australian avocados

Avocado Nutrition and Health: Reviewing the Scientific Evidence

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Contents

Introduction

This report provides an overview of the nutrition and health benefits of avocados. Avocados are a nutrient-dense fruit that plays an important role in a healthy diet, contributing almost 20 different nutrients and phytonutrients. Population research shows avocado eaters consume significantly more key nutrients than non-avocado eaters.[1]

Avocados contain healthy monounsaturated fats and have low levels of carbohydrates, sugars and sodium. Avocados are an excellent source of the B-group vitamin folate - an essential nutrient for cell division, blood formation and a healthy pregnancy.

A new review from CSIRO has also identified that, as part of a healthy diet, this wholesome plant food may help reduce some heart disease risk factors without causing weight gain, and could also play a helpful role in gut, eye and skin health.[8]

While avocados are technically a fruit, they are often enjoyed like a vegetable, and the Australian Dietary Guidelines (2013) suggest avocado as a healthy alternative to saturated fat spreads like butter.[2] Their versatility means they can help in many ways to meet the recommended daily serves of fruit and vegetables and, like other fruits and vegetables, they score five health stars.

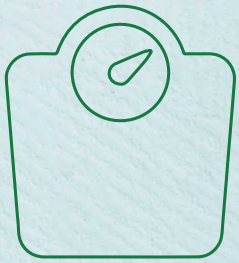
We recently consulted with a group of seven leading nutrition experts in a roundtable meeting to determine the ideal recommended serving size of avocado, which food group avocados belong in, and key nutrition education messages for avocados. A summary of the key findings from this roundtable is included in this report.

Whether smashed on toast, slipped into a smoothie, sliced into a salad or spread on bread, avocados are a nutritious, delicious food Australians could eat more of to boost their health and wellbeing. This nutrition and health report is a reminder of the many reasons to include a serve of avocado (half an avocado or 75g) in healthy diet recommendations.

Key findings

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

Improve lipid profiles and contribute to cardiovascular health



Assist in weight management

Increase the diversity and abundance of gut microbiota

Maintain cognitive function in aging

Improve skin appearance

Avocados are also:

- Rich in folate, which is needed during pregnancy for tissue development
- Nutrient dense with a soft texture making them a perfect first food for babies and the frail elderly
- A useful source of monounsaturated fats in lower-carb, higher-fat, low-GI diets to help with glycemic management

Enjoy more avocado

Aussies don't eat enough fruits and vegetables

A diet low in fruit and vegetables contributes to 1.4% of the cost of the burden of disease in Australia.[3]

According to the last National Health Survey (2017/18):[4]

- Half of Australian adults aged 18 years and over (51.3%) ate the recommended two serves of fruit a day
- 1 in 13 adults (7.5%) ate the recommended five serves of vegetables a day
- 1 in 20 adults (5.4%) met the recommendations for both fruit and vegetables
- 1 in 17 children aged 2-17 years (6%) met the guidelines for the recommended number of serves of both fruit and vegetables
- 7 in 10 (73%) children ate the recommended serves of fruit, but most didn't eat enough vegetables

Aussies don't eat much avocado

A national survey of Australians in 2011-12 found only 1 in 6 people (16%) reported consuming avocados on the day of the survey. These avocado-eaters consumed around 16g a day, which is less than 3g per person across the whole population.[5] More recent industry sales data from 2020/21 estimate Australians purchase 4kg of avocado per person per year or 8g edible weight per person per day.[6] At either estimate, Australian avocado consumption is low.

Aussies clearly need to eat more fruits and vegetables such as avocado. And the flavour of avocado certainly matches the high priority placed on taste in food choices.[7] It's the 'green' most people like.

National Nutrition Policy recommendations

Australian Dietary Guidelines

Our current Australian Dietary Guidelines (2013) recommend using avocado in place of high saturated fat spreads such as butter.

Guideline 3 states:

"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 and pastes, and avocado." [2]

How much is a serve?

The Australian Dietary Guidelines (2013) suggest a serve of vegetables is 75g.[2] The CSIRO review found that 100 - 330g of avocado a week could have health benefits without causing weight gain.[8]

The suggested serving size for Australian avocados is half a medium avocado (75g)

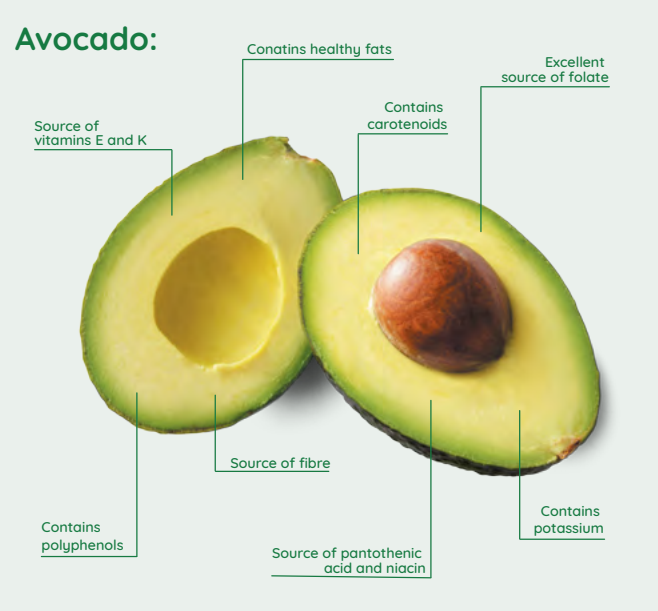
This is similar to recommended intakes in other countries. In the UK a serve of avocado is around 80g or ½ an avocado.[9] The US FDA serve recommendation is 50g [10] and both the US and Mexican avocado industries agree on 50g.[11] Americans actually consume around 70g of avocado on average a day.[1]

Health Star Rating

Health Star Ratings are an easy, at-a-glance guide on the front of food packaging to help you choose healthier foods.[12] Ratings can be as little as ½ star up to 5 health stars and the more stars a food or product has the healthier it is. Like all fruits and vegetables avocados are a 5-star food.

