Dairy Australia

Dairy and Gut Health

Key findings

Although there is no universally accepted definition, gut health generally refers to having a healthy gut microbiome with a balance between health promoting bacteria and pathogenic bacteria, resulting in the absence of gastrointestinal discomfort or disease.

Diet is a key driver of gut health.

Dietary patterns associated with gut health are those that are high in fibre (fruit, vegetables, legumes and wholegrains), unsaturated fatty acids and polyphenols, but low in saturated fats, sodium, alcohol and refined carbohydrates. The Mediterranean Diet is an example of a dietary pattern associated with gut health.

The evidence to date shows that dairy products can play a role in a gut-healthy diet, in particular the fermented dairy products such as yoghurt and kefir, however more research is needed to understand the specific influence of dairy products on the gut microbiome.

Fermented dairy products including yoghurt, serve as an ideal vehicle for probiotics to be delivered to the gut. Therefore, for those looking to include probiotics in their daily routine, choosing a yoghurt with added probiotics is a convenient and nutritious means of probiotic supplementation.

Individuals with concerns of lactose intolerance can safely include dairy products in their diet by introducing dietary management strategies, to reap their nutritional and health benefits.

AUSSIE DAIRY
MATTERS

What is meant by gut health?

The term 'gut health' has become increasingly popular in recent years. A google search of the term yields nearly 1.5 billion results including media reports, product advertisements, lifestyle modifications and scientific literature. Although there is no specific definition of gut health, research suggests that gut health can be defined by:

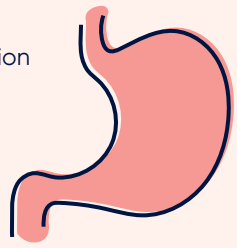
> " absence of gastrointestinal symptoms (e.g., abdominal pain, diarrhoea) and disease (e.g., inflammatory bowel disease, colon cancer), as well as an absence of other unfavourable local conditions".[1]

It appears that the central contributor to achieving gut health is the gut microbiome. Diet is suggested as the most notable modifiable factor in altering the gut microbiome.

The gut microbiome consists of micro-organisms, mainly bacteria, that live in the gastrointestinal tract.[2] The majority are found in the large bowel contributing to the fermentation of undigested food components and to faecal bulk.[3] The gut microbiome has now been clearly linked to overall human health.

Gut microbiome demonstrates its role in the:

- development and function of the immune system
- regulation of hormonal function
- modification of toxins
- regulation of bone density and
- optimisation of intestinal barrier function.[4]



Research demonstrates its role in the development and function of the immune system, regulation of hormonal function, modification of toxins, regulation of bone density and optimisation of intestinal barrier function.[4]

As such it seems that modulating the gut microbiome may contribute to the management and/or prevention of a range of chronic diseases. These include auto-immune diseases, diabetes, and cardio-vascular disease.[5] More recently, it has become clear that the gut microbiome also has a role to play in human neurophysiology and mental health.[6]

Consumers perspective on gut health

Despite the plethora of gut health related content in the media, there is limited published research on how consumers understand the term. An Australian study found that consumers equated 'gut health' with overall health and associated it with mental health, immune and bowel health.

They viewed diet as being the most influential modifiable factor and predominantly attributed the gut health benefits to probiotics or fermented foods.[7]

An increasing numbers of Australians report symptoms of digestive discomfort such as bloating and abdominal pain. Often, they look to dietary causes. In a recent survey, 31% of respondents reported bloating associated with dairy consumption, and 26% reported an upset stomach.[8] A common misconception is that lactose intolerance is the primary contributing factor. As a result, individuals often mistakenly eliminate all dairy products from the diet.

One in six Australians are reducing or completely avoiding dairy foods.

