Australian Avocados
An update on nutrition and health
Introduction

This report provides an overview of the nutritional benefits of avocados and summarises scientific evidence spanning the past 20 years.

Avocados are a nutrient-dense fruit that play an important role in healthy diets, contributing almost 20 vitamins, nutrients and phytonutrients. Research shows avocado eaters consume significantly more key nutrients than non avocado eaters.¹

In addition, avocados are an excellent source of healthy monounsaturated fats and have naturally low levels of sugars and sodium.

Avocados are an important dietary source of the B group vitamin folate - an essential nutrient for cell division, blood production, heart health and during pregnancy. Adequate folate is critical for the prevention of foetal neural tube defects.

Research also has identified, that as part of a healthy diet, this natural whole food may play a role in helping to manage conditions such as high blood cholesterol,¹⁷-²⁴,⁴³ a risk factor for heart disease. While avocados are technically a fruit they are often used as a vegetable and can tick either box when it come to meeting the recommended two serves of fruit and five serves of vegetables a day. Avocados have also been highlighted in the new Australian Dietary Guidelines as a healthy fat alternative to saturated fat spreads, like butter.²

On behalf of Avocado Australia’s Avocado Nutrition Program, I hope you find this a useful resource.

Lisa Yates
Advanced Accredited Practising Dietitian

Health Star Ratings are a quick, at a glance guide found on the front of food packaging to help you choose healthier foods. Star ratings can be from ½ star to 5 stars and the more stars a food or product has the healthier it is. Avocados score 4.5 stars, indicating a healthy food choice. As part of the fruit and vegetable category, avocados lose half a star because, even though they have a low proportion of saturated fat, other fruits and vegetables do not contain saturated fat. If avocados were categorised in the fats and oils category they would get five stars compared to other fats and oils.
How much is a serve?

The Australian Dietary Guidelines suggest a serve of fruit weighs 150g and a serve of vegetable weighs 75g, or the equivalent of 100-350kJ energy per serve.¹

The edible flesh of an Australian avocado weighs around 160-200g with 100g containing about 600kJ of energy, so a 50g portion providing 300kJ fits the Australian Dietary Guideline recommendations.

To keep it simple we recommend 50g of avocado daily, or about a 1/3 of a smaller or a 1/4 of a larger avocado.

Many research studies from overseas report the benefits of half an avocado but these are based on smaller avocados with a half weighing 75g.

Key findings:

The research shows that avocados, as part of a healthy diet, may:

- lower LDL cholesterol and boost HDL cholesterol, contributing to cardiovascular health
- help the absorption of colourful carotenoids necessary for eye health
- assist in weight management
- improve glucose tolerance for people with diabetes.

Avocados are also:

- rich in folate, which is needed during pregnancy for tissue development.

Avocados may also:

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Avocados are also:

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Nutrient Composition

Avocados are well known as a rich source of healthy fats but there is much more to this fruit. Avocados also provide vitamins C, E and K, minerals such as potassium, plant antioxidants and unusually for a fruit, some protein. They are also naturally low in sugar and sodium.

In fact, research shows avocado eaters tend to consume significantly more of several key nutrients than non-avocado eaters.

Healthy fats

Monounsaturated fats are needed to maintain heart health and aid in the body’s absorption of fat-soluble vitamins and carotenoids. Avocados contain healthy fats with a quarter of an avocado (50g) providing 3g of monounsaturated fats. As an avocado ripens the amount of monounsaturated fat it contains increases and saturated fat content decreases.

Carbohydrates and sugars

Unlike other fruit, avocados are naturally low in carbohydrate and sugars with a quarter of an avocado (50g) containing just 2.3g carbohydrates of which less than 1g is sugars.

Fibre

Fibre aids a healthy bowel function and increases satiety. Avocados provide a combination of insoluble and soluble fibre, in total around 2g per 50g serve.

Potassium and sodium

Research shows that a varied diet high in potassium and low in sodium helps to maintain normal blood pressure and protect against heart disease and stroke. Avocados positively contribute to a good potassium/sodium balance, with a quarter of an avocado (50g) providing 245mg of potassium and less than 2mg of sodium.

