Using Social Cognitive Theory to Improve Intake of Dairy Products by College Students

Kavita Hariram Poddar

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Committee Chair
Dr. Kathy Hosig PhD., MPH, R.D.

Committee Members
Dr. Eileen Anderson Ed.D.
Dr. Susan Duncan Ph.D., R.D.
Dr. William G Herbert Ph.D.
Dr. Sharon Nickols-Richardson, PhD, RD.

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ABSTRACT

College students engage in poor dietary behaviors which put them at risk of weight gain and subsequent future health problems. This necessitates implementation of nutrition interventions which target dietary behaviors in college students so that healthy dietary patterns can be adopted and maintained through adulthood. Dairy intake is one of the many dietary behaviors which has declined substantially in young adults (18-30 years of age) - a period which includes the college age population. According to 2005 dietary guidelines for Americans three or more than three servings of low-fat/fat-free dairy foods is recommended for young adults, which is associated with overall nutrient quality of the diet and several health benefits. Still dairy consumption in this age group is below two serving per day.

As emerging adults, college students may be more receptive to health advice than young adults older than traditional college years whose health habits are more established; nutrition intervention to improve dairy intake may be well received. Psycho-socio variables from Social Cognitive Theory (self regulation, social support, self-efficacy and outcome expectations) have been associated with adoption of healthy eating habits in college students and are associated with dairy consumption in adolescents. A series of studies were conducted to assess and improve dairy intake in college students by changing the mediating psycho social variables from Social Cognitive Theory (SCT) of behavior change including social support, self efficacy, outcome expectations and self regulation.

A pilot web based nutrition education intervention was conducted to improve dairy intake in college students using SCT. The aim of this study was to evaluate the effect of the intervention on self efficacy, outcome expectations, self regulation, behavior and dairy product intake. Two hundred and ninety four students participated in the study and data on dairy intake and SCT variables were collected using 7 day food records and questionnaires. A 5 week electronic mail intervention was conducted. The intervention improved some social cognitive factors such as self

regulation and self efficacy regarding increased dairy intake in college students, though dairy intake did not change.

Next, to understand factors associated with dairy intake in college students, qualitative data were collected using focus group discussions (n=3), elicitation interviews (n=13) and online asynchronous discussion forums (n=3) using identical questions. Fifty students participated in the study and the aim was to identify relevant barriers, motivators and facilitators to dairy and low-fat dairy consumption. The results indicated that there was widespread lack of clarity regarding amount of dairy/calcium required and whether students felt they were getting enough. Major barriers to consuming dairy foods included short shelf life, storage issues, taste and accessibility to dairy foods on campus. Major facilitators included constant reminders, knowing immediate benefits, more accessibility and breakfast consumption.

The aim of the final study was to improve social support, self efficacy, outcome expectations, self regulation and behavior related to dairy intake in college students using Social Cognitive Theory (SCT). One hundred and ninety one students participated in the study which included 8 week electronic mail intervention. Data collected included 7 day food records and for dairy intake and questionnaires for SCT variables. The intervention resulted in significant improvement in total dairy intake and use of self regulation strategies by college students.

Taken together, these results suggest that theory-based nutrition education interventions can improve nutrition behavior in college students, a population prone to poor dietary habits. Developing mastery experiences to improve self efficacy may enhance self regulatory skills like goal setting, planning and monitoring to improve dairy intake in college students. Health care providers should aim at dietary behavior modification via theory based intervention.

Dedication

This is dedicated to the memory of my mother,

I know you are watching over me, I love you and miss you mom.

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CHAPTER 1

Introduction

The 2005 Dietary Guidelines for Americans recommends a minimum of three servings (24 ounces) of low-fat milk or equivalent dairy products per day for young adults (1). This intake is associated with overall better diet quality (2-5) and several health benefits (6, 7) conferred by dairy and calcium from dairy products. There is a growing body of evidence to support the beneficial role of dairy products, in particular, calcium from dairy products beyond prevention of bone loss and osteoporosis (6, 7). Review of evidence on benefits of dairy consumption suggests that adequate dairy intake as part of healthy diet is associated with weight regulation and reduced risk of developing insulin resistance and hypertension (6, 7). Some studies also show an inverse association of dairy consumption with certain types of cancers (7).

Despite the fact that dairy consumption may improve overall health, intake has declined significantly across large portions (young adults, African Americans and females) of the American population. This is more pronounced in young adults (2-4, 8). More than 80% of Americans consume less than three servings per day (2, 4) with young adults consuming approximately two serving per day (8) of dairy products. In addition, individuals who consume below the recommended levels of dairy products do not meet the recommended intakes for associated micronutrients such as calcium, phosphorus, and magnesium (2-4, 8). Evidence suggests that adequate calcium requirements cannot be achieved from non-dairy food sources (9), and young adults who consume three or more servings per day of dairy products in their diets are more likely to meet micronutrient requirements (8). However, since regular fat dairy product consumption is associated with high saturated fat intake, low-fat dairy product consumption should be advocated by health professionals (2, 3, 8).

Emerging data on health behaviors in young adults who transition from high school to college demonstrate that many of these individuals engage in poor dietary behaviors (10-14) which put them at risk of rapid weight gain. These behaviors include low intake of fruits and vegetables, high intake of fast foods, fried foods and binge drinking along with decreased physical activity (10-14). Students are exposed to an environment in college which may put them

at risk of developing poor dietary patterns. Some examples of this environment include “all you can eat” dining halls, easily accessible soda machines and high calorie junk foods (15). Moreover, college students make food choices independently and may eat whatever is available, predisposing them to unhealthy food choices (15).

Diet quality declines substantially by young adulthood (16, 17)— a period which includes the college age population. Since eating patterns may develop early in life and persist into adulthood (18-20), healthy eating habits should be encouraged from childhood through college years. Moreover, poor dietary patterns and associated weight gain seen during college years may increase risk of future health complications (21-23). Furthermore since more than half of young adults have attended some college by 18 years of age (24), college students are ideal targets and young adulthood is an opportune time to intervene and promote dairy intake to improve dietary behaviors.

Theory based nutrition interventions which target psychosocial variables such as perceived barriers, self efficacy, self regulation and outcome expectations may be an effective approach in improving dairy intake in young adults. Research indicates that these variables may be associated with adoption of healthy eating patterns in young adults (25). They form an integral part of Social Cognitive Theory (SCT) which is the most commonly used health behavior model in nutrition education interventions (26-28). SCT is framed by personal, environmental and behavioral interactions to explain behavior and recognizes self regulation (ability to regulate action pertaining to the behavior) and self efficacy (one’s confidence in self to perform the behavior) as major determinants of behavior change (29, 30). According to Bandura, (29, 30) individuals who adopt healthy behaviors have high perceived self efficacy for behavior change and in turn employ better self regulatory skills and have high outcome expectations (i.e. good or bad consequences resulting from the behavior). Social support is another construct of the SCT model which impacts behavior *via* self efficacy. Health behavior change interventions designed to improve these factors have been shown to positively modify behaviors related to physical activity and diet in the young college-going population (31-34). Since studies specific to the correlates of dairy intake in young adults indicate that personal and behavioral factors (taste preferences, personal beliefs, availability of healthy foods, social support from family and

friends, and socioeconomic status) influence dairy intake (35-39), the SCT model of behavior change may be appropriate model to use in this population.

The exact relationship between these psychosocial variables has not been studied widely, but research suggests that social support may affect behavior *via* self efficacy and self regulation and has little influence by itself on behavior modification. Outcome expectations may not explain behavior beyond that explained by self efficacy. Self efficacy in turn has greater influence on behavior *via* self regulation which is one of the most important determinants of behavior in the SCT model (26-28, 31). According to Bandura, (29, 30) interventions focusing on development of skills for goal setting, planning actions to attain goals, monitoring actions, tracking changes and problem solving may help the target population in attaining self efficacy for self regulatory skills which are essential to behavior modification. College students may lack self regulatory skills needed to maintain healthy lifestyles and require social support for maintaining healthful patterns in college years (25).

Most studies focusing on behavior modification in young college adults have targeted physical activity (31-33), while relatively few have targeted dietary behavior (34) based on the SCT model; these dietary interventions have had little impact. Since college students may believe that they are invincible to nutrition related health problems and consider maintaining healthy lifestyle difficult due to high perceived barriers (40-43), nutrition interventions in young college adults using mixed models derived from several theories may be an effective approach in modifying behavior (44-48). Addressing the nutrition beliefs of young college adults by incorporating them in messages related to the key constructs of the SCT model may also prove to be a more effective approach to understanding and altering nutrition related behavior (49).

Statement of problem

In summary, the transition period from adolescence to young adulthood is characterized by decline in dietary patterns putting these individuals at risk of weight gain and poor health later in life. These dietary patterns include increased intake of high fat foods, fast foods and alcohol consumption in conjunction with low intake of whole grains, fruits and vegetables and dairy products. Various factors are associated with the choice of foods, specifically dairy products, made by young adults entering college. These factors are closely related to the environment in which they live and personal beliefs that they hold which may trigger their behavior. Therefore, there is an increased need to understand the interaction between these factors which can be informed by theory based interventions. Health providers could then implement effective nutrition intervention strategies to help college students make healthy food choices in their environment.

Aims and Objectives

The purpose of the current project was to assess and improve dairy and low-fat dairy intake in college students by addressing mediating psychosocial variables from Social Cognitive Theory (SCT) including social support, self efficacy, outcome expectations and self regulation.

Specific objectives included:

Study I

To evaluate the effect of a brief web-based nutrition education intervention grounded in Social Cognitive Theory on self efficacy, outcome expectations, self regulation, behavior and intake related to dairy intake in college students.

Study II

To identify relevant barriers, motivators and facilitators of dairy and low-fat dairy intake in college students.

Study III

To improve intake of dairy products in college students *via* nutrition education intervention and to assess the effect of the intervention on SCT mediators of behavior change which include social support, self efficacy, outcome expectations and self regulation.

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CHAPTER 2

Review of Literature

Current recommendations for dairy intake:

The current recommendation for consumption of dairy products according to the United States Department of Agriculture 2005 Dietary Guidelines by young adults (>18yrs) is 3 cups of low fat or fat free milk (24 ounces) or equivalent milk products per day (1). This recommendation is based on the dietary reference intake (DRI) for calcium intake in young adults (age 19 -30 years) which is 1000mg/day, established by the Food and Nutrition board (FNB), Institute of Medicine (IOM) at the National Academy of Sciences (NAS) (2). The current calcium DRIs for children up to 3 years of age is 500mg/day, for children aged 4 to 8 years is 800mg/day, for adolescents aged 9 to 18 years is 1300mg/day, for adults between 30 to 50 years of age is 1000mg/day and above 50 years of age is 1200mg/day.

Recognition of the beneficial role of calcium in health in general; and more importantly growing evidence from scientific research on importance of calcium in bone health during developmental stages, led to changes in calcium DRIs in 1997 and culminated in current DRIs and recommendation for dairy products by different age groups (1, 2). In addition to calcium, several nutrients play a role in the development and maintenance of bone health including protein, Vitamin D, Vitamin K, magnesium (3-6). Interactions between these nutrients is an important factor in development of bones during childhood and adolescence, maintaining bone health during adulthood and preventing osteoporosis during old age (2-6).

Dairy products as a source of calcium and other nutrients:

Food is recognized as the preferred source of calcium in the diet (7-9) with dairy products as an excellent source of calcium (8, 9). A plethora of research now shows that it is difficult to achieve calcium DRIs without consumption of dairy products and intake of three or more than

three servings of dairy products per day is necessary to meet the calcium DRI (2, 8, 9-11). Fulgoni and colleagues (11) assessed data from the Continuing Survey of Food Intakes by Individuals (CSFII – 1994-1996 and 1998) and National Health and Nutrition Examination Survey (NHANES – 1999 – 2000) and determined that consumption of three or more than three servings of dairy products was fundamental in meeting the DRI for calcium intake in all age groups. These findings were corroborated by that of Ranganathan *et al* (12) who reported that young adults who consumed three or more servings/day of dairy products met calcium requirements and in addition had higher intakes of many nutrients present in dairy products, such as magnesium, potassium, riboflavin, zinc, thiamin and many vitamins including vitamin A, D, K, B-12, B-6. Data from national surveys indicated that those who consumed dairy products below the recommended levels, specifically young adults (19-30yrs) did not meet the DRIs for nutrients like calcium, magnesium, phosphorus (13) and potassium (14).

Other plant components present in plant sources of calcium such as oxalates and phytates may decrease the bioavailability of calcium, thus making dairy products one of the best dietary sources of calcium. (8, 9). Overall, dairy products supply 72% of calcium, 32% percent of phosphorus, 26% of riboflavin, 23% of Vitamin A, 20% of Vitamin B12, 19% of protein, and 18% of potassium in the American diet (7). It is an excellent source of phosphorus, riboflavin and Vitamin D (when fortified with Vitamin D) since ~ 20% or more of percent daily value is achieved from one serving and is a good source of protein, niacin and vitamin A since it provides between 10 to 19% of percent daily value of these nutrients (7). One cup of milk (8 ounces) or equivalent amount of milk products like 8 ounces of yogurt or 1-1.5 ounces of cheese provides ~30% or more of the established DRI for calcium in young adults (1).

However, it is important to note that regular fat dairy consumption is associated with high saturated fat (>10% energy) intake which exceeds the national recommendation (15-18). These references are confusing. Conversely, low-fat dairy products (1% reduced fat or fat free milk) intake is associated with saturated fat intake of less than 10% of energy intake, consistent with recommended intake, without compromising the nutrient quality (12, 15-18). Since saturated fat intake is associated with many chronic health problems (19), low-fat/fat free milk intake should be encouraged.

Health benefits associated with dairy intake:

Consumption of dairy products have been associated with a myriad of health benefits mostly attributed to calcium, with a few benefits associated with other minerals and bioactive components present in dairy products (20, 21). These benefits include the well defined role of calcium from dairy in increasing bone mineral density during growth (22), attaining peak bone mass during adolescence and young adulthood (23, 24) and preventing bone loss during the aging process (25). Review of studies on dairy intake and obesity suggests that it may potentially prevent weight gain in healthy individuals and/or accelerate fat loss in obese persons (26). Furthermore, dairy intake is inversely associated with certain types of cancers like colon cancer (27) and may reduce the risk of developing hypertension and high blood pressure when consumed as a part of healthy diet (28). In addition to lowering the risk of developing hypertension, dairy intake is associated with lower risk of developing various risk factors associated with cardiovascular diseases and metabolic syndrome, including dyslipidemia, insulin resistance and glucose intolerance (29).

Hypertension:

Clinical trials like the PREMIER studies which include the DASH (Dietary Approaches to Stop Hypertension) diet and observational CARDIA studies in young adults indicate the association between healthy dietary patterns and reduced risk of developing a diverse range of health problems (30-33). The DASH diet in the PREMIER trial (30, 31) emphasizes the importance of including 3 servings of low-fat dairy products along with fruits and vegetables to observe magnified effects on lowering systolic blood pressure and subsequent risk of developing hypertension. Alonso *et al* (34) conducted a study in 5880 university graduates in Spain to examine the association between total dairy, regular dairy and low-fat dairy intake and incidence of hypertension. Consumption of low-fat dairy products was inversely associated with incidence of hypertension. Most of the benefits of dairy intake in hypertension and blood pressure are associated with other bioactive components present in milk and milk products (35) like casein and whey proteins which act by inhibiting Angiotensin-1 Converting Enzyme; a key regulator of hypertension. Similarly, the CARDIA study highlights the benefits of including three or more

servings of dairy products in reducing the risk of developing of insulin resistance syndrome (IRS), glucose intolerance and dylipidemias in young adults (32, 33).

Bone health:

Osteoporosis is a bone disorder in which bone quality and strength is compromised due to low peak bone mass during early years of life. This condition is prevalent in the older segments of the population in America; however younger individuals may also develop it (36). In the United States, fractures related to low bone density are increasing in all segments of population. Current costs related to this condition are approximately $17 billion with and it is estimated that this figure may increase to $50 billion by 2040 (37-39).

Bone growth and development peaks during adolescence up to age 18 years in which bone mineral content increases and maximum calcium deposition in the bones occur (40, 41). Approximately 90% of the adult bone mass is attained by age 18 years (40, 41). By the mid twenties and thirties bone mass continues to change and grow but at a slower pace than adolescence (42-44). A calcium deficit resulting from low dietary calcium intakes can cause weak skeletal development during infancy and adolescence due to inadequate mineralization which results from low calcium deposition (45-49). Many studies have shown that risk of fractures is high in children, adolescents and adults who have low peak bone mass and is associated with lower consumption of dairy products and calcium intake in the diet (46-49) and adequate intake of dairy calcium positively correlates with high bone density and peak bone mass (50-52).

Body weight regulation:

An expanding body of evidence suggests that dairy calcium intake may have positive effects on weight/fat loss and when consumed in adequate amounts (~ 3servings/day; Ca; ~ 1300mg/day) coupled with energy restriction may reduce adiposity in obese individuals (53-55). Dairy calcium consumption has been associated with prevention of excess weight and body fat gain in adolescent girls (56, 57) and adults in midlife (58). Several studies support an inverse association between dairy calcium and body weight among different age groups (59, 60), BMI in

children (61) and adults (62), weight gain in older adults (63), and waist-to-hip ratio in younger adults (64).

One potential mechanism via which calcium may regulate adiposity has been demonstrated in animal models and in *in vitro* studies. Briefly, low dietary calcium intake increases intracellular calcium, thereby stimulating lipogenic gene expression and inhibition of fat oxidation (65-68). Some human clinical trials suggest that high dairy intake increases fat oxidation, aiding in weight gain prevention in healthy individuals or weight loss in obese individuals (69-71). However, a definitive role of dairy products in weight regulation has not been established since several other studies (72-80) do not support the role of dairy products in weight regulation. Still, including adequate dairy products as a part of healthy diet may benefit individuals due to better overall nutrient quality.

Importance of adequate dairy intake in young adulthood:

Attaining peak bone mass:

Peak bone mass attained during early adulthood is a major determinant of bone health later in life. Bone loss in late adulthood can be prevented or slowed down with healthy lifestyle. This includes adequate calcium intake and nutrient balance in the diet (3-5) and enough physical activity (40, 43, 56). Since gain in bone mass continues through the mid twenties and thirties before stabilizing in the forties (40-44), it is essential that adequate dairy calcium consumption is supplied through the diet so that bone health can be maintained. By the late forties and fifties, bone mass begins to decline and bone loss accelerates after menopause (40-44). Studies in young adults indicate that adequate calcium intake (~1000 mg/day) is essential for bone health, attainment of maximum peak bone mass in young adulthood and prevention of bone loss (81-83). Matkovic and coworkers (84) examined the effect of supplemental calcium intake (randomized clinical trial) and habitual dairy product consumption (observational cohort study) on skeletal development of adolescents aged 15 years followed up to 18 years. They concluded from the study that calcium supplementation and habitual dairy calcium intake had a positive effect on bone acquisition; however in the dairy product group, milk intake exerted additional beneficial effects on bone growth and expansion compared to calcium from supplements (84).

The authors observed that the dairy group had higher protein intake than the calcium supplemented group suggesting that that other nutrients in milk may have a beneficial role in bone health. Though there are fewer studies to support the role of dairy product intake on bone health in young adults (81), a number of studies in older adolescents support the beneficial role of dairy calcium on accrual of bone mass (50, 51, 84) and provide evidence of the significance of dairy consumption during these years on bone health in young adulthood (49, 85).

Weight gain and obesity – A Major health concern for young adults:

Despite differences in the incidence of overweight and obesity across race, gender and age groups, recent statistics provide irrefutable evidence that weight management is a growing concern for young adults (86). According to the 2003-2004 National Health and Nutrition Examination Survey, the incidence of obesity [body mass index (BMI; kg/m^2) >30] and extreme obesity (BMI >40) in young adulthood (age 20-39 years) increased from 26.0 to 28.5% and 4.5 to 5.4%, respectively, over a 6-year period (86). Moreover, data from the National Longitudinal Study of Adolescent Health showed that excess weight gain in adulthood began in older adolescence and incidence of obesity was greater (13%) in those aged 19-26 years (87). Overweight children and adolescents are more likely to become obese adults (88, 89). Recent data on obesity trends in the US population suggest that adults (>20yrs of age) are becoming obese more rapidly than children and adolescents and by 2030 more than three quarters of US adults will be obese; 100% of adults will be obese by 2048 (90). This trend in overweight and obesity imposes major health, economic and social burdens on afflicted individuals as well as the nation (90-92).

Diseases such as diabetes once thought to arise during adulthood are now occurring in children, adolescents and young adults possibly associated with overweight status during early years. Studies on predictors of health problems in young adulthood suggest that those who are overweight or obese during childhood and adolescence are at risk of developing major health issues in young adulthood (93, 94) thus underscoring the need to implement weight loss strategies in early stage of the lifespan.

Dairy intake and prevention of weight gain in young adults:

Association of dairy intake with body composition:

Several studies show that consumption of dairy products may be linked to better body composition in individuals (32, 62, 64). Brooks and coworkers (64) examined the association between dairy and total calcium intake in 1306 young adults (mean age – 29.7 years) and reported that low-fat dairy products and overall calcium intake was inversely associated with waist to hip ratio in white males. The CARDIA study (32) of young adult population reported that normal weight individuals consumed higher total dairy intake (2.84 servings/day) as compared to overweight individuals (2.46 servings/day). Similarly, one study reported that fewer individuals (mean age: 35 yrs; 20.5%) were overweight or had BMI >25 kg/m^2 in the highest quartile of dairy product consumption group (>3 servings/day) compared to 43.5% individuals in the lowest quartile (<1.6 servings/day) of dairy product consumption group (62). Because the studies discussed above are observational in nature, causal role of dairy in body composition changes cannot be established.

Clinical trials:

Intervention studies indicate that increased dairy intake may be associated with weight maintenance in normal weight individuals (76). One clinical trial in young healthy normal weight adults did not find any changes in body weight and fat mass with dairy product intervention (76). Though other lifestyle factors were not assessed in the study, the participants (n= 135) were instructed to maintain an iso caloric diet (<2200 kcal) and were asked to increase intake of low-fat and/or fat free dairy products to bring their calcium levels to ~ 1000mg (median dairy group) and ~ 1300mg/day (high dairy group) (76). In a follow up study of the same participants (n=51) six months after the 1 year dairy intervention, Eagan *et al* (95) assessed the effects of dairy intake on body weight, fat and lean mass. The results showed that calcium intake was higher by 341 mg/day from baseline (18 months ago), was maintained at ~1000mg/day and predicted lower fat mass. These results suggest that adequate consumption of dairy over a period of time may result in maintenance of body weight and body fat. These results could be used to encourage

individuals who avoid dairy products due to weight concerns (96) to consume low-fat or skim dairy products.

Dairy intake and healthy diet and lifestyle:

There is no substantial evidence to suggest that consumption of dairy products results in body weight/fat loss in young adults. Studies that showed inverse association of dairy products with measures of body composition in young adults (32, 62, 64) also showed positive correlation between intake of dairy products and healthy dietary patterns in them. These patterns included low dietary fat intake with high whole grain, fruits and vegetable consumption. Many of these patterns and others such as regular breakfast consumption and increased physical activity have been linked to weight management (97-103). Young normal weight adults who reported high intake of total dairy products also consumed diets that were high in whole grain, fruits and vegetable intake (32), Similarly, one other study reported that mean low-fat dairy product and calcium intake were higher with lower intake of regular fat dairy product (0.75 servings/day; 847.8mg/day; 1.21 servings/day) in normal weight white males (64). Overweight individuals had lower intake of reduced fat dairy and calcium with higher intake of regular fat dairy product (0.44 servings/day; 791.7mg/day; 1.41 servings/day) even though total dairy product intake did not vary substantially between normal weight (1.96 servings/day) and overweight individuals (1.85 servings/day). However, the proportion of low-fat dairy product intake was much higher (38%) in normal weight white males than overweight (23%), suggesting an association between normal weight and healthier lifestyle (64). Thus it is possible that since dairy product intake is associated with healthy lifestyle in individuals it may indirectly aid in weight/fat regulation in individuals.

Current estimates of dairy intake in young adults:

Despite the fact that dairy foods provide a package of nutrients essential for maintenance of health, most Americans, notably young adults, are not meeting these guidelines (11-14, 64). Examination of data from Continuing Survey of Food intake in Individuals (CSFII 1994-1996 and 1998) and National Health and Nutrition Examination Survey (NHANES 1999-2000) showed that adults >19 years of age consumed less than 2 servings per day of dairy products and

did not meet calcium DRI (CSFII:1.41 servings/day dairy, 787mg/day calcium; NHANES: 1.79 servings/day dairy, 899mg/day). More than half consumed less than 1 serving per day of dairy products and did not meet even half of the DRI for calcium (CSFII (77%): 0.87 servings/day dairy products, 596mg/day calcium; NHANES (69%): 0.80 servings/day dairy products, 572mg/day) (11). According to Ranganathan and collegeaues (12), only 20% of young adults (19-28yrs) met the dietary guidelines for dairy products intake (> 3 servings/day) and of the remaining 80% more than half (43%) consumed below 1 serving/day. Similarly, Brooks *et al* (64) reported an average intake of 1.87 servings per day in young adults.

Dairy intake by type of dairy, race and gender*:*

Race:

Inadequate consumption of dairy products is more pronounced among those from African American descent as compared to Caucasians (12, 13). Young African American adults in the Bogalusa Heart study reported significantly lower total dairy product intake (1.22 servings/day) as compared to Caucasians (1.63 servings/day). Similar to the findings from the Bogalusa Heart Study, examination of national surveys (CSFII 1994-1996, 1998; NHANES 1999-2000) showed that total dairy product consumption was lower in African American young adults (CSFII:1.01 servings/day; NHANES: 1.46 servings/day) as compared to non African Americans (CSFII:1.57 servings/day; NHANES: 1.78servings/day) (13). In contrast to these two studies, Brooks *et al* (64) reported only slightly lower consumption of total dairy products in Caucasians (1.88 servings/day) as compared to African Americans (1.95servings/day). Research indicates that African Americans have greater sense of perceived lactose intolerance (104) which may result in low dairy product intake.

Gender:

Females consume lower amounts of dairy products than their male counterparts (12, 13, 64). In one study, total dairy consumption was significantly lower in African American women (1.19 servings/day) as compared to their male counterparts (1.27 servings/day). Surprisingly, in Caucasian; women had higher intakes (1.66servings/day) as compared to their male counterparts (1.59 servings/day) though the difference was not great (12). Similarly, one other study which

examined data from CSFII 1994-1996, 1998 and NHANES 1999-2000 showed that women from both races consumed lower amounts of dairy products as compared to their male counterparts. Women in the CSFII study consumed 0.93 servings/day (African Americans) and 1.27 servings/day (Caucasians) as compared to their male counterparts (African American 1.09 servings/day, Caucasians 1.87 servings/day). Results from NHANES data showed women consumed 1.20 servings/day (African Americans) and 1.53 servings/day (Caucasians) as compared to their male counterparts (African American; 1.72 servings/day, Caucasian; 2.03 servings/day) (13). Similar findings were reported by Brooks *et al* (64) who showed lower total dairy intake in women from both races (Caucasians, 1.73 servings /day vs. African Americans, 1.87 servings/day) as compared to their male counterparts (Caucasians, 2.02 servings/day vs. African Americans, 2.03 servings/day) (64). These data suggest that interventions to improve dairy intake in women are important since women are at higher risk of developing health conditions related to low bone mineral density after menopause (36, 37).

Type of dairy:

It is important to note that national guidelines recommend low-fat or fat-free milk and dairy intake for Americans over two years of age (1). Contrary to these recommendations, it is evident that most young adults (43%) consume whole milk (3.25% milk-fat) with only 27% consuming either 1% milk (8%) or fat free milk (19%) (12). One other study reported average low-fat dairy intake of 0.61 servings/day in the study population (64). Moreover Caucasians consumed higher amounts of low-fat dairy products (0.71 servings/day) as compared to African Americans (0.34 servings/day). Research shows that those who meet the recommendations for dairy product intake get more than half of it from milk consumption (12). In a study by Ranganathan *et al* (12), those who reported consuming less than 2 servings of dairy products per day, consumed most of it (37%) from mixed dishes and only 29% of dairy intake came from milk consumption. In comparison, 60% of dairy products came from milk for those who reported consuming more than three servings/day and only 12% of it coming from mixed dishes. This indicates that those who consumed more milk may have been conscious of their intake and intentionally increased milk intake in their diet.

A significantly lower percentage of African Americans consumed milk, cheese and yogurt (89%, 16% and 15% respectively) as compared to Caucasians (94%, 44% and 31%) (12). Similarly, Fulgoni *et al* (13) reported that African Americans (CSFII 1994-1996 and 1998) had lower intakes of milk (0.55 servings/day) and cheese (0.45servings/day) as compared to those from other races (milk; 0.85servings/day, cheese; 0.68servings/day). Examination of NHANES 1999-2000 data showed similar results in which African Americans had lower intakes of milk (0.70 servings/day) and cheese (0.75servings/day) as compared to those from other races (milk; 0.90servings/day, cheese; 0.84servings/day).

These findings suggest that total dairy product and type of dairy product consumption varies across race and gender in young adults (12, 13, 64). Dairy consumption in general is lower among African Americans and females as compared to individuals from other races and males, respectively. Additionally, African Americans consume a greater amount of high-fat dairy products as compared to Caucasians (64). A significant proportion of Americans are not meeting the dietary guidelines for dairy consumption. Further, understanding the pattern of dairy consumption in individuals who come from different races and belong to a particular gender can help health professionals to design interventions accordingly.

Rationale for improving dairy intake in college students:

College enrollment increased by 23% since 1995 to 2005 with approximately 17.5 million US populations attending undergraduate institutions. Of these, ~40% of them were young adults aged 18-24 who were enrolled in some college or university (105). Emerging data on health behaviors in young adults who transition from school to college demonstrate that diet quality is deteriorating in this population (106-113). Examples of these less healthful dietary patterns include reduced intake of healthful foods such as whole grain, fruits and vegetable, dairy, fiber with consequent increase in high fat foods, fast foods, sugar sweetened beverages and alcohol intake. Furthermore several studies demonstrate that dairy intake has particularly gone down in college age population with a subsequent increase in consumption of sugar sweetened beverages and sodas (114-116). These unfavorable dietary patterns are associated with decreased physical activity, thus increasing risk of weight gain and other chronic diseases

such as heart diseases, cancer, osteoporosis, diabetes and insulin resistance (117-120). Effective college or university-based interventions to improve dietary behaviors including dairy product intake could have a major impact in slowing or preventing the rising nutrition-related health issues in the United States (92).

Tracking of dietary patterns:

Despite the fact that dietary patterns are changing during young adulthood studies indicate considerable tracking of dietary patterns from adolescence to young adulthood and from young adulthood to adulthood (121 - 123), suggesting that interventions during the college years can set a path for beneficial dietary behaviors lasting into adulthood. Dietary habits may be established early in life (121-123) since dietary patterns remain unchanged to a large extent in later years. Lien *et al* (121) reported that 70% of subjects at age 14 years had not changed their dietary patterns by age 21 years for fruits, vegetables and sugary foods intake. Another 18-20 year follow up study of soft drinks tracking in adolescents reported that tracking of soft drink intake from age 15 to age 25 and from age 25 to age 33 was moderate to high, however from age 15 to 33 was low (122).

Though some studies suggest that dietary patterns are established in childhood or adolescence (121-123), many others have shown that dietary habits are constantly changing such that consumption of unhealthy foods has increased and healthy food has decreased (124-127) by the time adolescents transition into young adulthood. The new environment in which young adults are placed when they start college may overpower established habits and influence dietary choices toward less healthful patterns. Strong and colleagues (128) reported that students had poor time management skills and sluggish attitude towards healthful eating in spite of enough time on hand.

Factors influencing the dietary patterns of college students:

Complex interactions between the social, environmental and personal factors influence an individual's behavior. The period of 18 to 25 years of age is typically defined as "emerging adulthood" which is distinct from adolescence and young adulthood (129). This period is characterized by that of change and exploration in which these individuals are ready take risks

despite knowing the hazards since they want to experience everything before they enter the phase of young adulthood (>25 years and early thirties) and are still in the phase of identity seeking (129). Thus targeting this population to modify dietary patterns to incorporate healthy lifestyle may be effective since they may be receptive to suggestions and advice as opposed to older adults. As college students move from home to college dormitories, they face challenges for which they may not be prepared. Thus dairy intervention at this time may help college students make healthy food choices in the environment that they live in.

College environment:

"Eating All you can"

The environment to which students are exposed in college puts them at risk of developing poor behaviors characterized by poor dietary patterns and accompanying limited physical activity levels (106-113). One of the major characteristics of the college environment which may influence students to make poor dietary choice is "all you can eat" dining halls which are packed with energy dense food choices (128, 130). Levitsky *et al* (130) demonstrated that eating energy dense "junk foods" and consuming meals in the "all you can eat" dining halls, explained most (58%) of the variance in weight gain seen in college population. In recent years more young adults are obtaining higher energy intake in meals consumed at restaurants (131) and are consuming high amounts of pizzas and burgers with a decrease in milk and other healthful food products. College campuses are filled with restaurants that offer fast foods which are cheaper and convenient. Snacking has increased significantly in this age population (132). According to one study, the total number of snacks per day increased by 14% and total amount of energy from each snacking occasion increased by 26% in young adults between 1977-78 to 1994-1996. Beverage intake that included sweetened drinks and alcohol consumption increased from 14.3 % and 10.0% to 15.7% and 12.5% respectively. Simultaneously milk consumption in young adults went down from 8.8% to 5.8% (132).

Preparing your own meal:

Hull and coworkers (133) assessed 171 freshman and sophomore students who lived on-campus and off-campus for a year for body weight and composition changes. Students living off -campus had significantly lower percentage body fat (31.0% vs. 33%) and had higher fat free mass (37.2% vs. 36.1%) as compared to those living on-campus (133). This indicates that campus environment may promote unhealthy dietary patterns resulting in unhealthy body composition changes. Typically students living on-campus in dormitories do not get the opportunity to cook their meals and may have to settle for anything that is available. Research indicates those who prepare their own meals have healthier diet patterns (134). Those who live off campus get the opportunity to cook for themselves and may have better diet quality.

Vending machines:

Easy access to vending machines with sodas is another contributing factor to poor dietary patterns (128, 130). College students report consuming high amounts of sugar sweetened beverages (113, 135), thus warranting limited access to these sources on college campuses or replacement with healthier choices such as low-fat dairy drinks. Research indicates that vending machines are associated with beverage intakes in middle school children (136) and this concept can be applied to college students as well. Availability of dairy foods at meal times is positively associated with intake (137-139), therefore making dairy foods available on campuses like in vending machines may improve intake in college students.

Personal factors:

Body image

Body image and satisfaction are important concerns in college students and specifically in females who transition to college. Concerns about body weight gain lead to disordered eating in many college students which can lead to excessive weight gain (140-142). Some approaches to losing weight by students include on-again, off-again dieting which can lead to excess food intake and thus subsequent weight gain. Pliner *et al* (140) reported average weight gain of approximately four kilograms in those who were living on-campus and had restrained eating

patterns *vs*. approximately 1.5 kilograms in overall study population. Similarly, Lowe and colleagues (141) reported that those who were on diets to lose weight gained three times the weight of those who never went on diets. Delinsky *et al* (142) reported that weight gain in college students was not related to dieting; however disordered eating including binging and purging increased during the college years and was associated with poor body image. Moreover, dieting predicted disordered eating patterns in college students who had low self esteem and body image (142). Concerns about weight gain and self esteem during college years increased significantly leading to unhealthy restrained eating patterns. College students tend to avoid dairy intake as concerns about weight gain, and calorie intake increase (96, 143). Moreover, binge eating and substance abuse which increase during college years are negatively correlated with dairy intake (143). College students should be encouraged to consume low-fat or non-fat milk which are low in cholesterol and fat instead of completely avoiding dairy products.

Perceived stress and personal beliefs:

Perceived stress among college students is high (144, 145) and has been shown to affect the types and amounts of food consumed by them. Typically perceived stress is associated with less desirable dietary practices in college students (146-149). Liu *et al* (149) explored the relationship between depression, stress and intake of certain types of foods in college students and reported that high stress and depression was associated with low intake of fruits and high intake of snacks. Students who leave home to attend college have increased autonomy as they adjust to a new physical environment as well as a new social circle, along with different rules and expectations for academic success. Stressors for traditional (aged 18-24) college students include academic performance, parental pressure, roommate problems, relationships with boyfriends or girlfriends and dealing with substance abuse in friends (150). Other than perceived stress personal beliefs may also influence dairy intake in college students. One study assessed correlates of dairy product intake in adolescents and demonstrated that personal factors such as taste preferences and personal health beliefs may affect dairy intake (137). Those who liked the taste of milk were likely to consume it regularly. In addition, those who were health conscious; had higher self efficacy for milk consumption and consumed milk more often (137).

Social factors:

Social support is very important in determining dietary patterns in young population (137-139, 143, 151-153). Parental support is one of the major factors that play a role in the development of healthy dietary patterns in adolescents before they leave home to go to college. When college students' move to dormitories there is a shift in this support wherein support from friends increases. One study that examined the correlates of dairy product consumption in adolescents reported that those who were not strongly connected to their families had lower dairy consumption (143). College students need constant reminders for healthful eating and seeing others consume healthy meals is one way of being reminded. Studies on associations between dairy intake and environment support the role of parent modeling in improving dairy product consumption in young population (137- 139). Consumption of alcohol increases in college students while consumption of healthful foods decreases (106-1110). Social support for healthful eating practices may be lacking in college students. Socio-economic status is another important factor in development of healthy dietary patterns and is associated with dairy product intake (151-153). Higher education and higher socio-economic status are associated with more healthful eating patterns including higher dairy product consumption (151-153).

In summary, the complex interactions between social, personal and environmental factors contribute to the development of dietary patterns in college students, which may lead to unhealthy behaviors that are indirectly associated with low dairy product consumption. Therefore, to improve dairy product intake in this sector of the population these factors should be targeted. Since dietary patterns can be tracked from childhood to adolescence and adolescence to young adulthood and subsequently in older adults, interventions in the college setting may help to establish or maintain healthful habits that will continue into adulthood.

Importance of theory based interventions to promote healthful behavior:

Health behavior is a complex entity which is influenced by various factors including the social and physical environment and personal beliefs. Interventions to promote health that are based on theory are more effective than non theory based approaches since they can help to identify the processes via which a behavior is adopted (154, 155). Health promotion

interventions based on theories work by first recognizing the problem and then identify the risks associated with the behavior and finally categorize the "mediating variables" that are associated with the behavior. A successful theory based intervention focuses on changing the mediating variables which strongly influence behaviors. Baronowski *et al* (156, 157) posited the "mediating variable" framework, which states that an effective intervention will change the mediating variables significantly and this in turn will produce a significant change in the desired behavior. Behavior modification based on mediating variables will be unsuccessful without significant change in the mediating variables (157).

Interventions based on theory have had limited impact on behavior (nutrition or physical activity). This may be because no one theory perfectly predicts behavior, interventions are not focusing on changing the mediating variables, or the mediating variables are not related to the behavior in question (156-158). A review of nutrition and physical activity studies suggested that moderators (characteristics which cannot be controlled by intervention) such as gender, age and biology may affect health behaviors, decreasing the ability of health behavior theories to fully explain behavior (158). For example, one theory may be more effective for boys but not for girls or one theory may work in young adults but not in an older population. Therefore, interventions based on theory should test the theory on a target population first and then tailor it according to the population. Since constructs from different theories may overlap and each theory is limited in explaining and modifying behavior, integrating theories may be a better approach in effective health promotion interventions related to nutrition and physical activity (158-160).

Conceptual models for behavior change:

Several models for behavior change interventions have been proposed (154, 158, 161, 162) by different researchers. These models include constructs or determinants of behavior change which often overlap (154, 158, 161, 162) and have been used widely in behavior interventions. The most commonly used theories in nutrition education research include the Health Belief Model (HBM) and the Social Cognitive Theory (SCT) (154, 158, 161).

Health Belief Model:

Health Belief Model (HBM) model was first developed in 1974 and has the longest history of use in behavioral research, evolving over time. The main constructs include perceived susceptibility (one's belief in the chances of getting the condition), perceived severity (one's belief the condition is serious), perceived benefits (one's belief in the chances of achieving positive outcomes), perceived barriers (one's belief how easily the action can be taken), cues to action (events that can motivate to perform the action) and self efficacy (confidence that they can do it) (158, 161). HBM attempts to predict health-related behavior in terms of certain belief patterns. HBM is based on the understanding that people will take health-related action (e.g. increase low fat dairy intake) if they think that a negative health condition (i.e. osteoporosis) can be avoided, have positive expectations that by taking a recommended action they will avoid the negative health condition and believe that they can successfully take a recommended action (i.e. self efficacy). Several studies in adolescents, young adults and adults which targeted osteoporosis prevention (one of the main diseases of old age), used Health Belief Model to improve calcium intake (163-166). Positive changes in perceived severity and susceptibility to osteoporosis predicted behavior change. Perceived benefits of improved calcium intake and improved self efficacy for increasing calcium also predicted behavior change in these studies (163-166). Perceived severity, susceptibility, benefits and self efficacy are important mediating variables in Health Belief Model (158, 161). However perceived barriers and self efficacy from HBM predicts the most variance in behavior related to calcium and exercise (165, 166). Schmiege *et al* (166) used the HBM model as a base and integrated constructs from Social Cognitive Theory and Theory of Planned Behavior to increase the predictability of a model for behavior change in college students. They concluded from the study that the model predictability did not increase; however from the health belief model, barriers predicted most of the variance in calcium consumption (6%) and exercise (11%). Self efficacy in the study predicted 15% and 19% of variance in predicting calcium intake and exercise respectively (166). College students have low self efficacy and high perceived barriers to healthful eating (167), which may prevent them from healthy eating. While research using HBM has addressed perceived severity,

susceptibility, benefits and self efficacy from HBM (163-166) little research has addressed cues to action from this model.

