diabetes Australia and various members of the Expert Advisory Group declare no conflict of interest.

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