

Spotlight

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Developed by the team of Registered Dietitians at Dairy Farmers of Canada



Preventing and Managing Type 2 Diabetes: A Role for Milk Products

Synopsis

Changing dietary intake is a key lifestyle modification that can help both prevent and manage type 2 diabetes. Recent research has identified a role for milk products in managing diabetes, as well as in preventing or delaying the onset of the condition. Evidence suggests that consumption of specific milk product components, such as magnesium, vitamin D and calcium, and (in some varieties of milk) omega-3 fatty acids, is associated with a lower risk for developing type 2 diabetes. In addition, higher intakes of milk products have been linked to reduced risk for type 2 diabetes, obesity and metabolic syndrome. Excess body weight is an important determinant of type 2 diabetes; research suggests that milk products may help in the attainment of a healthy weight, which may significantly reduce the risk for diabetes and improve insulin sensitivity in those already diagnosed. The Canadian Diabetes Association's 2008 Clinical Practice Guidelines recommend that people at risk for developing, and those already with, type 2 diabetes follow the same recommendations as outlined for the general population in *Eating Well with Canada's Food Guide*, which includes two to four daily servings of Milk and Alternatives.

Introduction

Lifestyle modifications can prevent or delay the onset,^{1,2} and help manage, type 2 diabetes.³ Some risk factors for diabetes, such as age and genetics, lie beyond the control of the individual. However, lifestyle factors, including a balanced diet, healthy body weight, regular physical activity and abstinence from smoking,^{1,4} can help prevent or delay the onset of type 2 diabetes, as well as manage the disease. Recent research

has suggested that consumption of milk products is associated with reduced risk for developing type 2 diabetes.⁵⁻⁸

Type 2 diabetes is a condition occurring when the body does not make enough insulin and/or does not react to the insulin it produces. More than two million Canadians have been diagnosed with diabetes, and this number is expected to grow to three million by 2010; about 90% of those diagnosed

have type 2 diabetes.¹⁰ Left untreated, individuals with diabetes risk numerous complications, such as heart disease, kidney disease, blindness, impotence and nerve damage.^{10,11}

This issue of *Spotlight* examines the current understanding of the relationship between milk product consumption and the prevention and management of diabetes.

Dietary Patterns – Are They Responsible?

Rates of type 2 diabetes have increased considerably in the past few decades. It is unlikely that alterations in genetic factors are responsible because they would take generations to occur.¹² Given that, diet and activity lifestyle factors are primary suspects in the rising incidence of diabetes.¹³ Supporting this argument is strong epidemiological evidence revealing that not only do immigrants to Westernized countries have a greater likelihood of developing type 2 diabetes than those who remain in their native countries, but non-migrant populations undergoing Westernization, such as North American Aboriginals, also show increased rates of diabetes.¹²

A Western dietary pattern, characterized by high consumption of red meat, processed meat, French fries, refined grains, and sweets and desserts, is associated with an increased risk for type 2 diabetes. A more prudent pattern, including vegetables, fruit, legumes, fish, poultry and whole grains, as well as lower-fat milk products, is associated with a modest reduction in risk for type 2 diabetes.^{14,15} Tuomilehto and colleagues found that when a prudent dietary pattern was accompanied by daily moderate physical activity (30 minutes a day), the risk of diabetes was reduced by 58% compared to the control group.²

Bottom line: Dietary patterns greatly influence the risk for developing type 2 diabetes. A diet consisting of vegetables, fruit, legumes, fish, poultry, whole grains and lower-fat milk products may reduce the risk. The addition of daily physical activity may further reduce the risk.

What Is the Role of Milk Products?

Milk products contain a large variety of nutrients. Some milk product components, namely magnesium, vitamin D, calcium and omega-3 fatty acids (in some milk varieties), may be linked to reduced risk for type 2 diabetes.