Social Cognitive Theory

Social Cognitive Theory (SCT) is commonly used for nutrition education interventions across diverse population groups (161). Based on Bandura's theory of "reciprocal determinism", SCT is framed by environmental, personal and behavioral interactions to explain behavior in an individual (168). The key constructs of this model include self efficacy (one's confidence in self to perform the behavior), self regulation (ability to regulate action pertaining to the behavior), outcome expectations (i.e. good or bad consequences resulting from the behavior) and social support to perform a desired behavior (161, 168). According to Bandura (168,169), individuals who adopt healthy behaviors have high perceived self efficacy for behavior change and in turn employ better self regulatory skills and have positive outcome expectations (i.e. good or bad consequences resulting from the behavior). Self regulation is a multi-component process which involves goal setting, goal monitoring, problem solving and decision making and is an important construct of SCT model including self efficacy (168, 169).

Published research demonstrates that college students may lack self regulatory skills and that self efficacy, outcome expectations and social support are essential for maintaining healthful patterns during college years (128). Interventions designed to target these factors may positively modify behaviors in young adults who are in college (170-174). Rovniak *et al* (170) reported that SCT model explained 55% of variance in physical activity in young college students. Self efficacy and self regulation had greatest effects on behavior with social support and outcome expectations having small effects. Similarly, Sallis *et al* (171) reported self efficacy, social support and outcome expectation as potential mediators of behavior change in college students. Schnoll *et al* (172) reported that self regulation and self efficacy are important predictors of dietary fiber intake in college students. Though most studies using SCT in college students have focused on physical activity (170, 171), SCT is one of the most commonly used models in nutrition education and behavior studies (172, 175 -177) and explained 30-60% variance in behavior related to nutrition (175-177). The key constructs of the SCT model are some of the

factors associated with college students' behaviors and thus interventions based on SCT model maybe effective in positively modifying dietary behaviors.

Summary

Young adults consume substantially below the recommended levels of dairy products. Dairy product intake is associated with many health benefits including attaining peak bone mass and potential weight regulation, both of which are important in this age group (18-24 years). The college environment plays a pivotal role in influencing choices related to dietary patterns in young adults. Nutrition interventions at this stage of life can set a trajectory for healthful eating during adulthood since dietary patterns track from childhood to adolescence, adolescence to young adulthood and young adulthood to adulthood (121 - 123). Theory based nutrition education can have significant impact on behavior because mediating variables that are connected to behaviors can be targeted. Social Cognitive Theory is one of the most commonly used theories in nutrition education and relies on social, environmental and personal interactions for behavior change. Important constructs such as self regulation, self efficacy, social support and outcome expectations are the main mediating variables. Research on correlates of dairy products intake indicate that these constructs from SCT may influence dairy product intake in college students, thus targeting them may have significant impact on behavior related to dairy product intake. Since college students may believe that they are invincible to health problems distal in nature and have low perceived susceptibility and severity and high perceived barriers to dairy product intake, messages related to these constructs from Health Belief Model can be incorporated in outcome expectations in SCT model for an effective intervention.

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CHAPTER 3

Web based Nutrition Education Intervention Improves Self Efficacy and Self Regulation Related to Increased Dairy Intake in College Students

To be submitted to the Journal of Nutrition Education and Behavior

Abstract

OBJECTIVE: To improve social support, self efficacy, outcome expectations, self regulation and behavior related to dairy intake in college students using Social Cognitive Theory (SCT). **DESIGN:** Experimental design. **SETTING:** University campus. **PARTICIPANTS:** 294 college students, Mean±SE age: 20.2±0.1yrs. **INTERVENTION:** Intervention group (n=148) and Comparison group (n=146). Data collected included measured height and weight, dairy intake from food records and SCT variables from questionnaires administered in January 2006 and April 2006. A 5-week electronic mail intervention was conducted. **MAIN OUTCOME MEASURES:** Changes in dairy intake and SCT variables (social support, self efficacy, outcome expectations and self regulation). **ANALYSIS:** Multivariate analysis of covariance, with age and gender as covariates; $p<0.05$). **RESULTS:** Ninety two percent of subjects (n=135 intervention, n=136 control) completed the intervention. Dairy intake from food records did not differ between groups at baseline or follow-up (baseline, all subjects: Mean±SE low-fat dairy 0.45±0.05 servings/day; Mean±SE total dairy 1.44±0.06 servings/day). Compared to controls after intervention, subjects in the intervention group reported more frequent perceived consumption of dairy ($p=0.003$), improved use of self regulation strategies ($p=0.038$) and self efficacy for consuming 3 servings/day of dairy ($p=0.049$). **CONCLUSION**: A web based intervention in college students improved some SCT variables necessary for promoting future increases in dairy intake in this vulnerable population. Future research should target social support which is important for behavior change and maintenance in college students.

KEYWORDS: Social cognitive theory; young adults; dairy intake; self efficacy; self regulation

Introduction

A minimum of 3 servings per day of low-fat or fat free milk or equivalent dairy products is the recommended intake for young adults (1). This intake is associated with better overall nutrient quality of the diet (3) and health benefits (4) conferred by nutrients and bioactive components in dairy products. Despite the fact that dairy foods, primarily non-fat dairy products, have been associated with health benefits, total dairy product (including low-fat and regular fat) consumption has declined significantly in the American population (4-6).

Several studies have shown that eating patterns develop early in life and persist into adulthood (7-9); poor dietary patterns manifested during childhood and adolescent years are associated with poor health in adulthood (10-12). For example, weight gain and obesity, associated with many co-morbidities (13), may begin early in life and continue into adulthood (14-15). Hence, strategies to improve health status such as modifying behavior to incorporate healthy eating patterns should be implemented during early stages of the lifespan.

The dietary habits and eating patterns of young adults in college are influenced greatly by personal and environmental factors, including taste preferences, personal beliefs, availability of healthy foods at meal time, social support from family and friends, and home environment (16-21), among other factors. Therefore, creating an environment in which healthy food choices that promote positive health behaviors can be easily made by young adults attending college is warranted.

Theory based nutrition interventions may be an effective approach to impact behavior related to nutrition since they provide basis for understanding factors related to behavior (22,23). Published studies demonstrate that college students may lack self regulatory skills but that self efficacy, outcome expectations and social support are associated with maintenance of healthful patterns during college years (24). Interventions that have targeted some of these factors have shown positive impact on modifying behaviors in young adults who are in college (25-28). Self efficacy (one's confidence in self to perform the behavior), self regulation (ability to regulate action pertaining to the behavior), outcome expectancy (good or bad consequences resulting from the behavior) and social support (emotional support from family and friends to perform the

behavior) are key psychosocial constructs of Social Cognitive Theory (SCT), which is commonly used theory in nutrition education interventions (29-32).

The internet is an efficient way to promote behaviors in college students since most of them have access to internet and emails in universities, can be reached easily, and are familiar with online course management systems. Research shows that internet-based interventions are effective in promoting behaviors and are well accepted by college students (28). The primary aim of this study was to evaluate the effect of a web based nutrition education intervention grounded in the SCT on measures of self efficacy, outcome expectations, self regulation, behavior and intake related to milk and milk product consumption in college students.

Methods

The study protocol was approved by the Institutional Review Board for Human Subjects Testing at Virginia Polytechnic Institute and State University (VPI&SU), Blacksburg, VA (APPENDIX A, page # 115). Informed consent was obtained from each participant prior to participation in the study (APPENDIX A, page # 116).

Setting

A land grant, research-intensive university in a location in the mid-Atlantic region of the United States served as the setting for this study.

Recruitment

Participants were recruited from a personal health class (total enrollment for two sections, one residential, one internet-based~1000 students) in the spring 2006, semester. A recruitment announcement was placed on the course website during the first week of class, and a descriptive flyer was sent via electronic mail to all students enrolled in the course. In addition, the principal investigator visited the residential class to describe the study, answer questions, and encourage participation. Exclusion criteria were not applied. Participant number was not limited, and participation was not mandatory. Participants received 15% of total class points for the

residential section and 30% of total class points for the online section of the course. Alternative projects to earn equal credit were offered to students who did not elect to participate in the study.

Participants

Two hundred ninety four participants enrolled in the study. Of these, 55% were female and 45% were male. The majority of participants were Caucasian (82%), while 11% were Asian/Pacific Islander and 5% were Black/African American. This racial distribution was representative of the undergraduate student population at VPI&SU. Participants in the study were enrolled in all colleges in the university and represented 50 different majors.

None of the participants were underweight (0%). Most participants (69%) were of normal weight [body mass index (BMI)=18.5-24.9 kg/m^2], 25% were overweight (BMI=25-29.9 kg/m^2), and a small proportion (6%) were obese (BMI==30.0 kg/m^2) based on self-reported height and weight. Using a random number generator, participants were randomly assigned to either the intervention group (n=148) or the comparison group (no intervention; n=146).

Measures

Demographic variables and health history. Participants completed a standard questionnaire that included information on age, gender, race, ethnicity, and college major. Participants also completed a health history questionnaire (APPENDIX A, page # 124 and 132).

Anthropometric measures. Fasting (overnight and minimum of eight hours since last meal) body weight, height and waist circumference (WC) measurements were made with subjects wearing lightweight clothing and no shoes. Weight (kg) and height (cm) were measured using a balance beam (Seca, Hanover, MD) scale with a stadiometer. Waist circumference (cm) was measured three times at the narrowest curve between the ribcage and hip bone above the belly button using a non-stretchable measuring tape. Measurements were averaged, and the mean value was used in statistical analyses. Body mass index (kg/m^2) was calculated (APPENDIX A, page # 139).

Food record for dairy servings. Participants completed a 7-day food record (APPENDIX A, page # 138). A detailed instruction sheet was provided to each participant to assist in completion of food records (APPENDIX A, page # 136). Instructions included a list of examples for the correct recording of popular food items, including serving sizes. Participants were asked to

record their food intake using standard serving sizes along with the timing and location of the meal. Dairy servings from food records were calculated based on MyPyramid (33). Dairy products included milk, cheese, yogurt, ice cream, pudding and milk-based smoothies. Regular dairy and dairy products were defined as products made with > 1% milk fat. Low-fat dairy and dairy products were defined as products made with =1% milk fat. Total dairy intake was calculated as the sum of regular and low-fat dairy and dairy products. Servings of dairy from mixed meals were determined by calcium content equivalent to 1 cup of milk (8 ounces), or ~300 mg of calcium (33).

Perceived dairy intake. Each participant reported on a 5-point [*never (1) – seldom (2) – occasionally (3) – often (4) – repeatedly (5)*] scale their perceived intake of dairy. The following item "In the past 3 months, how often did you eat more dairy foods" was included.

Social Cognitive Theory Variables

Questions for the measuring the predictors of SCT variables including social support, self efficacy, outcome expectations (positive and negative) and self regulation were adapted from a validated health beliefs survey to measure eating behaviors (32) (APPENDIX A, page # 124).

Social support. Social support was measured using a 5-point *strongly agree (5) – strongly disagree (1)* scale (APPENDIX A, page # 127). Participants rated their perceived support from family members and friends regarding dairy and low-fat dairy intake for three items which included: "My family/friends try to eat low-fat dairy foods," "My family/friends eat or drink at least 3 servings of dairy foods everyday" and "My family/friends have told me that they want to eat or drink more dairy foods". Responses were averaged for social support from family (Cronbach's a = 0.58) and friends (Cronbach's a = 0.56).

Self efficacy. Self-efficacy was measured using a 100-point scale to rate "How certain are you that you can" for four items (APPENDIX A, page # 129). Possible responses ranged from *certain that I cannot (1) – somewhat certain I can (50) – certain that I can (100).* Statements included "Drink or eat at least 3 servings of dairy foods each day," "Drink 1%, ½ %, or fat-free (skim) milk instead of higher fat milk," "Eat low-fat cheese products (such as cottage cheese, sliced cheese, etc.)" and "Choose smoothies with less sugary and/or high-fat ingredients". The score of the first item was analyzed by itself as *self efficacy* for "dairy foods". The average of

responses for the other three items was calculated to produce a total score for *self efficacy* for low-fat dairy (Cronbach's a = 0.79).

Positive and negative expectations. Participants rated on a 5-point *strongly agree (5) – strongly disagree (1)* scale their expectations as a result of behavior change (i.e., increase dairy and/or low-fat dairy) (APPENDIX A, page # 131). Positive expectations included three items: "I will lose weight," "My health will improve" and "I will be less likely to gain weight". Negative expectations included three items: "Finding healthier foods on campus will be a lot of trouble," "I will have to spend too much time keeping track of what I eat" and "The food I eat will not taste good". Average scores for the three items constituting positive expectations (Cronbach's a = 0. 81) and negative expectations (Cronbach's a = 0.58) were calculated for each participant.

Self regulation. Each participant reported on a 5-point [*never (1) – seldom (2) – occasionally (3) – often (4) – repeatedly (5)*] scale, how often in the past three months he/she used self regulation strategies to consume low-fat dairy and dairy in his/her diet (APPENDIX A, page # 128). Strategies included "In the past 3 months, how often did you plan to drink or eat at least 3 servings of dairy foods every day" and "In the past 3 months, how often did you keep track of how many servings of dairy foods you eat each day". The average of the responses for these items was used as the self regulation variable (Cronbach's a = 0.68) for each participant.

Testing protocol. Data were collected at two points – January 2006 and May 2006. Technicians were trained to measure height, weight and WC by an American College of Sports Medicine director of Preventive and Rehabilitative Exercise Program (PD), according to guidelines of the American College of Sports Medicine for Exercise Testing and Prescription (34). Food records and questionnaires based on SCT were collected before the intervention and after the intervention during body measurement sessions.

Inclusion Criteria

Only participants who participated in data collection at the beginning of the study (January 2006) were eligible to participate in the second data collection period (May 2006), because paired data were required for data analysis. Subjects who completed data collection at both intervals were included in final analyses.

Intervention

Participants were randomly assigned to intervention or comparison groups after baseline data were collected. The intervention addressed self efficacy, outcome expectations, self regulation and self reported behavior for dairy and low-fat dairy and dairy products. Intervention components were delivered via a unique online course developed specifically for the study. Participants assigned to the intervention group (n=148) were added to the user list for the course and received messages via electronic mail sent to their University email addresses through the online course management system. After completion of baseline data collection, intervention components were delivered in modules, with one module per week for five weeks (APPENDIX A, page # 141).

Table 1 shows the intervention components in relation to the SCT model. The comparison group did not receive any form of intervention. Intervention topics included: importance of dairy/low-fat dairy intake in young adulthood (e.g., "calcium and bone health, calcium and weight regulation"); how to increase dairy/low-fat dairy intake in the diet (e.g., increasing intake of dairy-based smoothies, yogurt, cheese); recommended amounts of dairy/low-fat dairy servings to meet calcium requirements (e.g., number of dairy/low-fat dairy servings recommended by the United States Department of Agriculture guidelines; nutrient density per serving of dairy/low-fat dairy); availability of dairy/low-fat dairy on campus (e.g., nearby grocery stores and dining halls where dairy/low-fat dairy is available; brands that are available) and measuring intake to compare actual intake to recommended intake. For each topic, a variety of information was provided in short, attractive educational "flyers". Links to credible internet-based information were also provided (APPENDIX A, page # 150).

Information was sent via electronic mail to participants every day for the first three weeks, tapering to once each week for the final two weeks of the intervention (APPENDIX A, page # 141). Email messages tapered to one per week after three weeks due to fatigue reported by the participants. Participants were encouraged to complete daily behavior checklists that included target behaviors and were subsequently provided with tailored feedback. Participation for the completion of behavior checklists was encouraged with $20 gift drawings. Participants who completed all checklists for each week were entered into the drawing for that week.

Statistical Analyses

Data were analyzed via the Statistical Package for Social Sciences (SPSS) for Windows (version 15.0; Chicago, IL, 2006). The items in social support, self efficacy, and self regulation and outcome expectations (positive and negative) variables were averaged before computing the change score. Change scores for variables were computed by subtracting the post-intervention values from the baseline values. The change in SCT variables in intervention and comparison group were analyzed using multivariate analysis of covariance (MANCOVA) with age and gender as covariates. Self reported behavior change from the questionnaire was analyzed with the SCT variables. Changes in dairy and low-fat dairy servings from the food record were computed in the same way as change in SCT variable. Dairy servings from post intervention were subtracted from baseline values. Separate MANCOVA analyses were conducted to analyze the effect of the intervention on dairy and low-fat dairy intake from food records. Statistical significance was set at $p<0.05$.

Results

Study Population

Ninety two percent of the study participants completed the study (n=136 for comparison group, n=135 for intervention group), with no significant differences between groups for attrition. Mean±SE age of the participants at baseline was 20.2±0.1 years. There were no significant differences at baseline between intervention and comparison groups for gender, for age (yr), body weight (kg), WC (cm), BMI (kg/m^2), total dairy intake, low-fat dairy intake, or the combined SCT variables at baseline (Table 2)

Effect of Intervention on Total Dairy and Low-fat Dairy Intake from Food Records

Mean (adjusted±SE) low-fat dairy intake decreased by 0.03±0.06 servings/day in the comparison group and 0.01±0.06 servings/day in the intervention group. Mean (adjusted±SE) total dairy intake decreased by 0.11±0.08 servings/day in the comparison group and 0.12±0.07 servings/day

in the intervention group. There was no significant difference in change in total dairy intake or low-fat dairy intake between groups (comparison *vs.* intervention) after the intervention.

Effect of the Intervention on Social Cognitive Variables

Table 3 summarizes the estimated mean±SE change for the SCT variables in the comparison and intervention groups. A one-way MANCOVA was conducted to determine the effect of intervention on changes in SCT variables (i.e., social support, self efficacy, outcome expectations and self regulation) while controlling for age and gender. The multivariate test revealed significant differences between groups (intervention *vs* comparison) on the combined dependent variables, Wilks' $\Lambda = 0.930$, F (8, 260) = 2.436, $p = 0.015$. Age and gender did not show any significant influence on dependent variables. SCT variables which significantly differed between groups are described below.

Social support. There were no significant differences between groups (comparison *vs* intervention) for change in social support for dairy (total and low-fat dairy) from family and friends.

Self efficacy. There was significant group difference (comparison *vs*. intervention) in self efficacy for total dairy intake F (1, 267) = 3.900, $p=0.049$ (Table 3). Participants in the intervention group reported significant improvement on self efficacy to increase total dairy intake to at least three servings/day ($p<0.05$). However self efficacy for low-fat dairy intake did not improve in the intervention group and there was no significant group difference in self efficacy for low-fat dairy intake F (1, 267) = 0.894, $p>0.05$.

Positive and negative outcome expectations. There were no significant differences between groups (comparison *vs* intervention) for change in positive expectations and negative expectations after the intervention.

Self regulation. The intervention group showed significant improvement in the use of self regulation strategies to consume at least three servings of dairy every day after the 5-week intervention as compared to control group F (1, 267) = 4.360, $p=0.038$; (Table 3).

Self reported perceived dairy consumption. Participants were asked "In the past 3 months, how often did you eat more dairy foods". The intervention group showed significant

improvement as compared to the comparison group in perceived dairy intake F (1, 267) = 8.753, p=0.003.

Discussion

This study reports the effects of a web based intervention to promote self efficacy, self regulation, intent and behavior related to dairy intake in college students. Studies using web based interventions have reported that this method is well accepted by college students (28). Suminski *et al* (28) reported in one study that web based intervention improved knowledge and self regulation skills related to physical activity in college students. The intervention included email messages regarding information on dairy intake primarily. Additionally, credible links to resources on the World Wide Web were provided to the students, and fact sheets providing more detailed information related to email messages were posted on the course website. Online behavior checklists were used to promote self-regulation.

Although no changes were observed in the main outcome variable of dairy intake in this study sample, results showed positive and encouraging effects of the intervention on mediating SCT variables which included self regulation and self efficacy at the end of five weeks. This suggests that the internet based intervention may have been well received by the participants. Participants in the intervention group reported that they were more likely to use self regulation strategies and showed significant improvement in self efficacy to increase dairy intake than those in the comparison group.

Moreover, these findings support the importance of self regulatory skills, such as goal setting and self monitoring, and self efficacy for initiation and maintenance of healthy nutrition related behavior modification as theorized by Bandura (35, 36) and demonstrated in published studies (25-28). The relation between self regulation and self efficacy with dairy intake in this study population was not established. Rovniak *et al* (25) suggested that increase in self efficacy may lead to better employment of self regulatory strategies and subsequent behavior change in young adults. Contrary to the results by Rovniak and colleagues (25), Schnoll *et al* (27) reported that improved self regulation strategies affect behavior positively via self efficacy. Conflicting

results could be due to the fact that the outcome behavior in one study was related to physical activity (25) and the other was related to nutrition (27). Most of the studies in young adults targeting behavior modification have focused on physical activity (25, 26, 28) using SCT determinants with relatively few targeting nutrition related behaviors (27, 37). It is possible that self regulation and self efficacy may influence behaviors related to nutrition differently than to physical activity. Still, it is obvious that self regulation plays a pivotal role in behavior modification in young adults. Because college students lack self regulatory skills to maintain healthy lifestyles in spite of having high self efficacy (24), future interventions should target improving skills such as goal setting, self monitoring and planning to effectively modify behavior.

The intervention did not alter outcome expectations in the treatment versus comparison group. One possible explanation for this may be that young adults, specifically college students, believe that they are at a low risk of developing health related problems (38-41) specifically associated with dairy intake (39-40). Additionally, perceived barriers may result in lower self efficacy (38) which can result in no change in outcome expectations in this population. Moreover outcome expectations may not explain behavior beyond that explained by self efficacy (35 ,36). It is also possible that the intervention messages that addressed benefits of dairy intake and strategies to overcome barriers associated with dairy intake may have been inadequate.

The main outcome behavior of increased dairy intake did not change over the course of this intervention. Possible explanations for the inability of the intervention to change dairy and low-fat dairy intake include the length of intervention. The 5-week interval may have been too short, with limited impact. Social support which is an important mediating variable (25) was not addressed in the intervention. Published studies demonstrate that social support is crucial for maintaining healthful patterns throughout the college years (24, 26). Individuals in this age group may believe that they do not need to modify their behaviors. Although self regulation and self efficacy improved significantly, targeting social support may have enhanced the impact of the intervention on behavior change *via* self efficacy (25). Although participants in the intervention group scored significantly higher in the perceived measure of dairy intake than those in the comparison group, intake measured by food records did not change. Participants receiving the

intervention may have become more aware of the importance of dairy intake and therefore incorrectly perceived higher intake.

Interventions to change nutrition related behavior in young adults using mixed models derived from several theories may prove effective in young adults (37) as several theoretical constructs are related to behaviors. Young adults have low perceived severity/susceptibility to nutrition related health problems and high perceived barriers to nutrition related behavior modification (37-41). Thus, addressing these beliefs by incorporating messages into distinct and key constructs from multiple models of health behavior may be a more effective approach to understanding and altering nutrition related behavior (42-44).

Strengths of the current study include a relatively large sample size, and inclusion of 7-day food records for measuring the main outcome variable (dairy intake). The attrition rate for the study was low. Limitations include not addressing social support in the intervention which is an important mediator of behavior modification. Results of the study cannot be generalized to young adults not enrolled in school, nor to an ethnically diverse population of young students since the majority of the participants were Caucasians.

Conclusions

In conclusion, positive changes were seen in self regulation and self efficacy to improve dairy intake, although the intervention did not have the desired effect on behavior. This suggests that web based intervention was successful however a longer intervention addressing additional SCT variables may be required to influence behavior. Future interventions could target important constructs from the Health Belief Model such as perceived susceptibility/severity and benefits/barrier, by incorporating them in messages related to outcome expectations and expectancies in the SCT model.

TABLES

Table 1; Intervention components administered to address specific constructs from SCT model

Constructs	Intervention Component
Outcome expectations	Information on osteoporosis, weight gain and other health benefits; association between dairy calcium and health conditions. (Flyers email messages, websites). Nutrition information on low fat dairy foods; availability of dairy foods on campus.
Self efficacy	Tips for incorporating dairy in the diet while studying in the library or on the go. Adequate dairy intake. Behavior checklist. On-campus points of purchase for dairy products.
Self regulation	Behavior checklists, with quizzes and raffles as incentives for completion.

Table 2; Baseline characteristics and SCT variable measures of the participants in comparison and intervention groups [a,b]

	Comparison group (n=146)	Intervention group (n=148)
Female (%) [a]	80 (55%)	81 (55%)
Male (%) [a]	66 (45%)	67 (45%)
Age (years) [b]	20.18±1.5	20.20±1.29
Weight (kg) [b]	69.1± 1.2	69.3±1.2
Waist circumference (cm) [b]	76.10±0.96	76.11±0.94
Body Mass Index (kg/m^2) [b]	24.18±0.38	23.92±0.37
Total dairy (servings/day) [b]	1.43±0.09	1.46±0.08
Low-fat dairy (servings/day) [b]	0.44±0.07	0.46±0.07
Social support (Total dairy) family [b, c]	3.072±0.076	3.170±0.075
Social support (Total dairy) friends [b, c]	2.580±0.071	2.707±0.070
Self efficacy for low-fat dairy [b, e]	71.312±2.065	70.820±2.036
Self efficacy for total dairy [b, e]	66.158±2.299	64.735±2.266
Positive outcome expectations [b, c]	3.959±0.092	3.935±0.090
Negative outcome expectations [b, c]	2.950±0.076	2.895±0.075
Self regulation [b, d]	2.068±0.081	2.112±0.080
Perceived dairy intake [b, d]	3.094±0.092	3.217±0.090

[a] CHI SQUARE, $p<0.05$; expressed as percentages (%).

[b] MANCOVA with age and gender as covariates, p>0.05; means expressed as estimated marginal mean±SE.
[c] Scale of 1(strongly disagree) - 5(strongly agree).
[d] Scale of 1= Never 2= Seldom 3= Occasionally 4= Often 5=Repeatedly.
[e] Scale of 0 to100 where 0 is certain that I cannot, 50 is somewhat certain that I can and 100 is certain that I can.

Table 3; Estimated marginal mean change in SCT variable after intervention in the comparison and intervention groups [a]

Social cognitive Theory variables	Comparison Group (n=136)	Intervention Group (n=135)	F ratio/ P value
Social support from family [b]	- 0.214±0.074	0.071±0.074	1.851/0.175
Social support from friends [b]	- 0.121±0.076	-0.068±0.077	3.045/0.082
Self efficacy for low-fat dairy intake [d]	1.533±1.682	-0.720±1.688	0.894/0.345
Self efficacy for total dairy intake [d]	-1.745±2.157	4.291±2.165	**3.900/0.049***
Positive outcome expectations [b]	-0.025±0.130	-0.071±0.131	0.063/0.802
Negative outcome expectations [b]	0.021±0.088	0.053±0.088	0.351/0.554
Self regulation [c]	0.169±0.081	0.408±0.081	**4.360/0.038***
Perceived dairy intake [c]	-0.104±0.096	0.297±0.096	**8.753/0.003***

[a] MANCOVA with age and gender as covariates, p<0.05; means expressed as estimated marginal mean±SE.
[b] Scale of 1(strongly disagree) - 5(strongly agree)
[c] Scale of 1= Never 2= Seldom 3= Occasionally 4= Often 5=Repeatedly
[d] Scale of 0 to100 where 0 is certain that I cannot, 50 is somewhat certain that I can and 100 is certain that I can.

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CHAPTER 4

Identifying Factors Associated with Intake of Dairy Products in College Students

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Abstract

Objective: To identify barriers and motivators/facilitators of dairy consumption in college students. **Design:** Focus group discussions (n=3), online asynchronous discussion forums (n=3) or elicitation interviews (n=14) using identical questions based on student perceptions regarding dairy intake including barriers, motivators and facilitators for consuming dairy products.

Setting: Virginia Tech campus. **Participants:** Fifty students (36 females, 14 males) recruited from an introductory nutrition course. **Main outcome measures:** Barriers and motivators/facilitators for dairy consumption. **Analysis:** Major themes in responses were identified and compared for consistency. **Results:** Major barriers to consuming dairy foods included: 1) too expensive; 2) might go bad; 3) lack of refrigerated storage space; 4) sodas taste better/ more accessible/visible on campus; 5) more important for babies/children/old people; 6) will worry about it later. Major facilitators included: 1) seeing other people drinking milk; 2) reminders - make it visible; 3) awareness of specific, immediate benefits; 4) accessibility; 4) free refills (like soda in the dining halls); 5) having breakfast. **Conclusions and implications:** Students did not understand the amount of dairy products/calcium required and whether students felt they were getting enough. College campus environments should be altered to make incorporating dairy more “routine” for students.

KEYWORDS: Low-fat dairy, dairy intake, college students, barriers, facilitators, motivators.

Introduction

The 2005 Dietary Guidelines for Americans support consumption of three servings of dairy or equivalent dairy products per day by young adults (1). This intake is associated with adequate calcium intake recommended for this age group, overall nutrient quality of the diet (2-4) and health benefits (5) conferred by dairy products, specifically calcium from dairy products. Despite the fact that dairy consumption may improve overall health, consumption has declined significantly in the American population across race and gender and notably in young adults (2, 6-10). National food surveys (Continuing Survey of Food Intakes by Individuals 1994-1996, 1998 and National Health and Nutrition Examination Survey 1999-2000) show that young adults aged 19-30 years consume on an average less than two servings of dairy products per day (10). Similarly, Ranganathan *et al* (2) reported that only 20% of young adults consumed three or more than three servings of dairy products per day. This suggests that effective intervention strategies to improve consumption of dairy intake in young adults are needed.

Emerging data on health behaviors in adolescents and young adults suggest that many of these individuals engage in behaviors that may contribute to low intake of dairy products (6-8) and increase their risk for developing health issues such as obesity (11-14), insulin resistance (15), type II diabetes (16) and cancer (17). Research indicates that eating patterns develop early in life and persist into adulthood (18-20) and poor dietary patterns during childhood and adolescent years are associated with poor health in adulthood (21-24). Therefore, strategies to improve health such as modifying behavior to incorporate healthy eating patterns should be implemented during childhood, adolescence and emerging adulthood.

The dietary habits of young adults who transition from school to college are influenced by various factors. As they gain more independence away from home major lifestyle changes occur which may influence food choices. Personal and environmental factors including taste preferences, personal beliefs, and availability of healthy foods at meal time, social support from family and friends, and home environment (25-30) influence eating patterns. There is a need for understanding factors associated with dietary patterns and eating habits in college students so

that effective interventions can be implemented to improve them. Interventions to improve dairy consumption should target the salient motivators, barriers and facilitators of dairy intake to create an environment in which healthy food choices can be made and positive health behaviors can be promoted. While studies have identified some factors associated with dairy intake in adolescents (25-30), the current study aimed at identifying relevant characteristics that may contribute to the food choices, especially related to dairy intake, made by young adults in a college setting.

Description of the study

The study protocol was approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University (VPI&SU), Blacksburg, VA (APPENDIX B, page # 160). Informed consent was obtained from each subject prior to participation in the study (APPENDIX B, page # 1601).

Recruitment:

Participants (n=50) for this study were recruited from a freshmen level introductory nutrition course in the spring 2007 semester. All students in class (n= 450) were eligible to participate in the study. A recruitment announcement was placed on the course website using an online course management system during the first week of the class, and a descriptive flyer was sent via electronic mail to all students enrolled in the course. In addition, the principal investigator attended class to describe the study, answer questions, and encourage participation. Participant number was not limited, no exclusion criteria were applied, and participation was not mandatory. Participants received 5% of total class points as bonus points for participation. Alternate methods to earn bonus points were offered to students who chose not to participate.

Participants:

The age of participants recruited for the study ranged from 18 to 24 years (typical college age). Of the 50 participants who were recruited, 72 % (n=36) were females and 28 % (n=14) were males.

Data collection:

Participants were randomly assigned to focus group discussions, on-line discussion forums or elicitation interviews after they agreed to participate. Three focus group discussions were held with 4-6 persons per group, three online discussion sessions were held with 6-7 persons per group and 13 one on one elicitation interviews were held (APPENDIX B, page # 164).

Focus group discussions and elicitation interviews:

A facilitator (primary investigator) conducted all interviews and focus groups, according to standard methods (31, 32). The same facilitator guided each interview and focus group using probing statements when needed. The facilitator was a graduate student in human nutrition at Virginia Polytechnic Institute and State University. One co facilitator attended each focus group to maintain written records. All focus groups were conducted in a private conference room. All sessions were conducted during the Spring 2007 semester. Participants used their own understanding of what dairy products were during the focus group discussions and elicitation interviews. No instructions or any details were provided to them about products that are defined as dairy. Questions were designed to determine whether students were aware of current recommendations for dairy intake and could identify dairy products, to characterize student perception of current intake relative to future health risks, and to identify barriers and facilitators/motivators to consuming milk and dairy products on campus. Elicitation interview sessions included same questions as the focus group discussions (APPENDIX B, page # 164).

Online discussion session:

Questions similar to focus group discussions and elicitation interviews were posted via the discussion board application of the online course management system. Participants posted at least two responses (original thought or response to another participant's response) to each question; a response of "no comment" was also accepted. Participants were not required to respond or participate in the discussion on a particular issue if they were uncomfortable.

Data analysis:

Common themes were identified (31-33) by the secondary investigator and shared with the primary investigator who confirmed these themes based on original written notes and transcripts. Discrepancies were reconciled by the investigators. Common themes (similar responses reported by more than 50% of the participants) and meanings of these phenomena were categorized and described in the context of directed questions.

Outcomes

Seventeen students (female: n= 13; male: n=4) attended the focus group discussions, 13 (female: n=10; male: n=3) attended an elicitation interview and 20 (female: n=13; male: n=7) participated in the online discussion forum. There was widespread lack of clarity regarding amount of dairy products/calcium required and whether students felt they were getting enough. Almost half of the students considered foods like “eggs” “butter”, “cream”, “sour cream” and “margarine” as dairy products.

***Eating in dining halls**:*

The majority of the students (n=32, 63%) reported living in dormitories and having meals on campus because they found it “convenient”. Those who reported eating in dining halls (including the ones who lived off-campus) thought that these places were “accessible” and closer than going to eat off campus. Factors such as “meal plans”, “no time”, “parents pay” were associated with the choice to eat in the dining halls. A few students who lived off campus chose to have meals at home because they felt that they could cook healthy meals that taste better and cost less.

Barriers

Table 4 summarizes major themes identified for barriers to consumption of dairy products by the study population. Table 6 summarizes the questions associated with specific constructs.

Storage/shelf life/Accessibility:

Major barriers related to the intake of dairy products included the price of the product, shortage of storage place, and short shelf life. Many of those living on-campus found it difficult to store dairy products in the dormitory room refrigerator and since it “gets spoiled” fast and did not want to have it in their refrigerators. Additionally, they felt that getting to the store to buy

dairy products was too inconvenient and since sodas and carbonated drinks were more accessible and easily visible on campus they preferred to have sodas.

Price/flavor/family support:

Participants reported that sodas tasted much better than dairy products and were inexpensive. Participants revealed that having fountain dispensers and free refills for soda made it easier for them to choose carbonated drinks. Participants reported that since parents were not there to remind them to consume dairy products, they did not consume them as often.

Concerns about calories in milk and body image:

A few participants indicated that they avoided dairy products due to calories and believed that since they take calcium supplements it was not important to consume dairy products. The majority of students perceived low-fat milk to be tasteless and did not find it "filling" to incorporate it in their diets. Consuming dairy products did not seem like an important concern to these students in spite of their perception of not consuming recommended amounts of dairy products/calcium and being aware of its importance in health. They reported that they could not increase or have more dairy since they were not aware of the required amounts or did not know whether they needed to increase their intake.

Invincibility to health problems:

Some participants perceived college age in which they are developed completely and therefore assumed that they did not need to incorporate dairy foods in their diets. They revealed that their teeth and bones were fully developed so they did not need to incorporate dairy products into their diets. Many participants believed that they were not at risk of developing any kind of health problems related to low intake of dairy products. Moreover, health problems related to low dairy intake were perceived as "not important now".

Facilitators and Motivators

Table 5 summarizes the major themes identified for facilitators and motivators of consumption of dairy products by the study population. Table 6 summarizes specific questions associated with each theme.

Breakfast:

The majority of the participants who consumed dairy products reported that having breakfast, particularly ready to eat cereal, on a regular basis helped them to incorporate dairy products into their diets. Students reported that having breakfast which consists of “cereal” is “easy and quick”.

Immediate benefits:

Participants suggested telling them important and immediate benefits of dairy to help them consume recommended amounts of dairy products. Information on the amount of dairy products that is considered enough and how this intake would improve their health right now would definitely help them to increase their intake.

Accessibility/visibility/social support:

Participants suggested that making dairy products more “visible” on campus will “remind” them to consume it more often. They stated that “seeing other people drinking milk” would motivate them to do the same. Participants suggested having “free refills” like soda machines will facilitate their intake of dairy products.

Discussion

The themes identified in the current study show that barriers to dairy product consumption in college students are more pronounced compared to motivators/facilitators for consuming dairy products. Participants reported that their food choices on campus mostly depend on the time factor. For those living off campus, preparing meals at home was often too time consuming, which decreased their frequency of eating at home. These findings are consistent with published research which showed that lack of time is a major barrier to preparing food at home for young adults in college (34). Moreover, for those living on-campus in dormitories, inadequate resources such as appliances and meal preparation skills are major barriers thus prompting them to eat out more often (34).

In the current study participants reported lack of concern about problems associated with low intake of dairy foods such as bone loss and development of osteoporosis. Published studies have shown that concern about health and self efficacy for consuming healthy foods are

associated with the choice of location (i.e. restaurants, dining halls, home) for meals for young adults (35). It is possible that perceived lack of time and indifferent attitudes towards health problems associated with low dairy intake in college students may contribute to lower consumption of dairy foods. Since students who prepare meals at home are more likely to have healthier diets (34) and better meet dietary recommendations, future nutrition interventions should focus on importance of health associated with dairy intake, preparing meals at home, developing skills for preparing healthy meals in college students.

Participants in the current study felt that sodas are tastier, easily accessible and cheaper for them to consume more often than dairy products. Increased soda consumption has been associated with decreased dairy intake (8). Socioeconomic status also influences the choice of foods made by adolescents; as income level increases healthier food choices are made (25, 29). Dairy products may be perceived as an expensive food choice and therefore college students may not choose to incorporate them into their diet. Since college students mostly rely on parents for money, they may consider dairy intake as secondary in comparison to soda which is more freely available. Taste preferences are also associated with increased soda consumption and subsequent low dairy intake (25).

Lack of direct social support from parents at college was another factor associated with lower dairy intake. Parental influence has been shown to be a driving factor of dairy consumption in adolescents (25, 26). Moreover family support in adolescents is associated with lower soda consumption in young adulthood (25, 36). Therefore it is important that future interventions should attempt to incorporate family support to help young college students to increase their intake of dairy products.

Young adults feel they are invincible to diseases which are distal in nature, such as osteoporosis, and don't have time to think about it now (37). In the current study, students felt that they would worry about consuming dairy products later as they did not have time now. They wanted to know the immediate benefits of consuming dairy products to be convinced to consume them in adequate amounts. Moreover, college students may avoid dairy since they think that it has a lot of calories (29). Thus, interventions focusing on information regarding benefits of low-

fat and/or fat free milk in body weight regulation may help them to incorporate adequate dairy in their diets.

A major facilitator for dairy product consumption in the current study was breakfast intake. These findings extend prior published finding which shows that breakfast consisting of ready to eat cereal is associated with increased consumption of dairy (38). Some of the participants who consumed dairy products on regular basis in the current study indicated that they were aware of the importance of a balanced diet and were health conscious. This indicated that they may have had higher self efficacy for dairy products consumption as shown in studies previously (25). Individuals who are more health conscious have also been shown to have healthier diet patterns marked by high dairy intake (39). Participants reported that seeing others consume dairy products motivated them to increase their dairy intake suggesting the importance of social support (25-30). Research shows dairy intake is higher in home environments where dairy products are more "visible" and "accessible" (25-27). Having dairy products readily available during meals and/or easily accessible in the refrigerator at home increases intake of dairy products (25-27). Creating a similar campus environment by making dairy foods more "visible" and "accessible" in vending machines may improve their intake.

Implications for research and practice

This study investigated factors that were associated with dairy product/calcium intake in college students. The strongest barriers to consuming dairy products included the cost of dairy/calcium products, short shelf life, soda consumption and lack of social support including friends and family. Facilitators to dairy consumption included consumption of breakfast, easy accessibility, frequent reminders and increased self efficacy for healthful eating. These findings suggest that future interventions should target at improving self efficacy, social support from friends and family and increasing knowledge of immediate benefits of dairy product consumption in young adults. Creating an environment on campus in which participants are frequently reminded to consume dairy products and perceive dairy products to be easily accessible also may improve consumption of dairy products. Strategies for creating this

environment include having milk dispensers in dining halls with free refills and dairy foods in vending machines.