Nutrition composition

Avocados are well known for containing healthy fats, but there is much more to this fruit. They contain 20 or more different nutrients and phytochemicals.



Avocados provide vitamins E, K and folate, the mineral potassium, and antioxidant polyphenols and carotenoids. They are also naturally low in carbs, sugars and sodium. (See Nutrition Information Panel on page 8). Research shows avocado eaters tend to consume significantly more of several key nutrients in their regular diet than non–avocado eaters.[1,10]

Energy

Avocados, like other plant foods, have a high moisture content, being 74% water (and 3% fibre). Due to their healthy fats, avocado contains 490kJ per 75g serve, however, research suggests eating up to 330g of avocado a day does not cause weight gain.[8] (For more on weight see page 14).

Healthy fats

Avocados contain healthy fats with a 75g serve - half a medium avocado - providing 8g of monounsaturated fats. Monounsaturated fats are required to maintain heart health and help the body absorb fat-soluble vitamins and carotenoids.[10,13]

As an avocado ripens, the amount of monounsaturated fat it contains increases and saturated fat content decreases[10]

Carbohydrates and sugars

Unlike other fruits, avocados are naturally free of carbohydrate and sugars.

Fibre

Fibre aids a healthy gut function and gut microbiome, helps control blood glucose and blood cholesterol, and increases satiety.[14] Avocados provide a combination of insoluble and soluble fibre - around 3g per 75g serve in total.

Potassium and sodium

Research shows that a healthy varied diet high in potassium and low in sodium helps maintain normal blood pressure[15] and protects against heart disease and stroke.[16] Avocados positively contribute to a good potassium to sodium ratio, with 75g of avocado providing 460mg of potassium and 7mg 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.[17] Avocados are a rich source of folate with a 75g serve providing 97µg or nearly half (48%) of the adult regulatory recommended dietary intake (RDI). (For more on folate see page 9).

Vitamin E

Vitamin E is a fat-soluble vitamin commonly found in foods containing healthy fats, including avocados. A 75g serve provides 1.3mg of vitamin E or 13% of the regulatory RDI for adults. Vitamin E works with vitamin C to reduce cell damage by free radicals and protects cell membranes from oxidation.[18]

Vitamin K

Vitamin K is an important nutrient for building bones and also helps the blood to clot.[19] A 75g serve of avocado contains 16µg of vitamin K or 20% of the regulatory RDI for adults.

Phytochemicals

Avocados contain plant phytochemicals with antioxidant and anti-inflammatory properties. These include polyphenols and colourful carotenoids such as beta carotene and lutein, as well as chlorophyll that helps give avocado its unique colour.[20] These natural antioxidants help protect cells from free radical damage.[21] (For more on eye health see page 16).

What's in an avocado?

Nutrition Information (Average)

Servings per package: 2 serves per avocado
Serving size: ~75g or ½ avocado

	Average Quantity per Serve	Percentage Daily Intake‡	Average Quantity per 100g
Energy	492kJ (120kcal)	6%	656kJ (156kcal)
Moisture	55g		73.5g
Protein, total	1.1g	2%	1.5g
Fat, total	12g	17%	16g
– saturated	2.2g	9%	3g
– trans	0g		0g
– polyunsaturated	1.7g		2.2g
– monounsaturated	7.5g		10g
Carbohydrate	0g	0%	0g
– sugars	0g	0%	0g
Dietary fibre, total	3.2g	11%	4.3g
Sodium	7mg	<1%	9.2mg
Potassium	458mg		610mg
Niacin	1.4mg	14% RDI	1.9mg
Pantothenic acid	0.9mg	18% RDI	1.2mg
Folate	97µg DFE	48% RDI	129µg DFE
Vitamin E	1.3mg	13% RDI	1.7mg
Vitamin K^	16µg	20% RDI	21µg
Polyphenols	20mg GAE		27mg GAE
Beta carotene	54µg		72µg
Lutein	165µg		220µg

Sources:
2021 Hort Innovation analysis data (Hass) or ^ USDA Food Data Central
‡ based on an average adult diet of 8700kJ
RDI is Recommended Dietary Intake (FSANZ regulatory RDI for adults)
< means less than
GAE means Gallic Acid Equivalents
DFE means Dietary Folate Equivalents

Avocado and folate

What is folate?

Folate is a water-soluble B-group vitamin found in plant foods, especially avocados and green leafy vegetables. There is also a synthetic form of folate called folic acid that is used as a food additive and nutritional supplement. Folate from plant foods is not as readily absorbed as folic acid - about 50-60% is absorbed from food and 85% from folic acid.[17] However, folate in fruits and vegetables like avocado comes packaged with other essential nutrients and phytochemicals.

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 forms of anaemia resulting in weakness, fatigue, irritability and heart palpitations.[17]

Folate for pregnancy

Folate plays an essential role in the healthy development of babies in-utero, helping to create DNA, divide cells and form the neural tube. The neural tube fuses very early in pregnancy, developing into the brain and spinal cord. If it doesn't form properly, a neural tube defect (NTD) can occur. Spina bifida and anencephaly are the most common forms of NTD, affecting about 1 in 1,000 pregnancies in Australia.[22] A healthy varied diet rich in folic acid may reduce the risk of neural tube defects.