Vitamins

Folate

Everyone needs the B group vitamin folate as it contributes to normal blood formation and cell division. During pregnancy it is particularly important for tissue development.

Avocados are a rich source of folate with a 50g serve providing 60ug or 30% of the adult regulatory RDI. For more information see page 6.

Vitamin C

Vitamin C is an antioxidant vitamin that works with vitamin E to help reduce the effects of free radical cell damage. Vitamin C also helps the body’s absorption of plant iron. Avocados are a rich source of vitamin C with a quarter of an avocado (50g) providing 11mg of Vitamin C or 25% of RDI for adults.

Vitamin E

Vitamin E is a fat-soluble vitamin commonly found in healthy fat foods including avocado. A quarter of an avocado (50g) provides 1mg of vitamin E or 10% of RDI for adults. Vitamin E works with vitamin C to reduce cell damage by free radicals and protects cell membranes from oxidation.

Vitamin K

Vitamin K is an important nutrient for building bones and also assists the blood to clot. A quarter of an avocado (50g) contains 11ug of vitamin K or 14% of the RDI for adults.

Phytochemicals

Avocados contain phytochemicals with antioxidant and anti-inflammatory properties. These include polyphenols and colourful carotenoids such as beta carotene, beta cryptoxanthin, lutein and zeaxanthin that help give avocado its unique colour. These natural antioxidants contribute to cell protection from free radical damage.
**NUTRITION INFORMATION**
Servings per package: 4 serves per avocado
Serving size: ~ 50g or ¼ avocado

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<td>Folate **</td>
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<tr>
<td>Plant sterols</td>
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* Percentage daily intakes are based on the average adult diet of 8700kJ. Your daily intakes may be higher or lower depending on your energy needs.
** The RDI used to calculate the %DI is the RDI for adults (200μg), whereas for women, at least one month before pregnancy and three months during pregnancy, the recommended intake of folate is 400μg per day which increases to 600ug for the remainder of pregnancy and lactation.

Source: NMI Laboratory Analysis results May 2010 average of Hass and Shephard varieties except for:
- Vitamin E, lutein zeaxanthin, plant sterols - USDA National Nutrient Database for Standard Reference, Release 26
- Polyphenols - USDA ORAC Release 2, 2010
Avocados and Folate

What is folate?
Folate is the commonly used name for a water-soluble B-group vitamin found in plant foods, especially avocados and green leafy vegetables. There are also man-made forms of folate, such as folic acid additives and supplements.

Folate from plant foods is not as readily absorbed as folic acid, but it comes with the added health benefits that plant foods provide, such as nutrients and additional phytochemicals. A serve of avocado (50g) contains 60 micrograms of folate or 30% regulatory RDI for adults, which is 200ug.

Why is folate important?
Folate is important for healthy growth and development at all life stages.

Folate for children
Children and adolescents require folate to produce blood and help cells divide to meet their growth and development needs.

Folate for adults
Folate is essential in bone marrow as it works with vitamin B12 to produce blood cells. Too little of either of these key vitamins can cause some forms of anaemia resulting in weakness, fatigue, irritability and heart palpitations.

Folate for pregnancy
Folate plays an essential role in the healthy development of babies, helping to create DNA, divide cells and in the formation of the neural tube. The baby’s neural tube fuses very early in pregnancy. If it doesn’t close, the result is a neural tube defect (NTD). Spina bifida and anencephaly are the most common forms of NTD affecting about 1 in 500 pregnancies in Australia. A varied diet rich in folate may reduce the risk of foetal neural tube defects.

There are specific folate RDIs for women of childbearing age due to the importance of this vitamin during pregnancy. FSANZ recommends women of child bearing age consume a minimum of 400ug of folate for the month before and three months after conception. The National Health and Medical Research Council however, recommends an adequate intake of folate being 600ug during pregnancy. Advice could be that 400ug of folate could come from a folic acid supplement, with the remaining 200ug from food sources such as avocado, green leafy vegetables, grains, legumes and fortified foods. A serve of avocado (50g) contributes 60ug of folate, which is approximately 15% of the folate RDI of 400ug per day for women of childbearing age.

