THE CARB-APPROPRIATE REVIEW

A MONTHLY RESEARCH REVIEW BY

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ABOUT CLIFF

Cliff Harvey PhD is an author, clinician, and researcher. He was one of the first clinical nutritionists to begin working with ketogenic and low-carb diets, way back in the 1990s and is also considered a pioneer in the area of mind-body integrative healthcare.

Cliff's early post-graduate work was in mind-body healthcare, while his master's research focussed on the use of medium-chain triglycerides to mitigate 'keto-flu' and encourage faster induction of nutritional ketosis.

His doctoral thesis continued to investigate keto-flu and ketogenesis, and the effects of different types of low-carbohydrate diets along with the individualisation of dietary prescription and how 'carbohydrate tolerance' varies from person-to-person.

He is a former world champion strength athlete, submission grappler, and author of several best-selling books.

THIS MONTH

DOES MILK DO A BODY GOOD?

What are the effects of dairy on health?

Key Findings:

- Overall, dairy is likely to benefit heart disease, stroke, and diabetes
- Nutrients in dairy improve bone health and help to increase bone mineral density
- Dairy does not appear to have any strong association with the incidence of cancer
- Dairy does not appear to have any effect (positive or negative) on cognition
- Increased dairy might exacerbate acne

In *The Carbohydrate Appropriate Diet,* I wrote about the health benefits of dairy…and why some people should still avoid it. Since that book was published there has been a huge volume of research published and many reviews of that research summarising the most important results. There is also a lot of uncertainty around the topic of dairy. Some people promote it as a health panacea, others deride it as a pro-inflammatory dietary nightmare.

So, what does the evidence tell us about the impact of dairy overall, and for whom it is (and isn't) appropriate?

At the time of writing *The Carbohydrate Appropriate Diet,* despite dairy avoidance being a common theme in alternative and complementary health circles, the evidence for the absolute avoidance of dairy by most people was very thin on the ground. In fact, the research had demonstrated that in an adequate protein diet, a moderate dairy intake helped to retain lean mass during dieting more effectively than the same protein intake but with lower dairy intake, and that high protein, high dairy intake increased fat-loss.[1] Typically, people lost more fat when they supplemented with calcium, and more again when the same amount of calcium was provided from a diary containing diet,[2, 3] and it's is likely that dairy promotes a synergistic effect because of its relatively high content of protein (especially the BCAAs found in dairy in abundance) and angiotensin-converting enzyme inhibitors, to mitigate fat-gain.[4]

Systematic reviews and meta-analyses of the published studies have concluded that the inclusion of dairy in energy-restricted weight-loss diets significantly reduces weight and body-fat and improves lean-mass.[5, 6] There is also an association between the intake of dairy products and reduced rates of type-2 diabetes.[7, 8] Furthermore, high-dairy consumption might reduce insulin resistance without negatively impacting bodyweight or cardiometabolic markers.[9]

WHAT'S NEW?

You might think that not a lot has changed since 2014-2016 when I wrote and released *The Carbohydrate Appropriate Diet.* But since 2016 there have been nearly 60 systematic reviews or meta-analyses published on the effects of diary on various parameters of health! These include the studies I originally referenced but also many more.

So, let's do a deep dive into what the research tells us about dairy and its effects on health, whether good or bad.

Cardiometabolic Health

Overall, the evidence points towards favourable associations, albeit moderate, between total dairy intake and cardiometabolic risk, including for hypertension (high blood pressure), diabetes, and stroke.[10] A meta-analysis of 16 studies found that reductions in both type 2 diabetes and cardiovascular disease are associated with dairy intake but that this effect *was only significant for women and not men* (RR for T2D = 0.868; 95%CI, 0.82–0.92; P < 0.001; RR for CVD = 0.837; 95%CI, 0.75–0.93; P < 0.001).[11]

The evidence points towards favourable associations between dairy intake and cardiometabolic risk

Heart Disease

Overall, dairy has little if any association with heart disease (RR~1.0),[12] while it's possible that certain types of dairy (cheese in particular [SRRE=0·82; 95 % CI 0·72, 0·93]) might have a moderate, beneficial impact on the incidence of heart disease.[13] Additionally, a weak, yet statistically significant association between total dairy and cheese (but not milk), and 'pulse wave velocity', a measure of arterial stiffness (an important marker for cardiovascular health) has been observed (ES = −0.03; 95% CI [−0.04, −0.01]).[14]

Because observational research focussed on questionnaires of food frequency and other methods of inferring food intake have serious limitations, a review was conducted of 13 studies (> 7000 participants) that had looked instead at circulating fatty acids derived from dairy, as this would provide a quantitative measure of dairy intake and cardiovascular risk. Fatty acids found almost exclusively in dairy (pentadecanoic acid (15:0), heptadecanoic acid (17:0) and trans-palmitoleic acid (trans-16:1n-7)) were compared to the incidence of heart disease, stroke, heart failure, and cardiovascular disease mortality and the risk of CVD. There were no associations between the concentration of pentadecanoic acid with heart disease and stroke, but a negative relationship with heart failure (RR = 0.72, 95% CI: 0.55–0.95). Other fatty acids from dairy were not associated with any cardiovascular disorder and the authors concluded that *"Higher dairy fat exposure is not associated with an increased risk of cardiovascular disease"*.[15]