Table 4; Major Themes regarding perceived barriers to consuming dairy products

Theme	Meaning
Too Expensive	Milk and milk products are expensive on-campus
Shelf life	Milk and milk products go bad very fast
Storage	No place to store it in the dorm rooms and refrigerators
Prefer soda consumption	Soda consumption is easier as it is cheap and free refills are available. Thy taste better. They are more visible and accessible on campus
Important for babies/children and old people	Dairy and dairy products are required by those who are developing like babies and children and for old people
Will worry later	Osteoporosis/bone problems are old age issues and we will think about it later
Lack of parental influence	Parents are not there to remind us

Table 5; Major themes regarding perceived facilitators/motivators regarding consumption of dairy products

Theme	Meaning
Role models	Seeing others drink milk will remind us
Visible	Make it more visible on campus by having it in vending machines
Accessible	Offer free refills in dining halls
Benefits	Tell us the specific and immediate benefits
Breakfast	Easier to consume with cereal in breakfast “quick N easy”

Table 6; Interview Questions with the Health Behavior Model constructs addressed

Questions	Construct
List as many milk and dairy products that you can think of? Which ones are low-fat? Do you incorporate dairy and dairy products in your diet? Why or why not?	Self efficacy (SCT and HBM) Barriers or motivators (HBM)
Do you think it is important to have dairy/dairy products? Why or why not?	Outcome Expectancy (SCT)
Where do you buy your dairy/dairy products from? Why?	Self efficacy (SCT and HBM) Motivators (HBM)
Do you think you consume enough dairy/dairy products? Why or why not? Do you think you get enough calcium in your diet? Why or why not?	Self efficacy (SCT and HBM)
What things do you do to make sure you get enough dairy/dairy products?	Self Regulation (SCT): Monitoring
Tell me the first thoughts that come to your mind when you see the word? Skim milk, Low fat milk, Regular milk, Yogurt/Smoothies.	Outcome expectancies (SCT)
Do you think dairy/calcium intake will benefit you personally? Why or why not?	Negative and positive outcome expectations (SCT) Perceived barriers or benefits (HBM)
What are some positive things that you have heard about consuming dairy and calcium?	Positive outcome expectations (SCT) Perceived Benefits (HBM)
Are there any reasons that you or your friends tend to avoid dairy products? What are they?	Negative outcome expectations (SCT) Perceived Barriers (HBM)
Do you want to increase your intake of dairy? Why or why not?	Self Efficacy (SCT) Perceived Barriers or motivators (HBM)
What information do you need to increase your intake of dairy? Why?	Self Efficacy (SCT) OR Positive outcome expectation (SCT) Perceived Benefit or motivator (HBM)
What are some reasons that college students might have trouble getting enough dairy products or calcium in their diet?	Negative outcome expectation (SCT) Perceived barriers (HBM)

What are some reasons that college students might have trouble increasing their intake of low-fat dairy products?	
Do you think that you will gain unwanted weight in the next year? Why or why not?	Perceived susceptibility (HBM)
What will happen if you gain unwanted weight in the next year?	Perceived severity (HBM)
Do you think that you will have weak bones or break bones when you are old? Why?	Perceived susceptibility (HBM)
What will happen if you have weak bones or break bones when you are old?	Perceived severity (HBM)
In what ways do you get yourself to eat or drink things you think are healthy?	Self regulation (SCT): Planning and monitoring
Do you try to avoid gaining unwanted weight? -if yes, what things do you do to avoid gaining unwanted weight?	Perceived susceptibility and severity (HBM)

HBM: Health Belief Model
SCT: Social Cognitive Theory

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CHAPTER 5

Nutrition Education Intervention Improves Total Dairy Intake and Self Regulation Related to Increased Dairy Intake in College Students

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Abstract

OBJECTIVE: To improve social support, self efficacy, outcome expectations, self regulation and behavior related to dairy intake in college students using Social Cognitive Theory (SCT). **DESIGN:** Experimental design. **SETTING:** University campus. **PARTICIPANTS:** 211 college students, Mean±SE age: 20.2±0.1yr. **INTERVENTION:** Intervention group (n=107) and Comparison group (n=104). Data collection included measured height and weight, dairy intake from food records and SCT variables from questionnaires administered in January 2008 and April 2008. An 8-week electronic mail intervention was conducted (messages regarding benefits of dairy intake). Participants and their friends were invited to informative socials. **MAIN OUTCOME MEASURES:** Changes in dairy intake and SCT variables (social support, self efficacy, outcome expectations and self regulation). **ANALYSIS:** Multivariate analysis of covariance, with age and gender as covariates; ($p<0.05$). **RESULTS:** Ninety one percent of subjects (n=97 intervention, n=94 control) completed the intervention. Compared to controls, the intervention group reported higher intake of total dairy ($p=0.012$), improved use of self regulation strategies for consuming 3 servings/day of total dairy ($p=0.000$) and low-fat dairy ($p=0.002$) following the intervention. **CONCLUSION**: Nutrition education intervention improved total dairy intake and self regulation regarding increased dairy intake in college students. Future interventions should focus on immediate benefits of dairy consumption in young adulthood.

KEYWORDS: Social cognitive theory; young adults; dairy intake; low-fat dairy intake; self regulation

Introduction

College attendance typically occurs during a period of early young adulthood in which students gain independence as they transition from high school to college and make most of their decisions without parental guidance. This period is characterized by change in which they explore new environment and adopt new behaviors (1). One of these behaviors includes dietary choices and habits. According to research in college students on dietary behaviors, young adults in college engage in poor dietary behaviors which may put them at risk of rapid weight gain (2-4). One such behavior of concern is the declining intake of dairy products. Published data on dairy consumption in young adults – a period which includes the college age population, shows that average intake is between one to two servings per day (5, 6). A minimum of three servings per day of dairy products, preferably low-fat or fat-free, is the national guideline (7).

The campus environment to which college students are exposed may contribute to poor food choices and subsequent development of poor dietary patterns (8). Examples of this environment include “all you can eat” dining halls, easily accessible soda machines and high calorie junk foods (8). Since the recommended dairy intake is associated with overall better nutrient quality of the diet (9, 10) and because there are several health benefits conferred by bioactive components and nutrients present in dairy products (11), college students should be encouraged to improve total dairy intake, with emphasis on low-fat dairy products.

College students may be more receptive to new advice, compared to older adults (1). Therefore, nutrition interventions targeting improved dairy intake may be successful in this population and may continue into adulthood (12, 13). Moreover, since dairy intake declines substantially during young adulthood (6-9), intervention at this point and in this target population is ideal to prevent further decline in dairy intake.

Intervention studies focusing on health behavior modifications have shown little impact on behavior, thus highlighting the need for construction and testing of more rigorous theory-based interventions (14). An understanding of the processes via which mediating variables influence behavior is important so that effective interventions can be developed and implemented

to attain meaningful changes in behavior (14). Theory based interventions can provide this information (14). Social Cognitive Theory (SCT) is one of the commonly used theories in nutrition education interventions (15-18) and is framed by personal, environmental and behavioral interactions to explain behavior. Self efficacy (one's confidence in self to perform the behavior), self regulation (ability to regulate action pertaining to the behavior), outcome expectancy (i.e. good or bad consequences resulting from the behavior) and social support (emotional support from family and friends to perform a behavior) are key SCT constructs (19, 20). The theory posits that individuals who adopt healthy behaviors have high perceived self efficacy for behavior change and in turn employ better self regulatory skills to achieve it. Those who have high outcome expectations and supportive social network can sustain the behavior for longer periods of time in spite of lapses via improved self efficacy (19, 20). Published research demonstrates that college students may lack self regulatory skills and that self efficacy; outcome expectations and social support for maintaining healthful patterns strongly influence health behaviors during the college years. (21). Several studies that examined correlates of dairy intake indicate that personal and environmental factors that influence dairy consumption in this young adult population (22-27) fall into the realm of Social Cognitive Theory. Therefore, the main aim of the current study was to improve total dairy intake (regular and low-fat) in young college students and to test the SCT model of behavior change related to dairy intake.

Methods

The study protocol was approved by the Institutional Review Board for Human Subjects Testing at Virginia Polytechnic Institute and State University (VPI&SU), Blacksburg, VA (APPENDIX C, page # 166). Informed consent was obtained from each subject prior to participation in the study (APPENDIX C, page # 168).

Setting

A land grant, research-intensive university in a location in the mid-Atlantic region of the United States served as the setting of this study.

Recruitment

Participants were recruited from two personal health classes (EDHL 1514 and EDHL 3534) in the spring 2008, semester. A recruitment announcement was placed on the course website during the first week of the class using a course management software program, and a descriptive flyer was sent via electronic mail to all students enrolled in both courses. In addition, the principal investigator attended each class to describe the study, answer questions, and encourage participation. Participants received 15% of total class points; alternative projects to earn the same credit were offered to students who did not elect to participate in the study.

Inclusion criteria

All students enrolled in both the classes were eligible to participate. Participant number was not limited, and participation was not mandatory. No exclusion criteria were applied. Only participantss who participated in data collection at the beginning of the study (January 2008) were eligible to participate in the second data collection period (May 2008), because paired data were needed for data analysis.

Participants

Two hundred eleven participants enrolled in the study. Of these 211 subjects, 63% were female, and 37% were male. The majority of participants were Caucasian (78.7%), while 10% were Asian/Pacific Islander, 5.7% were Black/African American and 5.7% did not disclose their race. This racial distribution was representative of the undergraduate student population at VPI&SU. Only 14.7% of participants enrolled in nutrition (2.4%), foods (1.4%), exercise (0.5%) or health (10.4%) majors. The majority of the participants (93.8%) consumed dairy products. Few participants (1.9%) were underweight [body mass index (BMI)= <18.5kg/m^2]. Most participants (75.8%) were of normal weight [body mass index (BMI)=18.5-24.9 kg/m^2], 18.1% were overweight (BMI=25-29.9 kg/m^2), and a small proportion (4.2%) were obese (BMI==30.0 kg/m^2). Using a random number generator, 107 participants were randomly assigned to the intervention group, and 104 participants were assigned to the comparison group.

Measures

Demographic variables and health history. Participantss completed a standard questionnaire that included information on age, gender, race, ethnicity, and college major. Participants also completed a health history questionnaire (APPENDIX C, page # 177 and 178).

Anthropometric measures. Fasting (overnight and minimum of eight hours since last meal) body weight, height and waist circumference (WC) measurements were taken with participants wearing lightweight clothing and no shoes. Weight (kg) and height (cm) were measured using a balance beam (Seca, Hanover, MD) scale with a stadiometer. Waist circumference (cm) was measured three times at the narrowest curve between the ribcage and hip bone above the belly button using a non-stretchable measuring tape. Measurements were averaged, and the mean value was used in statistical analyses. Body mass index (kg/m^2) was calculated (Appendix A, 139).

Body composition. Data were collected at two time points – January 2008, and May 2008. Technicians were trained to measure height, weight and WC by an American College of Sports Medicine director of Preventive and Rehabilitative Exercise Program (PD), according to guidelines of the American College of Sports Medicine for Exercise Testing and Prescription (28). Food records and questionnaires based on SCT were collected before the intervention and after the intervention during body measurement sessions.

Food record for dairy servings. Participants completed a 7-day food record (APPENDIX A, page # 138). A detailed instruction sheet was provided to each participant to assist in completion of food records (APPENDIX A, page # 136). Instructions included a list of examples for the correct recording of popular food items, including serving sizes. Participants were asked to record their food intake using standard serving sizes along with the timing and location of the meal. Dairy servings from food records were calculated based on MyPyramid (29). Dairy products included milk, cheese, yogurt, ice cream, pudding and milk-based smoothies. Regular dairy products were defined as products made with > 1% milk fat. Low-fat dairy products were defined as products made with =1% milk fat. Total dairy was calculated as the sum of regular and low-fat dairy products. Servings of dairy from mixed meals were determined by calcium content equivalent to 1 cup of milk (8 ounces) or ~300 mg of calcium (29).

Social Cognitive Theory variables

Questions for measuring the predictors of social cognitive theory variables were adapted from a validated health beliefs survey to measure eating behaviors. Modifications of the Health Beliefs survey have yielded reliable and valid instruments (16-18) (APPENDIX C, page # 177).

Social Support. Social support was measured using a 5-point; *strongly agree (5)* – strongly *disagree (1)* scale (APPENDIX C, page # 180). Participants rated their perceived support from family members and friends regarding total dairy for five items, low-fat dairy intake for four items and osteoporosis for 2 items. Responses were averaged for social support from family for total dairy (Cronbach's a = 0.658) and low-fat dairy (Cronbach's a = 0.764). Similarly, responses were averaged for social support from friends for total dairy (Cronbach's a = 0.682) and low-fat dairy (Cronbach's a = 0.771). Table 8 shows items included for perceived social support from friends and family.

Self efficacy. Self-efficacy was measured using a 100-point scale to rate "How certain are you that you can" for self efficacy for reaching goals and consuming low-fat dairy foods (APPENDIX C, page # 183). Possible responses ranged from *certain that I cannot (1) – somewhat certain I can (50) - certain that I can (100)*. The responses for self efficacy for reaching goals included 2 items and were averaged (Cronbach's a = 0.783) and responses for self efficacy for consuming low-fat dairy foods included 8 items and were averaged (Cronbach's a = 0.899) separately. Refer to Table 8 for items included for self efficacy.

Outcome expectations. Participants rated on a 5-point *strongly agree (5) – strongly disagree (1)* scale their expectations as a result of the behavior change (i.e., increase dairy and/or low-fat dairy intake) (APPENDIX C, page # 184). Positive expectations included nine items, and negative expectations included thirteen items. Average scores for the nine items constituting positive expectations (Cronbach's a = 0. 824) and negative expectations (Cronbach's a = 0.882) were calculated for each participant. Table 8 shows the items included for this construct.

Self regulation. Each participant reported on a 5-point [*never (1) – seldom (2) – occasionally (3) – often (4) – repeatedly (5)]* scale; how often in the past three months he/she used self regulation strategies to consume three servings of total dairy and low-fat dairy products in his/her diet (APPENDIX C, page # 182). Responses for five items for total dairy (Cronbach's a = 0.848) and

six items for low-fat dairy (Cronbach's a = 0.903) were averaged. Table 8 shows the items included for this construct.

Intervention

Participants were randomly assigned to either treatment (n=107) or comparison (n=104) group after baseline data were collected. The intervention addressed self efficacy, outcome expectations, self regulation and social support for dairy and low-fat dairy products. Intervention components were delivered via a unique online course developed specifically for the study. Participants assigned to the intervention group were added to the user list via the online course management system and received messages via electronic mail sent to their University email addresses through the online course. After completion of baseline data collection, intervention components were delivered in modules, with one module per week for eight weeks (APPENDIX C, page # 190).

Treatment group

Messages:

Table 9 shows the intervention components administered in modules every week. Intervention topics included: 1) importance of dairy/low-fat dairy intake in young adulthood (e.g., "calcium and bone health, calcium and weight regulation"); 2) how to increase dairy/low-fat dairy intake in the diet (e.g., increasing intake of dairy-based smoothies, yogurt, cheese); 3) recommended amounts of dairy/low-fat dairy servings to meet calcium requirements (e.g., number of dairy/low-fat dairy servings recommended by the United States Department of Agriculture guidelines, nutrient density per serving of dairy/low-fat dairy); 4) availability of dairy/low-fat dairy on campus (e.g., nearby grocery stores and dining halls where dairy/low-fat dairy is available, brands that are available); 5) measuring dairy intake against recommended intake; 6) reading food labels on dairy products to make better choices (e.g., amount of calories per serving in low-fat milk). For each topic, a variety of information was provided in short, attractive educational "flyers" from 3 A day, National Dairy Association, and USDA websites. Links to credible information available on the internet were also provided. Information was sent via electronic mail to participants once each week for eight weeks. Participants were also asked to provide email addresses for their parents or family members who were sent similar information

on dairy intake in the diet for one week and were asked to encourage the participants to incorporate dairy products in the diet (APPENDIX C, page # 191).

Weekly quizzes:-

Participants completed weekly behavior checklists for consumption of low-fat dairy foods for four weeks. Checklists were designed to foster self-monitoring and goal setting to provide a mechanism for reinforcement of messages and behaviors. The quiz/exam tool in the online course management system was used to provide individualized feedback based on participant responses. Checklists were brief (3 to 5 questions) and provided space for comment by participants. Automatic feedback was programmed based on possible responses. For example, participants who responded that they consumed no low-fat dairy products for a particular week received different feedback than subjects who responded that they consumed three or more servings per day. Feedback included evaluation of success in meeting the recommended intake along with suggested strategies for improvement. Weekly raffles for two $10 gift certificates served as incentives for completion of checklists. Participants who completed the weekly checklist were entered into the raffle for that week and there were two winners each week.

Social events:

Three social events were held during one week; each participant was invited to attend one event. Invitations to the social event were distributed via announcements on the course website and individual email messages. Participants were encouraged to bring along their friends and were free to attend any session that met their scheduling needs. Attendance lists were kept to track attendance for individual participants. Participants were entered in a raffle draw for school sweatshirts and there were total of three draws, one for each event.

Each event included a short information session on dairy foods, hands-on activities, distribution of fact sheets, and free target foods such as yogurt and milk which were donated by a local dairy distributor. The campus dietitian attended the sessions to help deliver educational messages and to familiarize participants with different locations on campus where dairy foods were available. The free target foods highlighted items available on campus at various locations.

Comparison Group

Participants in the comparison group received information on stress management (APPENDIX C, page # 229). This topic was selected because it was not directly related to dietary habits or weight regulation. Delivery of the information for the comparison group was again primarily via internet, using an online course developed via the same online course management system. Individual email messages and reminders and brief messages were sent via campus mail which supplemented the course website. Links to online resources and leaflets already provided by Virginia Tech were provided to the participants. Refer to Table 9 for the intervention components.

Statistical analyses

Data were analyzed using the Statistical Package for Social Sciences (SPSS) for Windows (version 15.0; Chicago,IL, 2006). The items in social support, self efficacy, and self regulation and outcome expectations (positive and negative) variables were averaged before computing the change score. Change scores for variables were computed by subtracting the post-intervention values from the baseline values. The change in SCT variables in intervention and comparison group were analyzed using multivariate analysis of covariance (MANCOVA) with race and gender as covariates. Changes in total dairy, regular fat dairy and low-fat dairy servings from the food record were computed in the same way as change in SCT variable. Dairy servings from post intervention were subtracted from baseline values. Separate MANCOVA analyses were conducted to analyze the effect of the intervention on total dairy and low-fat dairy intake from food records. Statistical significance was set at $p<0.05$. Subjects who were lactose intolerant or avoided dairy products for other reasons and did not complete data collection at both intervals were excluded from the final analyses.

Results

Study Sample

Ninety one percent of the study participants completed the study (n=94 - comparison group, n=97 - intervention group). Of these one hundred and ninety one participants, ten participants were excluded from final analyses because they did not consume dairy foods; two other participants were excluded from final analyses due to improperly recorded 7 day food records. The final analyses included 89 participants in the comparison group and 90 participants in the intervention group. Mean±SE age of the participants at baseline was 20.2±0.1 years. There were no significant differences between intervention and comparison groups for gender: χ^2 (1, N=196) = 0.108, p=0.743, and race χ^2 (3, N=196) = 1.547, p=0.671. The multivariate test (MANOVA) indicated no significant differences between intervention and comparison group at baseline for age (yr), total dairy and low-fat dairy intake and SCT variables (Table 10).

Rate of participation in social events and behavior checklists

Of the 97 participants from the intervention group, only 15 (15%) attended the socials with their friends. Though free target foods (low-fat yogurt and milk) were distributed and door prizes were held, the participants were not motivated enough to participate. Seventy four students (76%) of the 97 enrolled in the intervention group participated in behavior checklist in the first week. The rate of participation declined later. Forty (41%), forty-eight (49.5%) and seventy-two (74%) students participated in the second, third and fourth quiz respectively. Most of the family members, who received information encouraged and reminded the students regularly to consume dairy. However only seventeen students of the 97 enrolled provided the email addresses.

Effect of Intervention on Total Dairy and Low-fat Dairy Intake

Overall mean (± SE) baseline total dairy, regular dairy and low-fat dairy intake in the population was 1.32±0.07 , 0.94±0.05 and 0.38±0.04 respectively. Dairy intake (total, regular and low-fat) did not differ between groups (Comparison *vs.* Intervention) at baseline (Table 10). The intervention group showed significant increase in total dairy intake after the 8-week intervention as compared to control group. Total dairy intake increased by 0.17 servings per day in the intervention group as compared to a decrease of 0.13 servings per day in the comparison group. Low-fat dairy intake showed marginal (p=0.080) increase by 0.17 servings per day in the intervention group (effect size = 0.106) as compared to the comparison group where it decreased (-0.04 servings/day). Regular dairy intake remained unchanged in the intervention group. Table

11 shows the estimated mean±SE change in dairy intake in the comparison and intervention groups.

Effect of the Intervention on Social Cognitive Theory Variables

Table 11 summarizes the estimated mean±SE change for the SCT variables in the comparison and intervention groups. A one way MANCOVA was conducted to determine the effect of intervention on changes in SCT variables change (i.e. social support, self efficacy, outcome expectations -positive and negative and self regulation) while controlling for race and gender. MANCOVA analysis showed significant differences between groups in one of the SCT variables which is presented below.

Self regulation. ANCOVA showed significant group differences for total dairy self regulation F (1, 177) = 15.160, p=0.000 [effect size = 0.273 (small)] and low-fat dairy self regulation F (1, 177) = 10.241, p=0.002 [effect size = 0.211 (small)] (Table 11). The intervention group showed significant improvement in the use of self regulation strategies to consume at least three servings of total dairy and low-fat dairy foods every day after the 8-week intervention as compared to control group.

Self efficacy. There was no change in self efficacy for achieving goals and self efficacy for consuming low-fat dairy intake in the intervention group or comparison group after the 8 week intervention (Table 11).

Outcome expectations. There were no significant differences between groups (Comparison *vs* Intervention) on positive expectations and negative expectations after the intervention (Table 11).

Social support. There were no significant differences between groups (comparison *vs* intervention) in social support for dairy (total and low-fat dairy and osteoporosis) from family and friends (Table 11).

Discussion

This study reports the effects of nutrition education intervention to promote self efficacy, self regulation, outcome expectations, social support and behavior related to total dairy (low-fat

and regular fat) intake in college students. At the end of the 8 week intervention, participants in the intervention group reported consuming significantly higher amount of total dairy (p=0.012) as compared to those in the control group. Published data shows that dairy intake declines in young adulthood (5, 6). The results of the current study support these data. Total dairy intake in the participants from the comparison group decreased by 0.13 servings per day. Though low-fat dairy intake did not change significantly, consumption improved in the intervention group by 0.17 servings per day. Thus, these results show positive and encouraging effects of the intervention on dairy consumption, suggesting that nutrition interventions in college students can help in preventing dietary habits from deteriorating as otherwise seen in this age group (2-4). The intervention may have produced significant changes in low-fat dairy intake in a larger sample.

Although no changes were seen in self efficacy, outcome expectations and social support, results showed positive and encouraging effects of the intervention on self regulation which is one of the most important mediating SCT variables (19, 20). Participants in the intervention group reported that they were more likely to use self regulation strategies for consuming at least 3 servings of total dairy and low-fat dairy intake at the end of the 8 week intervention as compared to those in the control group (Table 11). Self regulatory sub skills such as goal setting and self monitoring are important for initiation and maintenance of healthy nutrition related behavior modification (15-18). The intervention included weekly behavior checklist and quizzes on development of self regulation skills. Participants may have realized the importance of setting goals, monitoring dairy intake and planning the day such that they can incorporate dairy in the diet. Though self regulation for total dairy intake improved, it was not correlated with total dairy (r=0.095; p=0.191). This may be due to the small effect on change in total dairy intake and small sample size

Those who have high self efficacy to perform a behavior use improved self regulatory skills change behavior (30, 31). Self efficacy can be improved by mastery experiences (20). However, the intervention failed to improve self efficacy for improved dairy consumption in the current population. It is possible that since the intervention focused more on development of self regulatory skills, it may not have had the desired impact on self efficacy. Participation in the

intervention may have caused the participants to realize that achieving three servings per day of dairy products is important but requires effort, since mean intake was low (1.32 servings/day). Had the intervention been longer in duration (> 8 weeks) it may have had the desired impact on changes in self efficacy. Moreover, the intervention did not include specific mastery experiences and relied on messages related to improving self efficacy.

College students have high perceived barriers to healthy eating and low perceived severity/susceptibility to health problems related to dairy intake (32, 33). Moreover they may not be concerned about health problems (such as osteoporosis) related to low dairy consumption that are distal in nature (32, 33). Though, the current study incorporated messages related to barriers in outcome expectations (positive and negative), the intervention did not change outcome expectations in the participants. Participants in the study were given information on the amount of dairy which is recommended, calcium and other nutrients present in a cup of milk and the calcium content that is required per day by individuals, because research shows that knowledge of dairy and calcium may be one of the barriers which is associated with low dairy intake (32, 33). Still, the intervention failed to alter outcome expectations. It is possible that the intervention may not have addressed outcome expectations adequately. Moreover, college students may lack specific health goals which may result in low outcome expectancy (value associated with the benefits of the desired behavior) which is important to bring about behavior change (34). In the current study improved intake of dairy products (desired behavior) and associated health benefit (prevention of bone loss/ osteoporosis) may not be perceived as valuable by college students. The intervention group showed a marginal decrease in positive outcome expectations (Table 11). Positive outcome expectations addressed benefits associated with improved dairy intake (Table 8) and the impact of the intervention on outcome expectations may also have been reduced because participants may have become more realistic about their personal health goals.

A supportive social environment is crucial for development and maintenance of positive health behaviors in college students (35). High perceived social support from family and friends is important for enacting the self regulatory behaviors which are necessary for adopting the desired behavior. Social support for friends was incorporated in the intervention via socials in which participants were asked to bring their friends. However, participation in social events by

participants and their friends was very low, indicating they may not have been interested in attending these socials. Similarly, participants provided email addresses of one family member who were sent information on dairy foods similar to that given to the participants. Though friends and family members did encourage the participants to incorporate dairy intake, improved change in social support was not observed. This may be due to low participation rate in this component of the intervention.

Strengths of the current study were: inclusion of 7-day food records for main outcome variable measurement (dairy intake); incorporating messages related to barriers and susceptibility/severity from health belief model in outcome expectations (positive and negative); low attrition rate. Limitations of the current study include: self-reported dietary intake which may not reflect actual intake of individuals and may have led to overestimation or underestimation (36, 37); limited generalizability of the results to ethnically diverse population of young students as the majority of the participants were Caucasians; limited generalizability of the results to young adults not enrolled in college.

Implications for research and practice

The intervention was successful in increasing total dairy intake in the participants as compared to comparison group. Participants in the intervention group improved the use of self regulation strategies to increase total dairy and low-fat dairy intake. However self efficacy, social support and outcome expectations did not change. Since self efficacy may impact behavior via self regulation (30) future interventions should focus on raising self efficacy in participants which can be achieved by including mastery experiences. One way to improve mastery skills to increase dairy can be by showing participants different ways to incorporate dairy into cooking and teaching them how to improve their cooking skills. College students who lack cooking skills (38) may have low self efficacy to improve dairy because they may not know how to cook. Friends and family can be included in future interventions for a longer duration unlike the current study which included one week intervention for social support. Since college students are

worried about body image (39), one other strategy to improve positive outcome expectations by reducing barriers could be to incorporate benefits of dairy intake on body weight regulation more intensely and improving outcome expectancy. Though information on weight regulation was given in the current study, in the future it may help to emphasize this more instead of osteoporosis. Finally the study improved total dairy intake in the participants though the effect was small. Improved use of self regulatory strategies to consume at least three servings per day of dairy suggests that participants may have developed skills to set goals, plan and monitor their daily intake. These results indicate potential success for interventions based on SCT to improve dairy intake in college students. Future interventions should focus on more immediate benefits for young adults and place more emphasis on self efficacy, social support and outcome expectations.

TABLES

Table 7; Intervention components administered to address specific constructs from SCT model

Constructs	Intervention Component	Method of delivery
Outcome expectations	• Information benefits of dairy in health. • Nutrients present in dairy • Quantity recommended • Type of dairy that is recommended (low-fat vs. regular fat • Places on campus to find dairy	• Email messages • Informative Flyers from National Dairy Council • Presentation by campus dietitian during socials
Self efficacy	• Ways to incorporate dairy in the diet while studying in the library or on the go. • Provided recipes • Different ways to incorporate it in all the meals. • What kind of beverages to drink • How many servings to consume • The amount that constitutes one serving.	• Email messages • Informative Flyers from National Dairy Council • Presentation by campus dietitian during socials • Free dairy products were distributed during socials for tasting
Self regulation	• Behavior checklists • Weekly quizzes	• Incentives like gift certificates • Raffle draws for free products • Gifts from campus store
Social support	• Similar information on dairy foods provided to family members and friends.	• Email messages • Informative Flyers from National Dairy Council • Friends were invited to presentations by campus dietitian during socials

Table 8; Items included in the questionnaire for different constructs based on Social Cognitive Theory

Constructs	Items Included
Social Support from family and friends for total dairy [a]	• Believe that is it important to consume adequate calcium in the diet. • Eat at least 3 servings of dairy foods everyday. • Have told me that they want to eat enough calcium everyday. • Believe that consuming milk and milk products is important. • Believe that milk and milk products are the best sources of calcium.
Social Support from family and friends for low-fat dairy[a]	• Try to eat low-fat dairy foods everyday. • Believe that drinking whole milk adds unnecessary calories. • Like drinking skim milk and or low fat milk. • Like eating low fat and/or skim dairy products.
Self Regulation for total dairy intake [b]	• Pay closer attention to drinking/eating more dairy foods. • Plan to eat at least 3 servings of dairy foods every day. • Keep track of how many servings of dairy foods you eat each day. • Remind yourself that consuming adequate dairy is important. • Remind yourself that consuming adequate calcium is important.
Self Regulation for low-fat dairy intake [b]	• Pay closer attention to drinking/eating more low-fat dairy foods • Pay closer attention to drinking low fat milk or skim milk instead of higher fat choices • Plan to eat low-fat dairy instead of high fat dairy foods to control calories • Plan to eat at least 3 servings of low-fat dairy foods every day • Eat more low-fat dairy foods • Eat more low fat dairy and dairy products to consume adequate calcium
Self efficacy for reaching goals[c]	• Drink or eat at least 3 servings of dairy foods each day? • Drink or eat at least 3 servings of low-fat dairy foods each day?
Self efficacy for consuming low-fat	• Drink 1%, ½%, or fat-free (skim) milk instead of higher fat milk? • Eat low-fat cheese products (such as cottage cheese, sliced cheese, etc.)? • Eat low-fat fresh yogurt? • Eat low-fat frozen yogurt? • Eat low-fat ice cream?

dairy[c]	• Eat low-fat dairy foods before you go to class or work? • Eat low-fat dairy foods when you have an early class, meeting, etc.? • Choose smoothies with less sugary and/or high-fat ingredients?
Positive outcome expectations[a]	• I will have more energy. • I will lose weight. • I will not get osteoporosis. • I will feel better in my clothes. • My health will improve. • I will be less likely to get cancer or heart disease. • I will be less likely to gain weight. • I will be more attractive. • I will be doing what I know I should.
Negative outcome expectations[a]	• I will be hungrier. • I will miss eating the foods that I love. • Finding dairy foods on campus will be a lot of trouble. • Finding low-fat dairy foods on campus will be a lot of trouble. • I will have to change a lot of my favorite foods. • I won't be able to eat the same foods as my friends. • I won't be able to eat the same foods as the rest of my family. • I will have to spend too much time keeping track of what I eat • Low-fat dairy foods will not taste good. • It will take too long to prepare meals and snacks. • I will have to plan my meals too far in advance. • I won't be able to stick with it – I'll just go back to my old habits. • My friends won't want to eat with me.

[a] Scale of 1(strongly disagree) - 5(strongly agree).
[b] Scale of 1= Never 2= Seldom 3= Occasionally 4= Often 5=Repeatedly.
[e] Scale of 0 to100 where 0 is certain that I cannot, 50 is somewhat certain that I can and 100 is certain that I can.

Table 9; Intervention components administered during eight weeks in modules for the intervention and comparison group

Week	Treatment group	Comparison group
Week 1	• Attaining peak bone mass • Preventing osteoporosis • No of servings/day of dairy recommended by USDA • Reason for recommendation • Behavior checklist and online quiz on tracking dairy intake	• What is stress • Effect of stress on the body? (emotional and physical) • Leaflets provided by Virginia Tech were posted on the Blackboard™ site for the students
Week 2	• Potential role of dairy in regulating weight. • How much dairy is sufficient? • Nutrient information of different beverages (sports drinks and flavored dairy drinks) choosing the right beverage. • Behavior checklist and online quiz on monitoring dairy intake. • Social events for participants and their friends where information on dairy foods was provided by campus dietitian.	• What is burnout? • How to recognize it? • How to cope with it? • How the hormones respond to burnout?
Week 3	• Information on nine different nutrients present in dairy foods. • Information on other health benefits • Behavior checklists and quizzes on strategies to improve dairy intake.	• How to assess stress? • What is good and bad stress. • Recognizing physical, emotional and behavioral symptoms of stress
Week 4	• Importance of reading food labels • How to read them • Different types of labels and health claims	• Combat stress by relaxation and exercise? • Avoiding vices like smoking and alcohol to prevent stress
Week 5	• Information on dairy foods send to parents • Parents asked to encourage participants to incorporate 3 servings of dairy daily. • How to incorporate dairy for breakfast, lunch, and dinner was provided with different ideas for recipes. • Understanding diet quality.	• How to develop positive attitude towards stress and in turn combat stress.
Week 6	• Summary of all the information provided • Summary of health at a glance	• Keep everything light and not take things too seriously. • Laughter as best medicine.
Week 7	• How to set goals, plan, monitor, track and achieve goals. • Information on how to develop strategies • How they can achieve their goals.	• Importance of meditation to combat stress.
Week 8	• Reinforce development of strategy to achieve goals. • Behavior checklists and quizzes on strategies to improve dairy intake.	• Seven different stress busters

Table 10; Baseline characteristics and SCT variable measures of the participants in comparison and intervention groups [a,b]

	Comparison group (n= 104)	Intervention group (n=107)	P value
Female (%) [a]	60 (60.6%)	61 (62.9%)	0.743
Male (%) [a]	39 (39.4%)	36 (37.1%)	0.743
Caucasian [a]	80 (80.8%)	74 (78.6%)	0.671
Asian Pacific Islander [a]	10 (10.1%)	10 (10.3%)	0.671
African American [a]	4 (4%)	8 (8.2%)	0.671
Did not disclose race [a]	5 (5.1%)	5 (5.2%)	0.671
Age (years) [b]	20.08±0.14	20.27±0.14	0.345
Low-fat dairy (servings/day) [b]	0.39±0.06	0.42±0.06	0.679
Regular fat dairy (servings/day) [b]	0.98±0.08	0.95±0.08	0.732
Total dairy (servings/day) [b]	1.37±0.10	1.37±0.10	0.967
Social support (Total dairy) family [b, c]	3.59±0.056	3.58±0.056	0.938
Social support (Low-fat dairy) family [b, c]	3.34±0.08	3.38±0.08	0.702
Social support (Total dairy) friends [b, c]	3.18±0.05	3.20±0.05	0.792
Social support (Low-fat dairy) friends [b, c]	3.23±0.06	3.27±0.06	0.682
Self regulation strategies (Total dairy) [b, d]	2.59±0.09	2.54±0.09	0.656
Self regulation strategies (low-fat dairy) [b, d]	2.92±0.10	2.85±0.10	0.614
Self efficacy (Achieving goals) [b, e]	64.40±2.47	64.63.820±2.47	0.947
Self efficacy (Low-fat dairy) [b, e]	66.42±2.25	63.54±2.25	0.556
Positive outcome expectations [b, c]	3.41±0.05	3.36±0.05	0.420
Negative outcome expectations [b, c]	2.50±0.06	2.58±0.06	0.377

[a] CHI SQUARE, $p<0.05$; expressed as number and percentages (%).
[b] MANCOVA with race and gender as covariates, $p>0.05$; means expressed as estimated marginal mean±SE.
[c] Scale of 1(strongly disagree) - 5(strongly agree).
[d] Scale of 1= Never 2= Seldom 3= Occasionally 4= Often 5=Repeatedly.
[e] Scale of 0 to100 where 0 is certain that I cannot, 50 is somewhat certain that I can and 100 is certain that I can.

Table 11; Estimated marginal mean change in dairy intake and SCT variables after intervention in the comparison and intervention groups [a]

Dairy intake and Social cognitive Theory variables	Comparison Group (n=89) [e]	Intervention Group (n=90) [e]	P value
Low-fat dairy (servings/day) [a]	0.04±0.54	0.17±0.53	0.086
Regular fat dairy (servings/day) [a]	-0.17±0.72	0.00±0.77	0.130
Total dairy (servings/day) [a]	-0.13±0.79	0.17±0.82	**0.012***
Social support (Total dairy) family [a, b]	-0.02±0.05	0.00±0.05	0.781
Social support (Low-fat dairy) family [a, b]	0.08±0.0	0.10±0.06	0.802
Social support (Total dairy) friends [a, b]	0.01±0.05	0.05±0.05	0.513
Social support (Low-fat dairy) friends [a, b]	0.02±0.06	0.09±0.06	0.418
Self regulation strategies (Total dairy) [a, c]	0.23±0.08	0.68±0.08	**0.000***
Self regulation strategies (low-fat dairy) [a, c]	0.08±0.08	0.46±0.08	**0.002***
Self efficacy (Achieving goals) [a, d]	-0.13±2.55	3.96±2.53	0.256
Self efficacy (Low-fat dairy) [a, d]	-1.10±2.21	2.73±2.20	0.222
Positive outcome expectations [a, b]	-0.34±0.05	-0.21±0.05	0.061
Negative outcome expectations [a, b]	0.05±0.05	0.03±0.05	0.736

[a] MANCOVA with race and gender as covariates, $p<0.05$; means expressed as estimated marginal mean±SE.
[b] Scale of 1(strongly disagree) - 5(strongly agree)
[c] Scale of 1= Never 2= Seldom 3= Occasionally 4= Often 5=Repeatedly
[d] Scale of 0 to100 where 0 is certain that I cannot, 50 is somewhat certain that I can and 100 is certain that I can.
[e] Total number of participants (Comparison – 94; Intervention – 97) may vary due to missing data
* Significant at $p<0.05$

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CHAPTER 6

Summary

College students engage in poor dietary behaviors and are at risk of rapid weight gain (1-5) and associated health complications later in life (6-12). The college environment, which students are exposed to such as “all you can eat” dining halls, easily accessible soda machines and high calorie junk foods may predispose them to making unhealthy food choices (13). Moreover, college students make these choices independently and may eat whatever is available. Consumption of adequate (> 3 servings/day) dairy products (14) is one of the dietary behaviors of concern in this population. Research shows that dairy intake has substantially declined in young adults (15, 16) – a period which includes the college age population (17). Dairy intake is below 2 servings per day in this age group (15) despite the fact that adequate intake is associated with overall better diet quality (18, 19) and several health benefits conferred by bio active components and other nutrients present in it (20, 21).

The college years are characterized by newly found independence and change as student’s transition from home to campus environment (22). Students are more open to new lifestyles in which they explore and adopt new behaviors, thus making them receptive to advice (22). Therefore, college students are ideal targets for effective dietary interventions to improve behaviors which may continue into adulthood (23-25).

The first study was a pilot intervention aimed at evaluating the effect of a web based nutrition education intervention based on Social Cognitive Theory (SCT) on self efficacy, outcome expectations, self regulation, behavior and intake related to dairy intake in college students. The theory based intervention was implemented to get a better understanding of factors involved in dairy intake in college students (26). An SCT model of dairy intake was chosen because constructs from this model such as social support, self efficacy, self regulation and outcome expectations are some of the factors associated with adoption of healthy eating patterns and dairy intake in this population (27-34).

Two hundred and ninety four college students, (mean±SE age: 20.17±0.08yrs) participated in the study (intervention group n=148; comparison group n=146). Dairy intake from 7 day food records were evaluated and information on SCT variables (self efficacy, outcome expectations, self regulation and social support) was collected from questionnaires in January 2006 and April 2006. A 5-week electronic mail intervention was conducted in which students received information on importance of dairy intake.

Dairy intake was low (mean ±SE low-fat dairy 0.45 ± 0.05 servings/day; mean ± SE total dairy 1.44 ± 0.06 servings/day) in the study population and the intervention did not have an effect on the main outcome variable, i.e. improved dairy intake. However, compared to participants in the comparison group after intervention, participants in the intervention group reported more frequent perceived consumption of dairy (p=0.003), improved use of self regulation strategies (p=0.038) and self efficacy for consuming 3 servings/day of dairy (p=0.049). Self regulatory skills such as goal setting and self monitoring and self efficacy are important for initiation and maintenance of healthy nutrition related behavior modification as put forward by Bandura (35, 36) and demonstrated by previous work in young adults (37-38). The intervention did not alter the main outcome variable in the pilot study which may be due to high perceived barriers related to improved dairy intake and low severity/susceptibility to health problems associated with low dairy intake as demonstrated in literature (39-42).

To further understand factors that are associated with dairy intake in college students, the aim of the third study was to identify barriers and motivators/facilitators of dairy consumption. This was a qualitative design which included focus group discussions (n=3), online asynchronous discussion forums (n=3) or elicitation interviews (n=14) using identical questions. These questions were based on student's perceptions of dairy intake and to identify barriers, motivators and facilitators for consuming dairy products. Fifty one students (37 females, 14 males) participated in the study. The results showed that there was widespread lack of clarity regarding amount of dairy/calcium required and whether students felt they were getting enough. Major barriers to consuming dairy foods included: 1) too expensive; 2) might go bad; 3) no where to store it; 4) sodas taste better/ more accessible/visible on campus; 5) more important for babies/children/old people; 6) will worry about it later. Major facilitators include: 1) seeing other

people drinking milk; 2) remind us - make it visible; 3) tell us specific, immediate benefits; 4) make it more accessible; 4) provide free refills (like soda in the dining halls); 5) having breakfast.