Food fortification with folic acid alone may not be enough to meet the increased folate needs during pregnancy, so eating plant foods naturally rich in folate as well as taking folic acid supplements is recommended

The RDI for folate

While Food Standards Australia New Zealand (FSANZ) has set the regulatory recommended dietary intake (RDI) of folate at 200µg per day, the National Health and Medical Research Council (NHMRC) recommends 600µg during pregnancy and lactation.[17] This extra 400µg could come from a folic acid supplement and food sources such as avocado, green leafy vegetables, grains, legumes and fortified foods.[23]

A 75g serve of avocado contributes 97µg of folate, which is about 16% of the NHMRC folate RDI.

Recommended Dietary Intake for folate (FSANZ)[24]	75µg for infants 100µg for children aged 1-3 years 200µg for children aged 3 years and older 200µg for adults
Recommended Dietary Intake for folate (NHMRC)[17]	600µg for pregnant and lactating women
Dietary folate equivalents[17]	1µg dietary folate equivalent (DFE) = 1µg food folate = 0.5µg folic acid on an empty stomach = 0.6µg folic acid with meals or as fortified foods

Avocado and heart health

A large study including 68,786 women from the Nurses' Health Study (NHS) and 41,701 men from the Health Professionals. Follow-up Study (HPFS) found those who ate 80g of avocado or more per week had a 16% lower risk of cardiovascular disease (CVD) and a 21% lower risk of coronary heart disease compared to non-consumers. Replacing half a serving a day of margarine, butter, egg, yoghurt, cheese or processed meats with the equivalent amount of avocado was associated with a 16% to 22% lower risk of CVD.[25]

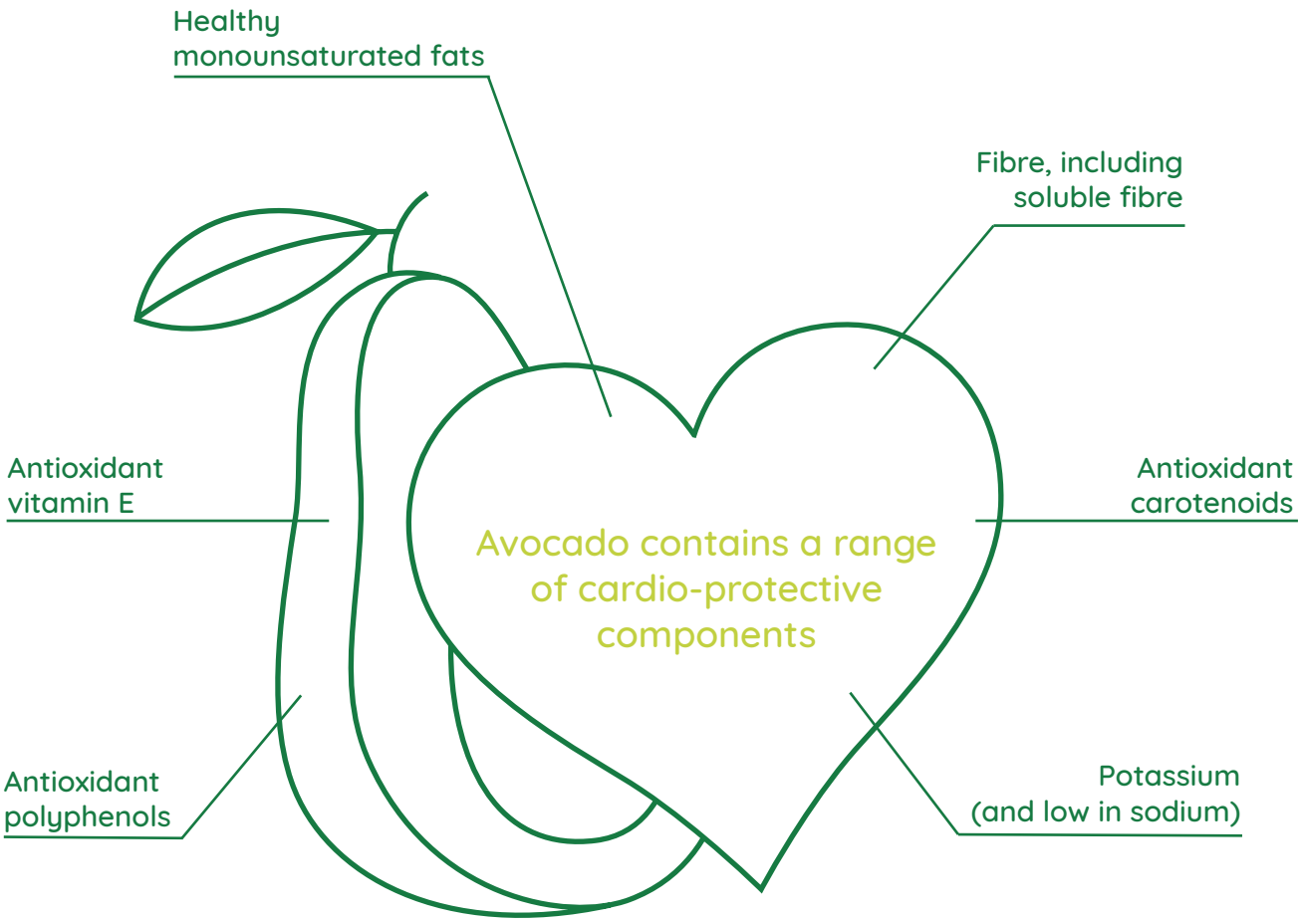
Clinical studies have demonstrated a range of positive heart health effects with diets containing avocados, including on some blood lipids.[8,26,27] There are many bioactives within this nutrient-dense fruit which may contribute to these effects.[10]