Diabetes and metabolic syndrome

Total dairy product consumption is associated with reduced risk of metabolic syndrome,[16-18] along with a lower risk of key markers of metabolic syndrome such as high triglyceride concentrations in blood, abdominal obesity, and yoghurt consumption has been associated with a 16% lower risk of high blood glucose concentrations.[17] It has been estimated that the overall protective effect of consuming dairy on the incidence of diabetes is ~10% (relative risk = 0.88 (95%CI: 0.80, 0.96), rate ratio = 0.92 (95% CI: 0.88, 0.97)).[17, 19] Dose-response analysis has suggested that there is a benefit from increasing intakes of both total and low-fat dairy,[18] and for every 200 g of dairy per day, there is ~4% reduced risk of developing diabetes.[12]

> Dairy product consumption is associated with reduced risk of metabolic syndrome

Effects on Insulin, Glucose, and HbA1c

Dairy intake is associated with a reduced risk of type 2 diabetes but the reasons for this had not been clearly demonstrated. In this review, markers of metabolic syndrome and diabetes; blood glucose, fasting insulin, homeostasis model assessment of insulin resistance (HOMA-IR), and HbA1c (glycated haemoglobin – a measure of average glucose levels) were analysed in relation to dairy intake in 44 studies featuring over 3000 participants.[20]

Key findings were:

- Fasting glucose was positively associated with increased dairy intake [34 studies, *n* = 2678; mean difference (MD): 0.07 mmol/L; 95% CI: 0.01, 0.12 mmol/L; *P* = 0.01, I^2 = 23%]
- However, HbA1c was negatively associated with elevated dairy product intake in 4 studies (*n* = 512; MD: −0.09%; 95% CI: −0.09%, −0.03%; *P* = 0.005, I^2 = 0%)
- Fasting insulin (29 studies, *n* = 1902; MD: −2.97 pmol/L; 95% CI: −7.05, 1.10 pmol/L; *P* = 0.15, I^2 = 21%) and HOMA-IR (13 studies, *n* = 840; standardized MD: −0.07; 95% CI: −0.26, 0.12; *P* = 0.49, I^2 = 38%) were not associated with elevated dairy consumption

While the risk of bias and some concern over the quality of some included studies, these results suggest that while fasting glucose may be elevated in response to increased dairy intake, average glucose levels do not appear to be elevated and there is little effect on insulin levels or insulin and glucose control.

Stroke and hypertension

Both total dairy intake and cheese show small yet statistically significant associations (SRRE=0·91; 95 % CI 0·83, 0·99; SRRE=0·87; 95 % CI 0·77, 0·99, respectively)[1] and milk a possible effect, between intake and risk of developing a stroke.[13, 21] Each 200 g per day increment of milk intake is associated with a 7-8% lower risk of stroke.[12, 22] The maximal likely benefit has been estimated though at a relatively limited intake of just 125 g per day of milk or 25 g per day of cheese.[22]

> Children in the highest intake group for dairy were 38% less likely to have childhood obesity

Obesity

Future obesity risk has been studied and reviewed in an analysis of 10 studies of > 46000 children and adolescents. Children in the highest intake group for dairy consumption were 38% less likely to have childhood overweight/obesity (pooled odds ratio (OR)=0.62; 95% confidence interval (CI): 0.49, 0.80). Each 1 serving per day increase in dairy consumption was associated with a reduction in body fat of 0.65% (β=0.65;

[1] SRRE = standardised relative risk estimate

95% CI: −1.35, 0.06; *P*=0.07), and the risk of overweight/obesity was 13% lower (OR=0.87; 95% CI: 0.74, 0.98).[23]

Dairy is a healthy food that is associated with improvements in markers of metabolic syndrome and diabetes, reduced risk of cardiovascular disease, and improved body composition.

Bone Health

Nutrients abundant in milk and other dairy foods, especially protein, calcium, vitamin D (in full fat and fortified dairy) and phosphorous, are important for the growth, repair, and overall health of bones. Despite the plausible benefits to bones from dairy, many claims have been made that dairy is 'bad' for bones.

Supplementing the diet with dairy products significantly increases bone mineral content

A recent systematic review summarised the available evidence from bone health in children and adolescents in relation to dairy consumption finding that *"supplementing the usual diet with dairy products significantly increases bone mineral content during childhood".*[24] Another review (11 randomised controlled trials) found significant benefits to bone mineral content and bone mineral density were found with an average 8% increase in bone density following ~16 months of increased dairy consumption.[25]

Osteoporosis, fracture, and bone mineral density

Total dairy intake (but not milk intake) was associated with a reduced risk of developing osteoarthritis (RR for total dairy 0.63; 95% CI: 0.55–0.73). However both total dairy intake and milk intake were associated with reduced risk of osteoporosis (22% and 37% reduced risk respectively) and milk also associated with a 25% reduced risk of hip-fracture in cross-sectional and case-control studies, while linear regression suggested a 9% *greater* risk of hip fracture for every 200 g increase in milk consumption per day.[26] A 2018 review of dairy intake in healthy adults (10 cohort studies) showed no strong associations between milk or total dairy intake and fracture but a < 3% lower average bone mineral density in those with lower dairy intakes and equivocal results for later milk consumption.[27]

Overall, bone mineral density and bone health overall are likely to be improved by dairy consumption.

