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RESEARCH REPORT

Researchers examine correlation between dairy product intake and health

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Executive Summary

The purpose of this project was to examine U.S. residents' dairy foods eating patterns and to assess the contributions of dairy foods to nutrient intakes and other health-related characteristics. All of our analyses were of data from the USDA's Continuing Survey of Food Intakes by Individuals (CSFII) 1994-96, and most of the analyses also included the CSFII 1998 Supplemental Children's Survey. The CSFII included two 24-hour dietary recalls with detailed information on the location and timing of each eating occasion. In addition, subjects were asked many questions about socioeconomic status, living situation, self-reported health and weight, supplement use, and so on. We looked at data from respondents age 2 and over who had two complete days of dietary data, and excluded pregnant and lactating women. Analyses were done for the total population as well as for age and gender subgroups. Sampling weights were applied to all data so that results presented are nationally representative. We used SAS Version 8 for data management and some descriptive statistics, and SAS-Callable SUDAAN for additional statistical analyses.

A consumer study shows that Americans drink most of their daily milk at breakfast.

We generated descriptive data on the mean, 10th, 25th, 50th, 75th, and 90th percentiles of intake of several dairy categories. Our descriptive data on intake are for the food categories of total dairy; fluid milk and types of fluid milk; yogurt; cheese; and cheese from mixtures. We had to develop a strategy to determine cheese intake from mixtures because the data are not provided directly in the CSFII datasets. The descriptive data were particularly important for us as we moved to other research questions. For example, we learned that it would not be useful to look at how nutrient intakes varied by quartile of yogurt or specific milk (nonfat, lowfat, etc.) intake, because too many in the population did not consume those specific foods during the two-day survey period. On the other hand, we confirmed that it would be useful to compare nutrient intakes by quartile of total dairy, total milk, and cheese intake.

Consumers eat most of their cheese as part of "food mixtures" such as pizza and tacos.

Based on our analyses, we found that cheese eaten in foods recorded as food mixtures (such as pizza, tacos, etc.) contributed up to 60 percent of total cheese intake depending on age group. It is of obvious importance to include "ingredient" use of cheese when assessing cheese intake.

We also examined patterns of dairy foods intake by meal and location (away vs. home meals). A key finding was the large proportion of intake of fluid milk at the breakfast meal (~50 percent for children 2-8 and ~60 percent for children and adults over age 9), even among school-age children who presumably are offered milk as part of school lunch programs. At the same time, fluid milk was very heavily consumed at home rather than away-from-home. It was not surprising that fluid milk consumption was greater in the home than away, and that cheese consumption was more evenly distributed between home and away meals. However, the proportion of fluid milk consumed away from home was disappointingly small: just 3-23 percent, depending on age/gender.

Part of our interest was in examining diverse dietary patterns compared with non-diverse patterns, particularly those with limited amounts of dairy products. We defined a diverse pattern as having at least one daily serving from each food group, and also defined numerous "non-diverse" patterns with less than one daily serving of one or more food groups. A diverse pattern was followed by about a quarter of consumers. Patterns lacking fruit, dairy, or dairy plus one or more other food groups were the most common non-diverse patterns, followed by 23 percent, 16 percent, and 25 percent of the population, respectively. When we looked at nutrient contributions of the common non-diverse patterns compared with diverse diets (controlling for energy intake in our statistical model), we found that people following the former had much lower intakes of many micronutrients. For the patterns lacking dairy, results were particularly striking for calcium but also for phosphorus, riboflavin, and zinc.

We also wanted to examine the relationship between dairy product intake and body mass index (BMI), given the common perception that dairy foods are "fattening," as well as recent interest in research that suggests the opposite. Our analyses of this cross-sectional CSFII data show that intake of total dairy and cheese were not related to BMI in adolescents and adults. (We did not examine children because of the unreliability of parent-reported weight and height values.) In women, there was no relationship between weight status and cheese intake, but there was a significant inverse relationship between BMI and total dairy intake. The perception of dairy foods as "fattening" was not validated, and in women the data suggest high dairy consumers actually had lower BMI.