Yantcheva B, Golley S, Topping D, Mohr P. Food avoidance in an Australian adult population sample: the case of dairy products. Public Health Nutrition. 2016;19(9):1616–23. doi:10.1017/S1368980015003250

There are a number of determinants of gut health. These include age, lifestyle, ethnicity and host health, however the most notable and modifiable driver is diet.[1] It is thought that gut health can be improved by optimising the gut microbiome through dietary changes. The optimal gut microbiome for health, and therefore the optimal diet, is still the subject of research. Although it is highly individual, there are certain characteristics that appear to be associated with good health. A 'healthy' gut microbiome is one that is diverse in bacterial species and has a balance between commensal and potentially pathogenic bacteria. Examples of beneficial bacteria are *Lactobacillus* and *Bifidobacterium* which have been well researched. Dysbiosis occurs when bacterial homeostasis is disrupted and there is a loss of beneficial bacteria, overgrowth of pathogenic bacteria and /or a loss of bacterial diversity.[10] Dysbiosis is considered to trigger pro-inflammatory effects and immune dysfunction. It has been associated with disease states including inflammatory bowel disease, diabetes, non-alcoholic fatty liver disease and atopy.[9,10]

Research into the exact impact of diet and dietary components on the gut microbiome is still in its early stages. It seems that although metabolic responses to meals are highly individual, there are general dietary principles that would appear to support a healthy gut. These include a diet high in fibre, unsaturated fats and polyphenols, but low in saturated fats, sodium and refined carbohydrates.[2]
The Mediterranean dietary (MD) pattern has been well researched and has been associated with a direct positive effect on health.

Although the MD is part of an overall lifestyle approach, the diet is characterized by the following:

- high consumption of legumes, fruit, vegetables, unrefined cereals, olive oil
- moderate consumption of dairy products, primarily cheese and yoghurt
- moderate to high consumption of fish and,
- low consumption of meat and meat products.[11]

The MD is associated with a myriad of health benefits. These include improved longevity, reduced metabolic risk of diabetes, reduced risk of malignancy and cardio-vascular disease, and improved cognitive function. Additionally, it is also associated with gut microbiome modifications that are associated with positive health outcomes.[14]

Probiotics, prebiotics, postbiotics and fermented foods in a gut healthy diet

A variety of terms are commonly used when discussing gut health and ways to modify the gut microbiome. The following section provides some important definitions.

Probiotics

Probiotics are defined as live microorganisms that when administered in adequate amounts, confer a health benefit on the host.[12] Probiotics are now available in a range of formats that are intended to be taken as dietary supplements. They are also commonly added to foods such as yoghurt, juice and cereals.

Prebiotics

Prebiotics are dietary components (mostly non-starch polysaccharides and oligosaccharides) that are non-digestible and lead to health benefits through a positive influence on native beneficial microbes.[10] Simply put, prebiotics feed the beneficial bacteria in the gut. Dietary sources of prebiotics include certain vegetables (e.g. garlic, onion, leek), legumes, certain fruits (e.g. nectarines, white peaches, grapefruit, dates and figs), and some cereals such as rye bread, and oats.

Postbiotics

The concept of postbiotics is relatively new and refers to substances derived from micro-organisms after they are no longer alive, that confer a health benefit.[13] Many postbiotics are produced in the colon as a result of colonic fermentation. This process occurs when non-digestible prebiotics and fibres are broken down by the gut microbiota. Amongst the beneficial compounds produced, and an example of postbiotics, are short chain fatty acids including butyrate, acetate and propionate. Short chain fatty acids have now been found to be important in maintaining a number of important functions. These include immune homeostasis, metabolic processes, intestinal barrier integrity and appetite regulation.[14]

Fermented foods

Food fermentation has been used historically as a means of preserving food to extend its shelf life. Fermentation involves the conversion of raw foods via the metabolic activity of microorganisms. For example, live cultures (a blend of one type or several strains of microorganisms) help transform milk into yoghurt.

As the 'good' bacteria multiply, they produce compounds that change the characteristics of the product including flavour, texture and nutrients. Fermented foods have been linked positively with human health since the early 1900s. The mechanisms for these health benefits have been postulated to include one or a combination of:[15]

- The direct nutritional value of the foods (including the bioactives produced through the fermentation process)
- Provision of nutrients promoting growth of indigenous gut microbes
- Capacity of the microbes present in fermented foods to become a component of the gut microbiome.