Kidney Function

Studies suggest a favourable effect of dairy intake on kidney disease but the data is limited and further research needs to be conducted.[28]

Cancer

Liver

A total of eight cohort and case-control studies featuring over one million participants suggested an association between dairy intake and liver cancer (RR 1.38, 95% CI: 1.00-1.91, $p < 0.05$) but this association was not shown for milk or yoghurt and was not significant for cheese.[29]

This suggests that other dairy or diets featuring higher amounts of other dairy foods, such as butter, *might* have some association with liver cancer, but it is extremely difficult to find causality.

Testicular

There is no strong evidence that dairy consumption is associated with risk of testicular cancer.[30]

Bladder

Some studies have reported that milk and dairy product consumption reduces bladder cancer incidence, whereas others have reported null or opposite findings. A meta-analysis of 26 cohort and case-control studies found that medium compared with low consumption of dairy was associated with lower risk of bladder cancer for total dairy (RR = 0.90; 95% CI: 0.81, 0.98), milk (RR = 0.90; 95% CI: 0.82, 0.98), and fermented dairy products (RR = 0.87; 95% CI: 0.79, 0.96). However, high compared with low consumption of whole milk was significantly associated with a higher risk (RR = 1.21; 95% CI: 1.04, 1.38). These findings suggest a decreased risk of bladder cancer associated with medium consumption of total dairy products and with medium and high consumption of milk and fermented dairy products.[31]

These results are unclear but suggest a likely reduction in bladder cancer risk from dairy, however, high consumption of full-fat milk provides an anomalous finding.

Colorectal

A review of 29 studies featuring greater than 22000 participants showed a consistent and significant decrease in colorectal cancer risk associated with higher consumption of dairy products (RR: 0.80; 95% CI: 0.70, 0.91) and milk (RR: 0.82; 95% CI: 0.76, 0.88). Cheese consumption was also inversely associated with the risk of colorectal (RR: 0.85; 95% CI: 0.76, 0.96) and proximal colon cancer (RR: 0.74; 95% CI: 0.60, 0.91). No significant associations with colorectal cancer were found for the consumption of low-fat dairy products, whole milk, fermented dairy products, or cultured milk. The study concluded that consumption of total dairy products and total milk was associated with a lower risk of developing colorectal cancer, while low-fat milk consumption was associated with a lower risk of cancer restricted to the colon. Cheese consumption was associated with reduced colorectal cancer risk, specifically proximal colon cancer.[32]

Dairy appears to be associated with a lower risk of colon cancers.

Prostate

In a review of high-quality meta-analyses (2 to 32 cohorts with > 800,000 subjects) high vs low consumption of dairy was associated with a possible increase in risk for prostate cancer (RR 1.06 to 1.68) and a suspected dose-response of 1.07 per 400 g consumed per day. However, the inconsistency in results and relatively small effect size cast doubt on this finding. All sub-group analyses had risk ratios that crossed 1.0 suggesting no likely increase in risk and interestingly more recent studies have decreased RRs compared to earlier ones.[33]

So, while some data suggest an increase in prostate cancer risk from increased total dairy, overall this effect is unlikely.

Cognitive Function

While dairy is likely to be associated with improved health outcomes for ageing such as reduced frailty and reduced rates of muscle loss, effects on mental health have been contradictory.[34] The existing, mostly observational, evidence does not show any strong associations between dairy intake and cognitive function and the quality of evidence and potential for risk of bias makes it difficult to make any conclusions regarding the effect of either milk or total dairy intake on the risk of cognitive decline or neurological disorders in adults.[35]

Dairy does not appear to have an effect, either positive or negative, on cognitive function but is associated with other health benefits.

Milk, Dairy and Pregnancy

A 2018 systematic review of the literature looked at the effect of milk and dairy consumption during pregnancy on pregnancy and lactation outcomes. A final inclusion of 17 studies (six prospective cohort studies, three intervention studies, three retrospective cohort studies, three cross-sectional studies, and two case-control studies showed a trend (not definitive) towards improved infant birth weight and length but a lack of quality data prevented any conclusions being drawn about the effects of dairy intake on preterm deliveries, spontaneous abortion, or lactation.[36]

The effects of dairy on pregnancy and birth outcomes is unclear. There is likely to be a beneficial effect IF dairy intake aids overall nutrient status and energy sufficiency.