Healthy fats

The fats in avocados are mostly healthy monounsaturated fats that absorb and carry fat-soluble vitamins, and help control cholesterol production which helps reduce the risk of CVD.[13] Diets high in foods that contain mostly monounsaturated fats, such as a Mediterranean diet with its extra virgin olive oil and nuts, are well known for their cardioprotective effects.[28,29]

The Australian Dietary Guidelines (2013) recommend avocado as a healthy fat alternative to saturated fat spreads such as butter.[2]

A healthy, varied diet that contains a high intake of both fruits and vegetables, such as avocado, reduces the risk of heart disease[15]



Soluble fibre

Soluble fibre can lower cholesterol re-absorption from the intestine. Avocado provides around 3g total fibre per 75g serve and two thirds of this is soluble fibre.[30]

Antioxidants

Vitamin E, carotenoids and polyphenols are compounds with antioxidant activity that help protect cells from free radical damage. These compounds also have anti-inflammatory effects that may help prevent atherosclerosis - the thickening, hardening and inflammation of blood vessels that is associated with cardiovascular disease.

Sodium vs potassium

Reducing sodium and maintaining an adequate intake of potassium can help guard against high blood pressure, heart disease and stroke.[16] A 75g serve of avocado contributes just 7mg of sodium, and a helpful 460mg of potassium – that's 12% of the NHMRC Adequate Intake (AI) for potassium for males.[31]

A healthy diet, which is also low in sodium and contains a variety of foods such as avocado, can reduce high blood pressure[32]

Avocado and cardiovascular health - the evidence

LATEST RESEARCH

In the systematic literature review and meta-analysis of trials conducted by CSIRO, avocado was helpful in lowering elevated total and LDL cholesterol compared to control diets[8]

Total and LDL cholesterol

Other individual research studies support eating avocados as part of a healthy diet to lower total cholesterol (TC) and low density lipoprotein (LDL) cholesterol.[33,34,35] LDL cholesterol is a major risk factor for heart disease.

People with high cholesterol

A 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.[36] Other aspects of the vegetarian diet may have contributed to this result.

An Australian study followed 15 women with elevated LDL cholesterol consuming ½ to 1½ avocados per day as part of a high carbohydrate diet. After three weeks, researchers noted an 8% reduction in total cholesterol and no change to high density lipoprotein (HDL) cholesterol. The control diet reduced HDL cholesterol by 14%, which was an adverse outcome.[35]

People without high cholesterol

Another study followed 16 healthy volunteers consuming a high carbohydrate and moderate fat diet (50% of energy from carbs and 30% from fat, with 75% of the fat from avocado) compared to a low saturated fat diet without avocado for two weeks. It found total and LDL cholesterol were significantly reduced compared to the low saturated fat diet, and HDL cholesterol was maintained. The low saturated fat control diet had the adverse effects of reducing HDL cholesterol and increasing triglycerides.[37]

Eating avocado as part of a healthy diet, moderate in total fat (mostly unsaturated), helps maintain HDL (good) cholesterol levels while lowering LDL (bad) cholesterol[37]

Participants with high cholesterol and type 2 diabetes

A study of 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. After one week, those with normal cholesterol reported a 16% decrease in total cholesterol. Those with moderate to high cholesterol levels 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%.[38]

In another study a diet high in monounsaturated fats mostly from avocado was compared with a high carbohydrate diet in people with type 2 diabetes. While there were similar blood cholesterol reductions in both groups, the avocado diet also resulted in a decrease in triglycerides.[33]

Triglycerides

Elevated triglyceride levels are a risk factor for CVD. Low fat, high carbohydrate diets generally increase triglycerides, while higher fat, lower carbohydrate diets reduce triglycerides.[39]

Avocados can be a delicious part of a moderate fat, plant-based diet that helps keep triglycerides in check and are best used to replace low quality carbohydrates such as highly processed, refined and/or high-sugar discretionary foods. For example, switching from rice crackers to wholegrain crackers with avocado for a snack, or switching from a soft drink to an avocado smoothie.

Helpful HDL cholesterol

High Density Lipoproteins (HDLs) have a range of functions including anti-inflammatory, antioxidant, anti-thrombotic and vaso-protective properties. There is evidence from a previous systematic review and meta-analysis that avocado consumption increases HDL levels.[26] Diets that enhance the functionality of HDL cholesterol are the subject of growing research.

The Mediterranean diet has been shown to markedly improve HDL functionality, with the phenolic compounds in extra virgin olive oil appearing to exert positive effects. Like olive oil, avocados contain polyphenols and predominantly monounsaturated fat and may offer additive benefits when included in a Mediterranean-style diet.[40]

Emerging biomarkers

Evidence is accumulating that other biomarkers – such as non-HDL cholesterol, TC:HDL ratio and apolipoprotein B – are better predictors of cardiovascular disease than LDL cholesterol.[41,42] Avocado consumption is showing promising effects on these non-traditional biomarkers.

One study compared three energy-matched diets in 45 overweight or obese participants: a low-fat diet and two moderate-fat diets – one with avocado and one with high oleic acid (monounsaturated fat) oils. The avocado diet group had a greater reduction in LDL cholesterol and non-HDL cholesterol than the low-fat and the high monounsaturated fat oil group.