Individual Nutrients in Milk Products

Magnesium: Evidence suggests that a diet high in magnesium-rich foods is associated with a substantially lower risk of type 2 diabetes.^{13,16} High intakes of whole grains and lower-fat milk products have been inversely related to risk for type 2 diabetes, with median intake of both not exceeding the number of servings per day recommended by *Canada's Food Guide*.¹⁷ Although the mechanism for the inverse relationship between intake of magnesium and risk for type 2 diabetes remains unclear, suggestions include a possible role for magnesium as a cofactor in the metabolism of glucose, and the effects of intracellular magnesium concentration on insulin sensitivity and insulin secretion.¹⁷

Vitamin D and calcium: Defects in beta-cell function in the pancreas, poor insulin sensitivity and systemic inflammation often precede the onset of type 2 diabetes. Researchers suspect that vitamin D and calcium play a role in these mechanisms.^{16,18,19} Researchers suggest that insufficient intakes of vitamin D and calcium may be linked to the rising incidence of type 2 diabetes, and that increased intakes of both may be linked to improved glucose metabolism.¹⁸

Omega-3 fatty acids: In Iceland, cow's milk contains five times the amount of very long chain omega-3 fatty acids found in milk from other Nordic countries. Feeding practices, including the use of fish meal in animal feed, may be responsible. Interestingly, although the Icelandic population has one Europe's highest rates of obesity, a known risk factor for diabetes, the prevalence of type 2 diabetes is lower in Iceland than in neighbouring countries.²⁰ Researchers hypothesize that because long chain omega-3 fatty acids

may positively affect glucose metabolism and insulin resistance, the higher supply of these fats from milk may explain the lower rate of type 2 diabetes in Iceland.²⁰ Omega-3 fatty acids are available in some milk varieties in Canada. Cows that produce this milk are fed a diet enriched with docosahexaenoic acid (DHA), an essential omega 3-fatty acid.

Overall Benefits of Milk Products

While individual components of milk products may be linked with a reduced risk for type 2 diabetes, it is valuable to consider the overall benefits of milk products in addition to the benefits of isolated nutrients.¹²

Recently, prospective cohort studies have shown that the relative risk for developing type 2 diabetes in people who consumed large amounts of milk products was significantly less than in those whose milk product intake was low.²¹ Researchers found that, independent of various factors, including age, body mass index, smoking, hypertension and physical activity, each daily serving increase in total milk product intake was associated with a 9% lower risk for type 2 diabetes in men (median daily servings of all study participants ranged from 0.5 serving to 4.1 servings).⁸ The same effect was seen in middle-aged and older women, for whom each daily serving increase of lower-fat milk products was associated with a 4% lower risk for type 2 diabetes. Intakes ranged from less than 1 serving per day to more than 2.9 servings per day.⁶

The consumption of milk products has also been linked to reduced prevalence of obesity and metabolic syndrome,^{7,9} two known risk factors for developing type 2 diabetes.^{22,23} Pereira and colleagues found that increased milk product consumption may protect overweight young adults (both men and women) from obesity and metabolic syndrome, with each daily serving of milk products associated with a 21% lower chance of developing metabolic syndrome.⁵ For more information on metabolic syndrome, see the *Spotlight* issue “Metabolic Syndrome: A Growing Concern,” available at dairynutrition.ca.

Did you know?

In 2000, diabetes cost Canadians \$884 million in direct health-care expenses. Indirect costs, such as lost productivity and premature death, added \$1.7 billion to that expenditure.⁴

Weight Management

Excess body weight is an important risk factor for type 2 diabetes.^{4,13,24} Weight loss of 5% to 10% in overweight individuals can significantly reduce the risk.⁴ An inverse relationship between body mass index and intake of dietary calcium and milk products has been observed in numerous studies.^{25–27} As a result, it is suggested that adequate intake of lower-fat milk products may be associated with a healthy weight, which may help prevent or delay the onset of type 2 diabetes. For overweight individuals who already have diabetes, research suggests that a diet rich in dairy calcium enhances weight reduction,⁹ which may improve insulin sensitivity.³ For a full review of the current evidence, see the *Spotlight* issue “Weighing in on the Dairy Connection: Examining the Role of Milk Products in Weight Management,” available at dairynutrition.ca.