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A major goal of study was to better quantify the relationship between dairy foods and nutrient intakes. All of our statistical models included energy intake as a covariable so we weren't just looking at an effect of higher food intake. When we looked at nutrients by quartile of dairy intakes, we found an overwhelmingly positive effect of total dairy, milk, and cheese on calcium intake and the same positive effect of total dairy and milk (though not cheese) on a whole array of micronutrients including zinc, iron, potassium, magnesium, riboflavin, folate, and vitamin A. It was of interest that people in the higher quartiles of milk and total dairy intake had higher intakes of iron and folate, since dairy foods are not good sources of these nutrients. Clearly, people with high total dairy and/or milk intakes made other wise dietary choices as well. At the same time, although saturated fat was significantly increased with increasing quartile of dairy intake, total fat was not and in some cases was actually lower in people with higher dairy intakes. Cholesterol intake was consistently lower in people with higher dairy intakes, suggesting that consumers eat dairy foods in place of higher-cholesterol foods in their diets.

We also looked directly at the contribution of dairy foods and ingredients to calcium, fat, saturated fat, and cholesterol intakes by using the recipe files available as technical support files from CSFII. Dairy foods and ingredients (including butter) provided about 50 percent of the calcium, 19 percent of fat, 32 percent of saturated fat, and 22 percent of cholesterol in U.S. diets. We examined what happens as people get an increasing proportion of those nutrients from dairy. Total calcium intake increased dramatically as the proportion of calcium from dairy increased, indicating that consumers do not somehow compensate for low dairy intakes by eating other rich sources of calcium. Saturated fat intake increased modestly, with an estimated increase of 0.6 percent for a 10 percent increase in the proportion of saturated fat from dairy. Fat did not change as the proportion of fat from dairy increased, suggesting that people compensate for fat in dairy by making other lower fat choices. And, consistent with our other findings, cholesterol intake declined as the proportion of cholesterol from dairy increased. Again, apparently dairy foods are eaten in place of more cholesterol-rich foods.

Our data present a very positive picture for the contributions of dairy foods, particularly milk, while indicating caution in the applicability of these findings when cheese alone is considered. Suggestions are made for applications of our results.

Major Accomplishments

There are several clear areas where our sponsors and others can apply our results. Some suggestions follow:

1) Use data on micronutrient intakes associated with dairy foods to provide strong support for dairy and particularly milk consumption. The positive picture is not limited to calcium, though calcium intake is most dramatically influenced by dairy (and based on our analyses, people do not compensate with other dietary calcium when dairy calcium is low).

2) In conjunction with data on very high proportion of fluid milk consumed at breakfast, work to increase intakes at other meals or maintain/improve intakes at breakfast (the latter is particularly critical given reports that breakfast cereals are no longer "convenience foods!").

3) Consider encouragement of food pairings to optimize nutrient intakes and adherence to Food Guide Pyramid type of recommendations. For example, the fruit and dairy groups are the least met groups, with 73 percent of the population consuming less than recommended amounts for each of those groups. Strikingly, only about a quarter of the population even consumes a diverse diet as we defined

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it. At the same time, dairy consumers were statistically more likely to be grain consumers and fruit consumers. It may be possible to use our data to provide even more encouragement for both dairy and fruit consumption.

4) The inverse relationship between BMI and total dairy product consumption in adult women is of interest, given the fact that women age 19 and over are the demographic group most likely to under-consume dairy products. While our data are cross-sectional and do not show cause and effect, they do call into the question the perception that dairy foods are "fattening" and may be used to set the record straight. Also, perhaps evidence that dairy products are not associated with obesity will encourage some adolescents to include more dairy foods in their diets.

5) It might be advantageous to dairy industry groups and to consumers if consideration is given to trying to modify the nutritional profile of cheese or if efforts are made to optimize food pairings with cheese for optimal nutrition. The positive dairy nutrition messages supported by our research are not as applicable to cheese alone (except for calcium). There is some potential threat to the image of dairy as nutrient-rich foods if the shift away from milk and toward cheese continues without any changes in nutritional profile of cheese or in overall dietary choices accompanying cheese.

6) Our analyses, conducted from numerous different angles, show that it is not correct to associate dairy foods with high fat and high cholesterol diets. This can be used as an educational message for consumers, and might lead some to examine the real contributors of fat and cholesterol in their diets. The consistent though modest contributions of dairy to saturated fat intakes supports continued efforts to reduce the saturated fat content of dairy foods.

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For More Information

This research report contains summarized results of Louise A. Berner's study entitled "The Contribution of Dairy Foods to Nutrient Intakes and Health in the United States," ARI Project No. 00-3-007 (Research Focus Area: *Food Science*). To view and/or obtain a copy of the complete final report, or to obtain additional information about this or other research projects, visit the ARI website at *ari.calstate.edu*. For information on projects specific to Cal Poly San Luis Obispo, visit the Cal Poly ARI website at *ari.calpoly.edu*.

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