In addition, the avocado diet significantly decreased LDL particle number, small dense LDL cholesterol, and the ratio of LDL:HDL – all changes which are considered to reduce CVD risk.[43] Two studies using avocado diet interventions have shown reductions in apolipoprotein B.[35,43]

Evidence on avocados and cardiovascular risk

- Avocado helps improve lipid profiles in a range of people, especially those with elevated LDL cholesterol
- Including avocado in a Mediterranean-style diet can reduce cardiovascular risk
- Avocado can improve emerging cardiovascular disease biomarkers

Avocado for weight and diabetes

Avocado and weight

Avocado can play a helpful role in creating nutrient-dense, healthy, satisfying and enjoyable eating patterns suitable for both weight loss and weight maintenance. Despite containing healthy fat and having a higher kilojoule content than most other fruits, avocados don't appear to cause weight gain.[8]

Avocado is satisfying

Avocado is a satisfying food - most likely due to the satiety effects of the fibre and healthy fats they contain. Another potential mechanism for avocados positive weight effect is that avocado inhibits the action of acetyl-CoA carboxylase, a key enzyme in production of fat in the body.[44] Emerging research also suggests avocado can beneficially influence the gut microbiota in people who are overweight or obese, a possible mechanism by which weight is influenced.[45]

A clinical trial in overweight and obese adults found an avocado breakfast increased fullness and satisfaction and suppressed appetite compared to a high carbohydrate control breakfast, and this was accompanied by higher PYY gut hormone and lower insulin levels also involved in satiety.[46]

A randomised crossover study found overweight people who added 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.[47]

Tick yes to avocado in weight loss diets

Studies have found avocados can be included in successful weight loss diets. A systematic review and meta-analysis of randomised controlled trials in overweight subjects, including 136-200g of avocado per day, found no significant differences in anthropometric measures compared to the control group, and some beneficial lipid profile changes. The authors concluded avocado consumption does not promote weight gain.[48]

One study used 200g avocado a day (30g fat) in an energy-restricted diet in overweight and obese people, compared with a diet containing 30g of fat from other sources. After six weeks, body weight, BMI and percentage of body fat all decreased significantly in both groups. The researchers concluded that 200g a day of avocado could be consumed in an energy-restricted diet without compromising weight loss.[49]

A 12-week randomised, parallel-controlled trial found that daily avocado consumption, as part of a hypocaloric diet, supported weight loss and an increase in beneficial gut bacteria.[50]

In another 12-week trial in people who were overweight or obese, one group ate one avocado a day and the control group ate the same number of kilojoules without avocado. Female subjects experienced a greater reduction in visceral adipose tissue, but this was not seen in male subjects.[51]

Avocado may help keep weight off

Associations have been found between avocado consumption and better weight-related indicators. A secondary analysis of the Australian National Nutrition and Physical Activity Survey found higher avocado consumption was associated with lower body weight and waist circumference, and a healthier eating pattern overall.[5] However, a healthier diet overall may have contributed to better weight control.

A US analysis of the National Health Survey found that avocado consumers on average weighed 3.4kg less, had a lower BMI and a 4cm smaller waist circumference compared to those who didn't eat avocado.[1] Another US longitudinal cohort study, The Adventist Health Study, found high habitual avocado consumers had reduced odds of becoming overweight or obese over 4 - 11 years of follow up.[52]

AVOCADOS DO NOT CAUSE WEIGHT GAIN

The systematic literature review and meta-analysis of avocado intervention trials conducted by CSIRO found consumption of avocado did not have undesirable effects on body weight, even when consumed in relatively high amounts[8]

AVOCADO AND WEIGHT

- Despite having fat and more kilojoules than most other fruits and vegetables, avocados don't cause weight gain
- People who regularly eat avocado have a lower BMI, a smaller waist and gain less weight over time
- Avocado can be included in kilojoule-controlled diets for weight loss
- Avocado can change gut microbiota in people who are overweight

Avocado and diabetes

The cardioprotective benefits of avocado are also important for people with type 2 diabetes as they have an increased risk of cardiovascular disease.[53]

Two studies have examined the effects of avocado in people with type 2 diabetes. One study found blood glucose levels were reduced in 13 of the 15 participants with type 2 diabetes, however, only five of the 15 had clinically significant reductions.[38]

A small, randomised crossover study involving 12 women with type 2 diabetes found that after four weeks on a high monounsaturated fat diet (with an avocado a day, divided between three meals) followed by four weeks on a high carbohydrate diet, the avocado diet was associated with a greater decrease in blood triglycerides (20% compared with 7% in the high-carbohydrate diet). Effects on glycemic management were similar with both diets.[33]

There may be health benefits from consuming other parts of the avocado plant too. Preliminary animal studies suggest that extracts of avocado leaf and seed taken as a supplement may improve management of blood glucose levels.[54-59]

Mediterranean diet

A network meta-analysis of the Mediterranean diet has shown it improves glycemic management, weight loss and cardiovascular risk factors in people with type 2 diabetes.[60] In another network meta-analysis, the Mediterranean diet was the most effective dietary approach for managing diabetic dyslipidemia in people with type 2 diabetes.[61] Avocados are a natural fit for this plant-based, predominantly monounsaturated fat, Mediterranean-style eating pattern.[62]

The MUFA effect

A review of the role of dietary fat type and quantity on metabolic syndrome found monounsaturated fat (MUFA) is preferable to polyunsaturated fat for lowering fasting insulin and lowering glucose levels. Replacing carbohydrates with fat of any kind lowers triglycerides, increases HDL cholesterol and lowers blood pressure.[63]

In people with type 2 diabetes, a shift toward a higher MUFA diet has been shown to reduce liver fat when compared with a higher carbohydrate and fibre diet with the same kilojoules.[64]

Avocados contain mostly monounsaturated fats and can be an effective food to achieve a dietary shift toward a higher monounsaturated fat (MUFA) diet

Avocado also contains 2% polyunsaturated fats (PUFA). Achieving a target level of 4-10% of energy as PUFA in the diet can help CVD risk reduction.[65]

The post-prandial advantage of MUFA

Regulation of blood glucose levels is a cornerstone of diabetes management. Adding healthy fats to meals with carbohydrate reduces the glycemic impact of the meal, so there is suggestive evidence that avocado can do this. Fat content of a meal is estimated to predict 31% of the variability of postprandial glycemia and insulinemia.[66]

A reduced glycemic impact has been demonstrated for nuts[67], peanut butter (both high in MUFA)[68] and hummus eaten on high Glycemic Index (GI) white bread.[69] Extra virgin olive oil (high MUFA) consumed with a high GI food reduces post-prandial glycaemia[70] and contains polyphenol antioxidants, similar to avocado.