Folate fortification of bread making flour alone may not be sufficient to meet the increased folate needs of pregnant women and therefore eating plant foods naturally rich in folate as well as taking folic acid supplements is also recommended.

Recommended Daily Intakes (Regulatory RDIs) of Folate*

- 100μg for children aged 1-3 years;
- 200μg for children aged 3 years and older; and
- 200μg for adults.

* Food Standards Australia New Zealand (FSANZ) Food Standards Code 1.1.1
Avocados and Heart Health

Clinical studies have consistently demonstrated the positive heart health effect of diets including avocado, particularly on blood lipid profiles. This is primarily because of the whole food effects of this nutrient-dense fruit.¹

Healthy fats

The fats in foods are always a mix of saturated and unsaturated fat, but usually one type predominates. The fats in avocados, like other plant foods, are mostly healthy monounsaturated fats.

As well as providing fat-soluble vitamins, the monounsaturated fats in avocados help to control cholesterol production and may reduce the risk of cardiovascular disease.⁴ Diets high in foods that contain monounsaturated fats, such as a Mediterranean diet with its olive oil and nuts, have also been shown to be shown to reduce the risk of cardiovascular disease.¹³,¹⁴

The extensive body of research supporting the cardiovascular benefits of monounsaturated and polyunsaturated fats resulted in the 2013 Australian Dietary Guidelines recommending avocado as a healthy fat alternative to saturated fat spreads.²

Australian Dietary Guidelines - Guideline 3 “Replace high fat foods that contain predominately saturated fat such as butter, cream, cooking margarine, coconut and palm oil with foods that contain predominantly polyunsaturated and monounsaturated fats such as oils, spreads, nut butters/pastes and avocado.”²

Plant sterols

Plant sterols help reduce cholesterol re-absorption in the intestine, increasing the amount of cholesterol excreted from the body.¹⁵ Certain margarine spreads, milks and other foods can have added plant sterols. Avocados naturally contain small quantities of plant sterols, around 40mg in a quarter of an avocado (50g)³.

Soluble fibre

In a similar way to plant sterols, soluble fibre can lower cholesterol re-absorption from the intestine.¹⁶ Avocado provides around 2g total fibre per 50g serve³ with two thirds soluble fibre.¹⁶

Antioxidants

Vitamin C, vitamin E, carotenoids, and polyphenols are compounds with antioxidant effects that help to protect cells from free radical damage. These compounds also have anti-inflammatory effects that may help prevent atherosclerosis or the thickening and hardening of arteries associated with heart disease.¹

Sodium and potassium

Reducing sodium and maintaining an adequate intake of potassium can help to guard against high blood pressure, heart disease and stroke.⁶ A 50g serve of avocado contributes less than 2mg of sodium and 245mg of potassium.³

A healthy varied diet that contains a high intake of both fruits and vegetables, such as avocado, reduces the risk of heart disease.⁵
Latest Research

Cholesterol

Eating avocados as part of a healthy diet may lower total and LDL (bad) cholesterol, major risk factors for heart disease.

Avocado clinical trials have consistently shown positive effects on blood lipids in studies using a variety of diets and on a range of participants including healthy, overweight or obese, hypercholesterolemic and participants with type 2 diabetes. Some of these studies are highlighted below, however, further larger, longer-term studies are required, particularly in those with type 2 diabetes.

Healthy participants

Avocado intake in those with normal cholesterol can significantly reduce total and LDL cholesterol, as well as maintain HDL cholesterol. An Australian study, published in the American Journal of Clinical Nutrition, followed 15 women consuming 0.5-1.5 avocados a day as part of a high carbohydrate diet. After three weeks, researchers noted an 8% reduction in total cholesterol and no change to HDL cholesterol. However, the no avocado control diet reduced HDL cholesterol by 14%. Another study, published in the Archives of Medical Research, followed 16 healthy volunteers consuming a high carbohydrate, moderate fat diet (50% of energy from carbs and 30% from fat of which 75% of the fat was from avocado) for two weeks. It found, their total and LDL cholesterol was reduced while HDL was maintained, whereas the low saturated fat control diet reduced HDL. In short, eating avocado helps maintain HDL levels while lowering LDL cholesterol.

