

CHEESE

IT'S OK TO RECOMMEND CHEESE: HERE'S WHY





Opinions differ on the health effects of dairy foods, including cheese. Some people may feel the need to moderate cheese consumption due to its saturated fat, sodium and energy content, and concerns around heart health, blood pressure and the waistline. However, the 2013 Australian Dietary Guidelines classifies all cheese as a Five Food Group food rather than a discretionary food.

Health professionals play an important role in educating consumers about good nutrition and providing accurate, evidence-based information.

The purpose of this paper is to provide a summary of the latest science on cheese consumption and conditions such as cardiovascular disease (CVD), blood pressure, type 2 diabetes, metabolic syndrome and obesity.

Dairy Australia is the national services body for the dairy industry. This report, prepared by health professionals at Dairy Australia, aims to bring together the most up-to-date and emerging research around the health benefits of cheese. It draws from the latest evidence from around the globe to help health professionals and policymakers to understand the unique health benefits of this ancient fermented dairy food, and to encourage all Australians to enjoy cheese varieties as part of a balanced diet.

How much cheese do Australians eat?

Almost one third of Australians eat cheese each day and some people believe that Australians are eating more than enough cheese. However, according to the 2011–2012 National Nutrition and Physical Activity Survey (NNPAS), the mean daily intake of cheese was only 12g – less than a third of the Australian Dietary Guidelines recommended serving size (40g).¹

Hard cheese was the most consumed type of cheese, accounting for 67% of consumption, followed by processed cheese (10%) and cream or cottage cheese (10%). Surface ripened cheese (e.g. camembert or brie) made up only 3% of the total cheese consumed.²

Most cheese was consumed in sandwiches, rolls and on toast (41%). A further 28% was eaten in mixed dishes, 18% was consumed alone and 14% was consumed on pizza.¹

What nutrients does cheese provide?

Cheese intake accounted for 7.2% of saturated fat and 3.9% of sodium intake, however it was the second largest provider of dietary calcium, contributing 9.6%.¹

Other nutrients provided by cheese included protein, vitamin A, riboflavin, niacin, vitamin B12, vitamin K2, iodine, phosphorus, selenium and zinc.



CHEESE IS PART OF THE DAIRY FOOD GROUP, ONE OF THE FIVE FOOD GROUPS RECOMMENDED FOR CONSUMPTION EVERY DAY

32%

of Australians
eat cheese each day

BUT

the average intake is

LESS THAN A THIRD

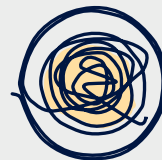
of the Australian Dietary Guidelines
recommended serving size (40g)

HOW CHEESE IS CONSUMED⁴



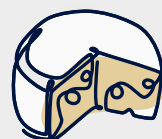
sandwiches, rolls
and on toast

41%



mixed dishes

28%



on its own

18%



pizza

14%

Insights on the impacts of cheese consumption on health



Evidence from prospective cohort studies

In recent years a number of papers have provided new insights on the impacts of cheese consumption on health. The following is a summary of systematic reviews and meta-analyses from prospective cohort studies.