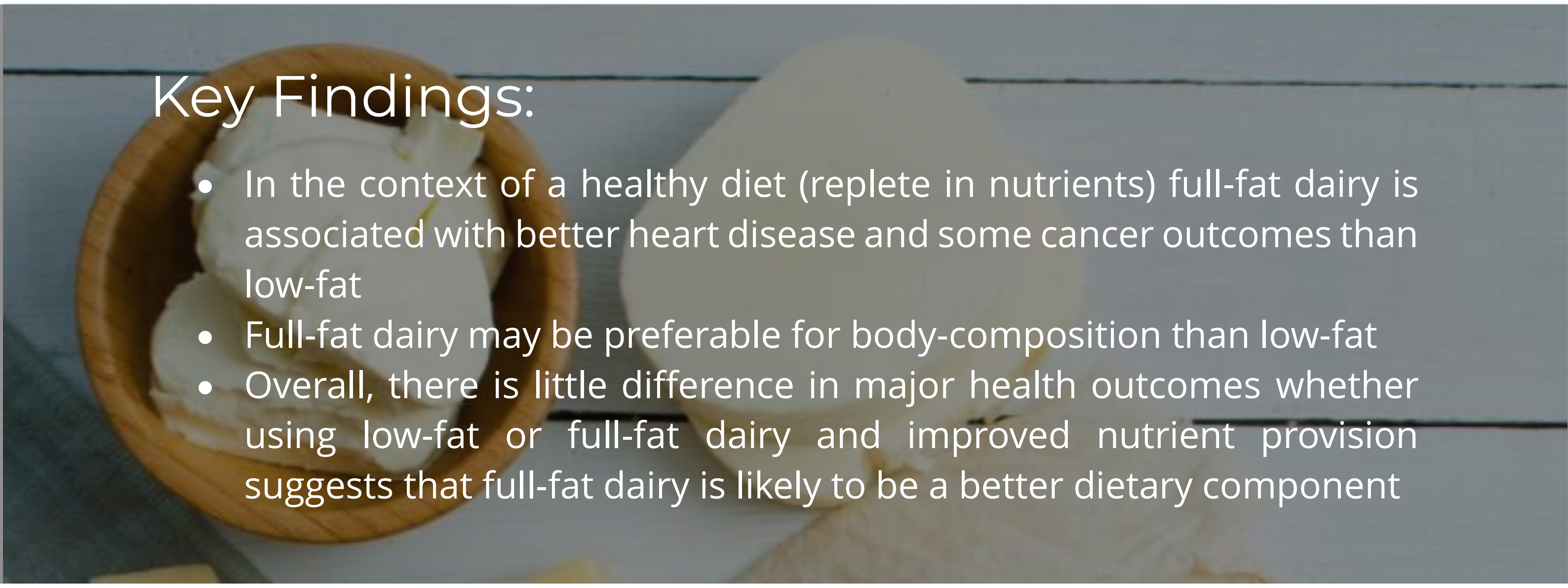
Dairy and acne

Another common belief, that has been considered by many in scientific circles to be folklore, is that dairy is associated with acne. In a recent systematic review of the literature (to the end of 2017), 14 studies with over 78000 participants there was an approximate increase in acne of 25% related to all dairy intake (OR 1.25; 95% CI: 1.15–1.36; $p = 6.13 \times 10^{-8}$) and this effect was dose-dependent: 1.24 (0.95–1.62) 2–6 glasses per week, 1.41 (1.05–1.90) 1 glass per day, and 1.43 (1.09–1.88) ≥2 glasses per day compared to intake less than weekly. While these results were both meaningful and significant, lack of consistency in the study results suggests caution in their interpretation but based on the accumulated evidence, dairy is likely to increase the risk of acne.[37]

In 14 studies with over 78000 participants, there was an approximate increase in acne of 25% related to all dairy intake

Increasing dairy intake may exacerbate acne. Those suffering from acne could reduce or eliminate dairy to see if they benefit.

IS LOW-FAT DAIRY SUPERIOR TO FULL-FAT?



Key Findings:

- In the context of a healthy diet (replete in nutrients) full-fat dairy is associated with better heart disease and some cancer outcomes than low-fat
- Full-fat dairy may be preferable for body-composition than low-fat
- Overall, there is little difference in major health outcomes whether using low-fat or full-fat dairy and improved nutrient provision suggests that full-fat dairy is likely to be a better dietary component

Full-fat dairy products are contributors to increased saturated fat in the diet. Because of the purported (but now mostly discredited) relationship between saturated fat and mortality, full-fat dairy has typically been advised against, while low-fat has been recommended in dietary guidelines for health. However, this guideline stands in contrast to the evidence.

Previously, the evidence had suggested that full-fat dairy promotes better outcomes for both death and disease than low-fat dairy and this is especially true when we look at the context of diet quality overall. For example, full-fat dairy in combination with a diet high in fruit and vegetables exerts a protective effect against coronary artery disease (an effect not seen with low-fat dairy),[38] and colorectal cancer.[39] In another study and in contrast to the author's hypothesis, it was discovered that lower-fat varieties of milk products (and not dairy fat) were associated with weight gain in an investigation of dairy consumption in close to 13,000 children.[40] A review of the literature by Kratz and colleagues concluded that the recommendation to consume low-fat dairy foods is in contrast to the observational evidence of a reduced cardiometabolic risk.[41]

In more recent reviews, both low and high fat yoghurt are associated with reduced risk of metabolic syndrome with little meaningful difference between them (low-fat yogurt: 2 study comparisons; RR: 0.72; 95% CI: 0.62, 0.84; whole-fat yogurt: 2 study comparisons; RR: 0.81; 95% CI: 0.70, 0.94).[16] Either total or low-fat dairy are not associated with metabolic syndrome risk,[16] and the risk of diabetes is reduced by both low- and high-fat dairy with little meaningful difference between them.[19]

Either total or low-fat dairy are not associated with metabolic syndrome risk

In a review of 15 prospective cohort studies, no significant relationships between dairy fat intake and cardiovascular disease or type 2 diabetes were found.[42] Similarly, in a review of randomised controlled trials and meta-analyses, 17 studies meeting the criteria for inclusion showed either positive or no benefit from dairy at different doses for heart disease and stroke and no significant changes to risk measures for cardiovascular disease such as blood pressure, cholesterol and LDL cholesterol. Either low-fat or full-fat dairy had no meaningful effect on the risk of cardiovascular disease.[43]

In reviews of 22 cohort and randomised, controlled trials no meaningful difference had been found between low-fat and full-fat dairy for diabetes and heart disease

The evidence suggests that low-fat dairy is not superior to full-fat dairy for health.