To address some of the perceived barriers and improve dairy intake in college students, the final study included messages related to perceived barriers in outcome expectations from SCT. This study was different from the pilot intervention in that it included social support, one of the important factors associated with behavior in college students (27), was longer in duration than the pilot intervention (8 week long) and addressed perceived barriers, susceptibility/ severity to behavior change by incorporating messages in outcome expectations. The aim of this study was to improve social support, self efficacy, outcome expectations, self regulation and behavior related to dairy intake in college students. Two hundred and eleven college students (mean±SE age: 20.18±0.10yrs) participated in the study (intervention group n=107; comparison group, n=104). Data collection included measured height and weight, dairy intake from 7 day food records and SCT variables from questionnaires in January 2008 and April 2008. An 8-week electronic mail intervention was conducted. Compared to participants in the comparison group after intervention, participants in the intervention group reported higher intake of total dairy ($p=0.012$) and improved use of self regulation strategies for consuming 3 servings/day of total dairy ($p=0.000$) and low-fat dairy ($p=0.002$). The intervention improved total dairy intake and improved use of self regulation strategies for total dairy and low-fat dairy consumption in college students.

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CHAPTER 7

CONCLUSIONS

In summary, overall dairy (~1.5 servings/day) and low-fat dairy intake (~0.5servings/day) was low in the study population. These findings parallel those reported in current literature which demonstrate that dairy intake is below the recommended level (3 or > 3 servings/day) in young adults (1-3). Adequate consumption of dairy products is important at this age for meeting calcium requirements since college students continue to develop peak bone mass at this time (2-5). With emerging evidence of the potential role of low-fat dairy in weight regulation (6), adequate dairy intake may further benefit college students in preventing weight gain during college years (7).

Therefore, to promote consumption of dairy products in college students a pilot intervention based on Social Cognitive Theory of behavior change was conducted. This theory posits that high self efficacy to perform a behavior may result in better use of self regulatory skills by an individual (8). The intervention was successful in improving some of the important mediators of behavior change; namely self efficacy in the pilot intervention and self regulation in both, the pilot intervention and the final study. Supportive social environment and high outcome expectations may further result in sustaining the behavior for longer period of time (9-11); however the pilot study did not address social support and outcome expectation also did not change. The main outcome variable which was improved dairy intake also did not improve in the pilot study. It is possible that social support which was not addressed would have had additional impact *via* self efficacy on dairy intake and would have showed improved effects on the main outcome behavior. One reason for not seeing changes in outcome expectation maybe that since students have high barriers to consuming dairy intake (12), they may have had low perceived outcome expectations. Taken together the pilot intervention showed encouraging results.

Many barriers to consuming dairy foods such as cost, shelf life, storage issues and availability of sodas on-campus which taste better were reported in the study. In addition to this students felt that at their age it was not important to consume dairy.

The third part of the study addressed some of these barriers and incorporated social support in the intervention. The study was effective in improving total dairy intake in the population. Students reported improved use of self regulation strategies to consume three servings of total dairy and low-fat dairy in the diet. However self efficacy, social support and outcome expectations did not change.

Though total dairy intake improved in the final intervention, low-fat dairy intake did not change. It is possible that change regarding quantity may have been much easier in the study population versus the type of dairy products. Intervention of longer duration may be essential to have greater impact on improving low-fat dairy intake. The intervention failed to alter outcome expectations (positive and negative). Positive outcome expectations showed marginal decrease in the intervention group. College students lack specific health goals and this may have resulted in low levels of expectations in the population. Moreover, participants may have become more realistic as a result of the intervention and this may have resulted in lower levels of expectations in the pilot intervention and the final study. It is possible that the intervention may have been unsuccessful in adequately addressing this variable due to short duration (5 and 8 weeks). College students may not worry about health problems that are distal in nature (e.g. osteoporosis) and may have low perception of positive outcome from improved dairy intake. Since college students are concerned about body image and worry about weight issues, future interventions should incorporate more information on the potential role of dairy in weight regulation. This may improve positive outcomes.

A supportive social environment can facilitate regular involvement of the individual in performing the behavior and maintaining it for longer time. Social support (family and friends) was included in the final intervention and failed to improve. An explanation for this could be that the study population was not highly motivated. Students and their close friends were invited to social events where information on dairy intake was provided. However, the turnout was very low. Intervention for family members was only for a week and may not have been adequate.

Self efficacy is one of the important variables which mediate change in behavior. Self efficacy significantly improved in the pilot study, which included a large sample size. The final

intervention showed improvement in self efficacy; however it was not significant, possibly due to smaller sample size.

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Implications for research and practice

Social Cognitive Theory provides an understanding of the processes via which behavior changes occur. Self efficacy, social support, self regulation and outcome expectations are main constructs and this theory posits that improved self efficacy results in better use of self regulatory skills such as goal setting, monitoring, planning and problem solving and predicts behavior. Therefore, future interventions should focus on increasing self efficacy and improving self regulatory skills in college students to improve dairy intake. One strategy to improve self efficacy would be to include mastery experiences. If students know how to cook, then they can incorporate dairy products into their cooking on regular basis. Providing different kinds of recipes which include dairy products and having workshops to teach cooking may help. Reducing perceived barriers to dairy intake (e.g. places on campus where dairy is available, imparting knowledge on the type of dairy that should be consumed, amount that is recommended) may also help to increase self efficacy.

Creating a supportive social network is also important for maintenance of healthy behavior. At home parents offer a supportive healthy environment. However, to gather similar support from friends, it is important that they are included in intervention in future studies.

Individuals who have specific health goals also have higher expectation from behavior change are likely to adopt the targeted behavior. However, since college students may lack such goals and may believe that they are invincible to nutrition related health problems, they may have low outcome expectation. Because students are concerned about body image and weight problems in college, focusing on the benefits of dairy intake in weight regulation may improve outcome expectation in college students.

Overall, adopting and maintaining healthy behavior can be difficult for college students. This may be because they are not concerned about nutrition related health problems during college years. Interventions should focus on improving knowledge regarding dairy intake. Improving and maintaining self efficacy, self regulation, social support and outcome expectations to increase dairy intake may be beneficial.

APPENDIX A

Web based Nutrition Education Intervention Improves Self Efficacy and Self Regulation Related to Increased Dairy Intake in College Students

IRB APPROVAL
CONSENT FORM(S)
DATA COLLECTION INSTRUMENTS
INTERVENTION MATERIALS

IRB Approval

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Institutional Review Board
Dr. David M. Moore
IRB (Human Subjects) Chair
Assistant Vice President for Research Compliance
1880 Pratt Drive, Suite 2006(0497), Blacksburg, VA 24061
Office: 540/231-4991; FAX: 540/231-0959
email: moored@vt.edu

DATE: January 11, 2006

MEMORANDUM

TO: Kathy Hosig HNFE 0430
Kavita Poddar

FROM: David Moore

SUBJECT: **IRB Expedited Approval:** "Calcium Intake and Body Weight Changes in College Students" IRB # 06-009

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective January 10, 2006.

Virginia Tech has an approved Federal Wide Assurance (FWA00000572, exp. 7/20/07) on file with OHRP, and its IRB Registration Number is IRB00000667.

cc: File
Department Reviewer: William G. Herbert

Consent Form(s)

On-Campus EDHL 1514

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Pilot Study: Calcium intake and body weight changes in college students

Investigators: Kavita Poddar, Kathy Hosig, Ph.D, MPH, RD and Shelly Nickols-Richardson, PhD, RD

I. Purpose of this Research/Project

All students enrolled in EDHL 1514 for Spring 2006 will be invited to participate in this study. This is a pilot study, and the purpose of the study is to find out whether an online nutrition and physical activity education program can help college students eat healthier and maintain a healthy weight. Results will be used to plan larger studies in the future.

II. Procedures

Everyone who agrees to be in this study will be assigned to one of two groups; a comparison group or an intervention group. If you are assigned to the comparison group, you will complete data collection only. If you are assigned to the intervention group, you will complete data collection and have the opportunity to participate as much as you wish in activities provided to help you learn more about eating healthy and being physically active at Virginia Tech.

Data Collection (all subjects)

If you decide to participate in this study, you will be asked to do certain things at two different times during this academic year (2006). The total time commitment for filling out questionnaires and body measurements is about 4 hours and 40 mins (2 hours and 20 mins each time).

Things you will be asked to do (once in early April) include:

1. Complete 5 questionnaires about your health, eating habits, physical activity, sleep habits and stress levels
2. Keep a record of your food intake and physical activity for 7 days
3. Come to a faculty office in Wallace Hall to have your weight, height, waist and hip measurements taken; you will need to make an appointment to come for these measurements when you have not eaten yet that day and have only had a maximum of 1 cup (8 ounces) of beverage that day. If you have diabetes, hypoglycemia, or any other condition that requires eating on a regular schedule, please inform the researchers ahead of time – you may eat that morning, and your food intake for that morning will be recorded on the form along with your weight.

You will receive the questionnaires and food/activity via log email before your appointment for the body measurements. If you prefer to have printed copies of these forms, you may inform Dr. Hosig and stop by her office to pick them up. You will bring the completed forms to your body measurement appointment.

Your weight and height and waist/hip circumference measurements will be taken in a faculty office (Dr. Hosig's office in 227 Wallace) by either Kavita Poddar, Dr. Hosig or a graduate research assistant. The door will be partially open. You will keep your clothes on but will be asked to remove any outer clothing such as hat, coat, sweater and shoes. We will measure your hips and waist over light clothing such as a t-shirt and cotton shorts or pants. You may have to loosen the waistband of your pants so that we can get an accurate waist measurement. If you wear clothes that are too thick or tight, we will provide a t-shirt and shorts for you to change into in the restroom down the hall before your measurements are taken.

Intervention Program (only subjects assigned to the intervention group)
If you are assigned to the intervention group, you will have access to a Blackboard™ site that is designed to provide short educational flyers about eating healthy. This site will also give you tips on how to eat healthy and at Virginia Tech, help you find people to eat or exercise with, provide links to other information that you might find helpful, invite you to social events for study participants, and ask you to complete daily checklists about foods you eat. You will sometimes receive emails about the study through the Blackboard™ site. You will not be required to participate in any parts of the intervention. You may choose to do all or none of the things available to you. The study site will show on your Blackboard™ account any time you access the system for your Virginia Tech courses, but you will determine how often you access it by clicking on the link for that site.

III. Risks

Some subjects may be uncomfortable having body measurements taken; we will keep the door to the room partially closed so that you will have privacy during these measurements.

Some subjects may experience minor emotional distress during completion of the questionnaires; you may refuse to answer any questions that make you feel uncomfortable. The questions on the questionnaires are not designed to be about sensitive information.

IV. Benefits

Potential benefits of participation in this study include receiving personal information about your body measurements and nutrient content of your diet. You may request a copy of your body measurements and nutrient analysis from your food record level once they are analyzed by checking the appropriate box(es) on this consent form.

The general public, especially college students, may benefit from this study if the intervention is successful in improving diet and physical activity habits of college students. Researchers can use results of the study to plan future larger interventions. Results of this study may be distributed in newsletters to college students and in scientific journals.

V. Extent of Anonymity and Confidentiality

All of your information from the study will be confidential. Your name will not be used on the questionnaires, food and activity record, body measurement forms, or any other data collection forms. Instead, you will be given a special code number that will be on these forms. The researchers will keep a list of names and code numbers in a locked file cabinet. This list is to make sure that the correct code number is put on the forms you get so that all of your information has the same code number. Your code

number will be put on the forms when you bring them to your body measurement appointment. Published results will not contain results for individual subjects.

VI. Compensation

Total compensation available for completion of all components for both data collection period is 15% of course points for the on-campus EDHL 1514 section.
Compensation for partial completion of study components will be provided per data collection period (2 periods) as 2.5% of course points for completion of questionnaires, 2.5% of course points for completion of the food/activity log and 2.5% of course points for completion of body measurements.

VII. Freedom to Withdraw

If you agree to participate in this study, you are free to withdraw or stop participation at any time without penalty. You will receive compensation for any part of the study that you have completed, as shown above. If you choose to withdraw during Spring semester, your grade in the course will not be affected. You will not receive compensation for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. If you withdraw from the study, you may gain unearned points up to 15% of course points (7.5% of course points per data collection period) – you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course (EDHL 1514).

If the researchers decide that you should not continue as a subject for any reason, such as missing data or incomplete information on study forms, you may be asked to withdraw from the study. If this happens, you will receive compensation as above for any parts of the study that you completed. Your grade for the course will not be affected. You will not receive points for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. You may gain unearned points as described above up to 15% of course points (7.5% of course points per data collection period), you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course (EDHL 1514).

VIII. Subject's Responsibilities

I voluntarily agree to participate in this study. By agreeing to participate in the study, I agree to complete all responsibilities listed above in section II, Procedures. I understand my right to withdraw my participation at any time.

X. Subject's Permission

I am 18 years of age or older have read and understand the Informed Consent and conditions of this project. I have had all my questions answered and have been given a copy of this form to keep. I hereby acknowledge the above and give my voluntary consent to participate:

_____ Date _____
Signature

Subject information:

Printed Name: _____

Phone number: _____ E-mail address: _____

☐ I would like to receive a copy of my nutrient analysis results when complete.

☐ I would like to receive a copy of my body measurements.

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

Kavita Poddar _____ poddar@vt.edu
Investigator e-mail

Dr. Kathy Hosig _____ (540) 231-4900/ khosig@vt.edu
Investigator Telephone/ e-mail

Dr. William G. Herbert_____ (540) 231-6565/ wgherb@vt.edu
Departmental Reviewer Telephone/ e-mail

Dr. David Moore_____ (540) 231-4991/ moored@vt.edu
IRB Chair Telephone/ e-mail
Institutional Review Board
for Human Subject Research Ethics

On-Line EDHL 1514

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects

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Investigators: Kavita Poddar, Kathy Hosig, Ph.D, MPH, RD and Shelly Nickols-Richardson, PhD, RD

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II. Procedures

Everyone who agrees to be in this study will be assigned to one of two groups; a comparison group or an intervention group. If you are assigned to the comparison group, you will complete data collection only. If you are assigned to the intervention group, you will complete data collection and have the opportunity to participate as much as you wish in activities provided to help you learn more about eating healthy and being physically active at Virginia Tech.

Data Collection (all subjects)

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1. Complete 5 questionnaires about your health, eating habits, physical activity, sleep habits and stress levels
2. Keep a record of your food intake and physical activity for 7 days
3. Come to a faculty office in Wallace Hall to have your weight, height, waist and hip measurements taken; you will need to make an appointment to come for these measurements when you have not eaten yet that day and have only had a maximum of 1 cup (8 ounces) of beverage that day. If you have diabetes, hypoglycemia, or any other condition that requires eating on a regular schedule, please inform the researchers ahead of time – you may eat that morning, and your food intake for that morning will be recorded on the form along with your weight.

You will receive the questionnaires and food/activity log via email before your appointment for the body measurements. If you prefer to have printed copies of these forms, you may inform Dr. Hosig and stop by her office to pick them up. You will bring the completed forms to your body measurement appointment.

Your weight and height and waist/hip circumference measurements will be taken in a faculty office (Dr. Hosig's office in 227 Wallace) by either Kavita Poddar, Dr. Hosig or a graduate research assistant. The

door will be partially open. You will keep your clothes on but will be asked to remove any outer clothing such as hat, coat, sweater and shoes. We will measure your hips and waist over light clothing such as a t-shirt and cotton shorts or pants. You may have to loosen the waistband of your pants so that we can get an accurate waist measurement. If you wear clothes that are too thick or tight, we will provide a t-shirt and shorts for you to change into in the restroom down the hall before your measurements are taken.

Intervention Program (only subjects assigned to the intervention group)

If you are assigned to the intervention group, you will have access to a Blackboard™ site that is designed to provide short educational flyers about eating healthy. This site will also give you tips on how to eat healthy at Virginia Tech, help you find people to eat or exercise with, provide links to other information that you might find helpful, invite you to social events for study participants, and ask you to complete daily checklists about foods you eat. You will sometimes receive emails about the study through the Blackboard™ site. You will not be required to participate in any parts of the intervention. You may choose to do all or none of the things available to you. The study site will show on your Blackboard™ account any time you access the system for your Virginia Tech courses, but you will determine how often you access it by clicking on the link for that site.

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Some subjects may be uncomfortable having body measurements taken; we will keep the door to the room partially closed so that you will have privacy during these measurements.

Some subjects may experience minor emotional distress during completion of the questionnaires; you may refuse to answer any questions that make you feel uncomfortable. The questions on the questionnaires are not designed to be about sensitive information.

IV. Benefits

Potential benefits of participation in this study include receiving personal information about your body measurements and nutrient content of your diet. You may request a copy of your body measurements and nutrient analysis from your food record level once they are analyzed by checking the appropriate box(es) on this consent form.

The general public, especially college students, may benefit from this study if the intervention is successful in improving diet and physical activity habits of college students. Researchers can use results of the study to plan future larger interventions. Results of this study may be distributed in newsletters to college students and in scientific journals.

V. Extent of Anonymity and Confidentiality

All of your information from the study will be confidential. Your name will not be used on the questionnaires, food and activity record, body measurement forms, or any other data collection forms. Instead, you will be given a special code number that will be on these forms. The researchers will keep a list of names and code numbers in a locked file cabinet. This list is to make sure that the correct code

number is put on the forms you get so that all of your information has the same code number. Your code number will be put on the forms when you bring them to your body measurement appointment. Published results will not contain results for individual subjects.

VII. Compensation

Total compensation available for completion of all components for both data collection period is 30% of course points for online EDHL 1514 section.

Compensation for partial completion of study components will be provided per data collection period (2 periods) as 5% of course points for completion of the questionnaires and 5% of course points for completion of the food/activity log and 5% of course points for completion of body measurements.

VII. Freedom to Withdraw

If you agree to participate in this study, you are free to withdraw or stop participation at any time without penalty. You will receive compensation for any part of the study that you have completed, as shown above. If you choose to withdraw during Spring semester, your grade in the course will not be affected. You will not receive compensation for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. If you withdraw from the study, you may gain unearned points up to 30% of course points – for each period (15% of course points per data collection period) you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course in which you are enrolled (EDHL).

If the researchers decide that you should not continue as a subject for any reason, such as missing data or incomplete information on study forms, you may be asked to withdraw from the study. If this happens, you will receive compensation as above for any parts of the study that you completed. Your grade for the course will not be affected. You will not receive points for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. You may gain unearned points as described above up to 30% of course points (15% of course points per data collection period) - you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course.

VIII. Subject's Responsibilities

I voluntarily agree to participate in this study. By agreeing to participate in the study, I agree to complete all responsibilities listed above in section II, Procedures. I understand my right to withdraw my participation at any time.

X. Subject's Permission

I am 18 years of age or older have read and understand the Informed Consent and conditions of this project. I have had all my questions answered and have been given a copy of this form to keep. I hereby acknowledge the above and give my voluntary consent to participate:

_____ Date _____
Signature

Subject information:

Printed Name: _____

Phone number: _____ E-mail address: _____

☐ I would like to receive a copy of my nutrient analysis results when complete.

☐ I would like to receive a copy of my body measurements.

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

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Departmental Reviewer Telephone/ e-mail

Dr. David Moore (540) 231-4991/ moored@vt.edu
IRB Chair Telephone/ e-mail
Institutional Review Board
for Human Subject Research Ethics

Data Collection Instruments

Questionnaire for SCT variables

General Information About You

Age:_____ **Gender** (circle): Female Male

Race/Ethnic background (check all that apply):

_____ White _____ Asian/ Pacific Islander _____ Native American

_____ Black/African American _____ Other (please specify):_____

Are you Hispanic or Latino (circle)? YES NO

Major (if known): _____ **OR** ____ Unknown at this time (check)

Were you an **athlete in high school** (circle)? YES NO

if yes, what sport(s) did you play: _____

Do you **play sports in college** (circle)? YES NO

if yes, please indicate which which level and which sport(s) you play below:

____ collegiate:_____

____ club level: _____

____ intramural: _____

Please indicate **reasons you are taking the course** you are taking: (mark all that apply)

Reason for taking EDHL 1514	**Check all that apply**
Required for major	
Meets university core requirement	
Elective	
Increase GPA	
Interest in topic	
Class was at a convenient time	
Other: please specify:	
Other: please specify:	

Code Number (entered when you are measured)**:** _____

Eating Attitudes Test (EAT 26)

Please check a response for each of the following statements:		Always	Usuall	Often	Some times	Rarely	Never
1.	Am terrified about being overweight.	□	□	□	□	□	□
2.	Avoid eating when I am hungry.	□	□	□	□	□	□
3.	Find myself preoccupied with food.	□	□	□	□	□	□
4.	Have gone on eating binges where I feel that I may not be able to stop.	□	□	□	□	□	□
5.	Cut my food into small pieces.	□	□	□	□	□	□
6.	Aware of the calorie content of foods that I eat.	□	□	□	□	□	□
7.	Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes,etc.)	□	□	□	□	□	□
8.	Feel that others would prefer if I ate more.	□	□	□	□	□	□
9.	Vomit after I have eaten.	□	□	□	□	□	□
10.	Feel extremely guilty after eating.	□	□	□	□	□	□
11.	Am preoccupied with a desire to be thinner.	□	□	□	□	□	□

12.	Think about burning up calories when I exercise.	□	□	□	□	□	□
13.	Other people think that I am too thin.	□	□	□	□	□	□
14.	Am preoccupied with the thought of having fat on my body.	□	□	□	□	□	□
15.	Take longer than others to eat my meals.	□	□	□	□	□	□
16.	Avoid foods with sugar in them.	□	□	□	□	□	□
17.	Eat diet foods.	□	□	□	□	□	□
18.	Feel that food controls my life.	□	□	□	□	□	□
19.	Display self-control around food.	□	□	□	□	□	□
20.	Feel that others pressure me to eat.	□	□	□	□	□	□
21.	Give too much time and thought to food.	□	□	□	□	□	□
22.	Feel uncomfortable after eating sweets.	□	□	□	□	□	□
23.	Engage in dieting behavior.	□	□	□	□	□	□
24.	Like my stomach to be empty.	□	□	□	□	□	□
25.	Have the impulse to vomit after meals.	□	□	□	□	□	□
26.	Enjoy trying new rich foods.	□	□	□	□	□	□

EAT© David M. Garner & Paul E. Garfinkel (1979), David M. Garner et al., (1982)

Note: This questionnaire is made available with permission of the authors.

Godin Leisure-Time Exercise Questionnaire

Considering a **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free time** (write on each line the appropriate number).

a) STRENUOUS EXERCISE **Times/week**
(HEART BEATS RAPIDLY)

(i.e. running, jogging, hockey, football, soccer, _____
squash, basketball, cross country skiing, judo,
roller skating, vigorous swimming,
vigorous long distance bicycling, etc.)

b) MODERATE EXERCISE
(NOT EXHAUSTING)

(i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing, etc.) _____

c) MILD EXERCISE
(MINIMAL EFFORT)

(i.e. yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking, etc.) _____

Considering a **7-Day period** (a week), **during your leisure-time**, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

OFTEN	**SOMETIMES**	**NEVER/RARELY**
1. □	**2.** □	**3.** □

HEALTH BELIEFS QUESTIONNAIRE

Code Number (entered when you are weighed): _____

Food Beliefs – Healthier Foods Social Support

Using a scale from 1 to 5, indicate how much you agree with the following statements:

1 = strongly disagree ***2= disagree*** ***3= unsure*** ***4=agree*** ***5 = strongly agree***

My family, and my closest friends…..	**Agree or Disagree (1-5)**	
	Family	**Friends**
1. Don't drink many regular sodas or sugared drinks.		

2. Believe that is it important to eat enough fiber.		
3. Eat whole grain cereal every day.		
4. Eat at least 5 servings of fruits and vegetables every day.		
5. Try to eat low-fat dairy foods.		
6. Eat whole grain bread every day.		
7. Have told me that they want to eat more fruits and vegetables.		
8. Believe that eating breakfast is important for good health.		
9. Eat breakfast every day.		
10. Have told me that they want to eat more whole grain foods.		
11. Believe that drinking too many sodas or sugared drinks is unhealthy.		
12. Eat or drink at least 3 servings of dairy foods every day.		
13. Have told me that they want to eat or drink more dairy foods.		
14. Have told me that they want to cut down on sodas or sugared drinks.		
15. Eat fruits or vegetables for snacks		
16. Eat fruits or vegetables for dessert.		

Food Beliefs – Healthier Foods Strategies

Using a scale from 1 to 5, indicate whether you agree with the following statements:

1= Never 2= Seldom 3= Occasionally 4= Often 5=Repeatedly

In the past 3 months, how often did you…..	**How Often (1-5)**
1. Pay closer attention to eating breakfast.	
2. Remind yourself that eating breakfast is healthy.	
3. Eat more vegetables.	
4. Eat more fruits.	
5. Eat more dairy foods.	
6. Eat more whole grain foods.	
7. Eat low-fat salad dressing when you ate salad.	
8. Remind yourself to drink fewer sodas or sugared drinks.	
9. Plan to eat breakfast.	

10. Plan to eat at least 5 servings of fruits and vegetables every day.	
11. Keep track of how many servings of fruits and vegetables you eat each day.	
12. Plan to drink or eat at least 3 servings of dairy foods every day.	
13. Keep track of how many servings of dairy foods you eat each day.	
14. Plan to eat more whole grain foods.	
15. Keep track of how many servings of whole grain foods you eat each day.	
16. Plan to drink fewer sodas or sugared drinks each day.	
17. Keep track of how many sodas or sugared drinks you drink each day.	
18. Eat breakfast on purpose when you would usually skip breakfast	

Food Beliefs – Healthier Foods Efficacy

These questions ask how CERTAIN you are that you can do different things to eat healthier foods.

You will be asked to decide how certain or sure you are that you can do these things on most days and in lots of different situations. Think about times when it will be easy to do these things and when it will be harder.

When deciding how sure you are that you can do these things, we want you to think about doing them:

ALL or MOST of the time, not just once or twice.

For a long time… until next year…. or even longer!!

In a lot of different situations – like when you are…..

- Eating in a dining center on campus…
- Deciding what to eat when at home, along, watching TV or doing chores….
- Studying late at night
- Eating with your family..
- Eating out with friends or at a party…
- At a fast-food restaurant
- Buying food at the grocery store
- Traveling

Use any number from 0 to 100 on the following scale to tell how certain you are that you can – all or most of the time:

0 ----------50---------- 100

Certain that I Somewhat Certain

CAN NOT *certain I CAN* *I CAN*

How certain are you that you can…..	**How certain? (0-100)**
BREAKFAST	
1. Eat breakfast every day?	
2. Eat breakfast on most days?	
3. Eat breakfast before you go to class or work?	
4. Eat breakfast when you have an early class, meeting, etc.?	
DAIRY FOODS	
5. Drink or eat at least 3 servings of dairy foods each day?	
6. Drink 1%, ½%, or fat-free (skim) milk instead of higher fat milk?	
7. Eat low-fat cheese products (such as cottage cheese, sliced cheese, etc.)?	
8. Choose smoothies with less sugary and/or high-fat ingredients?	
FRUITS AND VEGETABLES	
9. Take fruit to school or work for a snack every day?	
10. Eat at least 5 servings of fruits and vegetables every day?	
11. Eat vegetables for a snack?	
12. Eat fruit for a snack?	
13. Have a salad or other vegetable instead of French fries when eating out?	
14. Eat more than one serving of vegetables at a meal?	
15. Find vegetables on campus that you will eat?	
16. Find fruits on campus that you will eat?	
WHOLE GRAIN FOODS	
17. Figure out what foods are whole grain foods?	
18. Eat at least 3 servings of whole grain foods every day?	
19. Eat whole grain bread?	
20. Find whole grain bread on campus?	
21. Eat whole grain cereal?	
22. Find whole grain cereal on campus?	
23. Eat whole grain rice or pasta?	
24. Find whole grain rice or pasta on campus?	
25. Eat whole grain foods for snacks?	
26. Eat whole grain foods for breakfast?	

27. Eat whole grain foods for lunch?	
28. Eat whole grain foods for dinner?	
REGULAR SODAS AND SUGAR-SWEETENED DRINKS	
29. Limit regular sodas and sugar-sweetened drinks to one per day?	
30. Cut back on the size of regular sodas and sugared drinks?	
31. Choose fruit instead of juice when choosing fruits?	

Food Beliefs – Healthier Foods Outcomes

Now, tell us what you expect will happen when you eat healthier foods. Use this scale to tell us if you agree that the following will happen:

1= strongly disagree 2=disagree 3=unsure 4=agree 5 = strongly agree

If I eat healthier (breakfast, fruits and vegetables, whole grains, dairy, etc.), I expect:	**Do you agree? (1-5)**
1. I will have more energy.	
2. I will lose weight.	
3. I will feel healthier and happier.	
4. I will live longer.	
5. I will feel better in my clothes.	
6. I will be hungrier.	
7. My health will improve.	
8. I will miss eating the foods that I love.	
9. I will be less likely to get cancer or heart disease.	
10. I will be less likely to gain weight.	
11. Finding healthier foods on campus will be a lot of trouble.	
12. I will be bored with what I have to eat.	
13. I will have to change a lot of my favorite foods.	
14. I won't be able to eat the same foods as my friends.	
15. I won't be able to eat the same foods as the rest of my family.	
16. I will have to spend too much time keeping track of what I eat.	

17. The food I eat will not taste good.	
18. It will take too long to prepare meals and snacks.	
19. I will have to plan my meals too far in advance.	
20. I will be more attractive.	
21. I will be doing what I know I should do.	
22. I won't be able to stick with it – I'll just go back to my old habits.	
23. My friends won't want to eat with me.	

HEALTH HISTORY FORM

Medical History
Please indicate any current or previous conditions or problems you have experienced or have been told by a physician that you have had:

	Yes	**No**
Heart disease or heart problems:	_____	_____
Circulation problems:	_____	_____
Kidney disease or problems:	_____	_____
Urinary problems:	_____	_____
Reproductive problems:	_____	_____
Muscle problems:	_____	_____
Skeletal problems:	_____	_____
Neurological problems/disorders:	_____	_____
High blood pressure:	_____	_____
Low blood pressure:	_____	_____
Diabetes:	_____	_____
Thyroid problems:	_____	_____
Eating disorders (bulimia, anorexia):	_____	_____
Crohn's disease:	_____	_____
Hirsutism (unusual hair growth on face or chest):	_____	_____
Insomnia:	_____	_____
Unusual sleep patterns:	_____	_____
Other (Please list): _____	_____	_____

If "yes" to any of the above please indicate the date, explain, and describe:_____

Please list any hospitalizations/operations/recent illnesses (Type/Date):_____

Work Schedule and Patterns

Do you engage in night-time work? YES NO

If yes, please explain and indicate your usual work hours (time of day): _____

Limitations on Physical Activity

Are there any physical limitations you have that may restrict your ability to exercise? YES NO

If "yes" please explain: _____

Medications

Please indicate any current medications that you are taking on a daily or weekly basis: _____

Please list any nutritional supplements, herbal products, or other medications, (prescription and over-the-counter) you are currently taking on a daily or weekly basis: _____

Weight History

What is your current weight? _____

How much did you weigh six months ago? _____

How much did you weigh one year ago? _____

During the last 2 years, how many times have you lost 5 pounds? _____

During the last 2 years, how many times have you gained 5 pounds? _____

Smoking

Do you smoke (circle)? YES NO if yes, approximately how many cigarettes do you smoke per day? _____

Calcium food frequency questionnaire

	Please indicate how often you consume the following foods						
Food	**Serving size**	**Servings per day**	**Servings per week**	**Servings per month**	**Rarely or never**		
Example Non fat/Skim/ 0.5% milk	8 ounces	**2**					
Ice Milk	1 cup		**4**				
Tofu	0.5 cup			**3**			
Nonfat/skim/ 0.5% milk	8 ounces						
1% Milk	8 ounces						
2%milk	8 ounces						

whole milk	8 ounces						
chocolate milk	8 ounces						
buttermilk	8 ounces						
ice cream (regular)	1 cup						
Icecream (Low fat or light)	1 cup						
icemilk	1 cup						
frozen yogurt (regular)	1 cup						
Frozen yogurt (nonfat)	1 cup						
yogurt (regular)	1 cup						
yogurt (Lowfat)	1 cup						
Yogurt (nonfat)	1 cup						
Cheese (Regular)	1 ounce						
Cheese (lowfat)	1 ounce						
Cottage Cheese (regular)	1/2 cup						
Cottage cheese (lowfat)	1/2 cup						
Cottage Cheese (nonfat)	1/2 cup						
Pudding or custard (regular)	1/2 cup						
Pudding or custard (lowfat)	1/2 cup						
Beans (Navy, Pinto, Kidney, Etc	1 cup						
Tofu	1/2 cup						
Eggs	1 large						
Brooccoli or cooked greens	1/2 cup						
pancakes	3.4" diameter						
homemade biscuit	1.2" diameter						

mixed cheese dishes (macaroni and cheese , quiche, etc.	1 cup						
Pizza	1/8th of 15" pizza						
Regular cream soup (made with milk	1 cup						
Low fat or Fat free cream soup (made with milk)	1 cup						
Solid Milk Chocolate	1 ounce						
cappuccino, latte Hot chocolate made with milk	1 cup						
calcium fortified orange juice	8 ounces						
calcium fortified cereal	1 cup						
calcium fortified soy milk	1 cup						

Instructions for completing food and activity record

Instructions for Completing the 7-Day Food Record

It is extremely important that you take this part of the study seriously. We need for you to be as complete and specific as possible.

1. Please don't forget to write down **what time you got up** for the day!!!!

2. Please write down **everything** you eat or drink as soon as possible after you consume it.

3. Include **anything** you "eat", including hard candy, gum, etc.

4. Please fill out each column for each food item
   Time
   We need this to see if timing of eating makes a difference in the things we are looking at
   Amount
   We need this to be able to enter your food intake correctly into the computer. Use your best judgment, and here are some tips:
   a. 1 cup is about the size of a baseball (or a half-pint milk carton from the cafeteria, or your fist if your hand is average size) – also usually 1 scoop of main dish at a cafeteria
      i. ½ cup is about the size of a tennis ball (usually 1 scoop of side dish at a cafeteria)
      ii. 1 teaspoon is about the size of the end of your thumb – 3 teaspoons is 1 tablespoon
      iii. ¼ cup is about the size of a golf ball
      iv. 3 ounces of meat is about the size of a deck of cards
   b. Try to use amounts such as cups, tablespoons, ounces, etc. if possible, but just describe the amount if you are not sure
   c. If the item is a standard size at a fast food restaurant, you can just say exactly what the item was and what size (small/medium/large, 6-inch/12-inch, single/double, etc.) – remember to say WHERE you ate
   d. If you make it yourself, tell us how many pieces/slices of EACH thing on sandwiches, how much of EACH condiment or topping, etc.
   e. For drinks, tell us whether it was regular or diet, sweet or unsweetened, and the SIZE (small/medium/large, 8-oz/12-oz/16-oz./20-oz./24-oz), and anything you added (i.e. cream, sugar, etc.) – **please don't forget to include drinks!!!**
   f. If the item is one "pack" or "package", please tell us the size of the package – should be on the package itself
   g. For any foods that you can, especially bread/cereal/pasta/rice, etc., please tell us the **BRAND NAME and PRODUCT NAME** of the food you ate.]

5. **Examples** of complete entries: **use your own information and serving sizes, of course!!!**

   Please email me at khosig@vt.edu if you have any questions about how to enter a food that you ate – I will respond quickly

   a. Kellogg's Complete Bran Flakes – 1.5 cups
   b. Pepperidge Farms Multi-Grain Bagel – 1 large bagel (12oz per 6 bagels)
   c. Entenmann Chocolate Cake Donuts, large – 2 donuts
   d. Chips Ahoy Chewy Chocolate Chip Cookies – 4 cookies
   e. Quaker Chewy Granola Bars (peanut butter and chocolate chip) – 2 bars
   f. Kraft Singles 2% American Cheese – 1 slice
   g. Plumrose Deli Ham, baked – 2 slices
   h. Kraft Light Done Right ranch salad dressing – 3 tablespoons, ¼ cup, etc.

CONTINUES……..(over)

i. Kroger 2% milk – 1 cup
j. Subway 6-inch turkey/ham with provolone on honey/oat bread with mayo, mustard, pickle, black olives, etc.
k. Firehouse large pepperoni and mushroom pizza, regular crust (or thin crust, etc.) – 4 slices
l. Chef Salad at Dietrick – large with 1 cup lettuce, ¼ cup ham, ¼ cup turkey, 1 egg, ¼ cup cheese, ½ cup croutons, ¼ cup bacon bits, ¼ cup green pepper, ½ cup regular (as opposed to low fat or fat free) French dressing
m. Spaghetti with meat sauce – 2 cups pasta with 1 cup sauce and ¼ cup Parmesan Cheese
n. Mello Yello (regular) – 20oz bottle (or 12oz can, etc.)
o. Dr. Pepper (diet) – 20oz bottle (or 16oz cup, etc.)
p. Hardees 1/3 pound thickburger with mayo, mustard, lettuce, tomato
q. Wendy's single cheeseburger with lettuce, tomato, mayo
r. Krispy Kreme chocolate glazed crème-filled doughnut – 2 doughnuts
s. Sweet tea – Big Gulp at 7-Eleven (indicate ounces if you know it)
t. Beer – indicate how many draft beers, how many cans, name and whether regular or light
u. Extra sugar-free gum – 1 slice
v. Skittles candy – 1 bag (1.15 ounce)
w. Apple – 1 large
x. Banana – 1 medium
y. Broccoli with cheese sauce – ¾ cup
z. Campbell's Chunky Vegetable Beef soup – 1 can
aa. Great Value saltine crackers – 8 squares
bb. Canned peaches in heavy syrup (or light syrup or juice) – ½ cup, or 4 slices
cc. Kraft Easy Mac macaroni and cheese – 2 packages
dd. Kroger macaroni and cheese from mix – 2 cups
ee. Tuna sandwich – 1 can tuna in oil (drained), 3 tablespoons regular mayo, dash salt and pepper, 2 slices Kroger sandwich bread
ff. Peanut butter sandwich – 3 tablespoons Jif peanut butter, 1 tablespoon grape jelly, 2 slices Arnold 7-grain bread
gg. Ramen noodles, oriental flavor – 1 package (3 oz)
hh. Sbarro broccoli and spinach stromboli, small
ii. Sbarro large drink, Dr. Pepper
jj. Casserole with pasta, chicken, carrots, corn, lima beans, peas – 1.5 cups total (could put recipe in "special notes" column if you made it or know the proportions)
kk. Red grapes – 1 cup (or might use number such as 10 grapes, if you count them, or say 1 handful, 2 handfuls, etc.)

6. **Please don't forget to write down your physical activity** for the day on the front of the food/activity record, even if you don't use the back for food

Again, please be specific about what you did, how strenuous it was, and how long

Examples (use actual time, etc.):
a. basketball, full court, 20 minutes
b. jogged, 10-minute mile, 45 minutes
c. cardio machines, 30 minutes
d. walked, 40 minutes total
e. bicycle, outdoor, 1 hour
f. racquetball, 30 minutes
g. land aerobics class, 30 minutes
h. lifted weights, total actual lifting time 20 minutes

Food and Activity Record Sheet

Food/Activity Record

Web based Nutrition Education Intervention Improves Self Efficacy and Self Regulation Related to Increased Dairy Intake in College Students

Code # (entered when you are weighed)_____ Day of Week _____ Date _____

What time did you get up today? _____ (include am or pm)

How many hours did you sleep last night? _____

If you napped today, please list how long you napped: _____

*Remember: Please do not alter your normal activity or diet while keeping this record. Keep the record for 7 consecutive days. Use additional pages for each day if necessary. For foods eaten out, indicate where foods were purchased. For mixed foods, include recipe on a separate page.

Physical Activity

Please list any physical activity you had today, **including walking around campus to and from class**.

Type of Activity	**Time Spent in**	**Special Notes**

Food You Ate Today – (continue on next page)

Time	**Food Eaten - How Prepared**	**Amount Eaten**	**Special Notes**

Day of week: _____ Date: _____

Time	Food Eaten - How Prepared	Amount Eaten	Special Notes

Anthropometric data collection instrument

Anthropometric Data Collection Form

Subject Code Number: _____

January 2006

Date: _____ Time of day: _____ am / pm

Weight: _____ pounds

Height: _____ inches

Waist (inches): _____ Hip (inches): _____

_____ _____

_____ _____

April 2006

Date: _____ Time of day: _____ am / pm

Weight: _____ pounds

Height: _____ inches

Waist (inches):	_____	Hip (inches):	_____
	_____		_____
	_____		_____

Intervention Components

Email messages

Email Messages Week 1

Day 1

Welcome!

You've been selected to receive information on Calcium and its benefits in adolescence and early twenties. For the next 5 weeks we will be sending out information on various roles of calcium in general health. Along with this we will be giving you information on calcium rich foods and how you can improve your calcium intake. You may be asked one or two questions regarding the information we give you. Your feedback will give us information about how to improve the way we provide information. We hope you enjoy what you learn in the next few weeks and use the information to improve your eating patterns.

Day 2

Calcium and Bone Health.

NOW is the time to make sure your bones are as strong as they will be – time is running out!!

