

Nutritional

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OUTLOOK

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Metabolic Syndrome

Improving Metabolic Health

Can dairy play a role?

BY CHRISTOPHER J. CIFELLI, PHD, DAIRY RESEARCH INSTITUTE

Over the past few decades, environmental and behavioral factors that encourage excess caloric intake and physical inactivity have become more pervasive in the United States. As a result, nearly 68% of adults and 32% of children and adolescents are overweight or obese.^{1,2} The rapid rise in the prevalence of overweight and obesity is concerning because of the association of these conditions with other conditions, such as subclinical chronic inflammation, which contributes to the development of metabolic abnormalities and chronic diseases.^{3,4}

Alterations in the regulation of blood pressure, inflammation, or carbohydrate and fat metabolism can lead to the development of metabolic syndrome, a condition characterized by the presence of at least three metabolic abnormalities that are risk factors for cardiovascular disease (CVD) and type 2 diabetes. (See the table on page 86.) Approximately one-third of adult Americans meet the criteria for metabolic syndrome.⁵ In addition to impacting health, conditions associated with metabolic syndrome impose an enormous economic burden on the healthcare system. It was estimated that the total healthcare costs in the United States associated with diabetes and CVD amounted to approximately \$500 billion to \$650 billion in 2010.^{6,7} Clearly, there is intense interest in identifying factors that can be changed to avoid these dire health and economic estimates.

Dairy Products and Metabolic Health

Ongoing research is examining the role of spe-

cific foods, nutrients, or dietary components that can reduce the health and economic burden associated with overweight, obesity, and metabolic syndrome. Emerging evidence has suggested that the consumption of dairy products and ingredients may provide a benefit to overall metabolic health.⁸

A recent study published in the *American Journal of Clinical Nutrition* found that consuming three dairy-based smoothies per day significantly suppressed oxidative and inflammatory stress in overweight and obese adults.⁹ In contrast, consumption of soy-based smoothies did not alter either oxidative or inflammatory stress. "To our knowledge, this is one of the first studies to show an effect of dairy on oxidative and inflammatory stress in a clinical setting," says Michael B. Zemel, PhD, professor of nutrition and medicine at the University of Tennessee. "The results of this study suggest that the regular consumption of dairy products or ingredients, such as calcium or whey, can serve as functional foods to help maintain metabolic health."

High blood pressure, a key symptom of metabolic syndrome as well as CVD, is prevalent in the United States, with approximately 33% and 25% of adults having hypertension or prehypertension, respectively.⁶ Government, health professional organizations, and advocacy groups have made specific dietary recommendations with the goal of reducing hypertension, such as limiting sodium intake and increasing fruit and vegetable consumption. A recent review of the current evidence found that dietary patterns rich in dairy foods are associated with reductions in blood pressure.¹⁰ Dairy



Dairy products may aid against metabolic syndrome symptoms such as high blood pressure or oxidative stress.

products supply key nutrients to the diet that may favorably affect blood pressure, including calcium, potassium, magnesium, and vitamin D.¹¹ For this reason, lower-fat dairy foods are an important component of the government-approved Dietary Approaches to Stop Hypertension eating plan, which has been shown to improve blood pressure control.¹²

Dairy foods play an important role in a heart-healthy diet. In fact, the 2010 Dietary Guidelines for Americans stated that the current evidence indicates the intake of milk and milk products is associated with a reduced risk of CVD and type 2 diabetes as well as lower blood pressure in adults.¹³ Further, the report urges consumers to increase intake of nutrient-dense foods and beverages such as low-fat

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or fat-free milk and milk products as part of developing a healthy eating pattern. Therefore, it is important to continue to develop innovative and healthy dairy and dairy-based products that can easily be incorporated into the typical American diet.

Looking Ahead: Dairy Innovation for Health

Milk and milk products are a substantial contributor of many nutrients that benefit health, such as calcium, potassium, magnesium, zinc, phosphorus, and protein.¹¹ For example, emerging evidence suggests that specific dairy peptides may be related to reduced blood pressure.¹⁰ This creates a unique opportunity to develop new techniques and methods to better utilize dairy-derived compounds in product development.

Today, the National Dairy Foods Research Centers, supported by the Dairy Research Institute, are developing the technology needed to efficiently fractionate dairy proteins that may have health-promoting benefits.

"We are actively working to develop new ways to identify and purify dairy-derived proteins," says Bill Graves, senior vice president, product research, at the Dairy Research Institute. "These proteins will provide a foundation for the development of the next generation of dairy-based products that will excite health-conscious consumers."

Additionally, more research on the role of other dairy components, such as calcium and milk-fat, on metabolic health is needed. It is possible that some of the unique components of dairy eventually may serve as the platform for the development of new dairy-based foods.

As the scientific evidence begins to help us understand the impact that food and beverage consumption has on the components of metabolic health, the potential exists for developing innovative products and label claims. When new and exciting products are developed to help combat this growing epidemic, substantial market growth for dairy foods and ingredients can be envisioned.

Risk factors and associated cut-off values for diagnosing metabolic syndrome¹⁴

Risk Factor	Cut-Off Value
Abdominal Obesity	Waist circumference >102 cm for men Waist circumference >88 cm for women
Hypertension	Blood pressure \geq 130/85 mmHg
Elevated Fasting Glucose	Fasting glucose \geq 100 mg/dL
Elevated Triglycerides	Triglycerides \geq 150 mg/dL
Low HDL Cholesterol	HDL cholesterol <40 mg/dL for men HDL cholesterol <50 mg/dL for women

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Christopher J. Cifelli, PhD, is director of nutrition research at the Dairy Research Institute (www.usdairy.com). Cifelli has authored or co-authored more than 15 peer-reviewed research manuscripts, reviews, and abstracts. He is an active member of numerous scientific organizations, including the American Society for Nutrition and the Obesity Society.

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