Fermented dairy products include yoghurt, kefir and cheese.

How can dairy play a role in gut health?

Our evolving understanding of overall diet and the gut is shedding new light on their relationship. Delving deeper, how much do we know about the relationship between dairy and the gut microbiome?

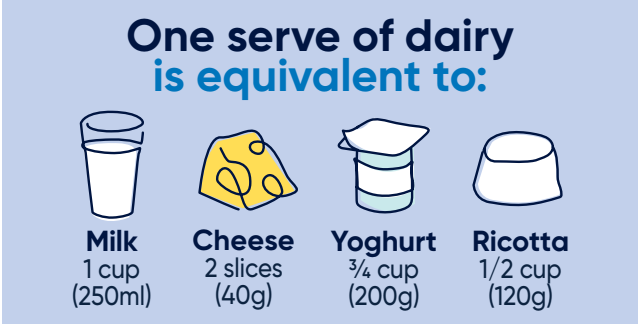
Dietary patterns including dairy foods

The current Australian Dietary Guidelines recommend including milk, cheese and yoghurt every day as part of a balanced diet for general health and wellbeing. The evidence for the dairy food group links adequate milk, cheese and yoghurt consumption to a reduced risk of heart disease, stroke, type 2 diabetes and finds no link between dairy foods and obesity.[16]

Minimum recommended number of serves from the dairy food group

	Age (years)	Number of serves per day
Men	19–70	2 ½
	70+	3 ½
Women	19–50	2 ½
	50+	4
	Pregnant or breast feeding	2 ½

Adapted from: 2013 Australian Dietary Guidelines. The dairy food group includes milk, cheese, yoghurt and/or alternatives.*



*Alternatives include: 250ml soy, rice or other cereal drink with at least 100mg of added calcium per 100ml.

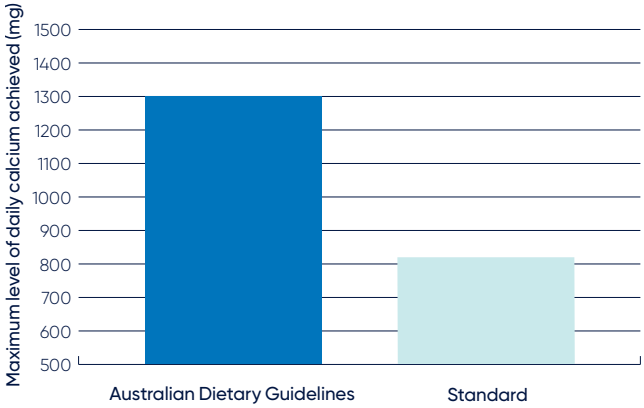
A recent systematic literature review looked at the effect of dairy/dairy derivative intake on the gut microbiota in adults. The search strategy identified articles published up to February 2019. Relatively few met the inclusion criteria and only eight studies were eligible for inclusion. The key findings are as follows.

Three studies found that milk, yoghurt and kefir increased abundance of beneficial *Lactobacillus* and *Bifidobacterium*. One study found that yoghurt was associated with a reduced abundance of the pathogenic strain of *Bacteroides fragilis*. The studies showed no changes or a reduction (in one study) in bacterial diversity with dairy interventions. *Lactobacillus* and *Bifidobacterium* have been shown to improve metabolic disturbances, immune modulation and regulating inflammation. Therefore, consumption of dairy products that results in increased abundance of these has the potential to have positive health benefits.

While some studies found varying effects of dairy products on gut microbiota, suggesting further research is needed, the review identified common trends across studies. Further research is required. Overall, the authors concluded that dairy products such as milk, yoghurt and kefir may favourably modulate the gut microbiota composition.