Cardiovascular disease (CVD)	<p>A meta-analysis of prospective studies by Chen et al. included 15 prospective cohort studies, most with a duration of over 10 years.³</p> <ul style="list-style-type: none"> • There was an inverse association between cheese consumption and risk of CVD. • Compared to lower cheese consumption, higher intakes were associated with a 10% lower risk of CVD. • These relationships were most pronounced at intakes of approximately 40 g/d cheese. <p>Guo et al. published a meta-analysis of 29 cohort studies (this included 938,465 participants and 25,416 cases of CVD).⁴</p> <ul style="list-style-type: none"> • The authors observed inverse associations of total fermented dairy consumption with risk of CVD. • Every 10 g/d of cheese consumption reduced CVD risk by approximately 2%.
Coronary heart disease (CHD)	<p>Drouin-Chartier et al. published a systematic review and meta-analyses of prospective cohort studies on the associations between dairy food consumption and the risk of cardiovascular-related clinical outcomes.⁵</p> <ul style="list-style-type: none"> • This study concluded there is no evidence that the consumption of any form of dairy is detrimentally associated with any cardiovascular-related clinical outcome. • Consumption of cheese was not associated with CHD. <p>A systematic review and meta-analysis by Alexander et al. included data from five studies (194,911 individuals were followed for 10–23 years).⁶</p> <ul style="list-style-type: none"> • Consumption of cheese was inversely associated with risk of CHD. • Cheese intake of at least 52.6g/d was associated with a 14% lower risk of CHD.
Stroke	<p>A meta-analysis of 11 prospective cohort studies, published by Gholami et al. in 2017, evaluated the association of the consumption of dairy products on the risk of stroke.⁷</p> <ul style="list-style-type: none"> • Cheese consumption was associated with a 7% reduced risk of stroke. <p>A systematic review and meta-analysis by Goede et al. included data from seven studies (272,368 individuals were followed for 10–17 years; there were 11,126 cases of stroke).⁸</p> <ul style="list-style-type: none"> • Consumption of cheese was marginally inversely associated with risk of stroke. This relationship was most pronounced at intakes above 25g/d. <p>These results are also consistent with the 2016 systematic review and meta-analysis by Alexander et al.⁸</p>
Elevated blood pressure	<p>Soedamah-Muthu et al. published a systematic review and meta-analysis in 2012. This included data from eight studies (51,007 individuals were followed for 5–10 years; there were 15,066 cases of hypertension).⁹</p> <ul style="list-style-type: none"> • Results indicated no association between cheese consumption and hypertension.
Type 2 diabetes (T2D)	<p>In a recent meta-analysis of prospective cohort studies, Alvarez Bueno et al. looked at dairy consumption and the relationship with T2D incidence.¹⁰ This study examined data from 12 systematic reviews and meta-analyses, four of which looked at cheese specifically.</p> <ul style="list-style-type: none"> • There was a moderate association between cheese consumption and reduced risk of T2D diabetes risk in adults. <p>A previous study by Gijsbers et al. examined the relationship between dairy consumption and type 2 diabetes, using data from 12 studies (369,697 individuals were followed for 4–30 years; there were 32,936 cases of diabetes).¹¹</p> <ul style="list-style-type: none"> • There was no association between cheese consumption and type 2 diabetes.
Mortality	<p>A 2019 overview of systematic review and meta analyses by Cavero-Redondo et al. looked at dairy consumption and risk of mortality.¹²</p> <ul style="list-style-type: none"> • This included two studies that looked at cheese, one by Tong et al. who examined the long-term association of cheese consumption with all-cause mortality.¹³ This included data from nine prospective studies (177,65 individuals were followed for 5–15 years; there were 21,365 cases of mortality). • There was no significant association between cheese consumption and all-cause mortality.
Body weight – adults	<p>The pooled analysis of prospective cohort studies with the longest follow up was conducted by Smith et al. in 2015.¹⁴ Data on cheese consumption and body weight was collected every four years (120,784 individuals were followed for 16–24 years).</p> <ul style="list-style-type: none"> • There was no association between cheese consumption and weight gain • An extra serve of cheese consumed in place of refined carbohydrates was associated with long term weight loss of around 85g per year.
Obesity risk – children	<p>In a systematic review and meta-analysis, Lu et al. looked at dairy and the risk of childhood obesity (not just cheese).¹⁵</p> <ul style="list-style-type: none"> • Data from four prospective cohort studies were pooled (22,505 children) with results showing children in the highest dairy intake group were 38% less likely to be overweight or obese. • Risk of childhood overweight/obesity was 13% lower with each serving/d increment in dairy intake. • One prospective cohort study considered cheese and showed no association between cheese consumption and risk of overweight/obesity.

Long-term studies have also provided some insights into cheese and health. For example, data from the European Investigation into Cancer and Nutrition (EPIC)- Norfolk study on 15,612 men and women (aged 40–78 y) followed individuals on for an average of 3.7 years. Studies have shown:

- A lower risk of ischaemic stroke with higher consumption of dairy foods, including cheese (per 30 g/day).
- An increase in consumption of fermented dairy products, including low-fat cheese was associated with a lower increase in body weight and body mass index (BMI).¹⁶
- No association with dairy food consumption (including cheese) on mortality.¹⁷

Evidence from randomised controlled trials

While evidence from observational research is informative, it cannot establish cause and effect. A number of randomised controlled trials (RCTs) have provided additional insights into cheese and health.