IS DAIRY INFLAMMATORY?

Key Findings:

- Dairy is typically *anti-inflammatory*
- There is little difference in the anti-inflammatory effects between low-fat, full-fat, and fermented dairy
- Dairy is typically anti-inflammatory for those with metabolic disorders
- Dairy is typically inflammatory for those with dairy allergies or those with immune and inflammatory disorders

Inflammation is a critical biological process that provides essential functions to the body's ability to recover from illness, infection, and injury. Inflammation though needs to be in balance and our modern lifestyle which includes reduced sleep length and quality, increased psychosocial stress, and foods that are pro-inflammatory, is likely to have played a role in the increased prevalence of diseases related to chronic inflammation and immune dysfunction. Dairy is a common allergen and the incidence of dairy allergies appears to be rising.[44] It is therefore often eliminated from diets, especially in the complementary and alternative health sphere. However, the evidence for that recommendation may not be strong.

> Dairy is often eliminated from diets but the evidence for that recommendation is not strong

A review of 52 clinical trials evaluated the inflammatory score of diets containing dairy. The overall evidence suggested an anti-inflammatory effect of dairy whether low-fat, high-fat, or fermented. However, most importantly, when the subjects in the studies were analysed according to health status, dairy was found to be anti-inflammatory for those with metabolic syndrome and pro-inflammatory for those with underlying allergies to dairy proteins.[45]

The overall evidence suggested an anti-inflammatory effect of dairy whether low-fat, high-fat, or fermented

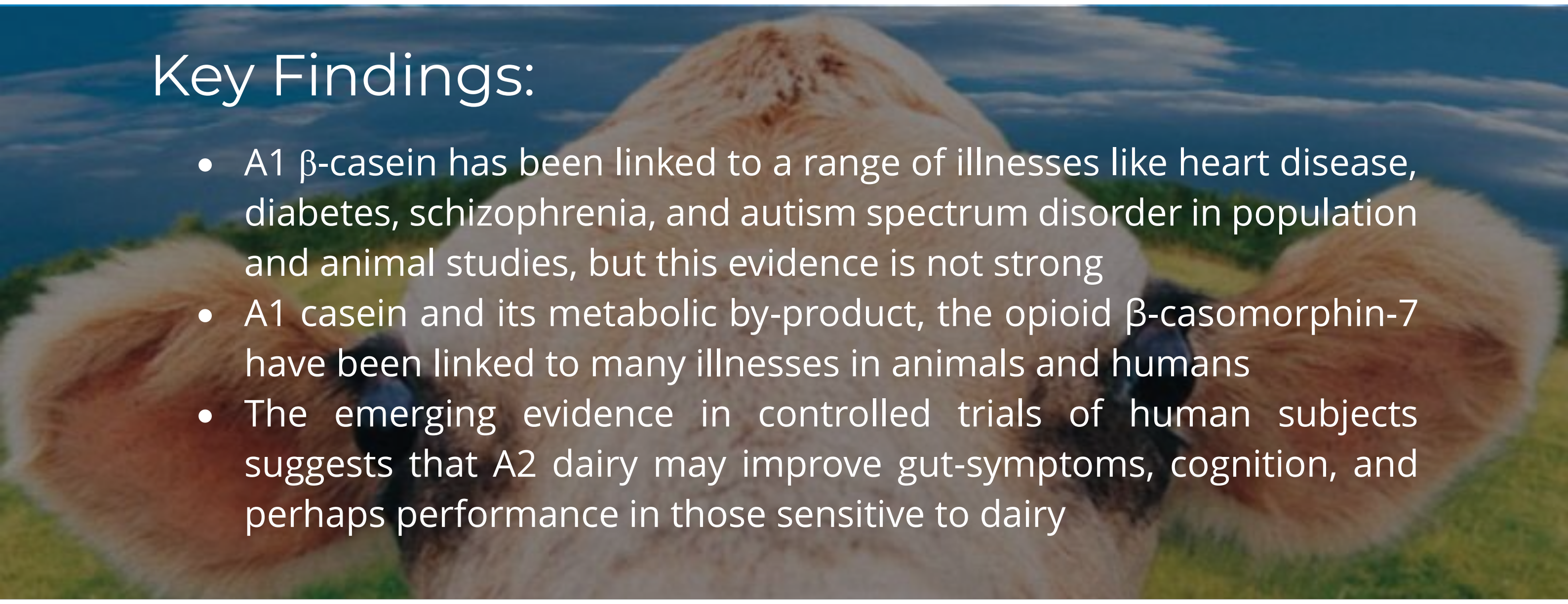
In an evaluation of the effect of dairy consumption on inflammatory blood markers (c-reactive protein, interleukins, cytokines, and vascular adhesion molecules or expression of proinflammatory genes in peripheral blood mononuclear cells), 16 studies including both healthy people and those with metabolic disorder or diabetes showed no pro-inflammatory effects of dairy. In contrast, the majority of studies documented a significant anti-inflammatory effect in both healthy and metabolically abnormal subjects, although not all the articles were of high quality.[46]

Dairy was found to be anti-inflammatory for those with metabolic syndrome and pro-inflammatory for those with underlying allergies to dairy proteins

Elimination diets that include the reduction or complete elimination of dairy have shown efficacy for autoimmune or inflammatory conditions such as Crohn's disease,[47] ulcerative colitis,[48] and asthma (especially when there is a suspected or diagnosed food allergy or intolerance),[49] and clinical experience suggests that dairy elimination should be trialled in those with inflammatory conditions.