As previously discussed, the gut microbiome associated with the MD pattern has been linked to its health benefits. However, this dietary pattern only includes moderate consumption of dairy products, and provides less calcium than the Australian Recommended Dietary Intake (RDI).

Figure 1 Calcium Intake Achieved Through Different Dietary Patterns



Source: Adapted from Choo JM et al. Nutrients 2023:15:3645.

A recent Australian study evaluated the effects of a MD supplemented with three to four daily serves of dairy foods (MedDairy). 34 adults with cardiovascular risk factors were followed over an eight-week period.[17] Compared with a low-fat control diet, the MedDairy diet was associated with a significant change in abundance of selected bacterial taxa. This includes an increase in beneficial *Butyricicoccus* which inversely correlated with changes in systolic blood pressure. The changes were consistent with changes previously reported for the traditional MD. The authors concluded that a Mediterranean Diet supplemented with extra dairy foods can help promote a healthy gut.

Yoghurt

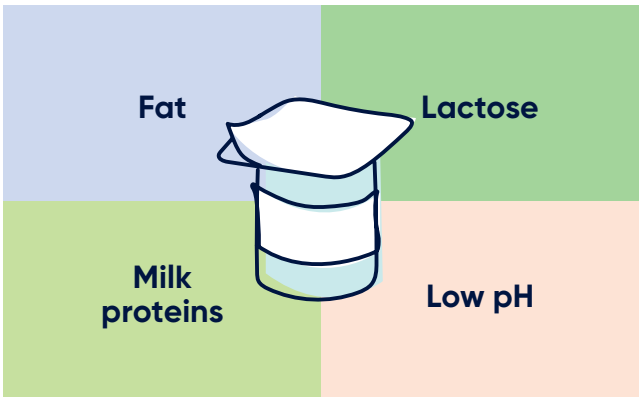
It is now well recognised that yoghurt, along with other fermented dairy products, is associated with a multitude of positive health outcomes. Yoghurt is fermented by starter cultures *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp *bulgaricus*. It may be supplemented with *Lactobacillus*, *Bifidobacterium*, or other probiotic microorganisms.

Several large epidemiological studies show that consuming yoghurt and other fermented foods is associated with a reduced risk of a number of diseases. These include a reduced risk of metabolic syndrome, diabetes and colorectal cancer.[18,19] Yoghurt contains live bacterial cultures known as lactic acid bacteria. The effect of these bacteria on the gut microbiome may be one of the mediators of the health benefits.

In a study of UK twins, yoghurt consumption was shown to alter the gut microbiome with an increase in the beneficial bacteria *Streptococcus Thermophilus and Bifidobacterium animalis*. This finding supports previous studies looking at the effect of yoghurt on the gut microbiome.[20] Studies suggest yoghurt modulates the immune system by impacting gut microbiota, leading to changes in circulating and systemic biomarkers.[21] Some studies have found yoghurt consumption is linked to reduced intestinal transit time and improved bowel function in constipated subjects.

Importantly, most clinical intervention trials used probiotic yoghurt as the intervention, that is yoghurt supplemented with added probiotics.

Fermented dairy products including yoghurt provide an ideal matrix for delivering probiotic bacteria to the body.



Yoghurt composition including milk proteins, fat and lactose and its low pH makes for an effective probiotic delivery system. These nutrients and low pH improve survivability of the probiotic species from the stomach to the gut. Therefore many yoghurts have specific probiotic cultures added to them, to provide consumers with additional health benefits. Food products with added probiotics (that make health claims about the probiotic) must label the bacterial strain, the dose (colony forming units) and associated health outcome.