Bottom line: Intakes of magnesium, vitamin D, calcium and (in some milk varieties) omega-3 fatty acids from milk products have been linked to reduced risk for type 2 diabetes. Recent studies found that each daily serving increase in milk products is associated with a reduction in risk for type 2 diabetes.

In Your Practice: Eating to Prevent and Manage Diabetes

Nutrition therapy, a healthy-eating strategy intended to maintain or improve quality of life and physiological health,³³ is an established approach to prevent or delay diabetes in high-risk individuals. Also a method of improving glycemic control in people with type 2 diabetes,^{33,34} nutrition therapy is carried out collaboratively by the client and a Registered Dietitian.

The Canadian Diabetes Association's 2008 Clinical Practice Guidelines for the prevention and management of diabetes in Canada recommend that people at risk for – or already with – type 2 diabetes follow the same recommendations for healthy eating outlined for the general population in *Eating Well with Canada's Food Guide*.³³ The eating pattern the *Food Guide* describes involves a variety of foods from the four food groups (Vegetables and Fruit, Grain Products, Milk and Alternatives, and Meat and Alternatives) with a focus on satiating foods with a low energy density to avoid overconsumption and to help achieve and maintain a healthy weight. Close

adherence to the number of servings and serving sizes recommended in the *Food Guide* will ensure sufficient intakes of carbohydrate, fibre, protein, essential fatty acids, vitamins and minerals.

Specifically, the *Food Guide* recommends between two and four servings of Milk and Alternatives per day, depending on gender and life stage, including at least two cups of milk for adequate vitamin D intake.

Bottom line: The Canadian Diabetes Association's 2008 Clinical Practice Guidelines recommend following *Canada's Food Guide* for both the prevention and management of type 2 diabetes. These guidelines recommend consuming between two and four servings of Milk and Alternatives per day, depending on age and gender. An individualized plan, prepared in partnership with a Registered Dietitian, is also recommended for diabetes management.

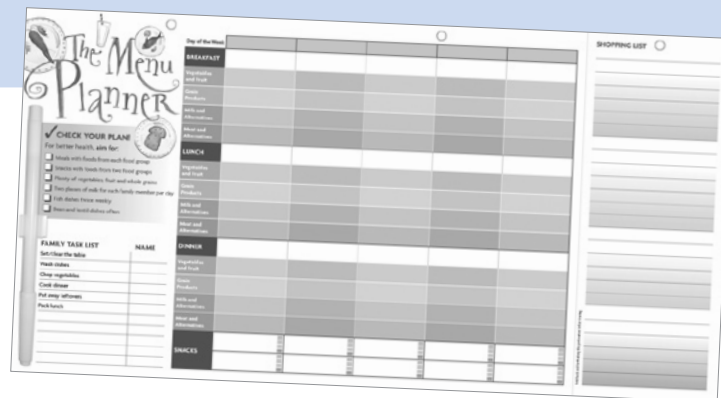
Recommended Food Intakes for Adults

Food Group	Gender and Age Group			
	Women 19-50	Men 19-50	Women 51+	Men 51+
	Food Guide Servings			
Vegetables and Fruit	7-8	8-10	7	7
Grain Products	6-7	8	6	7
Milk and Alternatives	2	2	3	3
Meat and Alternatives	2	3	2	3

What's New:

The Menu Planner

To help prevent or manage type 2 diabetes, it is important to plan meals ahead of time to ensure intake of the appropriate number of servings from each of the four food groups, as recommended by *Canada's Food Guide*. Planning ahead for healthy eating can also help achieve a healthy weight by limiting last-minute, often less-healthy, food choices. The Menu Planner wipe-off board can be kept on a fridge or bulletin board and comes with a re-usable shopping list and wet-erase pen.



For those in Ontario, Quebec and the Maritimes, go to dairynutrition.ca to order your free Menu Planner today. If you reside outside of these provinces, order your copies from breakfastforlearning.ca.

Conclusions

Milk products have a role in reducing the risk for developing type 2 diabetes, delaying its onset and managing it if it does develop. Two to four daily servings of Milk and Alternatives, depending on gender and life stage, can contribute to a lower risk for developing type 2 diabetes and is an effective approach to managing diabetes.



