

# Science Summary

## Dairy and Inflammation



### Overview

Dairy foods such as milk, cheese and yogurt are foundational foods in healthy dietary patterns recommended by the Dietary Guidelines for Americans (DGA). Healthy dietary patterns that include dairy foods are linked with lower risk of key chronic diseases such as type 2 diabetes, cardiovascular disease and obesity. These noncommunicable diseases are sometimes called “inflammatory diseases,” because they often co-occur with chronic, systemic inflammation. Lifestyle factors such as diet may impact chronic inflammation. Emerging evidence indicates that consuming dairy foods, including whole- and reduced-fat dairy foods, is not linked to increased levels of inflammatory markers. Some research indicates that consuming certain dairy foods may be linked to lower levels of some inflammatory markers.

### Healthy dietary patterns with dairy can help lower risk for chronic diseases linked with inflammation

Chronic diseases like cardiovascular disease (CVD), type 2 diabetes (T2D) and obesity affect millions of Americans and result in high healthcare costs and lost productivity.<sup>1-3</sup> These conditions are also associated with higher levels of inflammatory markers.<sup>4,5</sup> A healthy diet is the foundation for prevention and management of several chronic diseases, including CVD, T2D and obesity.<sup>5-10</sup> The Scientific Report of the 2020 Dietary Guidelines Advisory Committee emphasizes this point, stating that risk factors for CVD, such as inflammatory markers, are “favorably influenced by habitual adherence to dietary patterns that include fruits, vegetables, whole grains, legumes, nuts, unsaturated vegetable oils, fish, seafood, [and] lower fat dairy products.”<sup>11</sup> The Healthy U.S.-Style Dietary Pattern in the 2020 DGA includes these foods, recommending 3 daily servings of low-fat or fat-free dairy foods for those 9 years and older, 2½ servings for children 4-8 years and 2 servings for children 2-3 years.<sup>10</sup> It also recommends 1⅔ to 2 servings of whole- and reduced-fat dairy foods for toddlers 12-23 months and small amounts of yogurt and cheese for infants 6 to 12 months, depending on developmental readiness.<sup>10</sup>

### Eating dairy foods is not linked to inflammatory markers in systematic reviews or meta-analyses

Eating dairy foods does not increase levels of inflammatory biomarkers in individuals without a milk protein allergy, according to results of two meta-analyses and three systematic reviews. Six of the randomized controlled trials of healthy adults included in a meta-analysis by Benatar et al.<sup>12-18</sup> assessed the impact of low-fat or high-fat dairy foods on levels of C-reactive protein (CRP), a commonly used biomarker of inflammation produced by the liver. There were no differences in CRP levels between the dairy-rich diets and the control diets in four of these studies, even when higher-fat dairy foods were included in the dairy intervention. Zemel et al. reported lower levels of CRP at the end of a 28-day study,<sup>16</sup> and Stancliffe et al. also reported significantly lower CRP levels in the group consuming 3.5 daily servings of dairy foods.<sup>14</sup> Another meta-analysis used an “inflammatory score,” which combines many biomarkers

of inflammation into a single metric, to evaluate the results of 52 trials on dairy intake and inflammation.<sup>19</sup> This meta-analysis concluded that diets containing dairy foods, especially fermented dairy foods, had a modest anti-inflammatory effect most apparent in individuals with metabolic disorders like obesity. Three systematic reviews reported similar results, concluding that eating dairy foods had a beneficial impact or no impact on levels of inflammatory markers in both healthy individuals<sup>20,21</sup> and those with metabolic disorders.<sup>20-22</sup>

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### **Clinical trials find that consuming dairy foods exerts no change or favorable change on some biomarkers of inflammation**

In addition to the studies covered in meta-analyses and systematic reviews, at least five additional randomized controlled trials<sup>23-27</sup> have been published on the links between dairy foods and inflammation. These studies provide additional evidence that eating dairy foods does not cause inflammation in adults.

In one study, 139 adults with risk factors for metabolic syndrome ate either ~3 ounces of whole-fat cheese, low-fat cheese or a bread and jam control with the same amount of calories for 12 weeks.<sup>23</sup> There were no differences in CRP levels between these groups, indicating that a dairy-rich diet, even with whole-fat cheese, was not linked with increased inflammation. In another study<sup>24</sup> completed by 52 middle-aged adults, participants consumed an energy-deficit diet providing either high or low amounts of dairy foods for 24 weeks. There were no differences in CRP levels between the two groups after the intervention. In a similar randomized crossover study,<sup>25</sup> 45 middle-aged, overweight men and postmenopausal women consumed a high-dairy diet (5-6 daily servings of dairy foods) or a low-dairy diet (<1 daily serving of dairy foods) for 6 weeks. There was no significant difference in CRP levels between the two groups following the intervention. A randomized crossover trial of 92 men and women with abdominal obesity also found no differences in CRP levels after participants ate a diet rich in saturated fat from cheese, a diet rich in saturated fat from butter, a diet rich in monounsaturated fatty acids, a diet rich in polyunsaturated fatty acids, or a low-fat high carbohydrate diet for 4 weeks.<sup>27</sup> Another randomized controlled trial assessed the impact of eating yogurt on markers of chronic inflammation in healthy women with and without obesity.<sup>26</sup> Women consumed 12 ounces of either low-fat yogurt or soy pudding for 9 weeks. Eating yogurt led to decreased levels of several, but not all, markers of inflammation measured in this study in both the women with obesity and the women without obesity.

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### **Dairy foods are scored as neutral or “anti-inflammatory” by dietary inflammation scoring system**

A new, validated approach to assessing dietary and lifestyle factors that affect systemic inflammation was published in 2019.<sup>28</sup> The research team used food frequency questionnaires and levels of inflammatory biomarkers to assess dietary intake and create an inflammation biomarker score. They validated this score with 3 study populations including over 14,000 Americans. Both high-fat dairy foods (including whole- and reduced-fat milk, yogurt, cheese and ice cream) and low-fat dairy foods (including low- and fat-free milk, low-fat cheeses and ice cream) received negative scores (-0.14 and -0.12, respectively), indicating an anti-inflammatory effect. This scoring system, in conjunction with the other published literature on the topic, indicates that dairy foods do not cause inflammation and are either neutral or mildly anti-inflammatory.

## References

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