- A systematic reviews and meta-analysis by Goede et al. analysed the results of five different studies with a mean cheese intake of between three and five servings/day, demonstrating that cheese has different effects on blood lipids to what is usually predicted.¹⁸
- Additional RCTs investigating the effects of cheese on blood lipids have been published.^{19–22} They consistently indicate that high cheese intake (60–120g/d) does not cause detrimental changes in blood lipid concentrations, even in people with risk factors for CVD.
 - Three of these lasted between five and 12 weeks and monitored blood pressure and body weight. Results showed eating large quantities of cheese for one to three months did not adversely impact blood pressure, body weight or waist circumference.
 - In one of these studies, consuming 60g/d Camembert cheese compared to 250g regular-fat yoghurt did not modify lipid levels or blood pressure over 3 weeks.²²
 - A study by Brassard et al. showed consuming butter induces a significantly greater increase in LDL cholesterol compared with cheese.²³
- In another study, an amended DASH diet that included regular-fat dairy food has been shown to be as effective for lowering blood pressure as one with reduced-fat dairy.²⁴
- Alba et al. found that eating four serves of cheese for eight days – in the context of low and high sodium diets – protects against microvascular dysfunction. In this study, participants consumed a variety of different cheeses including Cheddar, Swiss, parmesan, mozzarella and provolone.²⁵

- A recent study indicated when participants with the metabolic syndrome followed a low-carbohydrate, high-fat diet that included cheese (200 g/day; five servings) of Cheddar or Gouda cheese), metabolic health was improved in more than half of participants, independent of weight loss.²⁶

(HEESE CONSUMPTION AND HEALTH


Systematic reviews and meta-analyses show that consumption of cheese is associated with a


REDUCED RISK OF

- ✗ STROKE
- ✗ TYPE 2 DIABETES
- ✗ CHILDHOOD OVERWEIGHT AND OBESITY

HAD NO ASSOCIATION WITH

- ✗ HYPERTENSION
- ✗ OVERWEIGHT AND OBESITY IN ADULTS





Perceived barriers to cheese consumption

About two thirds (21.6g/100g serve) of the fat in cheese is composed of saturated fatty acids so concerns that consumption might be linked with negative health effects are understandable.²⁷ Excess consumption of saturated fat has traditionally been linked with a rise in LDL cholesterol levels and this explains why worldwide, national nutrition guidelines often advise the consumption of reduced-fat dairy over regular-fat dairy.

Sodium and heart health

Coronary heart disease is a major cause of death in Australia and consumers are often advised to limit cheese consumption due to concerns about its sodium content.²⁸

The 2011–2012 Australian Health Survey revealed that only 4% of the total sodium consumed in the Australian diet comes from cheese (the major source being cereal-based products and dishes, followed by meat and poultry).¹ Cheese also supplies significant amounts of calcium (9.6%), as well as magnesium and potassium – minerals known to reduce blood pressure.²⁹

Salt plays an important role in the cheese making process, improving flavour, inhibiting growth of undesirable microorganisms and impacting on texture, stability and ripening. Even small reductions in salt can result in poor quality cheese and noticeable off flavours.³⁰

Since cheese consumption is not associated with risk of cardiometabolic disease, its consumption should not be discouraged due to concern about its sodium content.³¹

Saturated fat: not all fats are equal

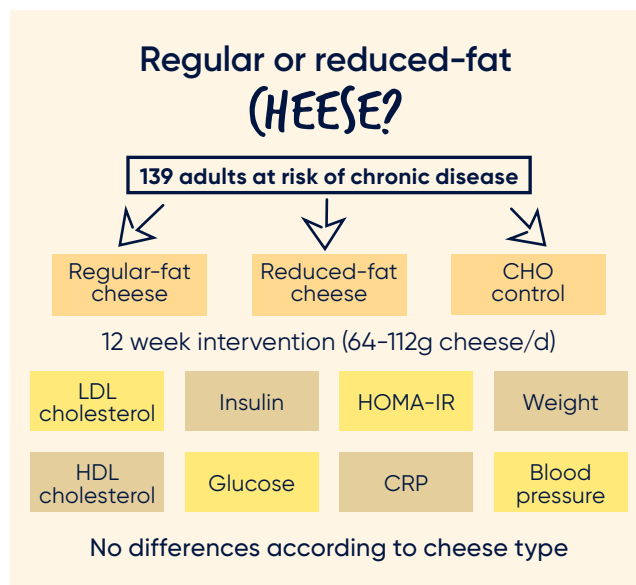
There is now substantial scientific evidence indicating that, unlike saturated fat from other animal products, consumption of saturated fat from dairy foods such as cheese is not associated with cardiovascular risk.³²⁻³⁴ Similarly, a meta-analysis by Imamura et al. revealed that participants with the highest levels of dairy-related fatty acids in their blood had a 30% lower risk of developing type 2 diabetes.³⁵ It is important to note that dairy fat has the most complex profile of all the fats, containing more than 400 different fatty acids (e.g. short, medium and long-chained fatty acids).³⁶