Avocado and diabetes

- People with diabetes have an increased risk of cardiovascular disease
- Consuming avocado as part of a healthy diet can help reduce cardiometabolic risk
- A Mediterranean-style diet pattern including avocado can improve glycemic management
- Avocado in meals and snacks could reduce post-prandial glycemia

Avocado and emerging health areas

Eye health

The macula lutea is a 'yellow spot' in the centre of the retina responsible for central vision. Macular degeneration is caused by age related damage and can lead to central vision blindness. The macula is yellow because it is rich in the carotenoid lutein thought to combat light-induced damage caused by free radicals.[71] Carotenoids are transported to the macula by HDL cholesterol[72,73] and help reduce the risk of macular degeneration.[74]

Avocados contain carotenoids[20] and their healthy fats help absorb fat-soluble carotenoids from within the avocado itself as well as from other vegetables consumed with them. Research shows adding 75 - 150g of avocado to a salad or salsa increases the absorption of carotenoids from other vegetables five-fold.[75]

Another study found eating 150g of avocado with other vegetables rich in carotenoids boosts both the absorption of carotenoids and their conversion to vitamin A, necessary for vision. Specifically, avocado enhanced the absorption of beta carotene from tomatoes by 2.4 times and enhanced the efficiency of conversion to vitamin A by 4.6 times. In the case of carrots, absorption was increased six-fold and the efficiency of conversion was 12.6 times higher.[76] Clearly, avocado is an essential salad ingredient.

The CSIRO scoping review[8] found two preliminary studies assessing the impact of avocado consumption on macular pigment density (MPD) and the findings were mixed.

One study[77] found MPD significantly increased by more than 25% at three and six months in the group consuming a normal diet with 135g avocado daily. The control group's MPD also significantly increased by 17% after three months but was not sustained at six months. A second study found no change in MPD after a daily meal with avocado or without over a 12-week period.[78] Avocado consumption increased serum lutein levels in both studies.

Avocado and eye health

- Avocado contains carotenoids
- Adding avocado to salads increases the absorption of carotenoids from other vegetables
- Avocado helps the conversion of carotenoids to vitamin A needed for vision
- More research is needed to determine if avocado consumption can change macular pigment density and reduce the risk of macular degeneration

Brain health

Avocados contain several nutrients necessary for optimal neurological and psychological function, making avocado a good mood food.[79] The CSIRO scoping review[8] also found some preliminary research on the impact of avocado on cognition. In an interesting link to eye health, Macular Pigment Density (MPD) is also a brain lutein biomarker associated with cognitive function in both young and older adults. But studies examining the effect of avocado and MPD on cognition have produced mixed results.

One study reported higher MPD was associated with improvements in spatial working memory and problem solving in older adults consuming one avocado daily,[77] but there were no relationships between MPD and cognition in the control group. The second study did not find any relationships between lutein levels and changes in any measures of cognition in younger adults.[78] Research in this area is still evolving and more work is needed to uncover the full role of avocados in brain health.

Gut health

Avocados contain both insoluble and soluble fibre important for gut function. The CSIRO scoping review found evidence that avocado consumption has a positive impact on the gut microbiome – changing the microbial diversity and abundance in overweight individuals on both normal and energy-restricted weight loss diets.[8]

One study[45] assessed 151 overweight participants eating 140 – 175g avocado per day for 12 weeks compared to those on a control diet without any avocado. Microbial diversity was significantly greater among the avocado group, compared to the control.

The avocado group also had higher faecal acetate (18%) and a trend for higher faecal total short-chain fatty acids (SCFA). SCFA are thought to play a key role in microbiota-gut-brain communication. This may help explain the possible mechanism of avocado's influence on brain function.[80]

Another study[50] comparing ~150g of avocado per day in an energy restricted diet to a similar control diet without avocado for 12 weeks found daily avocado intake resulted in positive changes: an increase in Firmicutes and a decrease in Bacteroides bacteria. This balance is indicative of a plant-based diet, although energy restriction can also change the gut microbiome.[8] Like all fruits and vegetables, avocado positively impacts gut health, but its specific role is still being explored.

Skin health

The CSIRO scoping review[8] found one study investigating the impact of one avocado daily as part of a habitual diet for eight weeks on skin health.[81] Researchers found participants in the avocado group showed a positive change in forehead skin firmness after eight weeks, compared with a control group eating a habitual diet with no avocado.

There were positive changes in most skin health markers – firmness, elasticity and tiring, melanin index and erythema (redness) – in both groups over time. However, none of these changes were significantly different between avocado and control groups. There were also no significant differences in hydration and sebum formation. It seems a healthy diet can improve skin condition, but it's not yet clear what specific role avocado plays.

Expert roundtable

In April 2022, an avocado expert roundtable was held with seven key opinion leaders in nutrition, with three key goals:

Establish a consensus on the recommended serving size for avocados

Determine which food group avocados should best be classified within

Agree on the most important nutrition messages for avocados

The following is a consensus from the roundtable.