Did you know that maximum bone growth and mineralization occurs during your teen years through early twenties? Well, it is true. Bones grow in length and width for the first two decades of life. People gain maximum peak bone mass during their teens through their early twenties. Calcium forms 80% of the bone mineral content of the bones. High peak bone mass in early adulthood lowers the risk of developing osteoporosis in individuals. Dietary calcium intake is very important to achieve maximum peak bone mass. People tend to lose bone starting in middle adulthood (the 40s). This can lead to osteoporosis if bones are not as strong as they can be by your early twenties. More information on Calcium in bone health will be posted on Blackboard.

Day 3

Calcium and Body Weight.

Did you know that calcium may help prevent excess body weight gain? Research shows that getting enough calcium in your diet may help obese/overweight individuals to lose weight. At the same time dairy calcium has shown to have more impact on weight loss than calcium from other types of foods. Adolescents and younger adults can keep off excess fat from accumulating by consuming enough dairy calcium.

As we all know weight gain has become a major health issue in United States and the best way to treat it is not “losing it” but “preventing it”. Let us all say “Cheese to Healthy Weight” with at least 3 servings of dairy a day.

Day 4

We all know by now that Calcium is an important nutrient not only to maintain healthy bones but also maybe healthy weight. Most of us consume low levels of calcium in our diets. Recommended intake is around 1300mg/day. There are many foods which are rich in calcium besides dairy and dairy products. Incorporating at least 3 servings of foods rich in calcium can provide you with enough calcium per day. Foods rich in calcium are:-

Foods	**1 Serving**
Yogurt, plain, low-fat	8 ounces
Orange juice, calcium-fortified	1 cup
Sardines, canned with bones	3 ounces
Cow's milk, nonfat	1 cup
Soymilk, calcium-fortified	1 cup
Sesame seeds	1 ounce
Collard greens, cooked	1 cup
Tofu, prepared with calcium sulfate	1/2 cup
Blackstrap molasses,	1 tablespoon
White beans, cooked	1 cup
Bok choy, cooked	1 cup
Parmesan cheese, grated	2 tablespoons
Figs, dried	5 medium
Navy beans, cooked	1 cup
Quinoa, cooked	1 cup
Broccoli, cooked	1 cup

Including around 3 to 4 servings in total of any of these foods can help you get enough calcium. So, let’s start eating healthy right away!

Day 5

QUIZ 1

" 3 A day Dairy"

Email Messages Week 2

Day 1

Osteoporosis is a condition of bones in which bones become fragile and brittle where they break easily. This is because of low bone mass and density along with structural deterioration of bone tissue. There is increased susceptibility to fractures, especially of the hip, spine and wrist, although any bone can be affected. A hip fracture almost always requires hospitalization and major surgery. It can impair a person's ability to engage in routine activities and may result in

long term or permanent disability. Spinal or vertebral fractures also have serious consequences, including loss of height, severe back pain, and deformity. There are many risk factors associated with osteoporosis and the ones of main concern which can be controlled are:-

- Low lifetime calcium intake
- Vitamin D deficiency
- An inactive lifestyle
- Current cigarette smoking
- Excessive use of alcohol

Late adolescents to early twenties is the time when most of us acquire 98 percent of our skeletal mass. Building strong bones during childhood and adolescence can be the best defense against developing osteoporosis later. There are five steps, which together can optimize bone health and help prevent osteoporosis. They are:

- A balanced diet rich in calcium and vitamin D
- Weight-bearing and resistance-training exercises
- A healthy lifestyle with no smoking or excessive alcohol intake
- Talking to one's healthcare professional about bone health
- Bone density testing and medication when appropriate

Day 2

If you are intolerant to milk you can try to incorporate calcium rich foods in your diet by increasing intake of the following food products:-

- Lactaid milk
- Yogurt
- Calcium fortified juices and beverages
- White beans, cooked,
- Bok choy, cooked
- Figs, dried
- Navy beans
- Quinoa, cooked
- Broccoli
- Dark, leafy vegetables such as broccoli, kale and collards

- Tofu
- Canned salmon or sardines with bones

Day 3

Tips for Healthy Spring Break!!!

- Cut smoking as calcium absorption from diet decreases.
- Restrict intake of caffeine and salt.
- Limit alcohol.
- Eat reasonable portions of meat, poultry and fish (six to eight ounces per day).
- Work out regularly. Include weight-bearing activities in your exercise routine along with walking, jogging or aerobics which will help to help maintain bone density.
- Include vitamin D fortified foods or exposure to sunlight.

Day 4

Summary

I wanted to just summarize everything that we have covered so far with regards to benefits of calcium and why we should try to include adequate intake of dairy and dairy products.

1. Calcium is essential for bone health and may be beneficial in preventing weight gain.
2. Dairy and dairy products are one of the best sources of calcium and to get adequate amount of calcium at least 3 servings of dairy or dairy products should be consumed.
3. Late teens and early twenties is the time when maximum peak bone mass is achieved which decreases the risk of developing osteoporosis and therefore adequate amount of calcium at this time is essential.
4. Healthy lifestyle which includes physical activity on regular basis is beneficial.

Remember “Health is Wealth”

Day 5

Vitamin D helps in absorption of calcium

You need vitamin D to help absorb calcium from the food you eat. Vitamin D is formed in your skin when it is exposed to sunlight or obtained from dietary sources (such as dairy or other fortified foods). About 15 minutes of sun exposure three times per week without sunscreen can provide enough Vitamin D. Food sources that contain vitamin D are fatty fish such as salmon or halibut, milk (fluid, dried or evaporated) and other fortified foods such as breakfast cereals. Vitamin D recommendation is no more than 2,000 IU International Units) or 50 micrograms per

day. The RDI (recommended daily intake) for vitamin D is 400 IU. One cup of milk contains 100 IU. Most cereals have about 40 IU per serving. Read labels to be aware of this.

E**mail Messages Week 3**

Day 1

Did you know that the dining places on campus offer a variety of dairy and dairy products? **Nutrition information (Nutrients in one cup of milk -8 ounces)**

Nutrient	Skim Milk	Low fat chocolate milk	Reduced fat milk	Fat free yogurt	Regular milk	Soda
Calories	83	158	125	100	146	-
Fat (grams)	0	8	4.7	0	7.93	-
Protein (grams)	8.2	8	8.53	5	8	-
Sugar (grams)	12.47	24.85	12	14	11	42
Calcium (mg)	306	288	314	200	276	-
Vitamin D (mg)	98	100	98	100	98	-

Did you know that 8oz of fat free milk, low fat milk or yogurt provides you with Proteins, calcium, Vitamin D and carbohydrate with very little sugar where as same quantity of regular soda provides only 42 grams of sugar. Well, its true!

Here are some healthy options for you to choose from Westend, the dining place on campus..

Fat free skim milk
Reduced fat milk
Low fat chocolate milk
Fat free yogurt
Regular milk

Consuming the above mentioned choices is much better than Soda.

Day 2 Nutrient Information on Frappuccino

Nutrient	**Café Vanilla Frappuccino**	**Caramel Frappuccino**	**Coffee Frappuccino**	**Mocha Frappuccino**	**Espresso Frappuccino**
Calories	470	430	260	420	230
Fat (g)	16	16	3.5	16	3
Protein(g)	6	6	5	6	5
Sugar (g)	65	52	44	51	38
Calcium (mg)	200	200	200	200	150
Vitamin D (mg)	-	-	-	-	-

Day 3 Nutrient information (Nesquik)

Nutrient	Nesquik Strawberry reduced fat milk	Nesquik Very Vanilla reduced fat milk	Nesquik Buncha Banana reduced fat milk	Nesquik Fat free Chocolate milk	Nesquik Double chocolate reduced fat milk	Danon Lite 8oz
Calories	200	200	200	160	200	60
Fat (g)	5	5	5	0	5	0
Protein(g)	8	8	7	8	8	5
Sugar (g)	31	29	29	30	30	7
Calcium (mg)	400	400	400	400	400	150
Vitamin D (mg)	100	100	100	100	100	60

GBJ (The one near Randolf Hall where Burger king is located) carries a variety of flavored milk which are healthier than sodas. These are available in the small convienient store located on the top floor.

The following choices are better than having a bottle of soda..
Fat free chocolate milk
Strawberry reduced fat milk
Buncha banana reduced fat milk
Very Vanilla reduced fat milk
Double chocolate reduced fat milk
These contain approximately 200 calories in 8 Fl.oz along with 400 mgs of calcium.

Starbucks frappacino is also available here but it has higher calories and lower calcium.

Day 4

There are various healthy choices available on campus. The convienience store just below deets carries various milk and milk products from which you could choose to meet your daily calcium requirement. They are as follows

Hershey's milkshakes in various flavors
Nesquik milkshakes in various flavors
Quaker milk chillers
Dannon light n fit

So if you happen to be that side you can pick up your calcium serving.

Day 5

Quiz 2

"Knowing your calcium intake"

Email Message Week 4 (one message)

Milk and milk products are available in the bookstore and squires student center. In addition to the products mentioned earlier in emails,the bookstore carries one more product called "Chocolate moose" a cool milk drink.
So then whether you are studying or reading in the library you can always carry your calcium with you.

Email Message Week 5 (One message)

Quiz 3

“Type of dairy On-campus”

Everything was put together and sent as a summary

Questions included in the quizzes

Quiz 1

3 A Day

Question 1. Did you visit the 3 A day website or the link which I forwarded to you on Tuesday?

Choice: Yes, No.

Question 2. Think about what you ate and drank yesterday. How many servings of dairy foods did you consume? If you need help with serving sizes, please refer to the information under the "Calcium Rich Foods" tab.

Choice: 0 servings, 1 servings, 3 servings, More than 3 servings

Quiz 2

Knowing your Calcium intake

Question 1. Think about yesterday. How many servings of calcium rich foods that were not dairy foods did you consume?

Choice: 0 servings, 1 servings, 3 servings, More than 3 servings

Question 2. So, how many servings in total of dairy foods plus other calcium rich foods did you consume yesterday?

Choice: 0 servings, 1 servings, 3 servings, More than 3 servings

Quiz 3

Type of dairy on-campus

Question 1. Which would you choose at a convenience store?

Choice : 1) Regular chocolate, vanilla or strawberry milk. 2) Lowfat chocolate, vanilla or strawberry milk. 3) Skim milk. 4) Low fat milk. 5) Whole milk. 6) Frappacino 7) Soda.

Question 2. Which choice gives the most calcium for the calories and fat you get?

Choice : 1) Regular chocolate, vanilla or strawberry milk. 2) Lowfat chocolate, vanilla or strawberry milk. 3) Skim milk. 4) Low fat milk. 5) Whole milk. 6) Frappacino 7) Soda

Flyers Posted

Bone health

www- nationaldairycouncil.org

http://www.nationaldairycouncil.org/NR/rdonlyres/4534BBD3-EAD4-4E94-9FBF-8B6F0757A647/0/DCD775.pdf

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BUILDING STRONG BONES: STARTING IN THE EARLY YEARS

SUMMARY

Prevention of osteoporosis, a debilitating disease characterized by low bone mass and increased risk of fractures, is a public health priority. Although this disease typically affects older adults, its prevention begins in childhood and adolescence by optimizing genetically determined peak bone mass reached sometime between late adolescence and the early 20s.

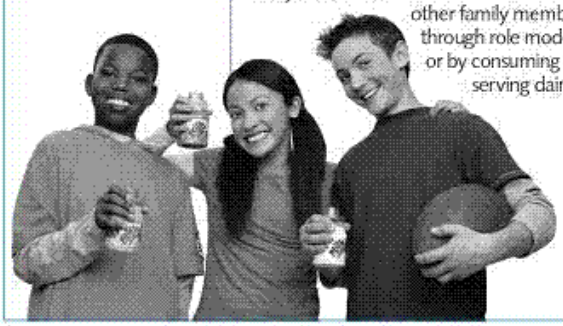
Bone mass is determined by genetics and environmental factors such as diet and exercise. Although many nutrients influence bone health, most attention has focused on calcium. Dietary calcium recommendations are 800 mg/day for children aged 4 through 8 years and 1,300 mg/day for children and adolescents 9 through 18 years of age. Unfortunately, most U.S. children older than 8 years fail to consume recommended intakes of calcium. Low intake of milk and other dairy foods (e.g., cheese, yogurt), the major dietary source of calcium, contributes in large part to low calcium intake. Dairy foods also contain other bone-building nutrients including vitamin D (if fortified), phosphorus, protein, potassium, magnesium, and zinc.

Several factors influence children's and adolescents' consumption of dairy foods, such as replacement of milk by soft drinks, fruit juices, and/or fruit drinks. Parents and other family members, through role modeling or by consuming and serving dairy foods themselves, can positively impact children's and adolescents' dairy and calcium intakes. For this reason, the American Academy of Pediatrics (AAP) encourages adequate calcium intake by all family members.

Numerous studies demonstrate that consuming an adequate intake of dairy foods and/or calcium during childhood and particularly adolescence is important for optimizing genetically determined peak bone mass. This in turn may reduce the risk of osteoporosis in later adult years. Childhood and adolescence is a critical period for establishing healthful dietary practices and lifestyle behaviors that, if maintained, can support skeletal health.

The 2005 Dietary Guidelines for Americans, recognizing the important role of dairy foods in improving overall diet quality, nutrient adequacy, and children's and adolescents' bone health, recommends 3 cups of low-fat or fat-free milk or equivalent milk products a day for children 9 years of age and older (2 cups a day or equivalent for children 2 to 8 years).

In a recent report on bone health, the AAP outlines several strategies to optimize bone health and calcium intake of children and adolescents. These include consuming 3 servings of calcium-rich dairy foods (e.g., low-fat milk, flavored milk, cheese, or yogurt) a day for children 4 to 8 years of age and 4 servings a day for children and adolescents 9 to 18 years of age as part of a well-rounded diet including fruits and vegetables, and participating in regular physical activity, especially weight-bearing exercise. The AAP encourages physicians to regularly assess children's and adolescents' calcium intakes and suggests that families at risk of inadequate calcium intake consult a registered dietitian for dietary advice.



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www.nationaldairycouncil.org

INTRODUCTION

Osteoporosis, a skeletal disease characterized by low bone mass and increased susceptibility to fractures, affects 44 million U.S. adults over the age of 50 (1). This chronic disease results in considerable morbidity and mortality and incurs direct healthcare costs reaching $18 billion a year (1). Even though this bone disease strikes late in life, its prevention begins in childhood and adolescence (1). Achieving genetically-determined peak bone mass, reached sometime during late adolescence and the early 20s, reduces the risk of osteoporosis later in life (1). In addition to genetics, environmental factors such as diet and physical activity influence bone health (1).

With respect to diet, dairy foods such as milk, cheese, and yogurt contribute a number of nutrients including calcium, vitamin D (if fortified), phosphorus, protein, potassium, magnesium, and zinc, which are important for bone health (1,2). Most attention has focused on calcium because of its critical role in bone structure and its generally low dietary intake (1). Approximately 99% of total body calcium is found in the skeleton. The amount of bone accumulated during growth is related to the amount of calcium consumed (1). Because of the increased rate of bone growth during childhood and adolescence, calcium needs are high during these years (3). Unfortunately, many youth, especially those older than 8 years of age, fail to meet their needs for calcium, primarily because of their low intake of dairy foods, the major dietary source of calcium (4,5).

Studies in children and adolescents demonstrate that increasing intake of dairy foods or calcium increases peak bone mass and possibly reduces risk of fractures during childhood (1,3,6). The 2005 Dietary Guidelines for Americans (7) acknowledges the important role of milk and other dairy foods such as yogurt and cheese for children's bone health. The Guidelines report recommends 2 cups of low-fat or fat-free milk or equivalent milk products a day for children 2 to 8 years and 3 cups of milk a day or its equivalent for children 9 years of age and older (7). The American Academy of Pediatrics (AAP), recognizing the wide gap between typical calcium intakes and dietary calcium recommendations, issued a report on optimizing children's and adolescents' bone health and calcium intakes (8). This report recommends 3 servings of milk, cheese, or yogurt a day for children aged 4 to 8 years and 4 servings a day for children and adolescents 9 to 18 years of age, as well as other calcium-rich foods (8).

The proportion of children consuming an adequate intake of calcium is lowest between the ages of 12 and 19 years when accumulation of bone mineral peaks and the requirement for calcium is highest.

This *Digest* reviews children's calcium needs, intake, and factors influencing their dairy food and calcium intake; scientific findings supporting a beneficial role for dairy foods and calcium in bone health; and recommendations to optimize children's and adolescents' bone health.

CHILDREN'S AND ADOLESCENTS' CALCIUM NEEDS AND INTAKES

For children aged 4 to 8 years, 800 mg of calcium/day is recommended, whereas for children and adolescents aged 9 through 18 years, 1,300 mg of calcium/day is recommended (3). This higher calcium recommendation coincides with peak calcium accretion rates in bone which occur at an average age of 12.5 years for girls and 14 years for boys (8,9).

For most children over 8 years of age and adolescents in the U.S., calcium intakes are below daily recommended levels (4,8,10,11). According to data from the National Health and Nutrition Examination Survey (NHANES) 2001-2002, only 6% of girls and 28% of boys aged 9 to 13 years and only 9% of girls and 31% of boys aged 14 to 18 years have calcium intakes greater than recommended (4). Not only does dietary calcium intake decline with age, but at all ages females' calcium intake is much lower than that of males (4,10).

In addition to calcium, bone health depends on an adequate vitamin D status, which increases calcium absorption (1,3,7,8). The current dietary recommendation for vitamin D for children and adolescents is 200 I.U. per day (3,12). Vitamin D status is influenced by exposure of the skin to sunlight and diet. Because few foods naturally contain vitamin D, virtually all milk in the U.S. is voluntarily fortified with vitamin D at a level of 400 I.U. per quart (3).

Two cups of vitamin D-fortified milk provides 200 I.U. of vitamin D, the amount recommended for children and adolescents. Some cheeses and yogurts as well as some breads, cereals and juices are also fortified with vitamin D. In recent years, there have been several reports of low vitamin D status among U.S. adolescents, especially those who are not regularly exposed to sunlight and/or do not consume at least 2 cups/day of vitamin-D fortified milk (12-15).

Inadequate consumption of milk and other dairy foods contributes to low dietary intake of calcium (and vitamin D) (1,2,10,16). Dairy foods are the major source of dietary calcium, providing 72% of the calcium in the U.S. food supply (17). On average, adolescent girls aged 12 to 19 years are consuming only 1.7 servings/day from the Milk Group, while similar aged boys are consuming 2.4 servings/day (5). Without including adequate amounts of dairy foods (i.e., at least 3 servings/day) in the diet, it is improbable that daily recommended dietary intakes of calcium will be met (1,2).

Many factors influence children's and adolescents' dairy intake, each of which needs to be considered in efforts to promote adequate calcium intake (8,10). A preoccupation with being thin or the misperception that all dairy foods are fattening can limit intake of these foods (8,10). The 2005 Dietary Guidelines for Americans (7) advises adults and children to not avoid milk and milk products because of concerns about weight gain. Also, the AAP report points out that "children, adolescents, and parents may not be aware that low-fat milk contains at least as much calcium as whole milk" (8).

Replacement of milk intake by soft drinks and fruit juices and/or fruit drinks may contribute to adolescents' low calcium intakes (8-10,18-20). This concern was expressed in the AAP's policy statements restricting soft drinks in schools (19) and limiting juice intake in children (20). Lactose maldigestion, which is more common in children of African, American Indian, and Asian descent than in white children, may lead to restriction of dairy and calcium intake (8,10). However, many children with lactose maldigestion can consume dairy products without discomfort by drinking smaller amounts of milk (e.g., 1 cup) especially with meals, eating aged cheeses (e.g., Cheddar, Swiss), or consuming yogurt with live active cultures (7,21,22). Lactose-free and low lactose milks are other options to encourage children to meet the recommended 3 servings/day of dairy foods. In a new report on lactose intolerance, the AAP recommends that children and adolescents with lactose intolerance consume dairy foods, as suggested above, in order to obtain enough calcium, vitamin D, protein, and other nutrients essential for bone health and growth (21).

Because of the family's influence on children's and adolescents' diets, family members are encouraged to serve as role models by consuming and serving milk and other dairy foods themselves.

Parents, through role modeling, expectations and attitudes, can influence their children's dairy and calcium intake (8,23-25). Researchers have found that mothers who drink milk more often tend to have young daughters who drink milk frequently and consume fewer soft drinks (23). A study of 192 girls followed from ages 5 to 9 and their mothers found that, at age 9, the girls who consumed recommended dietary intakes of calcium drank twice the amount of milk, had slightly higher bone mineral density, and had mothers who drank and served milk more frequently than girls with low calcium intakes (24). Some recent studies show that breakfast consumption improves children's and adolescents' calcium intake (26,27).

IMPROVING CHILDREN'S BONE HEALTH: WHAT STUDIES SHOW

Consuming an adequate intake of dairy foods and/or calcium during childhood and particularly adolescence is important for optimizing bone health, which may help reduce the risk of fractures in childhood and adolescence and osteoporosis in later adult years (1,3,6,28-32). In young children, increasing calcium intake has been shown to increase bone mineral density (1,3,6,24, 28-35). In a recent six-year prospective study of 151 Caucasian girls followed from age 5 to 11, higher calcium intakes (provided mainly from dairy products) at ages 7 and 9 years were positively associated with total body bone mineral content at age 11 (34). In another longitudinal study of young children aged 2 to 8 years, multiple nutrients (energy, calcium, phosphorus, protein, magnesium, and zinc) showed a positive

and significant correlation with bone mineral content (35). This finding led the researchers to suggest that children should consume a variety of nutrient-rich foods to protect their bone health (35).

Meeting calcium needs during adolescence is particularly important for bone health given that 40% of adult bone mass is accrued during the few years of peak skeletal growth (1,8). The benefits of increased calcium on adolescents' bone health are demonstrated in a number of studies (1,3,6,28-32,36-38). A one-year double-blind, placebo-controlled calcium intervention study (1,000 mg calcium carbonate/day) in 100 post-menarcheal girls with habitual low calcium intakes (<800 mg/day) found that calcium supplementation (1,000 mg/day) enhanced bone mineral acquisition, especially in girls who were two years past the onset of menarche (37).

Because milk and other dairy products are the major dietary source of calcium and provide other bone-building nutrients, several studies have examined their effect on bone health in children and adolescents (30,38-45). Researchers found that bone mineral content and bone mineral density were significantly increased in a study of 80 girls aged 12 years who consumed additional calcium (i.e., 1,125 mg/day compared to baseline calcium intake of 746 mg/day) in the form of whole or low-fat milk (i.e., two cups) for 18 months (39). A clinical study in 28 boys between 13 and 17 years of age found that increasing milk intake (3 servings of 1% fluid milk/day) favorably affected bone mineral responses to resistance training (40). A recent two-year placebo-controlled intervention trial in Finland found that consuming cheese to increase calcium intake was more beneficial for bone mass accrual in girls aged 10 to 12 years than a similar amount of calcium from calcium supplements (41). Other investigations in U.S. and Asian children and adolescents indicate that intake of dairy products has a positive influence on bone mineral density (42-45). A retrospective study showed that women aged 20 to 49 years who consumed more milk during childhood had higher bone mineral content than those whose intake of milk intake during childhood was low (46).

To optimize bone health, the American Academy of Pediatrics recommends 3 servings of dairy foods (e.g., low-fat milk, flavored milk, cheese, or yogurt) a day for children 4 to 8 years of age and 4 servings a day for children and adolescents 9 to 18 years, along with weight-bearing exercise.

Overall, controlled trials of calcium or dairy intake have reported positive short-term effects on bone measures during growth, particularly when habitual calcium intake is low (28,29,32). But whether or not there is a long-term benefit in attaining and maintaining maximum peak bone mass after the dairy food or calcium intervention is stopped has yet to be conclusively established (1,8,28,47). Several follow-up investigations indicate that the effects of dairy food or calcium intake on gain in bone mineral density are maintained (i.e., from 1 to 7.5 years, depending on the study) after the intervention is discontinued (33,48-52), whereas in other studies no sustained effect has been observed (53,54). Factors such as the timing of pubertal maturation, source of calcium (food or supplement), and habitual calcium intake may influence the lasting response to calcium supplementation. Because it is unknown whether a short-term increase in calcium results in a long-term benefit on bone health, it is important that dietary practices that promote adequate calcium intake be established in childhood and maintained throughout life (8).

Emerging evidence indicates that fractures in childhood and adolescence are related to low bone mass or skeletal fragility, which in turn is influenced by diet and physical activity (30,55-58). A recent meta-analysis of eight case-control studies found a positive association between low bone density and fractures in children (55). New Zealand children and adolescents aged 5 to 19 years with repeated forearm fractures had lower bone mineral content and weighed more, two factors that increase fracture risk, compared to fracture-free children of the same age and gender (56). Previous research by these investigators showed an increased incidence of fractures in children who avoided milk (58).

In addition to adequate calcium intake, weight-bearing exercise (e.g., running, jumping) is important to optimize bone

health during growth (1,8). The AAP states that "there is evidence that childhood and adolescence may represent an important period for achieving long-lasting skeletal benefits from regular exercise" (8). Some studies demonstrate that increasing calcium or dairy intake enhances the positive effects of high physical activity on bone mineral status during growth (59-63). However, additional research is necessary to determine the combined effects of calcium and exercise on bone health during childhood and adolescence (8,64).

STRATEGIES TO OPTIMIZE BONE HEALTH DURING GROWTH

The importance of calcium and calcium-rich foods such as milk, cheese, and yogurt for children's and adolescents' bone health is recognized by health professional and government organizations (1,7,8,65,66). The 2005 Dietary Guidelines for Americans (7) states that consuming milk products is associated with "overall diet quality and adequacy of intake of many nutrients" and "is especially important for children and adolescents who are building their peak bone mass and developing lifelong habits." In a position statement on dietary guidance for healthy children, the American Dietetic Association (65) recognizes that children's "failure to meet calcium requirements in combination with a sedentary lifestyle in childhood can impede the achievement of maximal skeletal growth and bone mineralization, thereby increasing the diet-related risk of developing osteoporosis later in life." In its report on optimizing children's bone health, the AAP (8) states that "drinking three 8-oz glasses of milk per day (or the equivalent…) will achieve the recommended adequate intake of calcium in children 4 to 8 years of age, and four 8-to-10-oz of milk (or the equivalent) will provide the adequate calcium intake for adolescents." The report identifies yogurt and cheese as good sources of calcium and adds that "flavored milks, cheeses, and yogurts containing reduced fat or no fat and modest amounts of sweeteners (both caloric and non-caloric) are generally recommended" (8). The National Medical Association consensus panel recommends 3 daily servings of low-fat milk, cheese, and/or yogurt a day for children and 4 servings a day for adolescents (66).

Childhood and adolescence is a critical period for establishing healthful dietary practices and lifestyle behaviors that, if maintained, can support skeletal health throughout life.

Milk and other dairy foods are identified as the preferred dietary source of calcium (1,3,7,8). Not only are milk and other dairy products calcium-dense foods providing about 300mg calcium/serving, but these foods also contain other nutrients important for bone health such as vitamin D (if fortified), phosphorus, protein, potassium, magnesium, and zinc (1,2). In fact, milk contains three nutrients (i.e., calcium, potassium, and magnesium) which the 2005 Dietary Guidelines (7) identifies as being low in the diets of children. Nondairy calcium-containing foods (e.g., some green leafy vegetables, beans) and calcium-fortified foods are other sources, although the bioavailability of calcium in some of these foods (e.g., spinach) is low (8,67). Calcium supplements are another source, but the AAP (8) cautions that "these products do not offer the benefit of other associated nutrients, and compliance may be a problem." For individuals who rely on calcium-fortified foods or nondairy foods low in vitamin D, another source of vitamin D is needed to provide an adequate intake of 200 IU of vitamin D/day (8).

In addition to consuming a nutritionally balanced diet including low-fat dairy products, fruits, and vegetables, children and adolescents should be physically active and participate in weight-bearing activities to optimize their bone health (1,8). Also, parents should be role models of healthy behaviors by serving milk at mealtimes and choosing milk as a beverage when eating out (8). The AAP recommends that physicians periodically assess children's and adolescents' calcium intake beginning at 2 to 3 years of age and have discussions with parents and families regarding their dietary habits to ensure that they are meeting daily calcium requirements (8). Information regarding the calcium content of

various foods should be given to patients and their families at risk of low calcium intakes. A registered dietitian may be consulted for a more thorough dietary assessment and to offer recommendations to increase calcium intake (8). Resources such as the Calcium Assessment Questionnaire, a new tool developed by the AAP and National Dairy Council (www.nationaldairycouncil.org), can help families determine if they are getting the calcium they need from their diets.

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RELATED RESOURCES

- **www.nationaldairycouncil.org**
  (under Health Professional Resources)
  Calcium Counseling Resource
  National Dairy Council. Dairy's role in children's health and wellness. Dairy Council Digest 76(5), 2005.
  National Dairy Council. Building better bones with dairy foods throughout the lifecycle. Dairy Council Digest 75(6), 2004.
- **www.nationaldairycouncil.org** (under Nutrition & Product Information)
  Thinking About Calcium? Find It in Food First
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  Professor of Pediatrics
  University of Wisconsin
  Madison, Wisconsin
- Connie M. Weaver, PhD
  Professor and Head,
  Department of Foods and Nutrition
  Purdue University
  West Lafayette, Indiana

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Calcium rich foods

Knowing which foods are high in calcium can help you make sure that you are getting enough calcium in your diet by choosing calcium rich foods. Remember that you should eat at least 3 or more than 3 servings of dairy products per day or the equivalent of non dairy foods to get enough calcium in your diet. It is also important to understand how much calcium you actually need. The Food and Nutrition Board of the National Academy of Sciences recommends….

- 1300mg a day for individuals who are in their late adolescents and early twenties.

Keep in mind that the %Daily Value for calcium on food labels is based on the adult requirements of 1000mg a day. So a cup of milk that was 30% DV for calcium would be equal to 300mg of calcium, which would be only about 23% of a teen's calcium needs.

Calcium Rich Foods

In addition to choosing foods from the following list, you should learn to look at food labels and simply choose foods that have a high %DV for calcium and at least 20% or more. You may find big differences in the calcium content of foods, even among different brands of the same foods, such as cheese, juice, and bread.

- Yogurt, plain
- Yogurt, fruit
- Milk, low fat or nonfat
- Milk, whole
- Cheese, including American cheese, Ricotta cheese, Cheddar cheese, Mozzarella cheese, etc.
- Milk shakes
- Eggnog

Be sure to check the nutrition label to make sure the cheese has a lot of calcium in it. And also look for foods made with these calcium rich foods as ingredients, such as a Macaroni and cheese (cheese), pudding (milk), nachos (cheese), etc.

Nondairy Foods with Calcium

- Salmon
- Tofu
- Collard Greens
- Rhubarb
- Sardines
- Spinach
- Turnip Greens
- Okra

- White Beans
- Baked Beans

Calcium Fortified Foods

In addition to the large number of calcium rich foods that are naturally found, like milk and cheese, there are also a lot of foods that are now fortified with calcium. These can be especially good choices if you don't like to drink milk or are intolerant to milk.

- Calcium fortified orange juice
- Calcium fortified breakfast cereal, including General Mills Whole Grain Total and Total Raisin Bran, which have 100%DV of calcium per serving!
- Calcium fortified soy milk
- Instant oatmeal
- Calcium fortified bread, English muffins, etc.

Get a feel for serving sizes and Calcium content

FOOD ITEM	SERVING (oz)	CALCIUM CONTENT(mg)
Milkshake	1 cup (8 oz)	415
Pizza, cheese	1/2 of 10-inch pizza	362
Eggnog, nonalcoholic	1 cup (8 oz.)	355
Low fat yogurt with fruit	1 cup (8 oz.)	330
Sardines, canned	1/2 cup (3-1/2 oz.)	314
Skimmed milk (1/2% fat)	1 cup (8 oz.)	302
Whole milk	1 cup (8 oz.)	291
Cheese soup made with milk	1 cup	288
Swiss cheese	1 slice (1 oz.)	272
Red salmon	1/2 cup (3-1/2 oz.)	259
Ricotta	1 ounce	257
Soft serve ice milk	1 cup	236
Provolone	1 ounce	214
Cheddar cheese	1 slice (1 oz.)	204
Pink salmon	1/2 cup (3-1/2 oz.)	196
Cheese sauce, homemade	1/4 cup	178
Mushroom soup made with milk	1 cup	178

APPENDIX B

Identifying Factors Associated with Intake of Dairy Products in College Students

IRB APPROVAL

CONSENT FORM

DATA COLLECTION INSTRUMENT

IRB Approval

VirginiaTech

Office of Research Compliance
Institutional Review Board
1880 Pratt Drive (0497)
Blacksburg, Virginia 24061
540/231-4991 Fax: 540/231-0959
E-mail: moored@vt.edu
www.irb.vt.edu
FWA00000572(expires 7/20/07)
IRB # is IRB00000667.

DATE: January 5, 2007

MEMORANDUM

TO: Kathy Hosig
Kavita Poddar

Approval date: 1/5/2007
Continuing Review Due Date:12/21/2007
Expiration Date: 1/4/2008

FROM: David M. Moore

SUBJECT: **IRB Expedited Approval:** "Determining Factors that Affect Dairy and Dairy Product/Calcium Consumption in Freshman Students" , IRB # 07-005

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective January 5, 2007.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.
3. Report promptly to the IRB of the study's closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher's responsibility to obtained re-approval from the IRB before the study's expiration date.
4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

Important:
If you are conducting **federally funded non-exempt research**, this approval letter must state that the IRB has compared the OSP grant application and IRB application and found the documents to be consistent. Otherwise, this approval letter is invalid for OSP to release funds. Visit our website at http://www.irb.vt.edu/pages/newstudy.htm#OSP for further information.

cc: File

Consent Form

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Determining Factors that Affect Dairy and Dairy Product/Calcium Consumption in College Students

Investigators: Kathy Hosig, Ph.D, MPH, R.D., Kavita Poddar

I. Purpose of this Research/Project

Students enrolled in the introductory nutrition class HNFE 1004 class will be invited to participate in this study. This study will serve to collect qualitative data on student perspectives regarding barriers and facilitators to consuming dairy and dairy products/calcium in the diets. Focus groups, one on one interview sessions, online discussion and online questionnaires will be used to collect the data. The information will be used to design programs to help college students increase their intake of calcium from dairy and dairy products.

II. Procedures

If you decide to participate in this study, you will be randomly assigned to participate in **one of the following**:-.

1) Focus Group:-
Focus group session will last approximately 60-90 minutes. During the focus group, you will discuss your perceptions regarding barriers and facilitators to consuming dairy and dairy products at Virginia Tech. There will be approximately six to eight participants in the focus group, all recruited from the HNFE 1004 class. Dr. Hosig, the faculty member in charge of the study, will lead the focus group discussion. Either a graduate student or another faculty member will serve as assistant moderator, who will take notes during the discussion. The discussion will also be audio taped in case we need to clarify any of the notes. No names will be included on the notes taken, but first names may inadvertently be used during the discussion and appear in the audiotape.

2) One-on-one interview session:-
One-on-one interview session will last for approximately 30 to 45 minutes. Questions included in this session will be same or similar to the one included in the focus group discussion. Dr. Hosig, the faculty member in charge of the study, will conduct the interview session.

3) Online discussion session:-
Questions similar to focus group questions will be posted online. Participants will be expected to post at least two responses (original thought or response to another participant's response) to each question; a response of "no comment" will be accepted. Approximate time required in this will be 60-90 minutes.

4) Online questionnaire session:-
Participants in this group will be asked to fill out an online questionnaire which will be used to collect information for a research study. You will be assigned to fill out a 12 page online questionnaire twice within a span of one week. Each time will take about 30 to 45 minutes (60-90 minutes total).

III. Risks

The risks or discomforts involved with this study are small. If you do not wish to respond or participate in the discussion of a particular issue, you will not be forced to do so. You may be asked to respond if you have not yet done so during the discussion, but you may choose to abstain without penalty. None of the questions will be about sensitive information, since we will be asking only about issues related to diet and physical activity.

IV. Benefits

If you participate in this study, you will benefit by getting ideas for ways to improve your own diet and incorporate dairy and dairy products/calcium.

The major benefit of this study will be information that we can use to help make it easier for future students make healthy choices and incorporate dairy and dairy products in their diets.

V. Extent of Anonymity and Confidentiality

Focus group
All of your information from the study will be confidential. Your name will not be used on the notes taken during the discussion, and only first names if any will be used during the discussion (and thus be included in the audiotape). You will sign your name on a list of participants when you come to the session, so that we will know that you should receive compensation for your time.

One-on-one interview session:-
All of your information from the study will be confidential. Your name will not be used on the notes taken during the interview session. You will sign your name on a list of participants when you come to the session, so that we will know that you should receive compensation for your time.

Online discussion groups:-
Online discussion participation will be verified through Blackboard. Your name will be removed once information is downloaded and your participation has been verified.

Online questionnaire group:-
Your name will be verified through the Blackboard and will be removed once information is downloaded and your participation has been verified.

VI. Compensation

If you participate fully in any of the 4 options for this study, you will receive five bonus points for HNFE 1004.

If you do not complete participation in the study once you begin, your grade in the course will not be affected. You will receive partial compensation for participation in the study as follows. If you decide to discontinue participation if you start in a focus group, discussion group or in-person discussion, you will receive 2 points for partial compensation. If you are assigned to the online questionnaire group and complete only one questionnaire, you will receive 2.5 bonus points as partial compensation.

If you do not wish to participate in this study, you may receive equal bonus credit (5 points) by completing a 2-day diet record and analyzing the nutrient content of the foods using an online computer program. Your instructor will provide instructions and guidelines for this project.

VII. Freedom to Withdraw

If you agree to participate in this study, you are free to withdraw or stop participation at any time without penalty.

VIII. Subject's Responsibilities

I voluntarily agree to participate in this study. I have the following responsibilities:

I will be randomly assigned to **one of the following options:**

Attend one focus group discussion or in-person interview, complete one online questionnaire twice within one week, or participate in an online discussion session. Each option will require me to provide my opinions about consuming calcium from dairy products. Each option will be require approximately 45 to 90 minutes of my time.

1) **Focus Group**
   OR
2) **One-on-one interview session**
   OR
3) **Online discussion session**
   OR
4) **Online questionnaire session**

X. Subject's Permission

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered and have been given a copy of this form to keep. I hereby acknowledge the above and give my voluntary consent:

PRINTED NAME: _____

_____ Date _____
Signature

Local Telephone: _____

Email address: _____

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

Kavita Poddar Principal Investigator	(540) 231-4900/poddar@vt.edu Telephone / e-mail
Dr. Kathy Hosig Investigator Departmental Reviewer	(540) 231-4900/ khosig@vt.edu Telephone / e-mail
Dr. David Moore IRB Chair	(540) 231-4991/ moored@vt.edu Telephone / e-mail

Data collection instrument

Questionnaire

Determining factors that affect dairy and dairy product/calcium consumption in college students

Questions for Focus Groups, In-person Interviews and Online Discussion Groups

Date:- _____ Time: _____

# of Male/Female:- _____ Code # _____

1) Do you live On Campus or Off Campus?
2) Where do you have your meals? Why?
3) List as many milk and dairy products that you can think of. Which ones are low-fat?
4) Do you incorporate dairy and dairy products in your diet? Why or why not?
5) Do you think it is important to have dairy/dairy products? Why or why not?
6) Where do you buy your dairy/dairy products from? Why?
7) Do you think you consume enough dairy/dairy products? Why or why not?
8) What things do you do to make sure you get enough dairy/dairy products?
9) Tell me the first thoughts that come to your mind when you see the word?
   Skim milk, Low fat milk, Regular milk, Yogurt/Smoothies,

10) Do you think you get enough calcium in your diet? Why or why not?
11) Do you think dairy/calcium intake will benefit you personally? Why or why not?
12) What are some positive things that you have heard about consuming dairy and calcium?
13) Are there any reasons that you or your friends tend to avoid dairy products? What are they?
14) Tell me when you consume dairy/dairy products, what do you prefer? Regular or low fat or skim? Why?
15) Do you want to increase your intake of dairy? Why or why not?
16) What information do you need to increase your intake of dairy? Why?
17) What are some reasons that college students might have trouble getting enough dairy products or calcium in their diet?
18) What are some reasons that college students might have trouble increasing their intake of low-fat dairy products?
19) Do you think that you will gain unwanted weight in the next year? Why or why not?
20) What will happen if you gain unwanted weight in the next year?
21) Do you think that you will have weak bones or break bones when you are old? Why?
22) What will happen if you have weak bones or break bones when you are old?
23) How can you decrease your risk of having weak bones or breaking bones when you are old?
24) In what ways do you get yourself to eat or drink things you think are healthy?
25) Do you try to avoid gaining unwanted weight?

-if yes, what things do you do to avoid gaining unwanted weight?