Participants with high cholesterol and/or type 2 diabetes

A recent randomised controlled trial, published in the Journal of the American Heart Association, found that when 45 overweight/obese people with high LDL cholesterol ate an avocado (136g) a day for five weeks as part of a moderate fat diet, their LDL cholesterol level, LDL particle size number and small dense LDL as well as LDL:HDL ratio were all significantly reduced.

A study published in the Archives of Medical Research demonstrated a diet enriched with avocado could significantly lower cholesterol in a week. The 30 participants with normal cholesterol and 37 participants with mild to high cholesterol (15 of whom had type 2 diabetes) were placed on a diet enriched with 300g avocado to replace all other fats each day. At the end of a week, those with normal cholesterol reported a 16% decrease in total cholesterol, while those with mild to high cholesterol reported a 14% reduction in total cholesterol, a 23% reduction in LDL cholesterol and a 14% increase in good HDL cholesterol. Those with type 2 diabetes saw reductions in total and LDL cholesterol of about 20%. Since heart disease risk is increased in those with type 2 diabetes including avocado in their diets maybe worthwhile.

Also published in the Archives of Medical Research, another small, randomised study examined the effects of avocado as a source of monounsaturated fat on serum lipids. Thirteen people with high cholesterol were randomly assigned one of three vegetarian diets. After four weeks, those consuming the vegetarian diet with 30% of energy from fats (the majority from avocado) had significantly reduced LDL cholesterol.

Summary

The addition of 75-300g of avocado to a variety of healthy diets has been shown to lower total and LDL cholesterol while maintaining HDL cholesterol. These benefits have been noted in participants exhibiting a range of health profiles.
Weight Management

There have been three studies looking at the effect of avocado on an aspect of weight management. 24-26

The first study, published in the Nutrition Journal, examined the effects of avocados as part of an energy-restricted diet on weight loss, serum lipids and vascular function in 55 overweight and obese people. The participants were randomly divided into two groups – one group consuming an energy restricted diet including 200g of avocado a day (30.6g of fat) in place of 30g of other dietary fats, the other group consuming an energy restricted control diet with no avocado. Following six weeks, body weight, body mass index, and percentage of body fat all decreased significantly in both diet groups. The researchers concluded that 200g a day of avocado could be consumed in an energy-restricted diet without compromising weight loss when substituted for 30g of other dietary fats.24

A randomised crossover study by Loma Linda University found that overweight people adding half an avocado (75g) to lunch increased their satiety by 25% and decreased their desire to eat by 30% for 3-5 hours following the meal.25 Adding avocado to lunch may help reduce mid meal snacking.

A recent US analysis of the National Health Survey, published in Nutrition Journal, found that avocado consumers had a lower body weight (an average of 3.4kg less), BMI and waist circumference (4cm smaller waist) compared to those who didn’t eat avocado.26

Further research is required to replicate these findings in larger, long-term trials as well as identify mechanisms for the role of avocados in weight management. One potential mechanisms, could be that an extract of avocado fruit inhibits the action of acetyl-CoA carboxylase, a key enzyme in production of fat in the body.27

Type 2 Diabetes

Two studies have examined the effects of avocado in those with type 2 diabetes (T2D). The Archives of Medical Research study, mentioned previously, also found blood glucose levels were reduced in 13 of the 15 participants with T2D, however, authors noted only five of the 15 had clinical significant reductions.22 A more recent study, published in 2013 in the Nutrition Journal, also investigated the effects of avocado in those with T2D. A small randomised crossover study involving 12 women with T2D, found that after four weeks each of a high monounsaturated fat diet (with an avocado a day, eating a third at each meal) and a high carbohydrate diet, both diets caused a minor cholesterol lowering effect with no major changes in HDL cholesterol. The avocado diet was associated with a greater decrease in blood triglycerides (20% vs. 7% in the high-carbohydrate diet) and glycemic control was similar with both diets. Researchers concluded that including avocado in the diet of those with T2D could help reduce cholesterol and triglycerides without compromising blood glucose control.28

Clearly more research in the area of T2D is needed but there have also been interesting T2D preliminary animal studies that suggest that extracts of avocado leaf and seed may improve blood glucose control.29-33

Summary

For people with type 2 diabetes, consuming avocado as part of a healthy diet may help manage blood glucose levels as well as lower cholesterol and triglycerides without compromising blood glucose control.