Probiotic supplemented yoghurts have been shown to have further positive health effects. A recent review found that probiotic yoghurt reduced total and LDL cholesterol in participants with mild to moderate hypercholesterolaemia.[23] An additional review found improved metabolic, inflammatory, and infectious outcomes of pregnancy.[24] Several randomized controlled trials have found that probiotic yoghurts are more effective than conventional yoghurts in improving glycaemic control in type 2 diabetic patients.[17]

Odamaki *et al* demonstrated that consumption of yoghurt with *Bifidobacterium longum* reversed the shift in microbiota composition created by an entirely animal-based diet. The animal-based diet involved subjects eating all meals containing primarily animal products including eggs, pork, beef and chicken. The diet resulted in a significant increase in fat and protein intake (63% and 23% energy respectively) and a significant decrease in fibre intake. The changes seen in the microbiota after five days of an animal-based diet (including a reduction in *Bifidobacterium*) were not seen in the participants consuming 200g yoghurt daily alongside the animal-based diet. This suggests yoghurt can mitigate the negative effects of an entirely animal-based diet on gut bacteria.[25]

Individual trials have shown that probiotic-supplemented yoghurt may be effective at improving gastrointestinal discomfort such as constipation[26], or irritable bowel symptoms.[27, 28] Systematic reviews are yet to show a significant effect.[29] Further research is required to agree on effective dose, bacterial strain, consumption duration and yoghurt formulation for differing health outcomes.

Yoghurt and lactose intolerance

As previously mentioned, dairy products are commonly unnecessarily avoided due to concerns and symptoms associated with lactose. It is now understood that yoghurt is well tolerated by lactose intolerant individuals. The bacteria in yoghurt help digest lactose, meaning that lactose in yoghurt is tolerated better than some other dairy foods. Bacterial lactase survives the acidic stomach environment allowing it to assist with the digestion of lactose in the small intestine and prevent symptoms of intolerance.[30]

In Australia under the Food Standards Code, if a yoghurt or fermented milk contains at least 10^8 cfu/g of the bacteria *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus* a manufacturer may make a claim that the product improves lactose digestion for those individuals who have difficulty digesting lactose.[31] Some products may make other health claims around lactose content and ease of digestion which are 'self-substantiated', requiring the manufacturer to hold the supporting evidence.

Kefir

Kefir is a fermented milk drink produced by bacterial fermentation of kefir grains. Kefir has been shown to have a number of health benefits including immune-modulation, cholesterol-lowering, antimicrobial properties and gastrointestinal effects. These benefits have been attributed to kefir's nutritional composition with the fermentation process enriching the content of vitamins B1, B12, K, folic acid, and calcium.[32]

Caption: Kefir grains

One study investigated the effect of kefir over 12 weeks in subjects with metabolic syndrome. The authors found some favourable effects for metabolic syndrome parameters, including fasting insulin, inflammatory markers and blood pressure. Although kefir altered the gut microbiota composition, only the increase in *Actinobacteria* was significant.[33]

A systematic review exploring the effect of fermented food consumption on the gut microbiota found two studies among immune-compromised patients with significant microbiota effects. The two studies (one with irritable bowel syndrome and one with inflammatory bowel disease) reported a link between fermented milk consumption, a change in gut microbiota and gut symptoms. This suggests that there may be more pronounced benefits in individuals with compromised gut health.[34] Kairey and colleagues published a systematic review specifically on the effects of kefir consumption on human health. This review included 16 studies. It found some promising results suggesting a potential role of kefir as a complementary therapy in reducing dental caries risk, eradication of *Helicobacter pylori*, and treatment of adult dyslipidaemia and hypertension. However, the majority of studies included had a high risk for bias.[35]

More research is required to understand the impact of kefir consumption on the gut microbiome and related health outcomes.

As with yoghurt, kefir's fermentation process results in a lower lactose concentration compared with regular cow's milk. Kefir has been shown to be well tolerated by people with lactose malabsorption.[36]

Cheese

Cheese also falls into the fermented milk product category. There is some emerging evidence that it can have a positive impact on the gut. An observational study of 130 healthy adults found that although cheese consumers did not show a difference in intestinal microbial groups, they did have higher faecal concentrations of short chain fatty acids. This indicates that cheese can potentially have a postbiotic effect.[37] Short chain fatty acids are produced by fermentation of polysaccharides by the gut microbiota and play an important role in the maintenance of health.[38]

A small study of adults consuming parmesan cheese daily for seven days, found that *Bifidobacterium* present in the cheese persisted into the gut of consumers based on faecal sample analysis.[39] This indicates the ability of this bacterial species used in dairy production to survive the harsh conditions of the gut, a key prerequisite of probiotic activity. However, the health outcomes observed in this study were unclear. It is unknown whether this has an impact on health.