APPENDIX C

Nutrition Education Intervention Improves Total Dairy Intake and Self Regulation Related to Increased Dairy Intake in College Students

IRB APPROVAL

CONSENT FORM(S)

DATA COLLECTION INSTRUMENTS

INTERVENTION MATERIALS

IRB Approval

VirginiaTech

Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24061
540/231-4991 Fax 540/231-0959
e-mail moored@vt.edu
www.irb.vt.edu
FWA00000572(expires 1/20/2010)

DATE: January 14, 2008

MEMORANDUM

TO: Kathy Hosig
Kavita Poddar

Approval date: 1/14/2008
Continuing Review Due Date:12/30/2008
Expiration Date: 1/13/2009

FROM: David M. Moore

SUBJECT: **IRB Expedited Approval:** "Nutrition Education Intervention to Improve Dairy and Low-Fat Dairy Intake in College Students" , IRB # 08-010

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective January 14, 2008.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.
3. Report promptly to the IRB of the study's closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher's responsibility to obtained re-approval from the IRB before the study's expiration date.
4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

Important:
If you are conducting **federally funded non-exempt research**, this approval letter must state that the IRB has compared the OSP grant application and IRB application and found the documents to be consistent. Otherwise, this approval letter is invalid for OSP to release funds. Visit our website at http://www.irb.vt.edu/pages/newstudy.htm#OSP for further information.

cc: File

Amended IRB Approval

VirginiaTech

Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24061
540/231-4991 Fax 540/231-0959
e-mail moored@vt.edu
www.irb.vt.edu
FWA00000572(expires 1/20/2010)
IRB # is IRB00000667

DATE: January 29, 2008

MEMORANDUM

TO: Kathy Hosig
Kavita Poddar

Approval date: 1/14/2008
Continuing Review Due Date:12/30/2008
Expiration Date: 1/13/2009

FROM: David M. Moore

SUBJECT: **IRB Amendment 1 Approval:** "Nutrition Education Intervention to Improve Dairy and Low-Fat Dairy Intake in College Students" , IRB # 08-010

This memo is regarding the above referenced protocol which was previously granted approval by the IRB on January 14, 2008. You subsequently requested permission to amend your IRB application. Since the requested amendment is nonsubstantive in nature, I, as Chair of the Virginia Tech Institutional Review Board, have granted approval for requested protocol amendment, effective as of January 29, 2008. The anniversary date will remain the same as the original approval date.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.
3. Report promptly to the IRB of the study's closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher's responsibility to obtained re-approval from the IRB before the study's expiration date.
4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

cc: File

Consent form EDHL 1514

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Nutrition education intervention to improve dairy and low-fat dairy intake In college students

Investigators: Kavita Poddar, BS and Kathy Hosig, Ph.D, MPH, RD

I. Purpose of this Research/Project

All students enrolled in EDHL 1514 for Spring 2008 will be invited to participate in this study. This is a dissertation study, and the purpose of the study is to improve dairy and low-fat dairy intake in college students *via* nutrition education program to help college students eat healthier. The current study aims to modify behavior related to dairy and low-fat dairy intake via factors like beliefs and attitudes. Results of the study will be used to publish data and dissertation.

II. Procedures

Everyone who agrees to be in this study will be assigned to one of two groups; a comparison group or an intervention group. If you are assigned to the comparison group, you will complete data collection and have the opportunity to participate in improving stress management skills. If you are assigned to the intervention group, you will complete data collection and have the opportunity to participate as much as you wish in activities provided to help you learn more about benefits of dairy and low-fat dairy intake and how to increase the intake at Virginia Tech.

Data Collection (all subjects)

If you decide to participate in this study, you will be asked to do certain things at two different times during this academic year (2008). The total time commitment for filling out questionnaires and body measurements is about 4 hours and 40 mins (2 hours and 20 mins each time).

Things you will be asked to do (Once in January 2008 and once in April 2008) include:

1. Complete online questionnaires about your health, eating habits, calcium questionnaire and dairy and low-fat dairy intake beliefs and attitudes.
2. Keep a record of your food intake and physical activity for 7 days
3. Come to a faculty office in Wallace Hall to have your weight, height, waist and hip measurements taken; you will need to make an appointment to come for these measurements when you have not eaten yet that day and have only had a maximum of 1 cup (8 ounces) of beverage that day. If you have diabetes, hypoglycemia, or any other condition that requires eating on a regular schedule, please inform the researchers ahead of time – you may eat that morning, and your food intake for that morning will be recorded on the form along with your weight.

The questionnaires will be available online to be filled out. You will be required to fill out these questionnaires before your appointment for the body measurements. Food and activity log will be available online through Blackboard™ site for downloading. You will be required to bring the completed food and activity log forms to your body measurement appointment to be submitted.

Your weight and height and waist/hip circumference measurements will be taken in a office (Wallace Annex, Room #3 in the basement) by either Kavita Poddar, Dr. Hosig or a graduate research assistant. The door will be partially open. You will keep your clothes on but will be asked to remove any outer clothing such as hat, coat, sweater and shoes. We will measure your hips and waist over light clothing such as a t-shirt and cotton shorts

or pants. You may have to loosen the waistband of your pants so that we can get an accurate waist measurement. If you wear clothes that are too thick or tight, we will provide a t-shirt and shorts for you to change into in the restroom down the hall before your measurements are taken.

Intervention Program (only subjects assigned to the intervention group)
If you are assigned to the intervention group, you will have access to a Blackboard™ site that is designed to provide short educational flyers about benefits of consuming adequate **dairy** and **low-fat dairy**. This site will also give you tips on how to eat healthy and increase your dairy and low-fat dairy intake and provide links to information that you might find helpful, invite you to social events for study participation, and ask you to complete daily checklists about dairy and low-fat dairy intake. You will sometimes receive emails about the study through the Blackboard™ site. You will not be required to participate in any parts of the intervention. You may choose to do all or none of the things available to you. The study site will show on your Blackboard™ account any time you access the system for your Virginia Tech courses, but you will determine how often you access it by clicking on the link for that site.

Comparison program (only subjects assigned to the comparison group)
If you are assigned to the comparison group, you will have access to a Blackboard™ site that is designed to provide information about **stress management**. This site will provide links to online resources already provided by Virginia Tech. you will be asked to complete weekly behavior checklists for stress management for 8 weeks each during the Spring 2008 semester. You will be provided with email address of the stress management personnel at Virginia Tech and encouraged to contact them to get assistance of any kind related to stress management. Links to these email addresses will also be available directly from within Blackboard™.

III. Risks

Some subjects may be uncomfortable having body measurements taken; we will keep the door to the room partially closed so that you will have privacy during these measurements.
Some subjects may experience minor emotional distress during completion of the questionnaires; you may refuse to answer any questions that make you feel uncomfortable. The questions on the questionnaires are not designed to be about sensitive information.

IV. Benefits

Potential benefits of participation in this study include receiving personal information about your body measurements and nutrient content of your diet. You may request a copy of your body measurements and nutrient analysis from your food record level once they are analyzed by checking the appropriate box(es) on this consent form.

The general public, especially college students, may benefit from this study if the intervention is successful in improving dairy and low-fat dairy intake of college students. Researchers can use results of the study to publish papers and for dissertation. Results of this study may be distributed in newsletters to college students and in scientific journals.

V. Extent of Anonymity and Confidentiality

All of your information from the study will be confidential. Your name will not be used on the questionnaires, food and activity record, body measurement forms, or any other data collection forms. Instead, you will be given a special code number that will be on these forms. The researchers will keep a list of names and code numbers in a locked file cabinet. This list is to make sure that the correct code number is put on the forms you get so that all of your information has the same code number. Your code number will be put on the forms when you bring them to your body measurement appointment. Published results will not contain results for individual subjects.

VI. Compensation

Total compensation available for completion of all components for both data collection period is 15% of course points for the on-campus EDHL 1514 section.

Compensation for partial completion of study components will be provided per data collection period (2 periods) as 2.5% of course points for completion of questionnaires, 2.5% of course points for completion of the food/activity log and 2.5% of course points for completion of body measurements.

VII. Freedom to Withdraw

If you agree to participate in this study, you are free to withdraw or stop participation at any time without penalty. You will receive compensation for any part of the study that you have completed, as shown above. If you choose to withdraw during Spring semester, your grade in the course will not be affected. You will not receive compensation for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. If you withdraw from the study, you may gain unearned points up to 15% of course points (7.5% of course points per data collection period) – you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course (EDHL 1514).

If the researchers decide that you should not continue as a subject for any reason, such as missing data or incomplete information on study forms, you may be asked to withdraw from the study. If this happens, you will receive compensation as above for any parts of the study that you completed. Your grade for the course will not be affected. You will not receive points for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. You may gain unearned points as described above up to 15% of course points (7.5% of course points per data collection period), you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course (EDHL 1514).

VIII. Subject's Responsibilities

I voluntarily agree to participate in this study. By agreeing to participate in the study, I agree to complete all responsibilities listed above in section II, Procedures. I understand my right to withdraw my participation at any time.

X. Subject's Permission

I am 18 years of age or older have read and understand the Informed Consent and conditions of this project. I have had all my questions answered and have been given a copy of this form to keep. I hereby acknowledge the above and give my voluntary consent to participate:

_____ Date _____

Signature

Virginia Tech Institutional Review Board: Project No. 08-010
Approved January 14, 2008 to January 13, 2009

EDHL 1514
Subject information:

Printed Name: _____

Phone number: _____ E-mail address: _____

☐ I would like to receive a copy of my nutrient analysis results when complete.

☐ I would like to receive a copy of my body measurements.

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

Kavita Poddar poddar@vt.edu
Investigator e-mail

Dr. Kathy Hosig (540) 231-4900/ khosig@vt.edu
Investigator Telephone/ e-mail

Dr. William G. Herbert (540) 231-6565/ wgherb@vt.edu
Departmental Reviewer Telephone/ e-mail

Dr. David Moore (540) 231-4991/ moored@vt.edu
IRB Chair Telephone/ e-mail
Institutional Review Board
for Human Subject Research Ethics

Consent form EDHL 3534

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Nutrition education intervention to improve dairy and low-fat dairy intake In college students

Investigators: Kavita Poddar, BS and Kathy Hosig, Ph.D, MPH, RD

I. Purpose of this Research/Project

All students enrolled in EDHL 3534 for Spring 2008 will be invited to participate in this study. This is a dissertation study, and the purpose of the study is to improve dairy and low-fat dairy intake in college students *via* nutrition education program to help college students eat healthier. The current study aims to modify behavior related to dairy and low-fat dairy intake via factors like beliefs and attitudes. Results of the study will be used to publish data and dissertation.

II. Procedures

Everyone who agrees to be in this study will be assigned to one of two groups: a comparison group or an intervention group. If you are assigned to the comparison group, you will complete data collection and have the opportunity to participate in improving stress management skills. If you are assigned to the intervention group, you will complete data collection and have the opportunity to participate as much as you wish in activities provided to help you learn more about benefits of dairy and low-fat dairy intake and how to increase the intake at Virginia Tech.

Data Collection (all subjects)

If you decide to participate in this study, you will be asked to do certain things at two different times during this academic year (2008). The total time commitment for filling out questionnaires and body measurements is about 4 hours and 40 mins (2 hours and 20 mins each time).

Things you will be asked to do (Once in January 2008 and once in April 2008) include:

1. Complete online questionnaires about your health, eating habits, calcium questionnaire and dairy and low-fat dairy intake beliefs and attitudes.
2. Keep a record of your food intake and physical activity for 7 days
3. Come to a faculty office in Wallace Hall to have your weight, height, waist and hip measurements taken; you will need to make an appointment to come for these measurements when you have not eaten yet that day and have only had a maximum of 1 cup (8 ounces) of beverage that day. If you have diabetes, hypoglycemia, or any other condition that requires eating on a regular schedule, please inform the researchers ahead of time – you may eat that morning, and your food intake for that morning will be recorded on the form along with your weight.

The questionnaires will be available online to be filled out. You will be required to fill out these questionnaires before your appointment for the body measurements. Food and activity log will be available online through Blackboard™ site for downloading. You will be required to bring the completed food and activity log forms to your body measurement appointment to be submitted.

Your weight and height and waist/hip circumference measurements will be taken in a office (Wallace Annex, Room #3 in the basement) by either Kavita Poddar, Dr. Hosig or a graduate research assistant. The door will be partially open. You will keep your clothes on but will be asked to remove any outer clothing such as hat, coat, sweater and shoes. We will measure your hips and waist over light clothing such as a t-shirt and cotton shorts

or pants. You may have to loosen the waistband of your pants so that we can get an accurate waist measurement. If you wear clothes that are too thick or tight, we will provide a t-shirt and shorts for you to change into in the restroom down the hall before your measurements are taken.

Intervention Program (only subjects assigned to the intervention group)
If you are assigned to the intervention group, you will have access to a Blackboard™ site that is designed to provide short educational flyers about benefits of consuming adequate **dairy** and **low-fat dairy**. This site will also give you tips on how to eat healthy and increase your dairy and low-fat dairy intake and provide links to information that you might find helpful, invite you to social events for study participation, and ask you to complete daily checklists about dairy and low-fat dairy intake. You will sometimes receive emails about the study through the Blackboard™ site. You will not be required to participate in any parts of the intervention. You may choose to do all or none of the things available to you. The study site will show on your Blackboard™ account any time you access the system for your Virginia Tech courses, but you will determine how often you access it by clicking on the link for that site.

Comparison program (only subjects assigned to the comparison group)
If you are assigned to the comparison group, you will have access to a Blackboard™ site that is designed to provide information about **stress management**. This site will provide links to online resources already provided by Virginia Tech. you will be asked to complete weekly behavior checklists for stress management for 8 weeks each during the Spring 2008 semester. You will be provided with email address of the stress management personnel at Virginia Tech and encouraged to contact them to get assistance of any kind related to stress management. Links to these email addresses will also be available directly from within Blackboard™.

III. Risks

Some subjects may be uncomfortable having body measurements taken; we will keep the door to the room partially closed so that you will have privacy during these measurements.
Some subjects may experience minor emotional distress during completion of the questionnaires; you may refuse to answer any questions that make you feel uncomfortable. The questions on the questionnaires are not designed to be about sensitive information.

IV. Benefits

Potential benefits of participation in this study include receiving personal information about your body measurements and nutrient content of your diet. You may request a copy of your body measurements and nutrient analysis from your food record level once they are analyzed by checking the appropriate box(es) on this consent form.

The general public, especially college students, may benefit from this study if the intervention is successful in improving dairy and low-fat dairy intake of college students. Researchers can use results of the study to publish papers and for dissertation. Results of this study may be distributed in newsletters to college students and in scientific journals.

V. Extent of Anonymity and Confidentiality

All of your information from the study will be confidential. Your name will not be used on the questionnaires, food and activity record, body measurement forms, or any other data collection forms. Instead, you will be given a special code number that will be on these forms. The researchers will keep a list of names and code numbers in a locked file cabinet. This list is to make sure that the correct code number is put on the forms you get so that all of your information has the same code number. Your code number will be put on the forms when you bring them to your body measurement appointment. Published results will not contain results for individual subjects.

VI. Compensation

Total compensation available for completion of all components for both data collection period is 15% of course points for the on-campus EDHL 3534 section.

Compensation for partial completion of study components will be provided per data collection period (2 periods) as 2.5% of course points for completion of questionnaires, 2.5% of course points for completion of the food/activity log and 2.5% of course points for completion of body measurements.

VII. Freedom to Withdraw

If you agree to participate in this study, you are free to withdraw or stop participation at any time without penalty. You will receive compensation for any part of the study that you have completed, as shown above. If you choose to withdraw during Spring semester, your grade in the course will not be affected. You will not receive compensation for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. If you withdraw from the study, you may gain unearned points up to 15% of course points (7.5% of course points per data collection period) – you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course (EDHL 3534).

If the researchers decide that you should not continue as a subject for any reason, such as missing data or incomplete information on study forms, you may be asked to withdraw from the study. If this happens, you will receive compensation as above for any parts of the study that you completed. Your grade for the course will not be affected. You will not receive points for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. You may gain unearned points as described above up to 15% of course points (7.5% of course points per data collection period), you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course (EDHL 1514).

VIII. Subject's Responsibilities

I voluntarily agree to participate in this study. By agreeing to participate in the study, I agree to complete all responsibilities listed above in section II, Procedures. I understand my right to withdraw my participation at any time.

X. Subject's Permission

I am 18 years of age or older have read and understand the Informed Consent and conditions of this project. I have had all my questions answered and have been given a copy of this form to keep. I hereby acknowledge the above and give my voluntary consent to participate:

_____ Date _____

Signature

Virginia Tech Institutional Review Board: Project No. 08-010
Approved January 14, 2008 to January 13, 2009

EDHL 3534

Subject information:

Printed Name: _____

Phone number: _____ E-mail address: _____

☐ I would like to receive a copy of my nutrient analysis results when complete.

☐ I would like to receive a copy of my body measurements.

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

Kavita Poddar poddar@vt.edu
Investigator e-mail

Dr. Kathy Hosig (540) 231-4900/ khosig@vt.edu
Investigator Telephone/ e-mail

Dr. William G. Herbert (540) 231-6565/ wgherb@vt.edu
Departmental Reviewer Telephone/ e-mail

Dr. David Moore (540) 231-4991/ moored@vt.edu
IRB Chair Telephone/ e-mail
Institutional Review Board
for Human Subject Research Ethics

Data collection instruments

Questionnaire for SCT variables

Date: - _____ **Code #** _____

General Information About You

Age:_____ **Gender** (circle): Female Male

Race/Ethnic background (check all that apply):

_____ White _____ Asian/ Pacific Islander _____ Native American

_____ Black/African American _____ Other (please specify):_____

Are you Hispanic or Latino (circle)? YES NO

Major (if known): _____ **OR** ____ Unknown at this time (check)

Do you avoid dairy foods/animal products? Yes No

IF YES, what the reason for avoiding (Check all that apply):

1. Lactose intolerant _____
2. Vegetarian (Avoid all animal products) _____
3. Vegan (Avoid eggs and dairy products) _____
4. Other (Please specify) _____

Which course are you taking right now? (circle): **EDHL 1514** **EDHL 3534**

Please indicate **reasons you are taking the course** you are taking: (mark all that apply)

Reason for taking EDHL 1514/3534	**Check all that apply**
Required for major	
Meets university core requirement	
Elective	
Increase GPA	
Interest in topic	
Class was at a convenient time	
Other: please specify:	
Other: please specify:	

HEALTH HISTORY FORM

Medical History
Please indicate any current or previous conditions or problems you have experienced or have been told by a physician that you have had:

	Yes	**No**
Heart disease or heart problems:	_____	_____
Circulation problems:	_____	_____
Kidney disease or problems:	_____	_____
Urinary problems:	_____	_____
Reproductive problems:	_____	_____
Muscle problems:	_____	_____
Skeletal problems:	_____	_____
Neurological problems/disorders:	_____	_____
High blood pressure:	_____	_____
Low blood pressure:	_____	_____
Diabetes:	_____	_____
Thyroid problems:	_____	_____
Eating disorders (bulimia, anorexia):	_____	_____
Crohn's disease:	_____	_____
Hirsutism (unusual hair growth on face or chest):	_____	_____

Insomnia: _____ _____

Unusual sleep patterns: _____ _____

Other (Please list): _____ _____ _____

If "yes" to any of the above please indicate the date, explain, and describe:_____

Please list any hospitalizations/operations/recent illnesses (Type/Date):_____

Work Schedule and Patterns

Do you engage in night-time work? YES NO

If yes, please explain and indicate your usual work hours (time of day): _____ _____

Limitations on Physical Activity

Are there any physical limitations you have that may restrict your ability to exercise? YES NO

If "yes" please explain: _____

Medications

Please indicate any current medications that you are taking on a daily or weekly basis:_____

Please list any nutritional supplements, herbal products, or other medications, (prescription and over-the-counter) you are currently taking on a daily or weekly basis: _____

Weight History

What is your current weight? _____

How much did you weigh six months ago? _____

How much did you weigh one year ago? _____

During the last 2 years, how many times have you lost 5 pounds? _____

During the last 2 years, how many times have you gained 5 pounds? _____

Smoking

Do you smoke (circle)? YES NO if yes, approximately how many cigarettes do you smoke per day? _____

Godin Leisure-Time Exercise Questionnaire

Considering a **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free time** (write on each line the appropriate number).

a) STRENUOUS EXERCISE **Times per week**

(HEART BEATS RAPIDLY)

(i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, etc.) _____

b) MODERATE EXERCISE
(NOT EXHAUSTING)

(i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing, etc.) _____

c) MILD EXERCISE
(MINIMAL EFFORT)

(i.e. yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking, etc.) _____

Considering a **7-Day period** (a week), **during your leisure-time**, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

OFTEN	**SOMETIMES**	**NEVER/RARELY**
1. □	**2.** □	**3.** □

HEALTH BELIEFS QUESTIONNAIRE

Dairy foods and Health beliefs

Using a scale from 1 to 5, indicate how much you agree with the following statements:

1=Strongly Disagree 2=Disagree 3= Unsure 4=Agree 5=Strongly agree

I, my family, and my closest friends…..	**Disagree or Agree (1-5)**		
	Myself	**Family**	**Friends**
1.Don't drink many regular sodas or sugared drinks.			
2.Believe that is it important to consume adequate calcium in the diet.			
3.Eat at least 3 servings of dairy foods everyday.			
4.Try to eat low-fat dairy foods everyday.			
5.Have told me that they want to eat enough calcium everyday.	N/A		
6.Believe that consuming milk and milk products is important.			
7.Believe that drinking too many sodas or sugared drinks is unhealthy.			
8.Believe that drinking whole milk adds unnecessary calories.			
9.Believe that drinking whole milk is more nutritious than low fat milk.			
10.Have told me that they want to cut down on sodas or sugared drinks.	N/A		
11.Believe that we may gain weight.			
12.Believe that we may get osteoporosis.			
13.Believe that our diet is inadequate in calcium.			
14. Believe that our diet is adequate in calcium.			
15. Believe that milk and milk products are the best sources of calcium.			
16.Know that we are at risk of osteoporosis.			
17. Know that we are at risk of being overweight.			
18.Know that our diet is inadequate in calcium.			
19.Know that our diet is adequate in calcium.			
20.Believe that we can never get osteoporosis.			
21.Believe that we will never gain weight.			
22.Like drinking skim milk and or low fat milk.			
23. Like drinking regular (not low fat) milk.			
24.Like eating low fat and/or skim dairy products.			
25.Like eating regular (not low fat) dairy products.			

Dairy Food Strategies

Now tell us about what you've done in the past three months to eat more dairy and low-fat dairy foods and to cut back on regular sodas and other sugary drinks.

Using a scale from 1 to 5, indicate how often you have done each of the following:

1=Strongly Disagree (Never) 2=Disagree (Rarely) 3= Unsure (Occasionally) 4= Agree (often) 5 =Strongly agree(Repeatedly)

In the past 3 months, how often did you…	**How Often (1-5)**
1. Pay closer attention to drinking/eating more dairy foods.	
2. Pay closer attention to drinking/eating more low-fat dairy foods.	
3. Pay closer attention to drinking low fat milk or skim milk instead of higher fat choices.	
4. Plan to eat low-fat dairy instead of high fat dairy foods to control calories.	
5. Plan to eat at least 3 servings of dairy foods every day.	
6. Plan to eat at least 3 servings of low-fat dairy foods every day.	
7. Keep track of how many servings of dairy foods you eat each day.	
8. Eat more low-fat dairy foods.	
9. Remind yourself that consuming adequate dairy is important.	
10. Remind yourself that consuming adequate calcium is important.	
11. Remind yourself to drink fewer sodas or sugared drinks.	
12. Plan to drink fewer sodas or sugared drinks each day.	
13. Keep track of how many sodas or sugared drinks you have each day.	
14. Cut down on how many regular sodas and sugared drinks you have each day.	
15. Eat more low fat dairy and dairy products to consume adequate calcium	

Dairy food Beliefs

Using a scale from 1 to 5, indicate whether you agree with the following statements:

1=Strongly Disagree 2=Disagree 3= Unsure 4=Agree 5=Strongly agree

Do you think or believe…..	**How Often (1-5)**
1. If I get osteoporosis I will be in severe pain.	
2. If I get osteoporosis I will be bedridden.	
3. If I get osteoporosis I will break my bones often.	
4. If I gain weight, I will not like how I look.	
5. If I gain weight, I will not like how I feel.	
6. If I gain weight I will not have as many friends.	
7. If I gain weight I will be less active.	

Healthier Foods Efficacy

These questions ask how CERTAIN you are that you can do different things to eat healthier foods.

You will be asked to decide how certain or sure you are that you can do these things on most days and in lots of different situations. Think about times when it will be easy to do these things and when it will be harder.

When deciding how sure you are that you can do these things, we want you to think about doing them:

ALL or MOST of the time, not just once or twice.

For a long time… until next year…. or even longer!!

In a lot of different situations – like when you are…..

- Eating in a dining center on campus…
- Deciding what to eat when at home, along, watching TV or doing chores….
- Studying late at night
- Eating with your family..
- Eating out with friends or at a party…
- At a fast-food restaurant
- Buying food at the grocery store
- Traveling

These questions ask how certain you are that you can do things to increase the dairy or low-fat dairy in your diet.

Use any number from 0 to 100 on the following scale to tell how certain you are:

0 ----------50---------- 100

Certain that I CAN NOT ***Somewhat certain I CAN*** ***Certain I CAN***

How certain are you that you can ALL OR MOST OF THE TIME…..	**How certain? (0-100)**
DAIRY FOODS	
1. Drink or eat at least 3 servings of dairy foods each day?	
2. Drink or eat at least 3 servings of low-fat dairy foods each day?	
3. Drink 1%, ½%, or fat-free (skim) milk instead of higher fat milk?	
4. Eat low-fat cheese products (such as cottage cheese, sliced cheese, etc.)?	
5. Eat low-fat fresh yogurt?	
6. Eat low-fat frozen yogurt?	
7. Eat low-fat ice cream?	
8. Eat low-fat dairy foods before you go to class or work?	
9. Eat low-fat dairy foods when you have an early class, meeting, etc.?	
10. Choose smoothies with less sugary and/or high-fat ingredients?	
REGULAR SODAS AND SUGAR-SWEETENED DRINKS	
11. Choose low-sugar or sugar-free smoothies?	
12. Limit regular sodas and sugar-sweetened drinks to one per day?	
13. Cut back on the size of regular sodas and sugared drinks?	
14. Avoid sodas and sugared drinks totally?	

Dairy Food Outcomes

Now, tell us what you expect would happen if you ate 3 or more servings a day of dairy/low-fat dairy foods.

Use this scale to tell us if you agree that the following will happen:

1=Strongly Disagree 2=Disagree 3= Neither agree or disagree 4=Agree 5=Strongly agree

If I have 3 servings or more of low fat milk and milk products per day I expect:	**Do you agree? (1-5)**
1. I will have more energy.	
2. I will lose weight.	
3. I will not get osteoporosis.	
4. I will feel better in my clothes.	
5. I will be hungrier.	
6. My health will improve.	
7. I will miss eating the foods that I love.	
8. I will be less likely to get cancer or heart disease.	
9. I will be less likely to gain weight.	
10. Finding dairy foods on campus will be a lot of trouble.	
11. Finding low-fat dairy foods on campus will be a lot of trouble.	
12. I will have to change a lot of my favorite foods.	
13. I won't be able to eat the same foods as my friends.	
14. I won't be able to eat the same foods as the rest of my family.	
15. I will have to spend too much time keeping track of what I eat.	
16. Low-fat dairy foods will not taste good.	
17. It will take too long to prepare meals and snacks.	
18. I will have to plan my meals too far in advance.	
19. I will be more attractive.	
20. I will be doing what I know I should.	
21. I won't be able to stick with it – I'll just go back to my old habits.	
22. My friends won't want to eat with me.	

Barriers to increase low fat dairy or dairy intake

Now, tell us would you increase dairy or low fat dairy and dairy products if you knew you consume inadequate amount of calcium in your diet.

Use this scale to tell us if you agree with the following statements:

1=Strongly Disagree 2=Disagree 3= Unsure 4=Agree 5=Strongly agree

I cannot increase my dairy or low fat dairy intake because	Do you agree? (1-5)
1. It is not available on campus	
2. I don't know where I can find these on campus	
3. They are expensive	
4. I am lactose intolerant	
5. I am vegan or another type of vegetarian and don't consume dairy products.	
6. I don't like the taste of milk	
7. I don't like the taste of milk products	
8. I consume adequate amount of calcium in my diet without dairy products.	
9. I don't know which foods are high in calcium.	
10. I don't have the time to go and buy milk and milk products	
11. I like to drink other carbonated beverages	
12. I like to drink other beverages	

Calcium food frequency questionnaire

	Please indicate how often you consume the following foods						
Food	**Serving size**	**Servings per day**	**Servings per week**	**Servings per month**	**Rarely or never**		
Example Non fat/Skim/ 0.5% milk	8 ounces	**2**					
Ice Milk	1 cup		**4**				
Tofu	0.5 cup			**3**			
Nonfat/skim/ 0.5% milk	8 ounces						
1% Milk	8 ounces						
2%milk	8 ounces						
whole milk	8 ounces						
chocolate milk	8 ounces						
buttermilk	8 ounces						
ice cream	1 cup						

(regular)							
Icecream (Low fat or light)	1 cup						
icemilk	1 cup						
frozen yogurt (regular)	1 cup						
Frozen yogurt (nonfat)	1 cup						
yogurt (regular)	1 cup						
yogurt (Lowfat)	1 cup						
Yogurt (nonfat)	1 cup						
Cheese (Regular)	1 ounce						
Cheese (lowfat)	1 ounce						
Cottage Cheese (regular)	1/2 cup						
Cottage cheese (lowfat)	1/2 cup						
Cottage Cheese (nonfat)	1/2 cup						
Pudding or custard (regular)	1/2 cup						
Pudding or custard (lowfat)	1/2 cup						
Beans (Navy, Pinto, Kidney, Etc	1 cup						
Tofu	1/2 cup						
Eggs	1 large						
Brooccoli or cooked greens	1/2 cup						
pancakes	3.4" diameter						
homemade biscuit	1.2" diameter						
mixed cheese dishes (macaroni and cheese , quiche, etc.	1 cup						
Pizza	1/8th of 15" pizza						

Regular cream soup (made with milk	1 cup						
Low fat or Fat free cream soup (made with milk)	1 cup						
Solid Milk Chocolate	1 ounce						
cappuccino, latte Hot chocolate made with milk	1 cup						
calcium fortified orange juice	8 ounces						
calcium fortified cereal	1 cup						
calcium fortified soy milk	1 cup						

Instructions for completing food and activity record

(APPENDIX A, Refer Page # 136)

Food and Activity Record Sheet

(APPENDIX A, Page # 138)

Anthropometric data collection instrument

(APPENDIX A, Page # 139)

Intervention Components

EMAIL MESSAGES

QUESTIONS INCLUDED IN THE QUIZZES

FLYERS POSTED

Email Messages (Intervention group)

Email Message Week 1

Dairy for Bone Health.

NOW is the time to make sure your bones are as strong as they will be – time is running out!!

Did you know that maximum bone growth and mineralization occurs during your teen years through early twenties? Well, it is true. Bones grow in length and width for the first two decades of life. People gain maximum peak bone mass during their teens through their early twenties. Calcium forms 80% of the bone mineral content of the bones. High peak bone mass in early adulthood lowers the risk of developing osteoporosis in individuals. Dietary calcium intake is very important to achieve maximum peak bone mass. People tend to lose bone starting in middle adulthood (the 40s). This can lead to osteoporosis if bones are not as strong as they can be by your early twenties. Dairy foods are the best sources of calcium and according to 2005 dietary guidelines for Americans children aged 9 to 18 years need 1300mg of calcium/day which is equivalent to 4 servings of dairy per day. Young adults aged 18 -24 years need 1000mg of calcium per day which is equivalent to 3 servings of dairy per day……..

So let's bone up with 3 A day dairy…….

Low-fat milk/fat free milk ---1 cup (8 ounces) = 1 serving = 300mg calcium

Cheese 1-1.5 ounces (2-3 slices = 300mg calcium

Yogurt 1 cup (8 ounces) = 300mg calcium

Thank you.

KEEP TRACK OF YOUR INTAKE ----------REMEMBER 3 servings per day.

Quiz 1

"Check your low-fat/fat-free dairy intake"

Flyer

"Tips to include dairy in the diet"

Email Message Week 2

Dairy calcium and Body weight.

Did you know that dairy calcium may help prevent excess body weight gain? Research shows that getting enough calcium from dairy in your diet may help obese/overweight individuals to lose weight. Dairy calcium has shown to have more impact on weight loss than calcium from other types of foods. Adolescents and younger adults can keep off excess fat from accumulating by consuming enough dairy calcium.

As we all know, weight gain has become a major health issue in United States. Research data indicates that soda and sugar sweetened beverage intake has gone up in young adults aged 18-24 years of age with subsequent decrease in milk intake. WHERE DO YOU STAND with your beverage intake? LET"S THINK OUR DRINK and say "Cheese to Healthy Weight" with 3-4 servings of low-fat/fat-free dairy a day. More information on calcium and body weight and flavored milk is posted on blackboard under "DAIRY IN HEALTH".

Flyer

DIFFERENT Types of DRINKS with nutrition facts….

Email Message Week 3

Hello everyone,

Welcome back! Hope you have fun filled spring break and are all charged up now that you are back to school. I wanted to give you some more information on the role of dairy in health but before that i wanted to make few announcements. For those who have won the $10.00 gift certificates, please come on Friday in the morning between 10.00-11.00am in the morning to collect it. For those who won the VT sweatshirts once again we will give those by the end of April. 30 seconds quiz is going to be held every week and there will be raffle draw for $10.00 gift certificate every week. In addition to this for those who take all the quizzes from this week, there will an additional $20 gift certificate raffle. SO ALL THE BEST TO ALL!!!! I will send out an email when there the quiz will be held.

LIVE WELL! WITH NUTRIENT DENSE FOODS IN YOUR DIET……YES….WITH 3-4 servings of low-fat/fat-free dairy foods in your diet…..

WHY DAIRY!!!!

It is a power punch……Excellent source of calcium, phosphorus, riboflavin, vitamin A, potassium and several B vitamins….

Good for individuals with high blood pressure…..THE DASH diet includes 3 servings of low-fat/fat-free dairy……..

Low-fat/fat-free dairy may reduce the risk of heart disease by lowering blood pressure……

Research shows that it may decrease insulin resistance thus may be good for diabetics……

May reduce the risk of certain types of cancer in men……

More information on health benefits of low-fat/fat-free dairy is posted on blackboard for your information under "Dairy in health".

Quiz 2

"Improve your dairy intake. Develop strategies"

Email Message Week 4

By now you all know that 3-4 servings of low-fat/fat-free dairy intake has a lot of health benefits. Key to eating healthy and staying fit depends on what kind of food choices we make and "Nutrition fact labels" play a very important role in helping us to decide what foods to choose.

FEW TIPS TO REMEMBER WHILE GROCERY SHOPPING: ---

Check the serving size and number of servings in the container…

Know your fats and reduce sodium for your health. Limit or eliminate saturated fat, cholesterol and trans fat.

Calories count, so pay attention to the amount.

Reach for healthy, wholesome carbohydrates like "whole grains, oats" etc.

Look for foods that are rich in certain nutrients like Vitamin A, C, Calcium and Iron.

For protein, choose foods that are lower in fat.

The % Daily Value is a key to a balanced diet.

The way you can achieve this is by "Checking the Nutrition Fact Label". See the attached food label example for more information……

Flyer

Nutrition Fact Label

Email Message Week 5

Email Message to parents

Hello,

I am writing to you because your child is participating in a project to improve low-fat/fat-free dairy intake in older adolescents and young adults. Most college students do not get enough calcium and dairy foods are an excellent way to get it. College students get about half the recommend number of servings of dairy foods. There are many health benefits associated with 3 to 4 (1 serving = 8oz of yogurt/milk/2-3 slices of cheese) servings of dairy intake. I am attaching some information that may be helpful to you.

College students tell us that they would eat more dairy foods if their parents, family and friends encouraged them and reminded them to do it. The next time you talk with your child, please encourage him or her to have at least 3 servings of low-fat or fat-free dairy foods each day.

All the information given to the students so far was send to the parents including flyers

Plus Additional flyers included for parents

YOU AND YOUR CHILD
FAMILIES

Email Message Week 6

Did you know that the dining places on campus offer a variety of dairy and dairy products?

DEETS, OWENS, HOKIE GRILL, ABP, SBARRO, WESTEND MARKET, D2……

CHOICES…..

Yogurt, MILK cartons, CHEESE on pizzas, sandwiches, omelettes, soups and more…

ICE CREAMS MILK STATIONS at D2, Smoothies…….

Besides dining halls, other places like the convenience store just below D2 carries various low-fat/fat-free milk and milk products from which you could choose to meet your daily calcium requirement. They are as follows

Hershey's milkshakes in various flavors

Nesquik milkshakes in various flavors

Quaker milk chillers

Dannon various flavors of light n fit yogurt
Milk and milk products are available in the bookstore and Squires student center.
So then whether you are studying or reading in the library you can always carry your "HEALTH DRINK" with you.

Email Message Week 7

I wanted to just summarize the reasons for incorporating adequate (3 or more servings) of low-fat/fat-free dairy foods in your diet and how the strategies that you can use to make sure you get enough low-fat/fat-free dairy in your diets.

- Calcium is essential for bone health and may be beneficial in preventing weight gain.
- Low-fat/fat/free dairy products are one of the best sources of calcium. Getting at least 3 servings of low-fat/fat-free dairy products is an easy way to get enough calcium (~ 1000 - 1300mg/day)
- Late teens and early twenties is the time when maximum peak bone mass is achieved which decreases the risk of developing osteoporosis and therefore adequate amount of calcium at this time is essential
- Low-fat/fat-free dairy foods are power punch as it provides much more than calcium in one serving:
    - 30% CALCIUM ---Builds strong bones and teeth
    - 25% VITAMIN D-Helps you absorb calcium
    - 24% RIBOFLAVIN-Helps produce energy

- 20% PHOSPHORUS- Keeps your bones and teeth healthy
- 16% PROTEIN- Builds strong muscles
- 13% VITAMIN B-12- Promotes healthy blood
- 11% POTASSIUM-Helps your blood pressure
- 10% VITAMIN A- Promotes healthy eyes and skin
- 10% NIACIN- (or niacin equivalents), Helps produce energy

❖ You can find low-fat/fat-free dairy products everywhere on the campus, so make sure you get your requirement for the day.

❖ A healthy lifestyle with at least 3-4 servings of low-fat/fat-free dairy intake is recommended.

Quiz 3

"Track your dairy intake 1"

Email Message Week 8

Remember to plan your days……

- This includes telling yourself to include low-fat/fat-free dairy in your diet for the day.

Set goals for the day…..

- Decide to have at least 3 servings of dairy for the day

Develop strategies to achieve your goals….

- Stack up your refrigerator with yogurt, cheese, milk
- Carry it with you when you are on the go
- Have a snack of yogurt while studying in the library
- Have a drink of milk when you are thirsty
- Have a cheese pizza, or cheese sandwich when hungry

Monitor your intake…

- Make sure you go by the plan
- Count how many servings of dairy you had at the end of each day

- If you did not achieve your goal today, make plans to do better tomorrow!

Wham!!!!! Achieve your goal….

Quiz Questions

Quiz 1

"Check your low-fat/fat-free dairy intake"

1. How many times a day do you drink white or flavored milk? (2%, 1%, or skim milk).

2. How often do you eat cheese, yogurt, yogurt drinks, or other dairy products?

3. Does your total intake of low-fat and/or fat-free milk and milk products add up to any one of the following?

Quiz 2

"Improve your dairy intake. Develop strategies"

1. How many servings/day is your goal for low-fat/fat-free dairy intake this week?
2. How do you plan on achieving your goal?
3. What was your goal this past week? See the scale below and answer the question.

    1 serving of dairy per day (1 serving = 1 cup of yogurt or fat-free/low-fat milk or 1-2 slices of cheese)
    2 servings of dairy per day (1 serving = 1 cup of yogurt or fat-free/low-fat milk or 1-2 slices of cheese)
    3 servings of dairy per day (1 serving = 1 cup of yogurt or fat-free/low-fat milk or 1-2 slices of cheese)
    More than 3 servings of dairy foods.
    How did you achieve your goal this past week?

Quiz 3

"Track your dairy intake 1"

1. Think about what you ate and drank yesterday. How many servings of dairy foods did you consume?

1 cup yogurt (8ounces) = 1 serving, 1 cup low-fat/fat-free milk (8ounces) = 1 serving, 2-3 slices of cheese (1.5-2 ounces) = 1 serving, 1 cup low-fat/fat free ice cream = 1 serving, 8 ounces of yogurt based smoothie = 1 serving

2. So, how many servings of dairy is your goal for the week?

3. I can achieve my goal of 3 servings of low-fat/fat-free dairy per day.

Do you agree or disagree.

Flyers Posted

Bone Health

(Appendix A, Page # 1501)

Weight Regulation

www. Nationaldairycouncil.org

http://www.nationaldairycouncil.org/NR/rdonlyres/27A26105-2902-41D0-803C-B7AADC3D888B/0/DCD766.pdf

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3-A-DAY OF DAIRY FOR A HEALTHY WEIGHT

3 servings of dairy a day in a reduced-calorie diet supports weight loss.

SUMMARY

Not only is a substantial proportion of Americans overweight or obese, but many are also undernourished. For example, many Americans fail to consume recommended amounts of calcium, primarily because of their low intake of dairy products. Although consuming too many calories in relation to energy expenditure is the primary determinant of overweight/obesity, a growing body of scientific research suggests that adequate calcium and dairy food intake may contribute to a healthy body weight.

Recently conducted randomized clinical trials (considered the "gold standard" of science) in adults provide the most compelling evidence for calcium's and dairy's beneficial role in the prevention and treatment of obesity. In these clinical trials of overweight or obese adults (males, females, whites, African Americans) following reduced-calorie diets, increasing consumption of dairy foods (milk, yogurt, or cheese) to 3 servings/day enhances body weight and body fat losses, reduces central (trunk) obesity, and minimizes loss of lean body tissue compared to the same degree of energy restriction while consuming little or no dairy.

