GLOBAL DAIRY PLATFORM

Dairy and Cardiovascular Disease – A Look at the Current Evidence

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About this Reprint

In September 2014 the Pan-American Dairy Federation launched the book *Yes to Milk! Dairy: essential food for human life* at the 13th Pan American Dairy Congress in Querétaro, Mexico. The book contains the latest evidence and trends demonstrating the positive value of dairy consumption on the health of populations, including the importance of high quality milk production, the chemical composition of milk and the human biological actions of different nutrients found in milk.

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For centuries, many populations around the world have enjoyed dairy foods as traditional dietary staples. Dairy plays an important role for cultural reasons, but also because of widespread supporting evidence about dairy's health attributes. The important nutrients found in dairy and their contribution to growth, development and health maintenance throughout the lifespan have been central to dairy's longstanding place in many traditional eating patterns and dietary guidelines.

Milk and most dairy foods are nutrient-rich, providing many essential nutrients including a complex fat component with more than 400 distinct fatty acids, many not found in other foods (Jensen 2002). The different types of fatty acids in milk comprised of both saturated and unsaturated categories at various chain lengths (short, medium and long) are often overlooked due to a focus on saturated fat (SFA). Overall SFA intake has been disparaged due to its link to elevated LDL-cholesterol and cardiovascular disease (CVD). The umbrella term of CVD, which includes diseases of the heart and blood vessels, is largely attributable to lifestyle-related conditions of atherosclerosis (hardening of the arteries) and hypertension (high blood pressure). As a result, many countries have put national policies in place encouraging consumption of low-fat or fat-free dairy foods instead of full-fat varieties.

However, a growing body of evidence calls into question some of these widely held assumptions about SFA, particularly the types unique to milk and the associated nutrient package contributed by dairy, and presents new insights into potential benefits of dairy intake on CVD risk. Overall, existing research indicates that consumption of dairy products does not cause an increased risk in CVD despite the saturated fat content in these foods. An impressive amount of recent evidence points to neutral or beneficial effects of specific dairy foods, including full-fat products, related to risk of CVD and other metabolic disorders such as high blood pressure and stroke. This chapter highlights some of the latest research in these important and evolving areas.

STATE OF THE SCIENCE

Existing research related to intake of dairy foods and CVD risk varies in type and strength. A number of randomized-controlled trials (RCTs) have evaluated the effects of dairy product consumption on CVD biomarkers such as blood lipids (cholesterol, triglycerides) and blood pressure, but most have involved relatively small numbers of subjects over a short time period. Much of the epidemiological evidence, on the other hand, has consisted of large, long-term observational studies, many of which have examined CVD risk and hard end points such as death. Epidemiological research can provide long-term information about the relationship between diet and CVD risk, but it cannot demonstrate cause and effect. Definitive studies needed to prove a true cause and effect relationship between specific foods such as dairy products and CVD risk have not been carried out and may never be conducted for practical reasons such as complex study design, long-term duration and high cost. As such, we must rely on both types of evidence – RCTs and epidemiological studies – to understand the role of dairy foods and CVD risk.

DAIRY FOODS MAY HAVE PROTECTIVE EFFECTS ON CVD BIOMARKERS AND RISK

RCT Evidence is Limited but Promising

The few RCTs that have evaluated the impact of milk, cheese or yogurt intake on CVD-related factors showed neutral results on some biomarkers and beneficial effects on others. For instance, researchers in New Zealand found that changing dairy intake (from total elimination to 2-3 servings of high fat dairy per day) for one month did not have a significant impact on blood lipids, blood pressure, or markers of inflammation and glucose metabolism in 180 healthy volunteers and concluded that dairy can be part of a normal healthy diet. (Benatar 2013) Results of a cross-over study of 12 overweight/obese adults examining the effects of low fat compared to full fat fermented or non-fermented dairy foods on inflammation, oxidative stress or atherogenesis indicated that consumption of full-fat fermented dairy products may have a favorable effect compared to low-fat varieties. (Nestel 2013) Another researcher found that increasing dairy intake to 3.5 servings/day as compared to less than 0.5 servings/day reduced oxidative and inflammatory stress as measured in multiple biomarkers in 40 overweight/obese adults with metabolic syndrome. (Stancliffe 2011)