These results further suggest that cheese can be part of a gut healthy diet, however further investigation of the effect on the gut microbiota is needed.

Overall benefits of including dairy in a gut healthy diet

The nutritional benefits of dairy foods are well documented, with milk, cheese and yoghurt being a rich source of macro- and- micronutrients. Dairy products can play an important role in a balanced diet at every life stage from infancy to healthy ageing. They provide a nutrient-dense, convenient, accessible, and affordable source of nutrition.

In addition to the nutritional benefits, dairy intake has been associated with multiple health benefits. These include a reduced risk of heart disease, stroke, hypertension, type 2 diabetes, colorectal cancer and metabolic syndrome. The unique package of nutrients and complex physical structure of dairy foods has also been shown to benefit bones, teeth, muscles and healthy weight.

See the fact sheet "Dairy Health Benefits" for further information: **dairy.com.au/health/dairy-health-benefits**

Conclusion

Evidence is now building that dairy foods can play a role in a gut-healthy diet. Fermented products such as yoghurt and kefir may positively influence the gut microbiome by facilitating the growth of beneficial bacteria. In addition to these effects on the gut microbiome, the qualities of fermented dairy products provide an ideal atmosphere for the survival of probiotic bacteria through to the gut. Dairy foods are therefore commonly 'fortified' with additional live probiotic cultures and used as a vehicle for safe and efficient delivery of these probiotic species.

It is also clear that yoghurt and kefir can assist in managing symptoms of lactose maldigestion with improved tolerance compared with milk.

References

1 Staudacher H & Loughman A. Lancet Gastroenterol Hepatol 2021;6:269
2 Jacka F. **https://foodandmoodcentre.com.au/2016/07/what-is-the-gut-microbiome**/ Accessed 12 December 2023
3 Conlon M & Bird A. Nutrients 2015;7:17-44
4 Perler B.K. et al. Ann Rev Physiol 2023;85:449-468
5 Vijay A & Valdes A. European J Clin Nutr 2022;76:489-501
6 Shoubridge A.P. et al. Mol Psychiatry 2022;27:1908-1919
7 Williams G et al. Nutr Diet 2023;80:85-94
8 Dairy Australia Tracking survey. June 2023. Data on file
9 DeGruttola AK et al. Inflamm Bowel Dis 2016;22(5):1137-1150
10 Martinez JE et al. Front Endocrinol 2021:667066
11 Martinez-Gonzalez MA et al. Nutr Rev 2009;67)Suppl 1):S111-S116
12 Guarner F et al. Probiotics and prebiotics 2017. World Gastroenterology Organisation Global Guidelines. **www.worldgastroenterology.org/UserFiles/file/guidelines/probiotics-and-prebiotics-english-2017.pdf** Accessed 12 December 2023
13 Salminen S et al. Nature Rev Gastroenterol Hepatol 2021;18:649-667
14 Vinelli V et al. Nutrients 2022;14:2559
15 Leeuwendaal NK et al. Nutrients 2022;14:1527
16 National Health and Medical Research Council. Australian Dietary Guidelines, Canberra: Commonwealth of Australia; 2013.
17 Choo JM et al. Nutrients 2023;15:3645
18 Kok CR & Hutkins R. Nutr Rev 2018;76(S1):4-15
19 Savaiano D & Hutkins RW. Nutr Rev 2021;79(5):599-614
20 Le Roy CI et al. BMC Microbiology 2022;22:39
21 Hasegawa Y. & Bolling BW. Curr Opinion Food Sci 2023;51:101017
22 Kaur H et al. Fermentation 2022;8:425
23 Pourrajab B et al. Nutr Metab Cardiovasc Dis 2020;30(1):11-22
24 He A et al. Cureus 2020;12(7):e9408
25 Odamaki T et al. Benef Microb 2016;7:43-484
26 Yang YX et al. World J Gastroenterol 2008;14(40):6237-6243
27 Lee J et al. Int J Dairy Technology 2013;66(2):243-255
28 Guyonnet D et al. Aliment Pharmacol Ther 2007;26:475-486
29 Yan J et al. Food Sci Human Wellness 2023;12:2124-21
30 Savaiano D. AJCN 2014;99(suppl):1251S-5S
31 Food Standards Australia New Zealand. Food Standards Code Schedule 4 **https://www.legislation.gov.au/F2015L00474/latest/download** Accessed 15 January 2024
32 Farag MA et al. Nutrients 2020;12:346
33 Bellikci-Koyu E et al. Nutrients 2019;11:2089
34 Stiemsma LT et al. J Nutr 2020;150(7):1680-1692
35 Kairey L et al. Nutr Rev 2023;81(3):267-286
36 Hertzler SR et al. J Am Diet Assoc 2003;103:582-587
37 Gonzalez S et al. Frontiers Microbiol 2019;10:1046
38 Tan J etal. Adv Immunol 2014;121:91-119
39 Milani C et al. Nature Communications 2019;10:1286