Dairy sources of calcium may exert a greater "anti-obesity" effect than calcium alone. In addition, a recent clinical trial in African American adults found that consuming 3 servings of milk, cheese, or yogurt/day not only enhanced body weight/fat loss and helped preserve lean body mass when dieting, but also improved body composition (i.e., reduced total body and trunk fat and increased lean body mass) and metabolic profile during weight maintenance compared to low intakes of dairy products.

Further support for a role of calcium and dairy products in weight management in adults comes from observational studies, although factors such as the level of baseline calcium or dairy intake, gender, and race appear to influence this relationship. Research from *in vitro* and experimental animal studies suggests potential mechanisms whereby dietary calcium and other components in dairy products may regulate energy metabolism and thereby reduce obesity risk.

The goal of weight management for overweight children and adolescents is to slow the rate of weight gain while achieving normal growth and development. Compared to studies in adults, relatively little research has examined the relationship between calcium or dairy intake and body weight/body composition in children and adolescents. Moreover, most of the studies are observational, which cannot prove a cause and effect relationship. In general, these studies suggest that increasing dietary calcium/dairy intake to recommended levels may play a role in promoting a healthy body weight, lowering the percentage of body fat, or preventing an unhealthy weight gain in children and adolescents.

Additional research is needed to clearly establish the underlying mechanisms and to further understand dairy's role in weight management. However, this emerging benefit of dairy products in helping to achieve and maintain a healthy body weight provides one more reason why Americans should be encouraged to consume recommended servings of milk, cheese, or yogurt a day within appropriate energy levels.

The *Dairy Council Digest*® is available on-line.
www.nationaldairycouncil.org

AN INTERPRETIVE REVIEW OF RECENT NUTRITION RESEARCH

INTRODUCTION

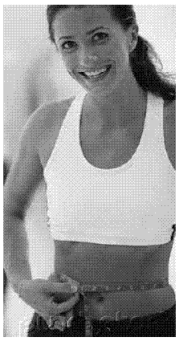
Overweight and obesity in the U.S. have risen dramatically in the past 20 years and are now considered a great public health concern (1,2). Nearly two-thirds (65.1%) of adults 20 years of age and older are overweight (body mass index or BMI of 25 to 29.9 kg/m^2) or obese (BMI of 30 kg/m^2 or greater) (3). Among children aged 6 through 19 years, 16% are overweight and an additional 15% are at risk for overweight (3). Overweight and obesity are associated with increased risk of major chronic diseases such as coronary heart disease, hypertension, stroke, type 2 diabetes mellitus, and some cancers, as well as excess mortality (1,2,4,5).

A positive energy balance or excess calorie intake relative to energy expenditure leads to overweight and obesity. To reverse the trend toward obesity, most Americans need to consume fewer calories, increase their physical activity, and make wiser food choices (2).

Not only are many Americans overweight or obese, but many are also undernourished. For example, many Americans fail to meet calcium recommendations largely because of their low intake of dairy products (6,7). Males and females 20 years and over are only consuming 1.8 and 1.4 servings of dairy/day, respectively, compared to the current recommendation of 3 cups of low fat or fat-free milk or equivalent milk products (e.g., cheese, yogurt) a day (2,7). Dietary calcium intake is most often considered in terms of promoting bone health (8). However, a growing body of scientific research indicates that calcium and particularly dairy foods may also play a role in improving body weight and/or body composition.

This emerging research on calcium's and dairy's role in both the prevention and treatment of obesity is discussed in several reviews (9-16). The current body of research includes randomized clinical trials (considered the "gold standard" of science) and observational, animal and cellular studies. This *Digest* reviews new research findings related to calcium or dairy food intake and body weight/body fat in adults and children. Emphasis is placed on studies – particularly randomized clinical trials in adults and some new observational investigations in adults and children – published since a previous *Digest* on this topic (17).

Reducing and preventing overweight and obesity is a public health priority.



DAIRY AND WEIGHT MANAGEMENT IN ADULTS

The goal for adults is to achieve and maintain a body weight that optimizes their health (2). For obese adults, even modest weight loss (e.g., 5 to 10% of body weight) has health benefits and the prevention of further weight gain is very important.

Randomized Clinical Trials. In the past two years, several randomized clinical trials have demonstrated that overweight or obese adults who consumed recommended daily intakes of calcium/dairy products as part of a balanced calorie-restricted diet lost significantly more body weight and body fat than those who consumed a balanced reduced-calorie diet with little or no dairy foods. This finding has been demonstrated in both males and females, whites and African Americans (18-20). Including dairy foods in the diet also helps to preserve lean body mass during weight loss and increase lean body mass during weight maintenance (19,20). Research shows that dairy foods exert a significantly greater effect on body weight and body fat compared to calcium supplements or low-dairy diets (18).

In a 24-week randomized, placebo-controlled study of 32 obese adults, those who consumed 3 servings/day of milk, yogurt, or cheese while on a balanced, reduced-calorie diet (500 calorie deficit) lost significantly more body weight and fat than those who consumed similar amounts of calcium through supplements or consumed little or no dairy (18). This was the first clinical trial directly comparing diets high in calcium from dairy foods to diets high in calcium from supplements. Subjects were randomized to a low calcium/low dairy control diet (0-1 servings of dairy foods/day or 400 to 500 mg calcium/day), a high calcium supplemented diet (control diet supplemented with 800 mg calcium/day), or a high dairy food diet (3-4 servings of dairy foods/day, total calcium intake of 1,200 to 1,300 mg/day). Weight loss was almost 15 pounds (6.6 kg) for the low

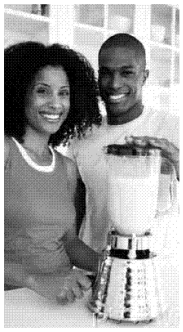
calcium group (6% of total body weight), 19 pounds (8.6 kg) for the high calcium group (9% of total body weight), and 24 pounds (11.1 kg) for the high dairy group (11% of total body weight) (18). A similar trend was found for losses of body fat and trunk fat (including fat around the abdomen which is associated with adverse health effects).

Another randomized clinical trial found that consuming 3 servings of yogurt/day as part of a reduced-calorie diet enhanced body weight and fat losses, reduced central obesity, and minimized loss of lean body tissue (19). Thirty-four healthy obese adults were placed on a balanced 500 calorie-deficit diet and randomly assigned to either a control diet providing 0-1 servings of dairy products/day (400 to 500 mg calcium/day) or the yogurt diet (3 six-ounce servings/day of fat-free yogurt which supplied 1,100 mg/day of total calcium) for 12 weeks. Participants in the yogurt group lost 22% more body weight than those in the control group (~ 15 pounds vs ~ 11 pounds) and 66% more body fat than those in the control group (~ 10 pounds vs 6 pounds) (19). Compared to the control group, those in the yogurt group lost 31% less lean body tissue and 81% more trunk fat (as indicated by a significantly smaller average waist circumference) during the 12-week study (19).

Two separate randomized clinical trials (one for weight loss, the other for weight maintenance) in obese African American men and women found that a dairy-rich diet enhanced body weight and fat losses when dieting and improved body composition during weight maintenance (20). For both 24-week studies, participants were randomly assigned to one of two diets: a low dairy diet (0-1 dairy servings/day; 500 mg/day of calcium) or a high dairy diet (3 servings/day of milk, yogurt, or cheese; 1,200-1,300 mg calcium/day).

In the weight loss study, 29 obese African American adults were placed on a 500 calorie-restricted diet, based on their baseline calorie needs, and were randomized to either the low dairy or high dairy diet (20). The average weight loss (pounds) for the high dairy group was nearly twice that of the low dairy group (24.2 vs 13.1); average fat loss (pounds) was more than twice that of the low dairy group (20.0 vs 8.7) (20). Also, the average loss of lean body mass was significantly less in the high dairy group compared to the low dairy group. These findings support those from previous studies showing that consumption of 3 servings of dairy foods/day as part of a reduced-calorie diet increases weight loss (18,19).

Recent controlled trials in overweight adults demonstrate that consuming 3 servings of dairy foods – milk, yogurt, or cheese – each day as part of a reduced-calorie diet increases body weight loss and improves body composition compared to reducing calories alone.



In the weight maintenance study, 34 obese African American adults were placed on diets to maintain weight and were randomized to either the low dairy or high dairy diet (20). As expected, there were no significant changes in body weight over the 24 weeks. However, there was a shift in body composition (20). Compared to the low dairy group, those in the high dairy group experienced significant decreases in total body fat (5.4%), trunk fat (4.6%), insulin (14%), and blood pressure (-6.8/-4.25 mm Hg), as well as an increase in lean body mass (2.2%).

These findings are of significance considering that African Americans are at greater risk for obesity and consume less calcium and dairy products than the white population (20). Also, the findings support the recommendations of the National Medical Association Consensus Report that encourages African Americans to consume 3 to 4 servings of dairy foods/day to reduce the risk for chronic diseases, including obesity (21).

Other recent randomized clinical trials indicate that healthy, normal weight adults can increase consumption of calcium-rich dairy products without a change in body weight (22,23). In a one-year randomized intervention in 135 healthy normal weight women (ages 18-30 years), no significant differences in body weight, body fat, or lean body mass were found between women who consumed higher amounts of dairy foods to increase their calcium intake to medium (1,026 mg/day) or high (1,131 mg/day) levels and those consuming their usual diets (742 mg calcium/day) (22). Throughout the intervention, the dairy groups had slightly higher, although not statistically significant, average caloric intakes than the control group (22).

A 48-week randomized clinical trial compared the weight loss results of 72 obese adults following three different

reduced-calorie diets: a high dairy diet that included 4 servings of dairy foods (milk, yogurt, or cheese) each day; a high dairy/high fiber/low glycemic index diet that included 4 servings of dairy/day; and a moderate dairy or standard diet that included 2 servings of dairy foods each day (23). After nearly one year (48 weeks), the participants in all three groups experienced significant body weight and body fat losses (23). However, there were no significant differences among the groups in loss of body weight, body fat, trunk fat, or changes in waist or hip circumferences. Those who closely adhered to the high dairy diets consumed 4 daily servings of dairy and about 100 to 140 more calories each day and still lost the same amount of weight as those who consumed 2 servings of dairy per day and fewer calories (23).

Another randomized clinical trial in overweight and obese adults who reduced their calories through diet and exercise found that consuming 3 to 4 servings of dairy foods/day (1,200-1,400 mg calcium/day) significantly reduced their body weight and body fat (24). However, weight and fat loss were not significantly different from that achieved with caloric restriction alone (24). This study shows that adults can consume 3 to 4 servings of dairy foods a day as part of a weight loss diet without jeopardizing their weight loss efforts.

Observational Studies. Unlike clinical trials, observational studies cannot prove a cause and effect relationship and can be subject to confounding. However, findings from observational studies often indicate the need for and provide direction for more carefully controlled clinical trials. Many observational studies of calcium and/or dairy intake and body weight/body fat are discussed in several reviews (11-15), including a previous issue of the *Digest* (17).

For example, results from the CARDIA (Coronary Artery Risk Development in Young Adults) study, which followed 3,157 African American and white adults aged 18-30 years for 10 years, indicate that increased intake of dairy foods may protect overweight young adults from becoming obese or developing insulin resistance syndrome (also known as metabolic syndrome), which is associated with increased abdominal fat (25). Another observational study which included nearly 500 adults in the Quebec Family Study demonstrated that, after controlling for other variables, women consuming less than 600 mg calcium/day had significantly greater body weight, BMI, percentage body fat, fat mass, waist circumference and abdominal fat compared with those consuming 600 mg calcium or more (26). Dairy products provided almost 62% of the women's calcium intake. In this study, significant associations between dietary calcium and body weight and body composition were observed mainly in women.

The 2005 Dietary Guidelines for Americans states that "adults and children should not avoid milk and milk products because of concerns that these foods lead to weight gain."

A more recent observational study suggests that gender and race may influence calcium's effect on body weight or composition (27). This cross-sectional study examined the relationship between total calcium intake and body composition in sedentary African American and white men and women who participated in the HERITAGE Family Study (25). Low calcium intake was associated with increased body fatness, particularly in African American and white men and white women, but not in African American women.

Findings from a longitudinal study in the Netherlands led the researchers to speculate that there may be a threshold for calcium intake, above which calcium has little or no additional beneficial effect on body weight or body composition (28). In this study, there was only a weak inverse relationship between calcium intake and body composition. This may be explained by the high average calcium intake of 1,269 mg/day for men and 1,148 mg/day for women. No difference in BMI or body fatness was observed between middle (600 to 1,200 mg/day) and high (>1,200 mg/day) calcium groups (28).

A recent cross-sectional study in Iran that examined the relationship between dairy consumption and BMI in 462 adults found that those with the highest intakes of dairy foods had a significantly lower

BMI after controlling for confounding factors and were less likely to be obese than those with the lowest dairy food intakes (29). Recent longitudinal studies link a dietary pattern including reduced fat or lowfat dairy foods with a beneficial effect on body weight and body composition (30,31).

DAIRY AND WEIGHT MANAGEMENT IN CHILDREN AND ADOLESCENTS

For overweight children and adolescents, the goal is to slow the rate of weight gain while achieving normal growth and development (2). Maintaining a healthy weight throughout childhood may reduce the risk of becoming an overweight or obese adult (2,32). Compared to studies in adults, relatively little research has examined the relationship between calcium/dairy food intake and body weight/body fat in children and adolescents, and few of these studies include overweight children or adolescents (16).

Some observational studies have shown an inverse relationship between calcium and dairy intake and body weight and fat in children and adolescents (33-38). In a 3-year longitudinal study of 53 preschool children, those with higher intakes of calcium and dairy foods had a lower body fat at 70 months of age compared to children with lower intakes of calcium and dairy foods (33). In a follow-up study, a habitually higher intake of dietary calcium, primarily from milk and other dairy products, was related to lower body fat in 8-year old children (34). A 2-year prospective study in young children demonstrated that milk avoiders had low calcium intakes and higher BMIs compared with a population of milk drinkers (35). A statistically significant inverse association between the frequency of milk consumption and BMI was found in a cross-sectional study of 884 children, average age of 7.5 years, in southern Italy (36).

Findings from a cross-sectional study of 323 Asian and Caucasian adolescents (aged 9 to 14 years) in Hawaii found that total calcium and dairy calcium, but not non-dairy calcium, were associated with lower body fat, after adjusting for other factors (38). For the entire group, one milk serving was associated with a decrease of approximately 0.78 mm in iliac skinfold thickness, whereas soda intake was positively associated with body weight (38). In the Asian children, one serving of milk was associated with a 1.89 mm smaller iliac skinfold thickness.

Further research is needed to determine if consumption of recommended servings of dairy foods as part of a nutritionally balanced diet helps to prevent and/or treat overweight in children and adolescents.

Other studies have shown that increasing calcium or dairy intake has no effect on body weight or fat in children and adolescents (39-42). A cross-sectional analysis of data collected over 3-1/2 years in 1,345 low-income preschool children in North Dakota found that weight change was not significantly related to intakes of several beverages, including milk, after adjusting for age, sex, energy intake, and other variables (39). In a cohort of 192 non-Hispanic white girls whose calcium intake was evaluated from ages 5 to 9 years, those who met calcium recommendations were not heavier, but had higher energy intakes and consumed almost twice the amount of milk compared to girls who consumed less than recommended calcium intakes (40). A longitudinal study of 178 normal weight girls aged 8 to 12 years at enrollment and followed through adolescence (~ age 18) found no evidence of a relationship between dairy foods or calcium intake and BMI or percent body fat (41). The researchers stated that the results refute the idea that dairy foods should be excluded during adolescence to avoid excess body weight and/or body fat accumulation (41).

The above findings are supported by a 2-year pilot study in 59 nine-year old girls randomly assigned to either a calcium-rich diet providing at least 1,500 mg of calcium/day, primarily from dairy foods, or their usual diet (42). Girls in the calcium-rich group had an average calcium intake of 1,656 mg/day, while those in the usual diet group consumed an average of 961 mg of calcium/day. Although the girls in the calcium-rich diet group consumed approximately 150 more calories per day, they did not have greater increases in body weight, BMI, or fat or lean mass

compared to the control (usual diet) group. The researchers concluded that calcium-rich diets do not cause excessive weight gain in pubertal girls while contributing positively to overall nutrition (42). The findings of this study corroborate those of earlier investigations (43-45).

A recent longitudinal study of more than 12,000 children aged 9 to 14 years found that children who consumed more than 3 servings of milk/day experienced gains in BMI greater than those who drank smaller amounts over the three year period (46). Quantities of 1% milk in boys and skim milk in girls were significantly associated with BMI gains, as was total calcium. However, when adjusted for total calorie intake, these associations were no longer statistically significant (46). The researchers concluded that calorie intake was the most important predictor of weight gain in this study (46).

CONCLUSION

Ongoing research is attempting to determine dairy foods' role in helping to achieve a healthy body weight and body composition in adults and children and to learn more about mechanisms involved in the dairy-body weight relationship. Research from *in vitro* and experimental animal studies suggests that dietary calcium and other dairy components (e.g., protein, branched chain amino acids, bioactives) may regulate energy metabolism and obesity risk (12-15,47). Based on the evidence to date, health professionals are encouraged to recommend adequate calcium intake, preferably from dairy foods, when counseling patients about weight management (48). D

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RELATED RESOURCES

- **www.nationaldairycouncil.org**
  - The Healthy Weight Health Education Kit (click on Health Professional Resources, then Nutrition Education Resources, then Health Education Kits)
- **www.healthyweightwithdairy.com**
- **www.assessyourdiet.webmd.com**
- **www.3aday.org**

Coming Next Issue:

THE ROLE OF THE SCHOOL ENVIRONMENT IN CONTRIBUTING TO CHILDREN'S WELLNESS

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- Marta Van Loan, Ph.D.
  Research Physiologist
  USDA, ARS,
  Western Human Nutrition Research Center
  University of California – Davis
  Davis, CA
- Michael B. Zemel, Ph.D.
  Professor of Nutrition and Medicine
  Director, The Nutrition Institute
  Department of Nutrition
  The University of Tennessee-Knoxville
  Knoxville, TN

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Tips to include dairy in the diet on daily basis

www.3aday.org

http://www.3aday.org/SiteCollectionDocuments/PDFs/DMIBoneup.pdf

Self Regulation (Planning)

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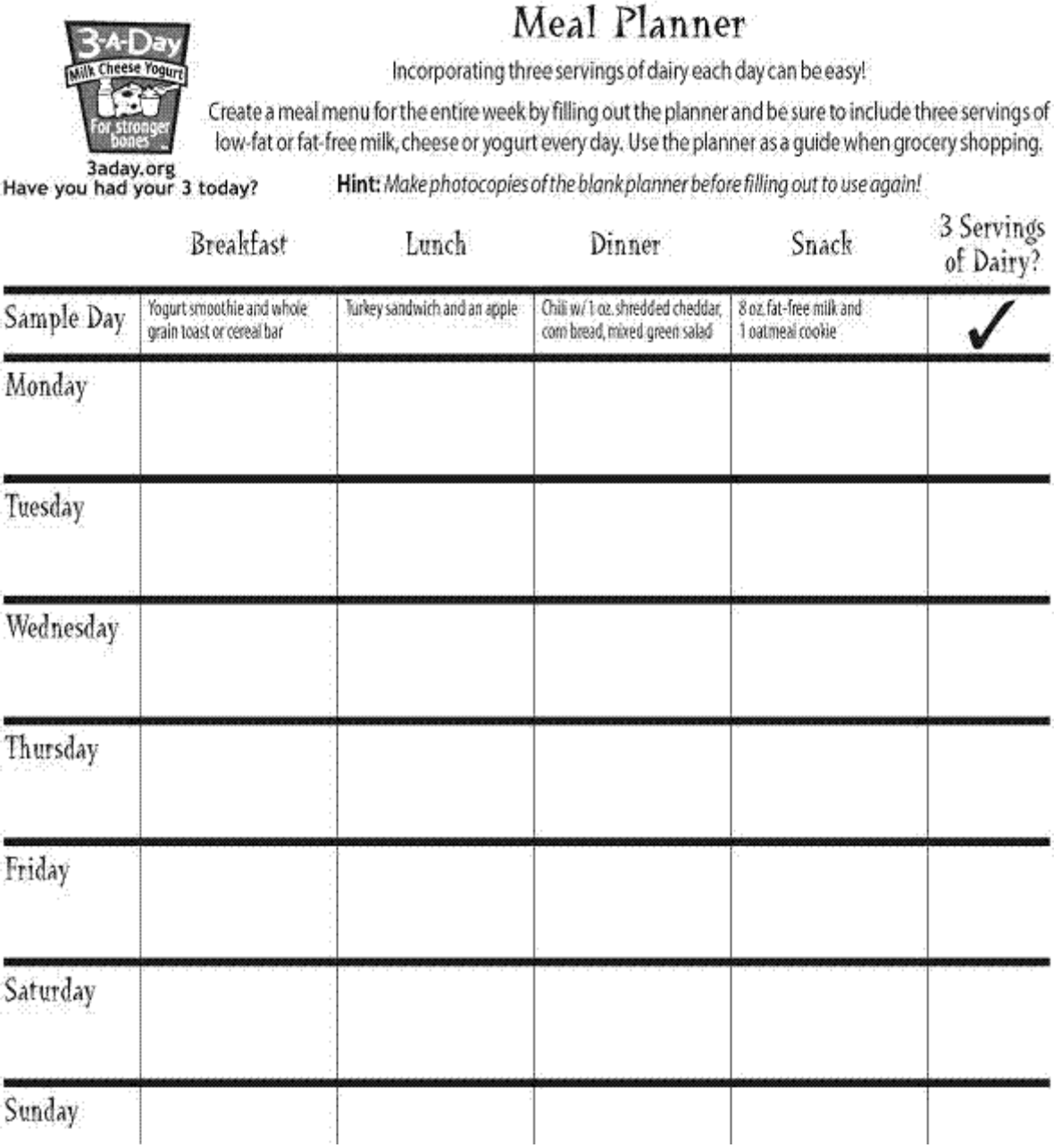


Meal Planner

3aday.org
Have you had your 3 today?

Incorporating three servings of dairy each day can be easy!

Create a meal menu for the entire week by filling out the planner and be sure to include three servings of low-fat or fat-free milk, cheese or yogurt every day. Use the planner as a guide when grocery shopping.

Hint: *Make photocopies of the blank planner before filling out to use again!*

	Breakfast	Lunch	Dinner	Snack	3 Servings of Dairy?
Sample Day	Yogurt smoothie and whole grain toast or cereal bar	Turkey sandwich and an apple	Chili w/ 1 oz. shredded cheddar, corn bread, mixed green salad	8 oz. fat-free milk and 1 oatmeal cookie	✓
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

http://www.nationaldairycouncil.org/NR/rdonlyres/39CC5550-B445-4CFF-9003-9DDD3AD66799/0/ThinkYourDrinkupdate.pdf

www.3aday.org

Flavored milk

http://www.nationaldairycouncil.org/nationaldairycouncil/nutrition/products/flavoredMilk.pdf

FLAVORED MILK

FLAVORED MILK

IN PERSPECTIVE

INTRODUCTION

Many varieties of flavored milks, including chocolate, strawberry, vanilla, banana, black raspberry, blueberry, root beer, cappuccino, and coffee, are available (1,2). Chocolate milk, however, has long been the most popular flavored milk consumed (2). Flavored milks are available in whole to nonfat varieties, but growth in flavored milk sales during the past decade has been predominantly in reduced, low, and nonfat varieties (3).

In general, flavored milks are milks to which a sweetened flavors such as cocoa or cocoa powder, strawberry or vanilla extract has been added, along with a sweetener such as sucrose or high fructose corn syrup (4). Federal standards for pasteurization, vitamin addition, milk solids, and milk fat levels are the same for flavored and unflavored milks (4).

Flavored milks, particularly chocolate, are well liked, especially among children and adolescents (2,5). According to a recent survey of 12,000 individuals regarding their usage of flavored milks, children under the age of 12 and adolescents were the most frequent users of flavored milk (2). About one-third of children aged 9 to 11 agreed that they would drink more milk if it were chocolate (2). This finding is similar to that of an earlier national survey in which 39% of children 8 to 13 years agreed that they would drink more milk if it were chocolate (5). Children are more likely to drink flavored milk on a regular basis at school than at home (2,5).

Despite the wide variety of flavored milks in the marketplace and the popularity of these beverages, especially among children, some parents, teachers, school food service directors, and school principals express concern about the nutritional and health benefits of flavored milks for school-aged children. Some are of the opinion that flavored milks are not as nutritious as unflavored white milk and that certain components in flavored milks such as added sugars may be detrimental to children's health and behavior. This report examines the latest scientific research related to the nutritional and health benefits of flavored milk, particularly chocolate milk, and helps to put myths regarding flavored milks into perspective.

Nutrient Contribution of Flavored Milks

Like unflavored milks, flavored milks are nutrient dense foods containing a high proportion of nutrients in relation to their energy content (6, Table 1). Flavored milks have an excellent nutritional profile, providing significant amounts of high quality protein, calcium, riboflavin, magnesium, phosphorus, niacin equivalents, vitamin B_{12}, vitamin A, and, when added, vitamin D, as well as several other essential nutrients (6).

A comparison of the nutrient content of chocolate milk and unflavored milk at various fat levels reveals similar levels of most nutrients (Table 1). The main difference is chocolate milk's higher total carbohydrate content due to the addition of sucrose and/or high fructose corn syrup and consequently its higher energy (calorie) content. Chocolate milks contain about 2 to 4 teaspoons more sugar and about 60 kcal more energy per 8-ounce servings than their unflavored counterparts (6). Also, a serving of chocolate milk contains slightly more fiber and iron than a serving of unflavored milk.

Table 1.
Nutrient Content of Unflavored and Chocolate Flavored Milk (expressed in amount per 8 oz serving) (6)

	Milk					
	Whole, 3.3%		Lowfat, 2%		Lowfat, 1%	
Nutrients	Unflavored	Chocolate	Unflavored	Chocolate	Unflavored	Chocolate
Energy, kcal	150	208	121	179	102	158
Protein, g	8.03	7.92	8.12	8.02	8.03	8.10
Total lipid, g	8.15	8.48	4.68	5.00	2.59	2.50
Total Carbohydrate, g	11.37	25.85	11.71	26.00	11.66	26.10
Fiber, g	0	2.0	0	1.25	0	1.25
Ascorbic acid, mg	2.29	2.28	2.32	2.30	2.37	2.32
Thiamin, mg	0.093	0.092	0.095	0.092	0.095	0.095
Riboflavin, mg	0.395	0.405	0.403	0.410	0.407	0.415
Niacin, mg	0.205	0.313	0.210	0.315	0.212	0.318
Pantothenic acid, mg	0.766	0.738	0.781	0.748	0.788	0.755
Vitamin B_6, mg	0.102	0.100	0.105	0.102	0.105	0.102
Folacin, mcg	12	12	12	12	12	12
Vitamin B_{12}, mcg	0.871	0.835	0.888	0.847	0.898	0.855
Vitamin A, IU	307	302	500	500	500	500
Calcium, mg	291	280	297	284	300	287
Iron, mg	0.12	0.60	0.12	0.60	0.12	0.60
Magnesium, mg	33	33	33	33	34	33
33 Phosphorus, mg	228	251	232	254	235	256
Potassium, mg	370	417	377	422	381	426
Sodium, mg	120	149	122	150	123	152
Zinc, mg	0.93	1.02	0.95	1.02	0.95	1.02

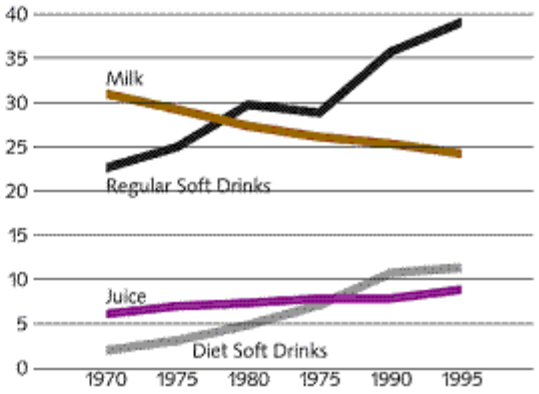
Milk and dairy products, including flavored milks, are the major source of calcium in the diet and account for 72% of the calcium available in the U.S. food supply (7). Each 8-ounce serving of chocolate milk provides 35% of the 800 mg of calcium recommended for children ages 4 through 8, 23% of the 1,300 mg calcium recommended for individuals 9 through 18 years, 30% of the 1,000 mg calcium recommended for adults 19 through 50, and 25% of the 1,200 mg calcium recommended for adults 51 years of age and older (6,8).

Government data indicate that many population groups fail to meet their daily calcium recommendations as set by the National Academy of Sciences (8,9). For example, 70% of preteen girls and 60% of preteen boys ages 6 to 11, and nearly 90% of teenage girls and almost 70% of teenage boys age 12 to 19 fall short of meeting their calcium needs (8,9). Consuming an adequate intake of calcium throughout life helps to reduce the risk of bone fractures in childhood and adolescence and osteoporosis in later adult years (10-12).

Recognizing children's low calcium intake, the American Academy of Pediatrics issued a policy statement urging pediatricians to recommend milk, cheese, yogurt, and other calcium-rich foods for children's daily diets to help build their bone mass and prevent rickets (11). This policy statement recommends that children meet their calcium needs from food first, because eating patterns developed during childhood tend to be followed throughout life. Other experts agree that the best way to meet calcium needs is to consume foods naturally containing calcium (13,14). Chocolate and other flavored milks are foods that naturally contain high levels of calcium. Because dairy foods such as chocolate and other flavored milks provide essential nutrients important for health, their intake improves the overall nutritional adequacy of the diet (13,14).

One factor that has contributed to low calcium intake is the change in beverages available in the U.S. food supply over the past few decades (15, Figure 1). As shown in Figure 1, in 1970 there was far more milk than regular soft drinks available in the U.S. food supply. However, by 1995, the availability of regular soft drinks greatly exceeded that of milk (15). Although the availability of juice has not declined, soft drinks have grown at a much higher rate than juice (15).

Figure 1.
Beverages Available in the U.S. Food Supply (Gallons/Person/Year) (15)



Vitamin D-fortified flavored milk, as well as the unflavored version, is an important source of vitamin D. This vitamin enhances the body's absorption of calcium and helps to prevent rickets, a bone-weakening disease caused by vitamin D deficiency. Although rickets was virtually eradicated in the U.S. by the 1960s following vitamin D fortification of cow's milk, this disease is experiencing a resurgence in appearance in young children (16,17).

Offering flavored milk as part of school meal programs such as the National School Lunch Program (NSLP) and the School Breakfast Program (SBP) has been shown to increase milk and nutrient intake (18-20). When approximately 400 elementary school children in Pennsylvania were provided with an option of chocolate milk in school meals, more milk was consumed and intake of nutrients such as calcium and riboflavin increased (18). Likewise, when 6th grade students in an elementary school in New York City were provided with 1% fat chocolate flavored milk as part of the NSLP, children's milk and nutrient (e.g., calcium, riboflavin, phosphorus) intakes increased (20).

A relatively new approach to increase students' milk and nutrient intake is to provide low and nonfat milks, including flavored milks, in school vending machines (21). Although chocolate milk has been found to be the preferred flavor, tastes vary geographically. For example, in Boston, coffee flavored milk accounted for 30% of the school vending machine milk sales (21).

Health and Behavioral Concerns Related to Flavored Milk Components

Sweeteners

Flavored milks generally contain more sucrose and high fructose corn syrup than their unflavored counterparts. Some parents and others attribute these sweeteners to a myriad of problems such as dental caries, behavioral disorders (e.g., hyperactivity, learning problems, and antisocial behaviors), obesity, and diabetes. However, scientific evidence fails to support these allegations, with the possible exception of dental caries (22-26). A task force of scientists convened by the Food and Drug Administration found no conclusive evidence that sugar in the average American diet or any specific food causes health or behavioral problems (22).

Likewise, a workshop on the evaluation of the nutritional and health aspects of sugars led to the conclusion that "many alleged adverse health effects of sugars are without scientific foundation" (24). Based on a review of sugars and health, one researcher concluded, "… there is no association between current consumption levels [of sugar] and chronic or other diseases except dental caries" (25).

The 2000 Dietary Guidelines for Americans (27) recommends that all healthy Americans 2 years of age and older choose beverages and foods to moderate their intake of sugars. It is important to appreciate that although flavored milks such as chocolate milk contain added sugar, these beverages make a very small contribution to total sugar intake. Major sources of added sweeteners in Americans' diets include soft drinks, sugar/sweets, sweetened grain products, and regular fruit drinks (28,29). Taken together, the above provide almost three-quarters (72%) of total sugar intake (28).

Flavored milk contains added sugars, but is rich in calcium and eight other essential nutrients. Recognizing this fact, researchers stated that "…it is important to ensure that nutrition education messages discouraging consumption of added sweeteners do not inadvertently discourage consumption of more calcium-rich foods [e.g., chocolate milk] within this category" (28).

- **Dental Caries.** Foods containing sugars (and other fermentable carbohydrates) can contribute to tooth decay (25-27,30,31). However, the amount of sugar alone is not the only or primary determinant of caries development. Many factors in addition to sugar intake influence caries (25-27,30-34). For example, a susceptible tooth surface, the presence of specific microorganisms, particularly mutans Streptococci, in the oral cavity, and sufficient time or duration of exposure to fermentable carbohydrates all must be present for caries to develop (32-34). In contrast, fluoridated water and toothpaste, proper oral hygiene, and regular dental care can help prevent dental caries (32-34). A recent investigation found that sugar intake was not associated with caries in British preschool children who brushed their teeth twice a day or more (35).

Chocolate milk's moderate amount of sucrose is no more likely to cause dental caries than other sugars such as lactose in milk. The chocolate flavoring in chocolate milk adds about 3.5 teaspoons of sucrose per 8-ounce serving, whereas a 12-ounce serving of a regular soft drink contain 10 teaspoons of added sugar (29). How frequently sugar or sugar-containing foods are consumed and how long they remain in the mouth determine sugar's ability to promote tooth decay (27,31-34). Because flavored milk, being a liquid, is rapidly cleared from tooth surfaces, it may be less likely to cause tooth decay than carbohydrate-containing solid foods that adhere to tooth surfaces (30-34).

Milk, including flavored milk, also contains components that may protect against dental caries (32,36-41). Researchers at the University of Rochester in New York found that 2% fat milk containing as much as 10% added sugar (i.e., the amount in chocolate milk) is no more cariogenic than 2% fat milk without sugar (36). The finding that 2% fat milk with 10% added sugar is less caries-promoting than water with 10% sucrose indicates that components in milk may be protective (36,37).

According to the American Academy of Pediatric Dentistry (42), "there is evidence that foods containing milk casein, calcium, phosphorus, and cocoa, all of which are found in chocolate milk, may be less likely to contribute to dental caries than sucrose alone or other snack foods." Some early studies found that cocoa powder is noncariogenic (38,39). At present, evidence indicates that flavored milk, including chocolate milk, when consumed in moderation, has a low cariogenic potential (41).

In contrast to chocolate and other flavored milks, intake of soft drinks and sugar-containing fruit drinks, because of their high sugar content, increases caries risk (30,41). Also, the sugar and phosphoric acid in soft drinks promotes demineralization of tooth enamel (30,41,43). Recognizing that excessive intake of fruit juice may be associated with tooth decay and other health problems in children, the American Academy of Pediatrics (44) recently recommended that juice intake be limited to 4 to 6 oz/day for children 1 to 6 years and 8 to 12 oz/day for children 7 to 18 years.

- **Behavioral Disorders.** Concern that sugar intake may lead to behavioral disorders has been given as a reason to eliminate flavored milk such as chocolate milk from children's diets (25). Yet, this allegation is based on anecdotal observations or subjective reports. Under carefully designed, well controlled experimental conditions, sugar intake has not been demonstrated to cause or exacerbate behavioral disorders such as hyperactivity, learning disorders, aggression, and delinquency (22,23,27,45-49).

  A well-designed study of the effect of sugar intake on behavior was conducted by Wolraich and colleagues (47). This double blind controlled trial included 25 normal preschool children ages 3 to 5 years and 23 school-aged children 6 to 10 years, all of whom were described by their parents to be sensitive to sugar. The children and their families followed a different diet for each of three consecutive 3-week periods. One diet was high in sucrose with no artificial sweeteners; one was low in sucrose with aspartame as a sweetener; and one was low in sucrose with saccharin (placebo) as a sweetener. Among the school-aged children, there were no significant differences among the three diets in any of the 39 behavioral and cognitive variables measured. For the preschool children, only four of the 31 measures differed significantly among the three diets and these differences were inconsistent (47). Thus, even when sugar intake was higher than usual, there were no effects on children's behavior or cognitive function (47). An accompanying editorial states, "it appears that any adverse effect of sugar is by no means as severe or as prevalent as uncontrolled observation and opinion would suggest. Specifically, there is no evidence that sugar alone can turn a child with normal attention into a hyperactive child..." (50).

  In a subsequent meta-analysis of 23 blinded, controlled trials examining the effects of sugar on children's behavior or cognition, researchers found that sugar intake did not affect behavior or cognitive performance (48). Parents and others may believe that sugar intake has an adverse effect on children's behavior because large amounts of sugar tend to be consumed on holidays or Halloween when children are already exuberant (48). Based on findings to date, there is no sound scientific evidence that sugar or foods such as chocolate milk that contain added sugars contribute to behavioral disorders or interfere with children's academic performance.

- **Obesity.** The sugar content of flavored milk has been alleged to contribute to obesity. However, scientific findings fail to support the suggestion that sugar intake per se or foods containing sugar such as flavored milks, when consumed in moderation and within an appropriate caloric intake, have a unique influence on obesity (22,23,25-27). However, over-consumption of sugar, as found in children consuming excessive intakes of sugar-sweetened beverages such as soft drinks, fruit drinks, and fruit juice, can increase calorie intake and risk of obesity (44,51).

  Obesity represents a positive energy (calorie) balance resulting from a long-term intake of excess calories, reduced physical activity, or a combination of these factors (25,26). This disease is multifactorial, involving genetic, hormonal, metabolic, and numerous lifestyle factors. As such, the cause of obesity cannot simply be attributed to a single dietary component. No relationship has been found between the per capita amount of sugar available in the nation's food supply and the incidence of obesity (25,52). In fact, epidemiological studies often demonstrate an inverse relationship between sugar intake and energy intake or obesity (25,52,53).

  Successful weight control does not require restricting any particular food or any category of nutrients or foods (26). For individuals concerned about their weight, flavored milks such as chocolate are available in low fat and fat free versions that are reduced in calories compared to their full fat counterparts. Also, new research findings indicate that including milk and dairy foods in the diet may protect against the development of overweight and obesity (54-56).

  In experimental animals fed a diet high in calcium/dairy foods, body weight and weight gain decreased (54). An analysis of data from the National Health and Nutrition Examination Survey (NHANES III) revealed an inverse association between calcium/dairy food intake and body fatness, especially in women (54). Similarly, a reevaluation of data from five studies over 12 years involving 780 women found that the highest calcium intake, mostly from dairy, was associated with lower body weight (55). In preschool children ages 2 to 5, increasing intake of dairy foods and calcium was found to be associated with lower body fat (56). However, a potentially beneficial effect of chocolate milk on body weight, when consumed within an appropriate calorie intake, has yet to be specifically examined. When obesity and excess calorie intakes are of concern, frequent consumption of high calorie nutrient void products (e.g., soft drinks) are an issue, particularly if they potentially displace nutrient dense foods such as calcium-rich dairy foods.

- **Diabetes Mellitus.** Although intake of sugar or sugar-containing foods has been proposed to contribute to or exacerbate Type 2 or non-insulin-dependent diabetes (NIDDM), there is no scientific evidence that sugar intake impairs glucose control or causes this form of diabetes (22,25,26,57-59). However, weight gain may trigger the onset of NIDDM in genetically susceptible individuals (60). Maintaining normal blood glucose levels and weight control are the primary objectives for managing NIDDM (58,59). According to nutrition guidelines issued by the American Diabetes Association, recommendations regarding sugar intake for diabetes are flexible, with intake depending on an individual's health concerns, tastes, and other lifestyle factors (58,59). Sugars added to foods do not affect blood glucose levels differently than do sugars alone (57). The total amount of carbohydrate in the diabetic diet is more important in terms of blood glucose levels than the source of carbohydrate (26).

Caffeine and Theobromine in Chocolate Milk

Caffeine and theobromine, the major methylxanthines in cacao beans, can act as mild stimulants of the central nervous system, depending on their dose and other factors (61-63). Possible adverse behavioral effects of caffeine and theobromine have been cited as a reason for restricting or eliminating chocolate milk from children's diets. Yet, there is no persuasive scientific evidence to justify this concern (61,64-67).

Chocolate milk contains a small amount of caffeine per serving compared to many other beverages (62,64, Table 2). The 2 to 7 mg of caffeine in an 8-ounce serving of chocolate milk is similar to that in one cup of decaffeinated coffee (64). Some regular soft drinks, on the other hand, contain up to 10 times more caffeine than chocolate milk (62,64). Furthermore, the amount of caffeine in a serving of chocolate milk is relatively small compared to children's average total daily caffeine intake of 38 mg or 1 mg/kg body weight (62,64).