Just as not all types of carbohydrate have the same impact on health, not all types of saturated fat are associated with the same health effects.

Regular or reduced-fat cheese?

A randomised controlled trial looked at the effect of regular versus reduced-fat cheese on cholesterol levels and metabolic syndrome risk factors.³⁷ Subjects recruited for this study were required to have a large waist circumference and one or more metabolic syndrome risk factors. Subjects were randomised to one of three 12-week intervention diets; regular-fat or reduced-fat cheese (approximately 80g per day), or a non-cheese, carbohydrate control (90g of bread and jam). Subjects were asked to live as they normally would, but were asked to replace normal foods in their diet with the test foods. They found no differences in health outcomes between the three diets, as shown in Figure 1.

Figure 1: A randomised controlled trial indicates high daily consumption of regular-fat cheese does not negatively affect health outcomes compared to consumption of reduced-fat cheese or a carbohydrate control in an adult population at risk of chronic disease.



FOODS VERSUS NUTRIENTS

When nutrients such as saturated fat and sodium are consumed as part of a food, together with other essential nutrients and bioactive components, they work synergistically to affect health rather than how you would expect them to act as nutrients on their own.

An example of this is cheese, which is composed of a highly complex matrix of nutrients.³⁸ Cheese is recognised as a Five Food Group food in the Australian Dietary Guidelines which make recommendations based on whole foods, as opposed to single nutrients.³⁹

POSSIBLE REASONS WHY CHEESE IS ATTRIBUTING TO HEALTH BENEFITS

A complex nutrient matrix

Cheese is composed of a complex matrix of nutrients and other bioactive components that work together to positively impact on health.

Fat excretion

Not all of the fat consumed in cheese is absorbed.¹⁹

This may be due to the presence of calcium, which increases fecal fat excretion.⁴⁰⁻⁴²

Displacing less healthy foods with a protein food

When people eat cheese (a Five Food Group food) they are likely to have less appetite for unhealthy, discretionary foods. The protein in cheese may also increase satiety.

Fermentation and ripening processes

Fermented and ripened dairy foods (such as cheese) have been found to have a favourable effect on biomarkers associated with inflammation, oxidative stress or atherogenesis in overweight and obese adults.^{43,44}

Gut microbiota

Cheese may be associated with positive health effects by modifying the gut microbiota.^{45,46}