Compelling evidence for a beneficial effect of dairy consumption on blood pressure is starting to emerge. A review including seven clinical trials examining the relationship between dairy and blood pressure determined that "adequate dairy consumption can improve blood pressure in those having compromised metabolic health." (Park 2013) A meta-analysis of 14 intervention trials of dairy-derived peptides showed a significant reduction on systolic blood pressure; the researchers concluded that specific dairy proteins may play a role in the blood pressure regulating effects seen with dairy consumption (Cicero 2013)

The type of dairy product, its nutrient package and food matrix all may be factors that contribute to the health effects of milk and milk products. For example, about a dozen clinical trials evaluating the effects of cheese consumption on blood total- and LDL-cholesterol have shown no increases relative to baseline conditions, but different effects relative to the control diets with variable food comparisons and fatty acid profiles. One of the most recent examples was a cross-over study of 49 adults in Denmark that found no effect of cheese consumption on LDL cholesterol levels compared to the effect of a habitual diet. (Hjerpsted 2011) Modifying the fatty acid composition of dairy products to increase the unsaturated fat has been shown to improve blood lipids in some but not all studies. (Livingstone 2012) It is clear that more high-quality RCTs evaluating multiple CVD biomarkers are needed to fully understand the relationship between specific dairy food intake and CVD risk.

Epidemiological Evidence Shows Broad Benefits

Numerous epidemiological studies from around the globe are providing supportive evidence to the RCTs about the potential beneficial effects of dairy product intake on CVD risk. Much of the recent research indicates an inverse relationship between total dairy intake and CVD risk. However, worldwide dairy product composition and consumption patterns are quite diverse making it difficult to understand how these distinctions relate to health benefits. Milk products also vary in their SFA content and their effects on blood lipids and provide many other essential vitamins and minerals known to beneficially impact health. For example, a serving of whole milk contains a moderate amount of SFA but also contains calcium, magnesium and potassium—three nutrients essential for heart health. In this light, much of the recent research emphasizes the beneficial effects of dairy foods in general, rather than individual nutrients, in modulating CVD risk or mortality.

The long-held view that SFA intake increases CVD risk is not only losing steam, it may even be reversing course.

In the past year an important systematic review of observational studies on the relationship between dairy fat and several metabolic disorders was published by researchers who critically and comprehensively evaluated the existing data. They concluded that in contrast to the prevailing view reflecting concerns about saturated fat, "dairy fat consumption is not typically associated with an increased risk of weight gain, CVD, or T2DM" (type 2 diabetes). (Kratz 2012) A meta-analysis of 17 prospective cohort studies on dairy and CVD risk carried out by Dutch researchers painted a similar picture: milk intake was not associated with total mortality and a modest inverse relationship with CVD risk may exist. Due to the small number of studies with data on individual dairy foods, further investigations are needed to make firm conclusions. (Soedamah-Muthu 2011)

Some indication of the effects of specific dairy foods was captured in a large Swedish cohort where overall dairy consumption protected against risk of CVD, fermented milk was associated with a 15% decreased incidence of CVD, and cheese consumption in women, but not in men, was associated with decreased risk of CVD. (Sonestedt 2011) Research from Australia found somewhat mixed results with total dairy intakes suggesting reduced risk of CVD mortality, but no associations for subtypes of dairy products such as low fat or full fat dairy foods. (Louie 2013) A study conducted in Japan showed a beneficial effect of dairy consumption on CVD mortality among women but not among men. (Kondo 2013)

Evidence linking intake of dairy foods with a reduction in myocardial infarction (heart attack) risk was found in large cohorts in several countries, including Sweden, Germany and Costa Rica. (Patterson 2013, Li 2012, Aslibekayan 2012) Whereas most of the epidemiological studies found beneficial cardiovascular effects of dairy product consumption, one study carried out in the Netherlands observed a 32% increased risk of CVD mortality associated with high-fat dairy but no association between dairy consumption and total (all-cause) mortality. The authors speculated that the relatively older age of cohort participants may have contributed to this result. (van Aerde 2012)

Consistent with evidence from RCTs, observational research also indicates blood pressure benefits associated with dairy consumption. In a large systematic review and meta-analysis of data collected in Spain, the Netherlands and the US, researchers found "an inverse association between low-fat dairy foods and fluid dairy foods and increased risk of elevated blood pressure." (Ralston 2012) Some evidence suggests that the blood pressure-lowering effects could be due to the action of dairy-specific proteins. (Chrysant 2013)