Did you know?

For most Canadian adults 19 and older, mean dietary calcium²⁸ and magnesium²⁹ intakes fall below adequate intake recommendations. This is not surprising since many Canadians do not consume enough servings of milk products, a source of both nutrients, as per *Canada's Food Guide* recommendations.³⁰ Recommended adequate intakes for vitamin D are currently under review,³¹ and the Canadian Cancer Society has issued a statement recommending vitamin D intakes higher than those currently suggested by Health Canada.³² If recommended intake levels increase, most Canadians will be at risk of insufficient vitamin D intakes. For more information on the role of vitamin D and chronic disease prevention, see the *Spotlight* issue "More than Sunlight: Why We Need More Vitamin D," available at dairynutrition.ca.

Q & A

Q: Are there recommended approaches for preventing the onset of type 1 diabetes?

A: Type 1 diabetes is a condition resulting from the autoimmune destruction of beta cells in the pancreas, causing it to cease production of insulin. There is no known form of prevention.⁴ Because safe and effective preventive therapies for type 1 diabetes have not yet been identified, any attempts to prevent type 1 diabetes should be undertaken only within the confines of formal research protocols.³⁵

Q: What is the role of physical activity in type 2 diabetes prevention and management?

A: Regular physical activity may help prevent or delay the onset of type 2 diabetes by improving insulin sensitivity and attaining or maintaining a healthy body weight.³⁶ For people with type 2 diabetes, regular physical activity not only improves overall glycemic control, it can also improve risk factors for cardiovascular disease, such as lipid profile and blood pressure.³⁶ This is especially important because those with type 2 diabetes have a much greater risk for cardiovascular complications than the general population does. Specifically, the 2008 Clinical Practice Guidelines recommend at least 150 minutes of moderate to vigorous aerobic exercise each week, spread over at least three days of the week, with no more than two consecutive days without exercise. Resistance exercise three times per week is also recommended.³⁷ Clients should consult their health-care team before initiating a new physical activity program to ensure blood glucose levels are appropriately maintained.

Q: To prevent and manage type 2 diabetes, how many meals are recommended in a day? How much time should pass between meals?

A: Three meals a day (including breakfast) are recommended and should be eaten at regular intervals to help regulate blood glucose levels. Meals should be spaced no more than six hours apart. A healthy snack may be required.³³ For those with type 2 diabetes, eating meals at regular intervals allows for better use of the remaining insulin in the blood and assists in the absorption of nutrients, facilitating better control of blood glucose.

Q: Do people with diabetes require more fibre than the general population?

A: Fibre plays a role in postprandial blood glucose control: it slows gastric emptying and delays glucose uptake in the small intestine.³³ In addition, a higher-fibre diet can help lower cholesterol levels, which is important for people with diabetes because they develop cardiovascular disease two to four times more often than people without diabetes.³⁸ As a result of these effects, it is recommended that adults with diabetes consume greater amounts of fibre (25–50 g daily) from a variety of sources, including soluble and cereal fibres.³³ To help prevent or delay the onset of diabetes, one should follow the daily fibre recommendations for the general population: 25 g for women and 38 g for men. Sources of soluble fibre include oat products, beans and eggplant. Sources of insoluble fibre include whole-grain bread, flax seed and the skins of fruit.

Q & A

Q: Should low-glycemic-index carbohydrates be recommended for individuals managing type 2 diabetes?

A: Choosing low-glycemic-index carbohydrates more often than high-glycemic-index carbohydrates within the same category of food can help improve glycemic control in individuals with type 2 diabetes.³³ Eating whole-grain breads instead of white varieties and enjoying pasta cooked *al dente* are examples of lower-glycemic-index carbohydrate choices. Milk products, such as milk, chocolate milk, yogurt and cheese, are also classified as low-glycemic-index foods. Recommending the use of the glycemic index as a meal planning strategy for managing type 2 diabetes should depend on the client's interest and ability.



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