Summary

Initial studies indicate a role for 75-200g of avocado a day in promoting satiety and as an alternative to other dietary fats in energy-restricted diets. People who eat avocado may weigh less, have a lower BMI and waist circumference.

www.avocado.org.au
**Eye Health**

The macula lutea is a “yellow spot” in the centre of the retina responsible for central vision. Macular degeneration is the result of age related damage and it impacts central vision.

The macula is yellow because it is rich in carotenoids lutein and zeaxanthin that are thought to combat light-induced damage caused by free radicals. Carotenoids help reduce the risk of macular degeneration and are transported to the macula by HDL cholesterol.

Avocados provide a wealth of benefits as they contain carotenoids, help boost HDL cholesterol and their healthy fats absorb fat soluble carotenoids from other foods.

Research shows that adding 75-150g of avocado to a salad or salsa increases the absorption of carotenoids from other salad vegetables five-fold.

Carotenoids are considered to be proVitamin A as they can be converted to vitamin A in the body. Vitamin A is a necessary fat-soluble vitamin that is needed for normal reproduction, vision and immune function. Preformed vitamin A is found in animal products while carotenoids are largely found in plant foods and eggs.

Research has recently revealed that eating 150g of avocado with other vegetables rich in carotenoids boosts both the absorption of carotenoids and their conversion to vitamin A. Specifically, avocado enhanced the absorption of beta carotene from tomatoes 2.4 fold and enhanced the efficiency of conversion to vitamin A by 4.6 fold. In the case of carrots, absorption was increased six fold and the efficiency of conversion to vitamin A by 12.6 fold. This may be particularly important for those who are vitamin A deficient or who avoid eating vitamin A rich foods such as dairy.

Summary

Avocados contribute carotenoids that are important for eye health. New research has revealed that adding 75g-150g of monounsaturated fat-rich avocados helps to significantly increase the absorption of carotenoids from other vegetables and aids in their conversion to vitamin A.

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<tr>
<th>Pigments in avocado</th>
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<tr>
<td>beta carotene^</td>
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<tr>
<td>beta cryptoxanthin#</td>
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<td>lutein and zeaxanthin*</td>
<td>271ug</td>
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Sources: ^NMI analysis 2010 average of Shepard and Hass varieties # NUTTAB2010 *USDA National Nutrient Database for Standard Reference, Release 26, + Reference 39

Carotenoids help reduce the risk of macular degeneration and are transported to the macula by HDL cholesterol.

**Conclusion**

Its wide range of nutrients makes avocado an excellent plant based whole food, and an important addition to a healthy diet. Avocado eaters consume significantly more of several key nutrients including dietary fibre, vitamin E, vitamin K, potassium and magnesium.

While the scientific evidence suggests avocado consumption has health benefits for weight management, eye health and assisting people with type 2 diabetes, most of the research underpins a potential role for avocado in lowering cholesterol and for heart health.

Avocados also are an important dietary source of folate, which is essential during pregnancy for healthy foetal development.

Australian Avocado Nutrition is committed to sharing the latest scientific evidence supporting the health benefits of avocados. Our message is simple, eat 50g of avocado daily – that’s about a 1/3 of a smaller or a 1/4 of a larger avocado – either as a tasty addition to meals or as a healthy sandwich spread, as suggested by the Australian Dietary Guidelines.
References


www.avocado.org.au
Advanced Accredited Practising Dietitian Lisa Yates prepared this document on behalf of Avocados Australia’s nutrition program – Australian Avocados Nutrition.

Avocados Australia is the peak industry body for the Australian avocado industry. The not-for-profit organisation representing avocado growers and associated businesses is committed to improving the health and wellness of all Australians by sharing credible up to date information about the health benefits of avocado.

**Australian Avocados**

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To find an Accredited Practising Dietitian freecall 1800 812 942 or www.daa.asn.au