Further reading

Literature Reviews

Author	Topic	Conclusion
Aslam et al. 2020	Effects of diary on the gut microbiota (SLR) 8 studies	Dairy products such as milk, yoghurt and kefir may modulate the gut microbiota in favour to the host. Further studies are required.
Hasegawa et al. 2023	Yoghurt consumption and immune health	There are gaps in evidence that yogurt consumption can prevent infection and treat gastrointestinal diseases. The dose, length, and formulation of yogurt required to improve immune health requires further investigation.
He et al. 2020	Probiotic yoghurt consumption and maternal health and pregnancy outcomes (SLR) 13 papers with 10 clinical trial reports	The consumption of probiotic yogurt was found to improve metabolic, inflammatory, and infectious outcomes of pregnancy. Studies on the consumption of probiotic yogurt appear to have many positive benefits, ranging from improving metabolism to decreasing preterm births.
Kairey et al. 2023	Effects of kefir consumption on human health (SLR) 16 studies	Kefir may have potential in reducing dental caries risk and in *Helicobacter pylori* eradication. Further high quality human trials are required
Kok et al. 2018	Yoghurt and fermented foods as a source of health promoting bacteria	Several studies have shown that consumption of yogurt and other fermented foods may improve intestinal and extraintestinal health and might be useful in improving lactose malabsorption, treating infectious diarrhea, reducing the duration and incidence of respiratory infections, and enhancing immune and anti-inflammatory responses.
Leeuwendaal et al. 2022	Fermented foods, Health and the Gut Microbiome	Fermented foods can effect the gut microbiome in both the short and long term and should be considered an important element of the human diet.
Pourrajab et al. 2020	Probiotic yoghurt consumption on lipid profiles (SLR) 7 studies	Probiotic yoghurt can significantly reduce total cholesterol and LDL-c in subjects with mild to moderate hypercholesterolemia without a significant effect on HDL-c and triglyceride levels.
Savaiano et al. 2021	Yoghurt, cultured fermented milk and health (SLR) 108 studies	Yoghurt and other fermented milk products provide favourable health outcomes beyond the milk from which these products are made.
Stiemsma et al. 2020	Does consumption of fermented foods modify the human gut microbiota? (SLR) 8 studies investigating fermented dairy	Some evidence to suggest that fermented milk and yoghurt alter the gut microbiota preferentially in individuals with compromised human health.
Yan et al., 2023	Effects of probiotics and fermented milk on constipation (SLR) 26 studies	Probiotic supplements were effective in relieving constipation but probiotic fermented milk showed no significant effect on stool frequency.