Overall, dairy is likely to be an anti-inflammatory food for most people BUT will exacerbate inflammation in those allergic or sensitive to dairy and those with autoimmune or inflammatory conditions.

A1 VS A2... DOES THE TYPE OF CASEIN PROTEIN IN DAIRY HAVE AN EFFECT ON HEALTH?



Key Findings:

- A1 β-casein has been linked to a range of illnesses like heart disease, diabetes, schizophrenia, and autism spectrum disorder in population and animal studies, but this evidence is not strong
- A1 casein and its metabolic by-product, the opioid β-casomorphin-7 have been linked to many illnesses in animals and humans
- The emerging evidence in controlled trials of human subjects suggests that A2 dairy may improve gut-symptoms, cognition, and perhaps performance in those sensitive to dairy

While the evidence overall has demonstrated a likely beneficial effect on inflammation from dairy consumption, those with allergies to dairy proteins are likely to experience increased inflammation from dairy proteins. There is also a large body of evidence that suggests improved outcomes resulting from the reduction or elimination of dairy from the diet for people with autoimmune and inflammatory conditions.

An emerging area of research has begun to look at the different effects of the two major dairy proteins; A1 or A2 β-casein. Both A1 and A2 proteins are found in most dairy proteins, while A2 type casein is found in dairy derived from Jersey or Guernsey cows, as well as Charolais, Limousin, and the African Zebu. It is available as A2 milk, cheese, and other dairy for consumers and these products contain only the A2 form of β casein.

> The original research suggested an association between A1 casein and diabetes and heart disease

The original research on A1 vs A2 casein relied on population data which suggested an association between A1 casein and diabetes and heart disease in people who consumed higher amounts of A1 protein (in countries like New Zealand) compared to higher intakes of A2 within populations from Western Samoa, the Masai in Eastern Africa,[50] along with regional analysis of Nordic and northern European countries.[51] Animal research at this time also suggested the link between A1 casein and both diabetes and heart disease.[50] Population data is always confounded and other factors are likely to have a stronger effect on the incidence of cardiometabolic disorders than the consumption of mixed A1-A2 milk or dairy vs A2-only. Animal data similarly is unreliable because the physiology and dietary predilection of both rats and rabbits (from which the experimental data was derived) are very different from humans and the results from these subjects are notoriously unreliable when translated to the human experience.

β-casomorphin-7 is theorised to be a trigger for diabetes, cardiovascular disease, autism spectrum disorder, schizophrenia, sudden infant death syndrome, apnoea, and constipation

One of the chemicals linked to health effects (especially diabetes but also to autism spectrum disorder and schizophrenia) is a relatively powerful opioid compound β-casomorphin-7.[52] This compound is theorised to be a trigger for auto-immune (type 1) diabetes,[50] along with cardiovascular diseases, autism spectrum disorder, schizophrenia, sudden infant death syndrome, apnoea, and constipation,[53] along with affecting opioid receptors throughout the body including in the nervous system, endocrine, and immune systems.[54] While it has been suggested that casomorphins are not demonstrably absorbed in humans,[50] it is likely that children with immature digestive systems and those with increased gut-permeability (i.e. a 'leaky gut') can absorb these endogenous opiates.[54]

It should also be considered that (as shown in the research presented in this issue of *CARR*) IF A1 casein was a strong and independent contributor to heart disease or diabetes, we would see increased incidence and prevalence of these with increasing intakes of dairy consumption, something that is not seen.

Emerging human trials

In the last few years, human trials have begun to appear comparing functional outcomes from the consumption of mixed A1/A2 dairy and A2-only dairy.

In a pilot study comparing A1 to A2 milk to placebo for recovery from exercise (21 participants), both A1 and A2 milk both improved 20 m sprint performance and trended towards improved maximal isometric contraction when compared with placebo, but there were no meaningful differences between A1 and A2 milk.[55] A recent honours thesis has suggested a possible, small improvement in recovery from high-intensity netball performance from A2 vs A1 milk.[56]

In a recent study of Chinese children with dairy intolerance, A2 milk was compared to standard milk (containing both A1 and A2 casein). The children who consumed A2-only dairy experienced significantly less severe gastrointestinal symptoms, reduced stool frequency (urgency to defecate is common in food intolerances and dairy allergy like this), and improvements in stool consistency, compared to those drinking A1-A2 milk. Immune and inflammatory markers (interleukin-4, immunoglobulins G, E, and G1) along with the opiate-like protein beta-casomorphin-7 were only elevated in those consuming conventional milk and this was also associated with lower glutathione levels (a key endogenous antioxidant). Interestingly, cognitive testing showed a significant improvement in test accuracy only after consumption of A2 milk.[57] A recent thesis containing both *in vitro* and human *in vivo* studies showed that A2 milk had a tendency to lower bloating and abdominal cramps and reduce c-reactive protein (a marker for systemic inflammation).[58]

Children who consumed A2-only dairy experienced significantly less severe gastrointestinal symptoms

While the evidence is mixed, emerging research does suggest that those with milk intolerances (especially related to gut symptoms and effects on cognition following ingestion) might be able to tolerate and benefit from A2 milk versus conventional dairy.