Table 2.
Caffeine in Beverages (in 8 oz servings) (64)

Beverage	Caffeine Content per Serving (range in milligrams)
Chocolate Milk	2 – 7
Cocoa beverage	3 – 22
Cola	
regular	20 – 40
caffeine free	0
Coffee	
brewed, drip method	65 – 120
instant	60 – 85
decaffeinated	2 – 4
Tea	
brewed, major U.S. brands	20 – 90
brewed, imported brands	25 – 110
instant	24 – 31
iced tea	9 – 50

Preference For And Attitudes Related to Flavored Milk

Flavored milks such as chocolate milk are well accepted, especially by children and adolescents, but also by parents, school food service directors, and pediatricians (2,5,19,20, 78-80). When 600 children ages 8 through 13 were asked about their attitudes toward milk and their milk-drinking habits, 78% agreed that they like the taste of chocolate milk (5). Thirty-nine percent said that they would drink more milk if it were chocolate and 45% agreed that they would drink more milk at school if more flavors were offered (5). Another survey found that approximately one-third of children aged 9 to 11 would drink more milk if it were chocolate (2).

Children are more likely to drink chocolate milk at school than at home (5). In a small study of about 60 sixth grade students in an elementary school in New York City, students rated 1% chocolate flavored milk more acceptable than either unflavored 1% or unflavored whole milk (20). The children consumed a greater quantity of the 1% chocolate flavored milk than either of the unflavored milks. Likewise, milk's flavor was found to be an important factor influencing children's milk drinking in a study of elementary school students aged 6 to 11 years in northern Texas (78). The majority of children chose chocolate milk at school. When asked about what advice they would give a new student at school, the children's typical response included "get chocolate milk" (78). This study found that milk flavor was the most important environmental factor influencing milk drinking (78).

Parents are also supportive of offering flavored milk to children in schools (79). When 200 parents of children ages 8 to 13 were interviewed, the majority of parents (85%) agreed that chocolate milk should be offered to students either daily (65%) or at least a few times a week (20%) (79). Eighty-one percent of parents considered chocolate milk to be a healthy treat (79).

School food service directors support offering students flavored milk (19). When 206 school food service directors in elementary and secondary schools in the southwest region of the U.S. were interviewed about the types of beverages offered in school food service programs, approximately 78% supported serving chocolate flavored milk (19). Main reasons given by the directors for serving chocolate milk were students' preference for chocolate milk (81.8%), their increased participation in school meal programs (41.7%), and higher calcium intakes (33.3%) (19).

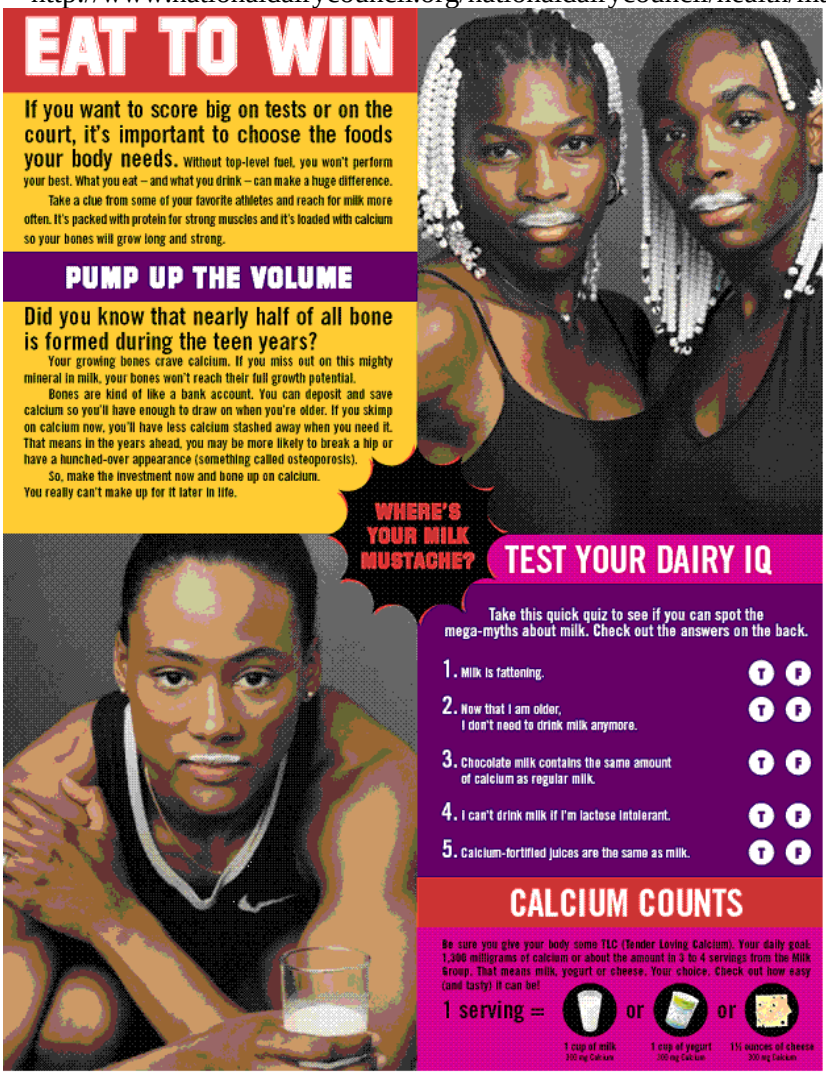
Pediatricians agree that chocolate milk is a nutritious beverage for children (80). According to a recent telephone survey of 300 pediatricians, the majority (87%) agreed that chocolate milk is a nutritious beverage option for children (80). Nearly 60% of those surveyed agreed that low fat and fat free chocolate milk is "the best beverage source of calcium," placing it above both calcium fortified orange juice and soymilk (80). This survey also revealed that 100% of pediatricians agreed that calcium is important for children's growth and development (80). Ninety-three percent of pediatricians surveyed said that children are not consuming enough calcium in their diets, with nearly 35% of all pediatricians being "very concerned" about children's low dietary calcium intake (80).

Summary and Conclusion

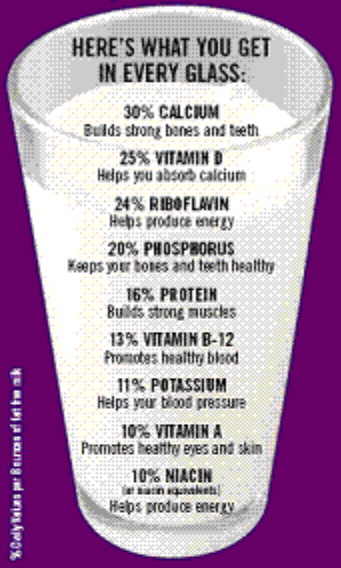
Flavored milks not only are well liked, especially by children and adolescents, but parents, school food service directors, and health professionals support intake of this beverage. The availability of flavored milks increases overall milk and nutrient intake. Health and behavior concerns related to components in flavored milks such as small amounts of sugar, caffeine, and oxalate are unfounded. This review of the scientific literature addressing various behavioral and health issues related to flavored milks indicates the following:

- Flavored milks are as nutritious as unflavored milks. Both types of milks are nutrient dense foods containing a high proportion of essential nutrients in relation to their energy content. Chocolate milk, for example, provides the same essential nutrients as white milk, including calcium, protein, vitamin D, vitamin A, vitamin B_{12}, potassium, phosphorus, riboflavin, and niacin. Like unflavored milks, all versions of flavored milks provide 300 mg calcium per serving or about one-third to one-fourth of children's daily calcium recommendation.
- The main difference between flavored milk such as chocolate and unflavored milk is the 2 to 4 teaspoons more sugar (sucrose or high fructose corn syrup) and about 60 more calories per serving in chocolate milks.
- Intake of sugar may contribute to dental caries, but it is unlikely that flavored milks cause this disease. Flavored milks, being liquid, do not readily adhere to tooth surfaces. Also, components in flavored milks may protect against dental caries. According to the American Academy of Pediatric Dentistry, because chocolate milk is a beverage it is less likely to cause cavities than sticky foods. Also, the calcium, phosphorus, and cocoa in chocolate milk may protect teeth from decay.
- The minute amount of caffeine in chocolate milk, which is similar to the amount in decaffeinated coffee, is generally considered too small to affect most children's behavior or health. Similarly, there is no evidence that theobromine in chocolate milk affects children.
- Although cocoa contains oxalate which binds calcium, calcium is absorbed equally well from chocolate and unflavored milks.
- For individuals with lactose maldigestion, flavored milks such as chocolate may be better tolerated than unflavored milks.
- Intake of chocolate milk does not spoil children's appetites nor displace intake of other foods at the same meal.
- Allowing the option of moderate amounts of flavored milks such as chocolate milk in a nutritionally balanced diet is compatible with nutrition education efforts and dietary guidelines. Successful nutrition education teaches people how to choose appropriate amounts of a wide variety of foods. The U.S. Dietary Guidelines for Americans recognizes that some foods with added sugars such as chocolate milk are also high in vitamins and minerals. The guidelines recommend that all individuals two years of age and over "choose beverages and foods to moderate your intake of sugars."
- Because of flavored milks' important contribution to children's nutrient intake, nutrition education messages targeted to children and their parents should encourage intake of low or nonfat flavored milks. Also, health professionals should support policies that allow flavored milks to be offered as a beverage option in school nutrition programs.

http://www.nationaldairycouncil.org/nationaldairycouncil/health/materials/Eat_to_Win_Tearpad.pdf



If you've only been slurping sodas or juice drinks instead of milk, you're depriving your bones of calcium at a time they need it the most. Whether fat free or flavored, milk is one of the easiest – and tastiest – ways to get the calcium you need. If you haven't been drinking much milk lately, it's time to get back on track.



% Daily Value per 8 ounces of fat free milk

Milk replenishes the fluids lost during your workout and provides lots of potassium – even more potassium than sports drinks. The high-quality protein in milk delivers the goods for strong muscles.

SNEAK IN MORE CALCIUM

- Get out the blender and whip up a cool smoothie made with a cup of milk, a handful of chopped fruit and ice.
- Satisfy your chocolate cravings by stirring a spoonful of chocolate syrup into an ice-cold glass of milk.
- Make a cup of hot cocoa with milk instead of water to warm up your insides on a chilly day.
- Kick the can of soda and chug a carton of chocolate milk.
- Instead of chips, crunch on crackers topped with cheese.
- Rather than a candy bar, choose instant pudding made with milk – it's ready in seconds.
- Eat milk with cereal, anytime!
- Top Mexican favorites with shredded cheese: tacos, burritos, enchiladas or taco salad.

TIPS FOR TOLERANCE

INSTEAD OF DITCHING DAIRY IF YOU THINK YOU MAY BE LACTOSE INTOLERANT, TRY THESE TIPS:

START SMALL. Try smaller and more frequent portions of milk and drink milk with a meal or snack instead of on an empty stomach. Most people are fine with drinking 1 cup of milk or less at a time.

REDUCE IT. Look for lactose-reduced or lactose-free milk. Or buy lactase enzyme drops at the drug store that you can add to regular milk. You can also take enzyme tablets to ease dairy digestion.

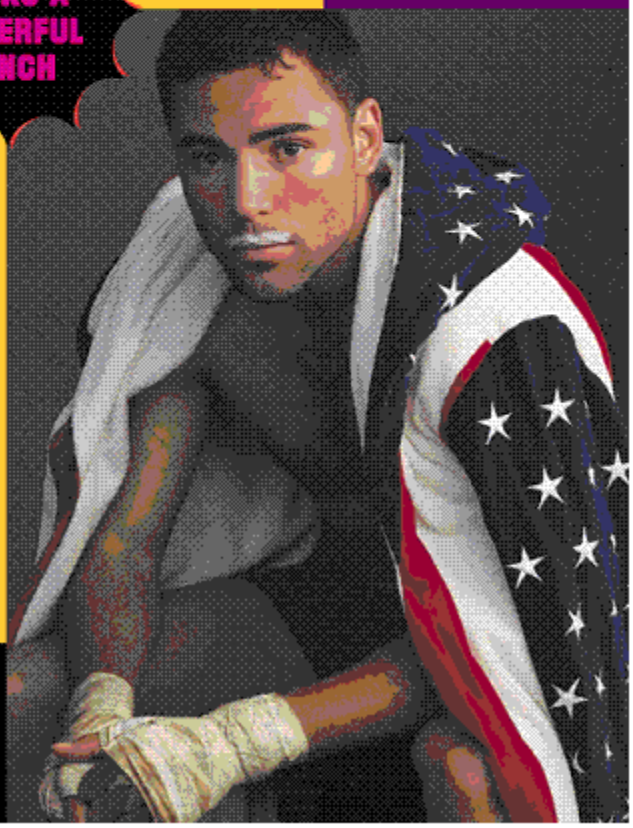
SAY CHEESE, PLEASE. More than half of the lactose is removed when cheese is made. Aged hard cheese like Cheddar, Colby, Swiss and Parmesan are particularly low in lactose and easier to digest.

GET A LITTLE "CULTURE." You probably won't have any trouble with cultured dairy products like yogurt, which contain "friendly" bacteria that help your body digest lactose.

GO TO THE PROS. These tips may not apply to everyone. Follow the advice of your doctor or consult a registered dietitian.

CHECK IT OUT

MILK PACKS A POWERFUL PUNCH



How'd ya do?

1. **FALSE.** That's a big fat lie. One 8-ounce glass of fat free milk has zero fat and contains only 80 calories, which is about what you'll find in an apple. A glass of lowfat milk has just 100 calories and 2.5 grams of fat. No matter what type of milk you choose - fat free or flavored - it's all packed with 9 essential nutrients.

2. **FALSE.** Milk is more important than ever. Now is when your bone growth shifts into high gear, so you need to feed your bones plenty of calcium every day.

3. **TRUE.** Chocolate milk is chock full of the same amount of calcium as you'll find in regular milk. You can find chocolate milk in grab-and-go containers or make your own with a spoonful of chocolate syrup.

4. **FALSE.** Milk may not be the problem, only your doctor will know for sure. But even if you are lactose intolerant, you can still enjoy milk. (see "Tips for Tolerance" above)

5. **FALSE.** Although other drinks may have added calcium, milk is naturally rich in calcium. In addition, it contains 8 other essential nutrients, including vitamin D which helps you absorb the calcium.

National Medical Association

NATIONAL DAIRY COUNCIL®

MilkPEP

got milk?

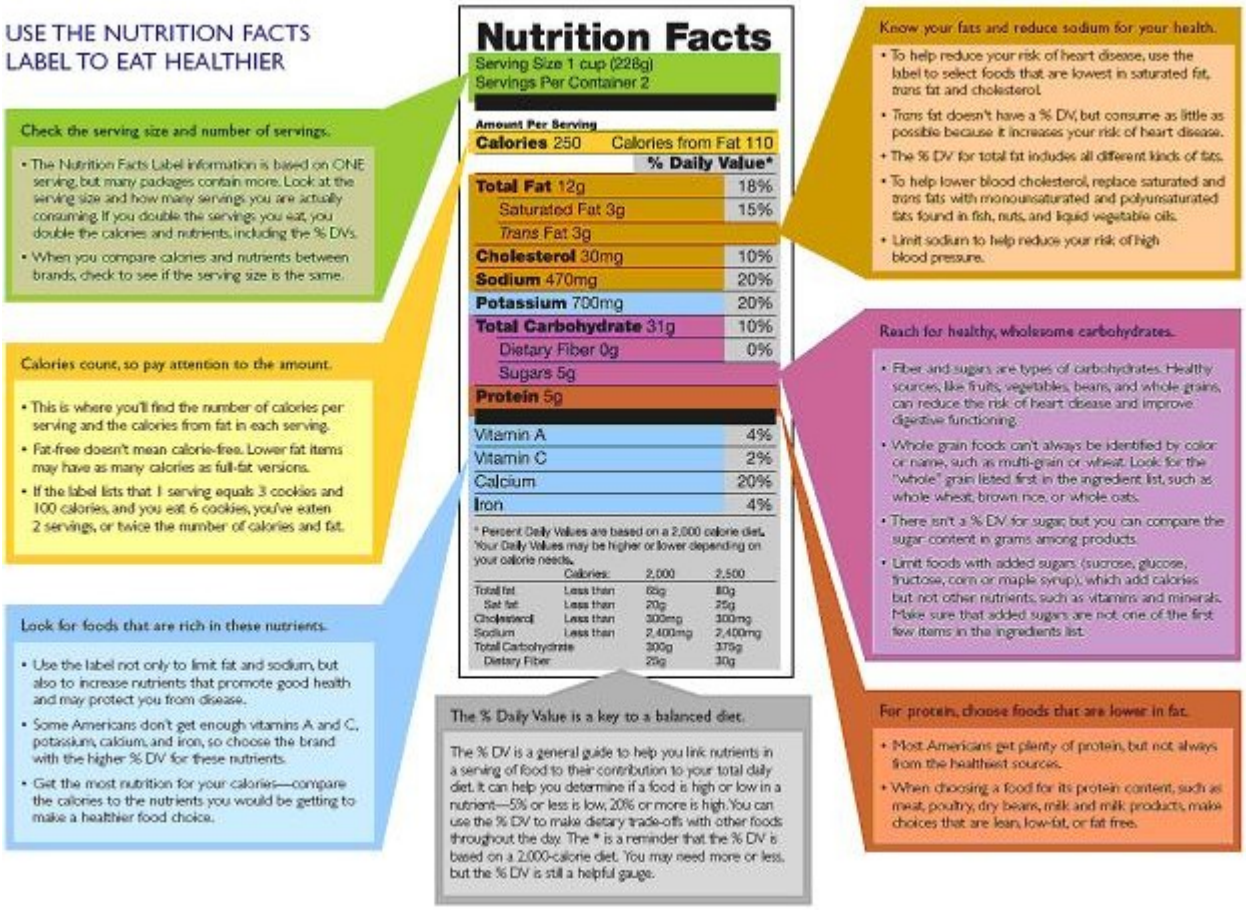
Supported by an educational grant from the National Dairy Council® and Milk Processor Education Program.
For more information, check out www.whymilk.com and familyfoodzone.com.

Food labels www.usda.gov

Eating healthier and
feeling better using the

Nutrition Facts Label

U.S. Department of Health and Human Services
U.S. Department of Agriculture
www.healthierus.gov/dietaryguidelines


USE THE NUTRITION FACTS LABEL TO EAT HEALTHIER
Check the serving size and number of servings.
• The Nutrition Facts Label information is based on ONE serving, but many packages contain more. Look at the serving size and how many servings you are actually consuming. If you double the servings you eat, you double the calories and nutrients, including the % DVs.
• When you compare calories and nutrients between brands, check to see if the serving size is the same.
Calories count, so pay attention to the amount.
• This is where you'll find the number of calories per serving and the calories from fat in each serving.
• Fat-free doesn't mean calorie-free. Lower fat items may have as many calories as full-fat versions.
• If the label lists that 1 serving equals 3 cookies and 100 calories, and you eat 6 cookies, you've eaten 2 servings, or twice the number of calories and fat.
Look for foods that are rich in these nutrients.
• Use the label not only to limit fat and sodium, but also to increase nutrients that promote good health and may protect you from disease.
• Some Americans don't get enough vitamins A and C, potassium, calcium, and iron, so choose the brand with the higher % DV for these nutrients.
• Get the most nutrition for your calories—compare the calories to the nutrients you would be getting to make a healthier food choice.
Nutrition Facts
Serving Size 1 cup (228g)
Servings Per Container 2
Amount Per Serving
Calories 250 Calories from Fat 110
% Daily Value*
Total Fat 12g 18%
Saturated Fat 3g 15%
Trans Fat 3g
Cholesterol 30mg 10%
Sodium 470mg 20%
Potassium 700mg 20%
Total Carbohydrate 31g 10%
Dietary Fiber 0g 0%
Sugars 5g
Protein 5g
Vitamin A 4%
Vitamin C 2%
Calcium 20%
Iron 4%
* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.
Calories: 2,000 2,500
Total fat Less than 65g 80g
Sat fat Less than 20g 25g
Cholesterol Less than 300mg 300mg
Sodium Less than 2,400mg 2,400mg
Total Carbohydrate 300g 375g
Dietary Fiber 25g 30g
The % Daily Value is a key to a balanced diet.
The % DV is a general guide to help you link nutrients in a serving of food to their contribution to your total daily diet. It can help you determine if a food is high or low in a nutrient—5% or less is low, 20% or more is high. You can use the % DV to make dietary trade-offs with other foods throughout the day. The * is a reminder that the % DV is based on a 2,000-calorie diet. You may need more or less, but the % DV is still a helpful gauge.
Know your fats and reduce sodium for your health.
• To help reduce your risk of heart disease, use the label to select foods that are lowest in saturated fat, trans fat and cholesterol.
• Trans fat doesn't have a % DV, but consume as little as possible because it increases your risk of heart disease.
• The % DV for total fat includes all different kinds of fats.
• To help lower blood cholesterol, replace saturated and trans fats with monounsaturated and polyunsaturated fats found in fish, nuts, and liquid vegetable oils.
• Limit sodium to help reduce your risk of high blood pressure.
Reach for healthy, wholesome carbohydrates.
• Fiber and sugars are types of carbohydrates. Healthy sources, like fruits, vegetables, beans, and whole grains, can reduce the risk of heart disease and improve digestive functioning.
• Whole grain foods can't always be identified by color or name, such as multi-grain or wheat. Look for the "whole" grain listed first in the ingredient list, such as whole wheat, brown rice, or whole oats.
• There isn't a % DV for sugar, but you can compare the sugar content in grams among products.
• Limit foods with added sugars (sucrose, glucose, fructose, corn or maple syrup), which add calories but not other nutrients, such as vitamins and minerals. Make sure that added sugars are not one of the first few items in the ingredients list.
For protein, choose foods that are lower in fat.
• Most Americans get plenty of protein, but not always from the healthiest sources.
• When choosing a food for its protein content, such as meat, poultry, dry beans, milk and milk products, make choices that are lean, low-fat, or fat free.

THE RIGHT TOOL TO BALANCE YOUR DIET

You probably already use the Nutrition Facts label in some way—maybe to check calories, fat or sodium content. But, the more familiar you are with the information, the more you'll want to use it daily to ensure you're eating a healthy, balanced diet.

Use the label when you shop, as you plan your meals, and as you cook each day. The label makes it easy to determine the amounts of nutrients you're getting and to compare one product to another.

Strive for a diet that emphasizes fruits, vegetables, whole grains, and fat-free or low-fat milk and milk products. Include lean meats, poultry, fish, beans, and nuts. Choose foods that are low in saturated fats, *trans* fats, cholesterol, salt, and added sugar.

Regular physical activity is important for your overall health and fitness. It also helps you control body weight by balancing the calories you take in from food with the calories you expend each day. For more information, visit www.healthierus.gov/dietaryguidelines.

www.ndc.org

JUMPSTART YOUR DAY WITH A HEALTHY BREAKFAST

According to the 2005 Dietary Guidelines for Americans, individuals should consume three daily servings of dairy and whole grains. Try these nutrient-packed breakfast and mid-morning treats to help meet your daily requirements and rejuvenate for the day ahead.

Mango Peach Smoothie
Blend a cup of fresh peaches, mango, low-fat milk and ice cubes to re-fuel after a workout.

Breakfast Split
Top a small banana with a ½ cup of reduced-fat vanilla yogurt, a ½ cup of reduced-fat strawberry yogurt, and a ¼ cup of whole-grain cereal for a creamy, crunchy start to your day.

Morning Mocha
Mix a cup of reduced-fat milk with a teaspoon of instant coffee and cocoa for a morning pick-me-up.

Patriotic Parfait
Crumble a small bran muffin in a bowl and top with a cup of low-fat vanilla yogurt, a ½ cup of blueberries and strawberries and chopped walnuts.

Benedict Bagel
Layer a slice of low-fat ham, swiss cheese and a poached egg on a toasted whole-wheat bagel for a protein-packed breakfast.

Morning Medley
Start your day the smart way with a cup of oatmeal mixed with a cup of skim milk and lightly sweetened with a tablespoon of your choice of brown sugar, raisins, honey or maple syrup.

Seasonal Sensations
Top a bowl of whole-grain cereal and milk with your favorite seasonal fruit.

Eating on-the-Go
Stash cartons of yogurt in the office refrigerator and keep whole-grain cereal at your desk for at-work breakfasts.

Muffin Mania
Try muffin recipes using whole-grain cereal and whole-wheat flour as key ingredients.

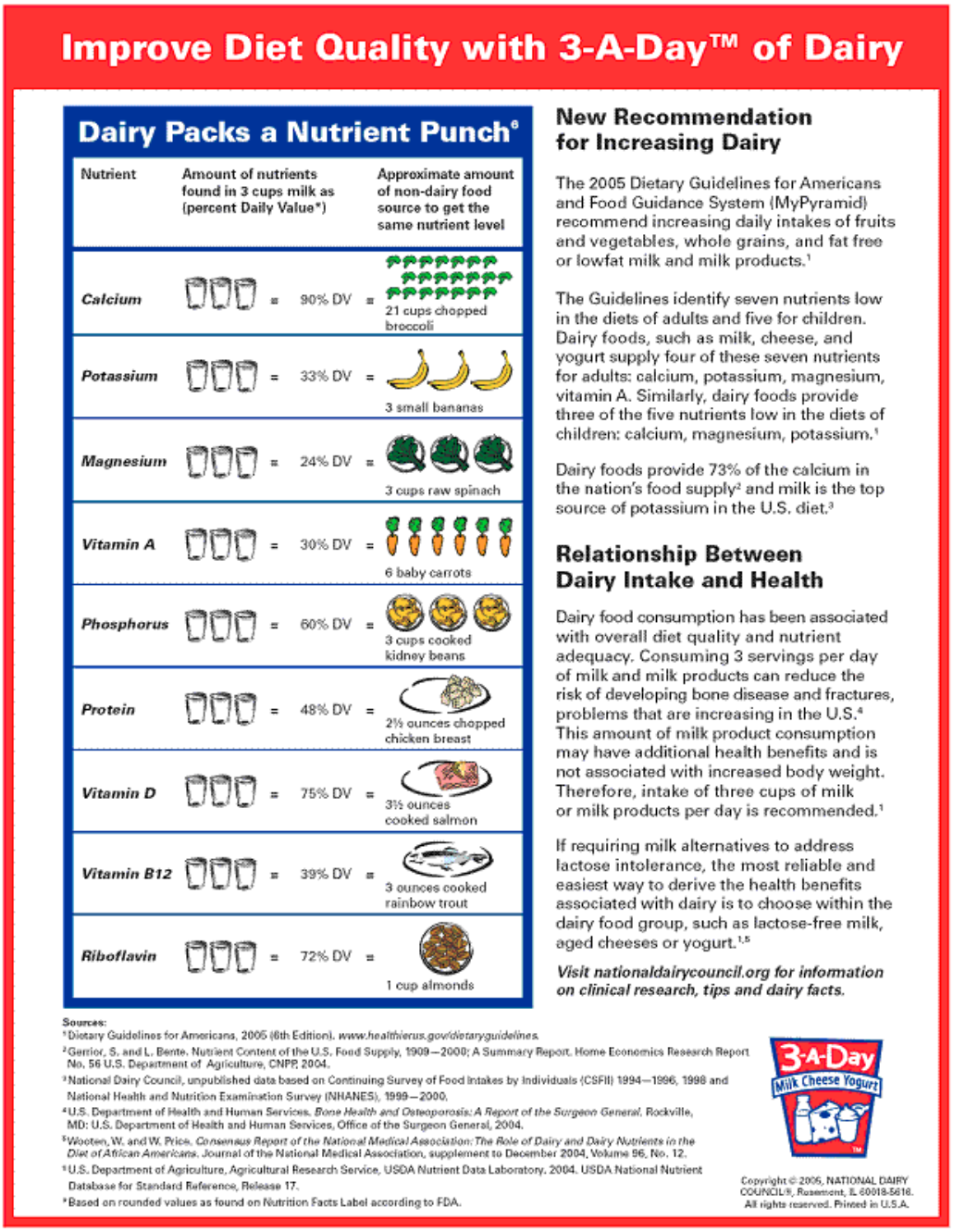
Whole-Grain Power Mix
Mix whole-grain cereal, dried fruit and nuts for a handy, on-the-go trail mix. Pair with a single-serve plastic container of milk for a nutritious snack.

Bell Institute of Health and Nutrition
GENERAL MILLS
NATIONAL DAIRY COUNCIL

www.

www.3aday.org

http://www.3aday.org/SiteCollectionDocuments/PDFs/MilksNutrientComposition.pdf



Improve Diet Quality with 3-A-Day™ of Dairy

Dairy Packs a Nutrient Punch[6]

Nutrient	Amount of nutrients found in 3 cups milk as (percent Daily Value*)	Approximate amount of non-dairy food source to get the same nutrient level
Calcium	= 30% DV =	21 cups chopped broccoli
Potassium	= 33% DV =	3 small bananas
Magnesium	= 24% DV =	3 cups raw spinach
Vitamin A	= 30% DV =	6 baby carrots
Phosphorus	= 60% DV =	3 cups cooked kidney beans
Protein	= 48% DV =	2½ ounces chopped chicken breast
Vitamin D	= 75% DV =	3½ ounces cooked salmon
Vitamin B12	= 39% DV =	3 ounces cooked rainbow trout
Riboflavin	= 72% DV =	1 cup almonds

New Recommendation for Increasing Dairy

The 2005 Dietary Guidelines for Americans and Food Guidance System (MyPyramid) recommend increasing daily intakes of fruits and vegetables, whole grains, and fat free or lowfat milk and milk products.[1]

The Guidelines identify seven nutrients low in the diets of adults and five for children. Dairy foods, such as milk, cheese, and yogurt supply four of these seven nutrients for adults: calcium, potassium, magnesium, vitamin A. Similarly, dairy foods provide three of the five nutrients low in the diets of children: calcium, magnesium, potassium.[1]

Dairy foods provide 73% of the calcium in the nation's food supply[2] and milk is the top source of potassium in the U.S. diet.[3]

Relationship Between Dairy Intake and Health

Dairy food consumption has been associated with overall diet quality and nutrient adequacy. Consuming 3 servings per day of milk and milk products can reduce the risk of developing bone disease and fractures, problems that are increasing in the U.S.[4] This amount of milk product consumption may have additional health benefits and is not associated with increased body weight. Therefore, intake of three cups of milk or milk products per day is recommended.[1]

If requiring milk alternatives to address lactose intolerance, the most reliable and easiest way to derive the health benefits associated with dairy is to choose within the dairy food group, such as lactose-free milk, aged cheeses or yogurt.[1,5]

Visit nationaldairycouncil.org for information on clinical research, tips and dairy facts.

Sources:

[1] Dietary Guidelines for Americans, 2005 (6th Edition). *www.healthierus.gov/dietaryguidelines*.

[2] Gerrior, S. and L. Bente. Nutrient Content of the U.S. Food Supply, 1909—2000; A Summary Report. Home Economics Research Report No. 56 U.S. Department of Agriculture, CNPP, 2004.

[3] National Dairy Council, unpublished data based on Continuing Survey of Food Intakes by Individuals (CSFII) 1994—1996, 1998 and National Health and Nutrition Examination Survey (NHANES), 1999—2000.

[4] U.S. Department of Health and Human Services. *Bone Health and Osteoporosis: A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, Office of the Surgeon General, 2004.

[5] Wooten, W. and W. Price. *Consensus Report of the National Medical Association: The Role of Dairy and Dairy Nutrients in the Diet of African Americans*. Journal of the National Medical Association, supplement to December 2004, Volume 96, No. 12.

[6] U.S. Department of Agriculture, Agricultural Research Service, USDA Nutrient Data Laboratory. 2004. USDA National Nutrient Database for Standard Reference, Release 17.

* Based on rounded values as found on Nutrition Facts Label according to FDA.

3-A-Day Milk Cheese Yogurt

http://www.nationaldairycouncil.org/NR/rdonlyres/DC814163-3255-4B16-9A5A-01918A00EDF0/0/Wanted_Stronger_Bones.pdf

www.3aday.org

http://www.nationaldairycouncil.org/nationaldairycouncil/health/materials/Mealtime_Makeover.pdf

www.3adat.org

http://www.3aday.org/SiteCollectionDocuments/PDFs/33DairyTips.pdf

33 Tasty Snack Ideas

Including a dairy snack between meals is a healthy way to keep hunger in check and stay energized throughout the day. Together milk, cheese and yougurt provide a unique nutrient package of nine essential nutrients that help Americans improve overall diet quality. Enjoying three servings a day can also help maintain a healthy weight.

Milk

1. Rise and Shine:
Get a mid-morning boost with a cold glass of fat free milk and sliced peaches.

2. Strawberry-sicles:
Mix lowfat strawberry milk with fresh strawberry slices and freeze in a popsicle container.

3. Flavor on-the-Fly:
Fat free flavored milks are perfect anywhere you go- just take, shake and sip!

4. Choco-Raspberry Chug
Blend a cup of fat free milk with frozen raspberries and sweetened cocoa.

5. Sweet Milk Steamer:
Microwave a cup of lowfat milk and honey.

6. Banana Split Blenders:
Blend lowfat strawberry milk with banana slices and ice.

7. Morning Mocha
Mix a cup of reduced fat milk with a teaspoon of instant coffee and sweetened cocoa.

8. A Sip of Spice
Warm a cup of milk and mix with Chai tea to warm up the afternoon.

9. Graham Dunk:
Dip a few graham crackers into a cold glass of lowfat milk.

10. Fruity Splash:
Blend your strawberry milk with fresh bananas and ice.

11. Vanilla-Berry Bowl:
Enjoy lowfat vanilla milk with a bowl of fresh berries.

Cheese

12. Salsa Roll-Up:
Roll Monterey Jack cheese into a whole-wheat tortilla and dip in salsa.

13. Cheddar Crunch:
Mix ½ cup of Cheddar cheese shreds with popcorn and pretzels.

14. Veggie Wraps:
Wrap Colby Jack cheese around spears of asparagus.

15. Cherry Tomato Crunchers
Top wheat crackers with reduced fat Mozzarella cheese and cherry tomatoes.

16. Cheese & Crackers:
Layer lowfat American cheese and smoked turkey onto crackers.

17. Seafood Spread:
Mix canned salmon or crab with Ricotta or Mozzarella cheese and eat on pita wedges.

18. Zesty Tostada:
Top a tostada with fat free refried beans and reduced fat shredded Pepper Jack cheese.

19. Chicken Melt:
Melt a slice of reduced fat Colby Jack cheese over canned chicken on an English muffin.

20. Cheese Ka-bob:
Alternate small slices of apples and reduced fat Cheddar cheese on skewers.

21. Lettuce Wraps
Wrap a slice of Swiss cheese, turkey, and Dijon mustard in lettuce leaves.

22. String by String:
Pack light string cheese into your bag for a post-workout energizer.

Yogurt

23. Tropical Smoothie:
Blend fresh orange slices with strawberry yogurt and ice.

24. Cucumber Salad
Mix diced cucumber with a cup of lowfat plain yogurt, mint and a pinch of salt and pepper and spread on whole-wheat pita wedges.

25. Mango Mixer
Enjoy a tropical treat by blending mango, plain lowfat yogurt and a splash of pineapple juice.

26. Parfait Pleaser:
Layer granola and fresh fruit with your favorite lowfat yogurt.

27. Simple Shortcake:
Try pieces of angel food cake with a cup of strawberry yogurt for a heavenly treat.

28. Berry Blast:
Mix blueberry yogurt with fresh blueberries or raspberries.

29. Go Nuts:
Top lowfat vanilla yogurt with a few crushed pecans and cinnamon.

30. Honey Fruit Dip:
Mix fat free yogurt with a dollop of honey for a sweet fruit dip.

31. Yo-on-the-Go:
Enjoy your favorite flavor of drinkable yogurt at the office or on the go.

32. Mocha Mudslide
Stir chocolate syrup into a cup of coffee-flavored yogurt and freeze.

33. Yogurt Pops:
Freeze squeezable yogurt for a quick and creamy popsicle.

www. 3aday.org

http://www.3aday.org/SiteCollectionDocuments/PDFs/Calcium_Assessment_Questionnaire_020306.pdf

ARE YOU AND YOUR CHILD EATING ENOUGH FOODS WITH CALCIUM?

Seven out of 10 boys and nine out of 10 girls don't get the calcium they need.

Dairy foods like milk, cheese and yogurt provide your body with the calcium it needs to make strong bones. Not eating enough calcium is a concern for the whole family. If you are not eating the recommended amount as the parent, then your child may not be getting enough either, which may increase risk of bone fractures and osteoporosis.

Assess your calcium intake with these questions and discuss the answers with your pediatrician, family doctor or registered dietitian.

1. *How many times a day do you (or your child) drink white or flavored milk? (whole, 2%, 1%, or skim milk)*

   Answer:_____

2. *How often do you (or your child) eat cheese, yogurt, yogurt drinks, or other dairy products?*

   Answer:_____

DOCTOR SAYS: Children and adults can get the calcium they need by enjoying three servings of milk, yogurt or cheese each day (4 servings for adolescents). Choose low-fat or fat-free dairy foods often.

3. *Do you (or your child) eat any of the following: broccoli, beans, cooked greens (eg, collards, turnip greens, kale), or tofu?*

   Answer:_____

4. *Do you (or your child) drink calcium-fortified juices or eat any other calcium-fortified foods like cereal or bread? How often?*

   Answer:_____

5. *Do you (or your child) take any calcium supplements including those containing vitamins?*

   Answer:_____

DOCTOR SAYS: Dairy products, including milk, yogurt and cheese (low-fat and fat-free versions are encouraged), are the recommended way to get calcium and other nutrients like vitamin D and potassium. Many vegetables contain calcium, but large portions are required to get the amount of calcium you need. Some foods have added calcium (fortified), but they don't have other good vitamins and minerals found in dairy. For people who cannot or will not eat dairy foods, calcium supplements might be needed.

6. *How often do you (or your child) drink soft drinks, fruit drinks, fruitades, etc?*

   Answer:_____

DOCTOR SAYS: Milk is a better drink choice. If you drink a lot of soft drinks and fruit juices and/or fruit drinks instead of milk, you might not be getting enough calcium or other important nutrients.

7. *How many times a week do you (or your child) participate in vigorous physical activity?*

   Answer:_____

DOCTOR SAYS: Physical activity, mostly weight-bearing exercise (such as running or playing basketball), is encouraged as part of an overall healthy bone program. Be physically active most days of the week.

8. *Have you (or has your child) had any bone fractures?*

   Answer:_____

9. *Is there a family history of osteoporosis?*

   Answer:_____

DOCTOR SAYS: A family history of bone fractures or osteoporosis means it's even MORE important to get the right amount of calcium to improve bone health.

BE A ROLE MODEL AND ENJOY DAIRY WITH YOUR FAMILY (ONE SERVING* EQUALS):

8 ounces (1cup) milk

*For ages 4 and older

1 to 1½ ounces of cheese

6 or 8 ounce countainer of yogurt

3-A-Day Milk Cheese Yogurt For stronger bones

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

www.aap.org

Visit 3aday.org to sign up to be a 3-A-Day™ of Dairy Mom. As a 3-A-Day Mom, you'll receive delicious recipes the family will love, exclusive member-only offers and great advice from other moms.

Intervention Components

Email messages (Comparison Group)

WEEK 1

DO YOU FEEL TIRED, IRRITABLE, DEPRESSED OR ANXIOUS……

WELL MAYBE YOU ARE STRESSED……..

YEAH THAT'S TRUE……

Stress is our body's response to wear and tear from different experiences which can be negative or positive as we adjust to continually changing environment. It has physical and emotional effects on us and can create positive or negative feelings. As a positive influence, stress can help compel us to action; it can result in a new awareness and an exciting new perspective. As a negative influence, it can result in feelings of distrust, rejection, anger, and depression, which in turn can lead to health problems such as headaches, upset stomach, rashes, insomnia, ulcers, high blood pressure, heart disease, and stroke. With the death of a loved one, the birth of a child, a job promotion, or a new relationship, we experience stress as we readjust our lives. In so adjusting to different circumstances, stress will help or hinder us depending on how we react to it.

For more information on stress, check out the information posted on blackboard under "INFO ON STRESS" TAB. There are various resources available on campus to help you relieve stress.

FLYER

Stress

Email message WEEK 2

Burnout is a very common symptom of stress. It is a state of emotional and physical exhaustion. The main reason for burnout is excessive and prolonged stress. It can occur when you feel overwhelmed or overworked and are unable to meet constant demands. As the stress continues, you begin to lose the interest or motivation. Burnout reduces your productivity and drains your

energy, leaving you feeling increasingly hopeless, powerless, cynical, and resentful. The unhappiness burnout causes can eventually threaten your job, your relationships, and your health.

It doesn't happen overnight and it's difficult to fight once you're in the middle of it — it's important to recognize the early signs of burnout and head it off. Burnout usually has its roots in stress, so the earlier you recognize the symptoms of stress and address them, the better chance you have of avoiding burnout. See more information on what causes burnout and how you can prevent it on blackboard under information on stress.

Flyer

Burnout

Email message WEEK 3

Flyer

Different ways to assess STRESS!

Email message WEEK 4

Relaxation is a way to combat stress. However many people resort to alcohol and other vices like cigarette smoking to relax. Think twice before using these measures to relax from everyday pressures. Alcohol and cigarette smoking can increase mental and physical stress and regular use can led to dependency.
Positive ways to combat stress include regular exercise, meditation, laughter and involvement in outside activities and bring positive changes in your attitude and enhance your life along with reduced stress.

I have posted some resources on blackboard site under "information on stress" for you to check it out.

Email message WEEK 5

Flyer

Optimism to beat STRESS

Email message WEEK 6

Flyer

Laughter to beat STRESS

Email message WEEK 7

Flyer

Meditation to beat STRESS

Email message WEEK 8

Stress can result in tense muscles and shallow breathing……Relax your self by taking some deep breaths and doing few stretches to release the tension….

Flyer

Different STRESS BUSTERS and Breathing Techniques to relieve STRESS!