REFERENCES

- 1 Australian Bureau of Statistics. 4364.0.55.007. Australian Health Survey: Nutrition First Results – Foods and Nutrients, 2011-12. Canberra 2014.
- 2 Australian Bureau of Statistics. 4364.0.55.007. Australian Health Survey: Nutrition First Results – Foods and Nutrients, 2011-12. Canberra 2014 and personal communication with the ABS.
- 3 Chen GC et al. Cheese consumption and risk of cardiovascular disease: a meta-analysis of prospective studies. *Eur J Nutr*. 2017 Dec;56(8):2565-2575.
- 4 Guo J et al. Milk and dairy consumption and risk of cardiovascular diseases and all-cause mortality: dose-response meta-analysis of prospective cohort studies. *Eur J Epidemiol*. 2017;32:269-87.
- 5 Drouin-Chartier JP. Systematic Review of the Association between Dairy Product Consumption and Risk of Cardiovascular-Related Clinical Outcomes. *Adv Nutr*. 2016 Nov 15;7(6):1026-1040.
- 6 Alexander DD. Dairy consumption and CVD: a systematic review and meta-analysis. *Br J Nutr*. 2016 Feb 28;115(4):737-50.
- 7 Gholami F et al. Subgroup dairy products consumption on the risk of stroke and CHD: a systematic review and meta-analysis. *Med J Islam Repub Iran*. 2017 (27 Mar); 31:25.
- 8 de Goede et al. Dairy consumption and risk of stroke: a systematic review and updated dose-response meta-analysis of prospective cohort studies. *J Am Heart Assoc*. 2016 May 20;5(5). pii: e002787.
- 9 Soedamah-Muthu SS et al. Dairy consumption and incidence of hypertension. A dose-response meta-analysis of prospective cohort studies. *Hypertension*. 2012;60: 1131-37.
- 10 Alvarez-Bueno C et al. Effects of Milk and Dairy Product Consumption on Type 2 Diabetes: Overview of Systematic Reviews And Meta-Analyses. *Adv Nutr*. 2019;10(S2): 97-104.
- 11 Gijsbers L et al. Consumption of dairy foods and diabetes incidence: a dose-response meta-analysis of observational studies. *Am J Clin Nutr*. 2016;103, 1111-24.
- 12 Cavero-Redondo I et al. Milk and Dairy Product Consumption and Risk of Mortality: An Overview of Systematic Reviews and Meta-Analyses. *Adv Nutr*. 2019;10 (suppl 2), S97-S104.
- 13 Tong X et al. Cheese Consumption and Risk of All-Cause Mortality: A Meta-Analysis of Prospective Studies. *Nutrients*. 2017 Jan; 9(1):63.
- 14 Smith JD et al. Changes in intake of protein foods, carbohydrate amount and quality, and long-term weight changes: results from 3 prospective cohorts. *Am J Clin Nutr*. 2015 Jun;101(6):1216-24.
- 15 Lu L et al. Long-term association between dairy consumption and risk of childhood obesity: a systematic review and meta-analysis of prospective cohort studies. *Eur J Clin Nutr*. 2016;70, 414-23.
- 16 Trichia E et al. The associations of longitudinal changes in consumption of total and types of dairy products and markers of metabolic risk and adiposity: findings from the European Investigation into Cancer and Nutrition (EPIC)-Norfolk study, United Kingdom. *Am J Clin Nutr*. 2020 Jan 8. pii: nqz335.
- 17 Pala V et al. Associations of dairy product consumption with mortality in the European Prospective Investigation into Cancer and Nutrition (EPIC)-Italy cohort. *Am J Clin Nutr*. 2019 Nov 1;110(5):1220-1230.
- 18 Goede J et al. Effect of cheese consumption on blood lipids: a systematic review and meta-analysis of randomized controlled trials. *Nutr Rev*. 2015 May;73(5):259-75.
- 19 Thorning TK et al. Diets with high-cheese, high-meat, or carbohydrate on cardiovascular risk markers in overweight postmenopausal women: a randomized crossover trial. *Am J Clin Nutr*. 2015 Sep;102(3):573-81.
- 20 Nilsen R et al. Effect of a high intake of cheese on cholesterol and metabolic syndrome: results of a randomized trial. *Food Nutr*. 2015 Aug;59:27651.
- 21 Raziani F et al. High intake of regular-fat cheese compared with reduced-fat cheese does not affect LDL cholesterol or risk markers of the metabolic syndrome: a randomized controlled trial. *Am J Clin Nutr*. 2016 Oct;104(4):973-981.
- 22 Schlienger JL et al. Effect on blood lipids of two daily servings of Camembert cheese. An intervention trial in mildly hypercholesterolemic subjects. *Int J Food Sci Nutr*. 2014 Dec;65(8): 1013-8.