EXECUTIVE SUMMARY: *WHAT DOES THIS ALL MEAN?*

Dairy is a common allergen, and there appears to be a rising incidence of milk protein intolerance and allergy.[44] I have often erred towards eliminating dairy early in the process of fat loss because of its highly insulinergic nature,[59] and to help determine if the client does, in fact, have any degree of dairy protein intolerance or allergy. But overall, there is likely to be no risk for cancer, diabetes, metabolic syndrome, heart disease, or any other major malady from the consumption of dairy. In contrast, there is compelling evidence that dairy can help to support nutrient and energy sufficiency, aid the retention and growth of both muscle and bone tissue, and reduce risk factors associated with cardiometabolic disorders.

Dairy can aid the retention and growth of muscle and bone tissue, and reduce risk factors associated with cardiometabolic disorders

However, there are a significant number of people who are, to a greater or lesser degree, allergic to or intolerant of certain compounds in milk, particularly lactose (intolerance) and casein (allergy), with fewer allergic to whey. Many people who are affected by a dairy protein allergy may not suffer effects from A2 dairy.

Many people who are affected by a dairy protein allergy may not suffer effects from A2 dairy

So, there is little need for people to avoid or reduce dairy if they experience no negative effects from it. Negative effects can include sinus problems, congestion, constipation or IBS, skin conditions like eczema and eczema-like symptoms, and 'brain fog'. Those who have a diagnosed or suspected intolerance or allergy, and those with autoimmune and inflammatory conditions should experiment with reducing or avoiding dairy entirely or trial the use of A2 β-casein only varieties of milk, yoghurt, and cheese.

IN THE LITERATURE

Does increasing dairy intake increase insulin and reduce insulin sensitivity?

Impact of a high Intake of Dairy Product on Insulin Sensitivity in Hyperinsulinemic Adults: A Cross-Over Randomized Controlled Trial

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Current Developments in Nutrition, Published: 24 July 2019

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Abstract

Background

Dairy product intake has been associated with decreased risk of type 2 diabetes (T2D) in cohort studies. However, results from clinical trials on T2D-related risk factors remain inconclusive.

Objective

The objective of this clinical trial is to evaluate the impact of increased dairy product intake (HD) (≥ 4 servings/day) for 6 weeks, compared with an adequate dairy product intake (AD) (≤ 2 servings/day), on glycemic and insulinemic parameters, insulin sensitivity, insulin secretion and beta-cell function in hyperinsulinemic adults.

Methods

In this cross-over clinical trial, hyperinsulinemic adults were randomized to HD or AD for 6 weeks, than crossed-over after a 6-week washout period. Serum glucose, insulin, C-peptide, HOMA-IR, Matsuda index, insulinogenic index and disposition index were measured and analyzed using a repeated measures mixed model adjusted for age, sex and BMI. Anthropometric measures were collected and food intake was evaluated using a validated food frequency questionnaire.

Results

Nineteen males and 8 females completed the study (mean ± SD: age:55 ± 14 y, BMI:31.3 ± 3.3 kg/m^2. Dairy product intake was 5.8 servings/day in HD and 2.3 servings/day in AD after 6 weeks. No difference was observed between HD and AD after 6 weeks for all outcomes.

Conclusions

High dairy product does not affect glycemic and insulinemic parameters, insulin sensitivity, insulin secretion and beta-cell function over an adequate intake in hyperinsulinemic adults. Additional larger

and longer studies assessing T2D-related risk factors are required. Registration number: *Clinicaltrials.gov* (NCT02961179).[60]

Comment

I had, in my earlier years in practice, expressed some concern about the insulinergic (insulin increasing) effect of dairy. As early as 1997 Holt and colleagues had demonstrated that foods could have insulin responses that were vastly different from their glycaemic index.[59] In other words, some foods seemed to have much greater insulin responses than blood-sugar responses and this could potentially be problematic for those with metabolic disorder and insulin resistance and might pose a problem for people wanting to lose fat or remain metabolically healthy. However, even this early research did show that, with some exceptions, there were general trends, including that glycaemic load (total carb content per 100 g) and sugar did have a strong association with insulin response, while protein content and fibre generally had a negative association with insulin (i.e. the more protein and the more fibre in a food, the lower the insulin response overall). However, protein *does* elicit an insulin response, and this can be as large as that of carbohydrate, so, there is always going to be insulin released in response to protein-containing foods. We need to remember that this is not a bad thing! Insulin is not the universal bogey man than many in low-carb circles have painted it as. Insulin aids the clearance of substrate (glucose, but also amino acids and beneficial compounds like creatine) from the blood into tissue for use and inhibits hepatic glucose output and gluconeogenesis.

Insulin is not a strong independent indicator of risk for obesity or other metabolic challenges. So, on balance, insulin is not a problem per se. It is only when metabolic disorder/insulin resistance and hyperinsulinaemia are present and growing that the interplay between insulin release and resistance is a problem in and of itself.