1. Serving size and frequency

A 75g serve, the equivalent of half a medium avocado, was the agreed recommendation for a serving size of avocado. Half an avocado was considered a pragmatic recommendation – it's easy (and common practice) to cut an avocado in half.

There was agreement that avocados should be 'consumed regularly', although a consensus could not be reached on a specific recommendation regarding frequency of avocado consumption. Daily consumption is associated with health benefits in the scientific literature, however, it is often not realistic in practice to eat avocado every day.

2. Which food group, or groups, should avocados belong to?

Avocados can be part of several food groups (vegetables, fruits, and healthy fats and oils), as is the case with nuts and legumes. However, nutritionally, and from a culinary perspective, avocados are a 'best fit' in the vegetable food group - especially at the recommended 75g serving size.

3. Key nutrition and health messages

It was agreed avocados have a wide range of nutritional benefits:

1. **Heart-healthy**
   A key benefit from regular avocado consumption
2. **Gut-friendly**
   A key benefit due to fibre content
3. **Diabetes-friendly**
   Avocado can reduce the glycemic impact of meals and snacks which is valuable in diabetes. Avocado has a low carbohydrate content which suits a lower-carb, higher monounsaturated eating pattern for people with diabetes
4. **Great for weight**
   Avocado is suitable for inclusion in weight loss diets and increases satiety
5. **Elderly nutrition**
   A high nutrient-density, and their soft texture, makes avocado ideal for the elderly, especially considering emerging cognition and eye health benefits
6. **Good for infants**
   Avocado is ideal for introducing solids to infants and has benefits as a savoury flavour to contrast with the sweet flavours of popular first foods, such as puree fruits
7. **Plant-power green goodness**
   Avocado can increase nutrient content, flavour, phytonutrient absorption and consumption of other vegetables when, for example, they are consumed in a salad

Key messages from the Avocado nutrition roundtable:

A serving of avocado is 75g, equivalent to half a medium avocado

- Avocado fits best into the vegetable food group
- Enjoy avocado regularly for better health
- Avocado is best consumed regularly to obtain nutrition and health benefits, and regular consumption is not linked to weight gain. Avocado can be included in a healthy weight loss eating plan
- While traditionally viewed as a heart-healthy food, avocado provides a range of other health and nutrition benefits including gut health, brain health and benefits for diabetes
- The healthy mono and poly unsaturated fats in avocado make it a natural fit in plant-based, higher-fat eating patterns such as the Mediterranean diet
- From a culinary perspective, avocado provides great-tasting nutrition that offers simplicity and versatility in both sweet and savoury meals and snacks

Roundtable experts

- Clinical Weight Management - Dr Janet Franklin, APD (Royal Prince Alfred Hospital)
- Public Health - Jemma O'Hanlon, APD (Heart Foundation)
- Media and Sports Nutrition - Leanne Ward, APD (The Fitness Dietitian)
- Diabetes - Rachel Freeman, AdvAPD (Australian Diabetes Educators Association)
- Food Service / Culinary Nutrition - Karen Kingham, APD (Australian Catholic University)
- Exercise Physiology - Caitlin Reid, APD, AEP (Health and the City)
- Research - Genevieve James-Martin, APD (CSIRO)

Culinary nutrition

The smooth texture, creamy taste and gorgeous green colour of avocados makes them a family favourite, whether it be the Hass variety with purple skin or the Shepard variety with green skin.

Avocados are botanically a fruit and are used in sweet dishes in other parts of the world. Australians use them more like a vegetable and love them in savoury dishes such as guacamole, salads or as a topping on bread or toast.

Smashed avocado on toast has attained icon status in Australian food culture

Avocados are a nutritious plant food that work well in any kind of diet: heart healthy, Mediterranean, low salt, diabetes, vegetarian, vegan, gluten free, low FODMAP or low carb/keto/paleo diets. Avocados are suitable for people of all ages and stages, from the young to the young at heart.

Practical advice

Buying

The best way to tell if a Hass avocado is ready for immediate use is by the colour of the skin. They change from green, through light purple and finally to dark purple when ripe.

Avocados do not begin to ripen until they are picked from the tree

To test if the green skinned Shepard avocado is ripe, use gentle pressure on the stem of the fruit to see if it yields. Avoid squeezing the fruit body, as this will bruise the delicate flesh inside.

Ripening

To ripen an avocado, place the fruit in a plain brown paper bag and store at room temperature until ready to eat. This will usually take two to five days. Including an apple or banana in the bag accelerates the process, as these fruits give off ethylene gas - a natural ripening agent. To delay ripening, submerge avocados in water to prevent the action of ethylene.

Storing

Whole, ripe avocados can be stored in the refrigerator uncut for two to three days. Cut avocado should be sprinkled with lemon juice, lime juice or vinegar to stop discolouration, and placed in an air-tight container in the refrigerator. They can also be wrapped tightly with cling film or stored in an avocado saver kitchen gadget.

Peeling and de-seeding

Start with a ripe avocado and cut it lengthwise around the seed. Rotate the halves to separate. Remove the seed by sliding the tip of a spoon gently underneath and lifting out. Avoid using a knife as this can result in the dreaded 'avocado hand' laceration. Peel the fruit by placing the cut side down and removing the skin with a knife or your fingers, starting at the small end. Or simply scoop out the avocado flesh with a spoon.