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- 23 Brassard D et al. Comparison of the impact of SFAs from cheese and butter on cardiometabolic risk factors: a randomized controlled trial. *Am J Clin Nutr.* 2017 Apr;105(4):800-809.
- 24 Chiu S et al. Comparison of the DASH (Dietary Approaches to Stop Hypertension) diet and a higher-fat DASH diet on blood pressure and lipids and lipoproteins: a randomized controlled trial. *Am J Clin Nutr.* 2016 Feb;103(2):341-7.
- 25 Alba BK et al. Controlled Feeding of an 8-d, High-Dairy Cheese Diet Prevents Sodium-Induced Endothelial Dysfunction in the Cutaneous Microcirculation of Healthy, Older Adults through Reductions in Superoxide. *J Nutr.* 2020 Jan 1;150(1):55-63.
- 26 Hyde PN et al. Dietary carbohydrate restriction improves metabolic syndrome independent of weight loss. *JCI Insight.* 2019 Jun 20;4(12).
- 27 Food Standards Australia New Zealand 2019. Australian Food Composition Database, Canberra.
- 28 Australian Institute of Health and Welfare (AIHW) 2019. Leading causes of death. Available: <https://www.aihw.gov.au/reports/life-expectancy-death/deaths-in-australia/contents/leading-causes-of-death>.
- 29 Houston MC & Harper K.J. Potassium, magnesium, and calcium: their role in both the cause and treatment of hypertension. *J Clin Hypertens.* 2008 Jul;10(7 Suppl 2):3-11.
- 30 International Dairy Federation 2014. The importance of salt in the manufacture and ripening of cheese. Special issue of the International Dairy Federation S1-1401. Brussels: Belgium.
- 31 Astrup A et al. Effects of Full-Fat and Fermented Dairy Products on Cardiometabolic Disease: Food Is More Than the Sum of Its Parts. *Adv Nutr.* 2019 Sep 1;10(5):924S-930S.
- 32 Astrup A. WHO draft guidelines on dietary saturated and trans fatty acids: time for a new approach? *BMJ.* 2019 Jul 3;366:l4137. doi: 10.1136/bmj.l4137.
- 33 Duarte C et al. Dairy versus other saturated fats source and cardiometabolic risk markers: Systematic review of randomized controlled trials. *Crit Rev Food Sci Nutr.* 2020 Mar 19:1-12.
- 34 Fontecha J et al. Milk and Dairy Product Consumption and Cardiovascular Diseases: An Overview of Systematic Reviews and Meta-Analyses. *Adv Nutr.* 2019 May 1;10(suppl_2):S164-S189.
- 35 Imamura F. Fatty acid biomarkers of dairy fat consumption and incidence of type 2 diabetes: A pooled analysis of prospective cohort studies. *PLoS Med.* 2018 Oct 10;15(10):e1002670.
- 36 Jenson RG. The composition of bovine milk lipids: January 1995 to December 2000. *J Dairy Sci.* 2002;85:295-350.
- 37 Raziani F et al. High intake of regular-fat cheese compared with reduced-fat cheese does not affect LDL cholesterol or risk markers of the metabolic syndrome: a randomized controlled trial. *Am J Clin Nutr.* 2016 Oct;104(4):973-981. Epub 2016 Aug 24.
- 38 Thorning T et al. Whole Dairy Matrix or Single Nutrients in Assessment of Health Effects: Current Evidence and Knowledge Gaps. *Am J Clin Nutr.* 2017;105(5):1033-1045.
- 39 National Health and Medical Research Council. Australian Dietary Guidelines Canberra: Commonwealth of Australia; 2013.
- 40 Lorenzen JK & Astrup A. Dairy calcium intake modifies responsiveness of fat metabolism and blood lipids to a high-fat diet. *Br J Nutr.* 2011;105(12):1823-31.
- 41 Lorenzen et al. Milk minerals modify the effect of fat intake on serum lipid profile: results from an animal and human short-term study. *Br J Nutr.* 2014;111(8):1412-20.
- 42 Soerensen K et al. Effect of dairy calcium from cheese and milk on fecal fat excretion, blood lipids, and appetite in young men. *Am J Clin Nutr.* 2014; 99(5):984-91.
- 43 Bordonni A et al. Dairy products and inflammation: a review of the clinical evidence. *Crit Rev Food Sci Nutr.* 2017;57(12): 2497-2525.
- 44 Nestel PJ et al. Effects of low-fat or full-fat fermented and non-fermented dairy foods on selected cardiovascular biomarkers in overweight adults. *Br J Nutr.* 2013;110:2242-9.
- 45 Zheng H et al. Metabolomics investigation to shed light on cheese as a possible piece in the French Paradox puzzle. *J Agric Food Chem.* 2015;63(10): 2830-9.
- 46 Zheng H et al. Metabolic effects of a 24-week energy-restricted intervention combined with low or high dairy intake in overweight women: an NMR-based metabolomics investigation. *Nutrients.* 2016; 8(3):108. an NMR-based metabolomics investigation. *Nutrients.* 2016; 8(3):108.

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