There will be significant variation in the insulin and glycaemic responses between foods, between individuals,[61, 62] and even from time-to-time in an individual,[63] and even factors like the polyphenol antioxidant content of a meal could improve glucose response.[64] An incredibly interesting study from Zeevi et al. found that there was large variability in the glucose responses to different foods between people (and that this was linked to metabolic health and to individuality of the microbiome) and when people were allocated to eat foods that they had the lowest blood glucose responses to, not surprisingly, their post-meal glucose responses were better and there were positive changes to the microbiome.[65]

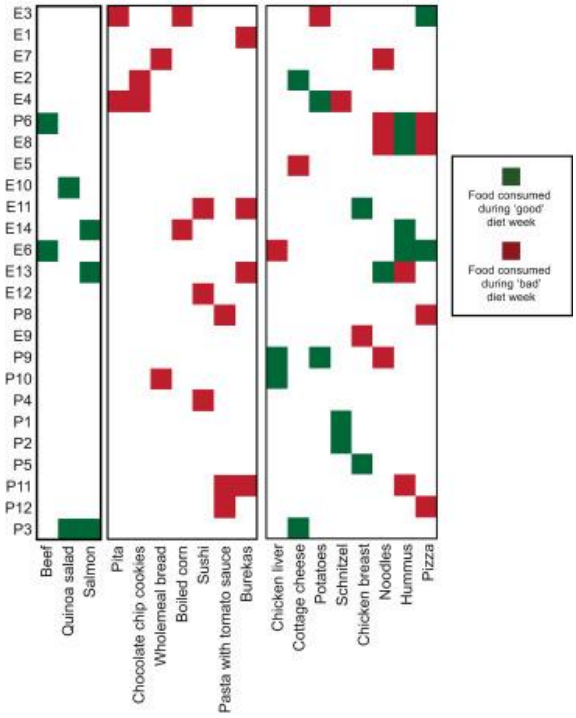

Figure 1. Foods allocated to participants in Zeevi et al., based on 'good' or 'bad' glucose responses

However, on balance, in mixed meals, in a mixed diet that is based on natural, unrefined foods, variation in glucose and insulin responses to foods is to be expected and should not cause concern, and nor should the insulin response to dairy itself.

The evidence has become quite clear that milk and dairy overall are not associated with diabetes or metabolic syndrome and assuming you can tolerate dairy, could actually be protective against it, along with other benefits to health. This study helps to confirm that there is no significant or meaningful effect of an increase in dairy intake on insulin and blood glucose homeostasis.

The evidence has become quite clear that milk and dairy overall are not associated with diabetes or metabolic syndrome

IN THE MEDIA

Ministry right to urge reduced meat and dairy in hospitals

Scoop Health (NZ)

Friday, August 9, 2019

http://www.scoop.co.nz/stories/GE1908/S00033/ministry-right-to-urge-reduced-meat-and-dairy-in-hospitals.htm

Article Summary

The New Zealand Ministry of Health recently suggested that meat and dairy should be reduced in hospital meals to reduce climate impact and improve health. In this article, *Ora Taiao* (The New Zealand Climate and Health Council), supported by *Doctors for Nutrition* (a vegan advocacy group) have urged the MOH to follow through with these reductions.

Comment

There IS a likely effect on climate change gasses from both meat and dairy farming. However, the effect has typically been modelled in a very absolutist way and may not properly account for the carbon-sequestering effect of pasture lands. It also accounts for the animal feed used in US-style factory farming, which increases the inputs and climate effects, versus Australian and New Zealand style free-range farming. When we consider the carbon sequestering effect of pasture and appropriate land-usage (i.e. not all land is suitable for growing crops, but much of that is useful for raising livestock) the climate effects are much smaller than typically suggested.

On the health front, many of the claims in this article and touted more generally as a reason for reducing animal-derived foods in hospitals lack strong evidence.

Claim: "people who eat a plant-based diet are at reduced risk of many diseases"

This is true…but disingenuous. The research is quite clear that if you eat plenty of plant-derived food, you will be less at risk of disease BUT that does not mean that a plant-based diet should not contain meat!

Claim: "processed meats are group one carcinogens"

Again, this is correct…and again is disingenuous. Processed meats have a much stronger association with cancer, which is why some caution should be exercised with them. But they are often lumped in with red meat or total meat (including white meats) and to do this obfuscates the issue. Several important things need to be considered:

1. WHO classifications for grouping of carcinogens reflect the strength of evidence that something can cause cancer, not that eating it WILL cause cancer
2. The WHO classifications characterise risk, not the risk related to dose and exposure

3. Therefore, small amounts of known carcinogens may not provide for any meaningful increase in risk

That notwithstanding, the risks from red meat are far lesser than that of processed meats and again, any risks are both dose-dependent and need to be considered in the context of the diet overall. For example, in a recent CARR, I highlighted some of the flaws in research linking red meat to mortality risk.

What could be some of the risks of reducing meat and dairy in hospitals?

Meat and dairy provide nutrient-dense, whole food options that can help to support the nourishment of patients in hospitals. Taking them away is likely to reduce bioavailable Vitamin A, zinc, and protein, among other nutrients. Given the poor state of hospital meals, it is concerning that the few remaining food groups supplied in at least some abundance, that can help to support health, might be reduced based on weak and conflicting associative evidence.

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