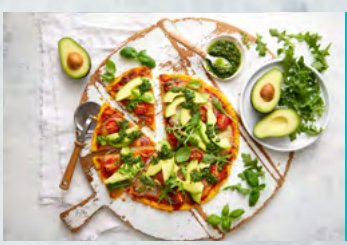
Top tips for enjoying more avocado

Avocado is perfect any time of the day:

START THE DAY with a classic - smashed avocado on wholegrain toast, perhaps with cherry tomatoes and baby spinach

Recharge in the AFTERNOON with an avocado smoothie (milk, avocado, yoghurt, cacao, dates, banana)

Take a break MID-MORNING with some wholegrain crackers and avocado dip



Avo DELICIOUS DINNER - avocados go well with meat, seafood and eggs, salads, sauces and dips, pasta, pizza and burgers

Add avocado to your salad for LUNCH - avocados make other veggies taste better and go well with beef, chicken, tuna or eggs

Don't forget DESSERT - avocados give a decadent velvety finish to chocolate mousse and make it better for you

Better with avocado

Adding avocado to fast foods such as hamburger patties can reduce the inflammation these foods cause and help prevent blood vessels constricting.[82] Avocados can help make less-healthy foods a better option

Mexican corn and avocado toast

Try this simple recipe for Mexican corn and avocado toast that takes smashed avo on toast to a whole new level.

Serves: 2 Preparation: 5 minutes Cooks in: 10 minutes

Ingredients

2 slices sourdough, or your favourite bread, toasted

½ large ripe avocado

Juice from ½ lime

2 cobs of corn, husks removed

1 tsp olive oil

¼ tsp smoked paprika or chilli powder

2 tbsp crumbled feta cheese, optional

Salt & pepper

Fresh coriander leaves & lime wedges, to serve

Tips

- Thawed frozen corn, or canned corn, can be drained and used in place of fresh. Skip boiling and drizzle the olive oil into a skillet over high-heat. Add corn, and cook until warmed through and starting to char.
- Substitute toast with 4 small tortillas, if preferred.
- The skin of a Hass avocado changes colour as it ripens, from green to purple-black when ready to eat.

Method

1. Place corn into a pot of boiling water, cook for 1 minutes. Remove, drain on kitchen towel, and brush cobs with olive oil. Preheat barbeque of heavy-based skillet to high. Add corn and cook, turning regularly, until lightly charred.
2. Slice corn off of cob with a sharp knife, sprinkle with paprika.
3. Smash avocado in a small bowl. Stir through lime juice and season with salt and pepper.
4. Spread toast with avocado. Top with charred corn, feta cheese and coriander leaves.
5. Serve immediately, with extra lime.

For more recipes and usage ideas visit australianavocados.com.au/recipes

Avocado for the young and old

Avocado for babies

Avocado is a great first food for babies. Nutrient-rich, low in salt and with a smooth texture and mild flavour, avocado is ideal for immature taste buds and tiny hands.[83] The introduction of solid foods is recommended from around six months of age.

Depending on baby's appetite, a third of an avocado (50g) can provide infants (aged 6-12 months) with:

- ~330 kJ of energy to help baby thrive
- Healthy fats to help absorb fat soluble vitamins and carotenoids
- Fibre to help keep baby regular, around 2g per 50g serve
- Vitamins and minerals needed for normal growth and development

According to the regulatory RDIs[24] for a 6-12 month-old baby, 50g of avocado provides:

- 86% RDI of folate, important for cell division and blood formation
- 33% RDI of niacin, needed to extract energy from food
- 22% RDI of magnesium for nerve and muscle function, teeth and bones
- 21% RDI of vitamin E that protects cells from free radical damage
- 19% RDI of copper for nervous system function, skin and hair
- 13% RDI of manganese for growing bones
- 11% RDI of vitamin B6 for iron transport and immune function

Avocado for toddlers

Avocado is also an ideal toddler snack. As well as providing great nutrition, avocado is colourful, has a mild taste and an appealing texture. Avocados make a great dip for soft vegetable sticks and toast fingers, a healthy butter substitute, a healthy salsa (sauce) for meat, fish and poultry, and are a great low-salt, low-sugar alternative to processed snacks.

Avocado for the frail elderly

The nutrient-density, soft texture and pleasant flavour of avocado can also be useful for the frail elderly. Malnutrition is a serious health issue for many older Australians.[84] In people over 71 years, vegetable intake is 1.8 serves a day less than recommendations, and fibre intake is 84% of the Adequate Intake (AI).[85]

The last National Nutrition Survey found older adults may be consuming inadequate amounts of carotenoids, potassium and vitamin E,[86] which are all contained in avocado. Because avocados are phytonutrient-rich, this may help support the immune system, eye health and cognitive function in this age group.[87]

Where are avocados grown?

4 avocado facts[88]

1. There are about 800 avocado growers in Australia
2. Avocados are grown in all states of Australia, across eight main regions. Our diverse climate means we have avocados available all year round
3. Around 120,000 tonnes of avocados are grown each year and increasing - that's about 21 million trays
4. The most popular variety of avocado is Hass, the purple skin variety, making up about 80% of all avocados grown, and is available all year round. The second most popular (around 15%) is Shepard, the green skin variety, available February to April each year. The remaining 5% is made up of another 25 more unusual varieties of avocado

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This report was prepared by Accredited Practising Dietitians Nicole Senior and Lisa Yates on behalf of the Hort Innovation Australian Avocados research and development program.

CSIRO was commissioned by Hort Innovation in 2022 to conduct a systematic literature review on the health effects of avocado consumption, which has informed parts of this report. A systematic review and meta-analysis on avocado consumption and cardiometabolic disease risk factors has been submitted for publication.

The information contained in this report is for educational purposes only and should not be considered medical advice. Please see your health care provider for individual medical advice if required.

Hort Innovation
Strategic levy investment

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