SLR: Systematic literature review

Studies

Author	Intervention	Participants	Measures or outcome(s) assessed	Results
Bellikci-Koyu *et al.*,2019	180ml/d **kefir** for 12 weeks	22 adults with metabolic syndrome	Anthropometry; blood pressure; serum glucose, insulin, lipids, CRP, inflammatory markers; microbial analysis of faecal samples	Regular kefir consumption resulted in a significant increase only in the relative abundance of *Actinobacteria*
Choo *et al.*, 2023	Med Diet including 3-4 serves **dairy**/d for 8 weeks	34 adults with CV risk factors	Microbiota of stools; clinical, anthropometric and cognitive outcomes	Compared to a low-fat control diet, the MedDairy diet resulted in changes in the abundance of specific gut bacteria, which were associated with clinical outcomes in adults at risk of CVD
Gonzalez *et al.*, 2019	Observational study of **fermented foods**	130 healthy adults	Dietary fermented food intake (FFQ); microbial and SCFA analysis of faecal samples; blood glucose, lipids and CRP;	Natural yogurt consumers showed increased fecal levels of *Akkermansia* with respect to non-consumers. Serum levels of CRP were significantly reduced in yogurt consumers.
Guyonnet *et al.*, 2007	2 x 125g pot **Fermented milk** containing *Bifidobacterium animalis DN-173 010* and yoghurt strains for 6 weeks	274 adults with IBS-C	Patient reported: HRQoL discomfort score; IBS symptoms; stool characteristics	HRQoL discomfort score was higher, as was the decrease in bloating score at week 3 in the test group. In those subjects with <3 stools/week, stool frequency increased over 6 weeks in the test group suggesting suggests a beneficial effect of a probiotic food on IBS-C. A high placebo effect was noted.

Author	Intervention	Participants	Measures or outcome(s) assessed	Results
Milani *et al.*, 2019	Parmesan **cheese** 45g/d for 7 days	20 healthy adults	Microbial analysis of stool samples	*B. mongoliense* was detected in the faeces of all enrolled individuals during the seven days of cheese consumption.
Lee *et al.*, 2013	130ml LGG-containing **probiotic yoghurt** twice daily for 6 weeks.	83 adults with IBS	Microbial analysis of faecal samples; blood LFTs, lipids, and glucose	Probiotic yoghurt was effective in alleviating some IBS symptoms and resulted in slight changes in certain gut microbiota.
LeRoy *et al.*, 2022	Observational study of yoghurt	1000 UK adult twins	Yoghurt intake (FFQ); health biomarkers including anthropometry and body composition; microbial analysis of faecal samples	Yoghurt consumption was associated with reduced visceral fat mass and changes in gut microbiome including transient increase of yoghurt-contained species (i.e. *S. thermophilus* and *B. lactis*).
Odamaki *et al.*, 2016	200 g of **yoghurt supplemented with *Bifidobacterium longum*** for 17 days	33 healthy adults	Microbial analysis of faecal samples	The animal-based diet (without yoghurt) caused a significant increase in the relative abundance of *Bilophila, Odoribacter, Dorea* and *Ruminococcus* (belonging to *Lachnospiraceae*) and a significant decrease in the level of *Bifidobacterium* after five days. These changes were not observed in the intervention group. These results suggest that the intake of yoghurt supplemented with *bifidobacteria* played a role in maintaining a normal microbiota composition during the ingestion of a meat-based diet.
Yang *et al.*, 2008	100g fermented milk containing *Bifidobacterium lactis* for 2 weeks	135 adult females with constipation	Stool frequency, defaecation condition, stool consistency.	This study suggests a beneficial effect of a fermented milk containing *B. lactis DN-173010* on all outcomes in adult women with constipation after 1 and 2 wks of consumption.

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Dairy Australia Limited ABN 60 105 227 987
E enquiries@dairyaustralia.com.au
T +61 3 9694 3777
F +61 3 9694 3701
dairyaustralia.com.au

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