Although the mechanisms remain unclear, a link between dairy intake and reduced stroke risk is also apparent. Results of a large meta-analysis of 11 prospective studies across 6 countries showed an inverse association between dairy calcium and reduced stroke risk. (Larsson 2013) Two studies indicate potential stroke benefits from certain types of dairy foods: a Swedish cohort study found reduced stroke risk associated with low-fat dairy intake (Larsson 2012) and research from the Netherlands showed a similar association with fermented dairy intake. (Dalmeijer 2012) Large observational studies from the U.S. on dietary protein sources also produced evidence of reduced stroke risk with dairy consumption as compared to red meat, causing authors to speculate that higher intakes of multiple dairy nutrients – such as potassium, magnesium or calcium – may play a role. (Bernstein 2012)

SFA AND CVD: A PARADIGM SHIFT

The long-held view that SFA intake increases CVD risk is not only losing steam, it may even be reversing course. Improvements in data collection and statistical techniques are shedding new light into this area and challenging some important assumptions. U.S. researchers examining 21 studies of nearly 350,000 total participants concluded that dietary intakes of SFA are not associated with increases in the risk of either coronary heart disease (CHD) or CVD. (Siri-Tarino 2010) Researchers in Japan found an overall inverse relationship between SFA intake and CVD. (Yamagishi 2013) Other large epidemiological reviews found either no association between SFA intake and CVD risk (Schoenaker 2012, Trumbo 2011, Micha 2010) or inconclusive results. (Parodi 2009) Based on the mounting evidence, the 2010 Food and Agriculture Organization (FAO) and World Health Organization (WHO) Expert Panel on fats and fatty acids indicated no convincing effects of SFA on CVD risk other than on LDL cholesterol levels. (FAO 2010)

Perhaps the situation is best described in a recent review of the impact of SFA intake on CVD risk, "The influence of dietary fats on serum cholesterol has been overstated, and a physiological mechanism for saturated fats causing heart disease is still missing." The authors call for a re-evaluation of dietary recommendations based on serum cholesterol reduction and an increased focus on holistic approaches to nutrition policy. (Lawrence 2013) Current evidence on the relationship between SFA and CVD led researchers to conclude that, "not all SFA are created equal and the food sources of SFA, as well as individual characteristics of the SFA, such as chain length, should be considered in dietary recommendations." (O'Keeffe 2013) There is also a shift away from emphasis on single CVD biomarkers or risk factors, as reliance on these may not accurately indicate long-term biological effects. (Astrup 2011, Mozaffarian 2009)

DAIRY AND CVD RISK: LOOKING AHEAD

The evidence of a favorable relationship between dairy foods and CVD risk is strengthening, yet clear understanding of the mechanisms of action is still emerging. As such, more research is needed to determine how the results observed from the controlled clinical trials on dairy and CVD biomarkers relate to everyday eating plans and long-term health outcomes.

The new thinking about the effect of SFA on CVD risk plays an important role in this relationship, as do new insights on the cardio-protective nutrients found in dairy foods. But perhaps most important is the consideration of dairy's overall vital nutrient package when it comes to health maintenance over the life span. Case in point: Using a novel technique to estimate population risk and healthcare savings, economists in Australia determined that the healthcare costs attributable to low dairy consumption totaled approximately AUD$2.0 billion in 2009-2010, or nearly the equivalence of the total national spending on public health that year. This analysis demonstrates the substantial improvements in health and reductions in healthcare costs that could be achieved by meeting dairy intake recommendations. (Doidge 2012) As scientists work to unravel the complexities of CVD and its contributing factors, dairy is likely to emerge as a key player.

About the Authors

Cindy Schweitzer, PhD, CFS is the Technical Director for Global Dairy Platform, which leads the development of a collaborative, unified approach on common industry issues and the nurturing of innovative research so that consumers value milk and dairy products as naturally nutritious, enjoyable and an essential part of a healthy diet. Her extensive food and nutrition experience spans more than 25 years of in the non-profit, ingredient and food service industries. Schweitzer received a BS degree in Food Technology from the University of Wisconsin-Madison and became skilled at fermented dairy product manufacture as a technical sales representative in the US Midwest. Schweitzer earned a Ph.D. in Human Nutrition at Utah State University and in 2013 was credentialed as a Certified Food Scientist from the Institute of Food Technologists.

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