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STUDY FINDS LOW-FAT DAIRY CONSUMPTION REDUCES MARKER OF INFLAMMATION IN OBESE ADULTS

Low-grade systemic inflammation has been receiving attention as a potential component of the metabolic syndrome and a possible risk factor for cardiovascular disease. This 8-week randomized, clinical trial using a crossover design, evaluated the effect of low-fat dairy consumption on inflammatory markers and adhesion molecules in 35 healthy overweight and obese subjects. Participants were randomly assigned to consume 500 ml (~2 cups) of low-fat milk and 150 g (~6 ounces) low-fat yogurt per day or to the control group who consumed 600 ml of fruit juice and 43 g (3 pieces) fruit biscuits per day. The total calorie content of the two treatments were similar. Then after a 2-week washout period, participants switched to the opposite treatment.

Results:

- Total calorie intake and average body weight of participants at the end of the intervention periods was not different between the low-fat dairy group and the control group.
- Among the markers of inflammation measured, concentrations of TNF- α tended to be lower (but not statistically significant) after dairy diet consumption compared to the control period.
- The TNF- α index (defined as the TNF- α :s-TNFR-2 ratio and measure of the biologically available TNF- α) was decreased significantly by the dairy diet compared to the control. According to the authors, "Elevated concentrations of TNF- α have been found to be related to obesity, insulin resistance and the metabolic syndrome."
- "Other inflammatory markers and adhesion molecules, however, were not affected by dairy consumption."

"Taken together," the authors conclude, "the present results indicate that low-fat dairy consumption for 8 weeks, compared with carbohydrate-rich product consumption, may modulate TNF- α signaling by increasing s-TNFR-2, but that it does not affect other markers of low-grade systemic inflammation and endothelial function in overweight and obese subjects." [van Meijl LEC and Mensink RP, *British J Nutr*, published online June 28, 2010] [Editor's note: The authors mention that a previously published randomized trial in overweight adults by Zemel et al. demonstrated that a dairy-rich diet reduced inflammatory markers and increased adiponectin in overweight and obese subjects compared to a soy-rich diet, without changes in body weight. The Zemel et al. study (Zemel, MB, et al., *Am J Clin Nutr*, 91: 16-22, 2010) was summarized in the January 2010 issue of Current Awareness.]

A HIGH CALCIUM DIET WITH SMIM MILK POWDER IS ASSOCIATED WITH LOWER FAT MASS IN OBESE ENERGY-RESTRICTED RATS

This study in 64 diet-induced obese rats determined the effect of four protein sources (skim milk powder (SMP), whey, casein, and soy protein isolate (SPI)) either high or low in calcium on weight loss in male rats on an energy-restricted (70% of usual food/energy intake) diet for 4 weeks. Results showed, "The interaction between dietary protein and calcium affected final body weight and fat mass."

- Fat mass was less in rats fed the high-calcium SMP diet than in those fed the low-calcium casein or SPI diets.
- "Lean body mass was greater in rats fed SMP than in those fed whey."
- "Rats fed high-calcium diets had a lower plasma glucagon area under the curve than those fed low-calcium diets."
- "Glycemic control is inconsistently affected by a diet rich in SMP."

The authors say this is the first study to compare casein, whey, SPI, and SMP proteins with high or low calcium concentrations on weight loss during energy restriction. Because neither casein or whey alone matched the metabolic changes seen with SMP (whole food), the authors say studies are needed to identify additional bioactive compounds in milk, and their effect on insulin sensitivity. [Eller L and Reimer RA, *J Nutr*, 140: 1234-1241, 2010]

STUDY SHOWS NO EFFECT OF HIGH-DAIRY OR HIGH CALCIUM DIET ON BODY COMPOSITION OR BLOOD LIPIDS IN OBESE PUERTO RICAN ADULTS

This 21-week randomized clinical trial evaluated whether dairy or calcium supplementation alters body composition or blood lipids in 30 Puerto Rican obese adults (21-50 years) without calorie restriction or exercise. Participants were randomly assigned to one of three groups: 1) High dairy (~1300 mg/d of calcium provided by four servings of low-fat milk, cheese, or yogurt substituted for other foods; 2) High calcium (~1300 mg/d, ~700 mg/d from the diet and 600 mg/d from a calcium supplement); 3) control group (received a placebo tablet). Participants in the high calcium and control groups were instructed to maintain their usual diets and physical activity level. A total of 25 subjects completed the study. Average calcium intake during the trial was 1200 mg/d in the high dairy group, 1171 mg/d in the high calcium group, and 668 mg/d in the control group. Results showed that increasing calcium intake through dairy products or supplements did not lead to significant changes in body composition (weight, lean body mass, body fat mass, percent body fat, trunk body fat mass, percent trunk fat, total bone mineral content/density, total cholesterol, HDL-cholesterol, LDL-cholesterol, and triglycerides). The authors say the sample size may have been too small to detect differences between groups. [Palacios C, et al., *Nutrition*, published online July 1, 2010]

SKIMMED MILK IS A POTENTIAL VEHICLE FOR FOLIC ACID FORTIFICATION IN SPAIN

Mandatory folic acid fortification was introduced in the United States and Canada 12 years ago to help prevent neural tube defects in infants. Investigators in Spain tested the efficiency of using skimmed milk as a vehicle for folic acid fortification by conducting a single-dose bioavailability study. They compared the acute absorption of folic acid from fortified skimmed

milk with that of fortified and unfortified whole milk in 5 healthy volunteers. The volunteers were asked to consume a folic acid-free diet for 24 hours before the test day. On the test day after an overnight fast the volunteers were given breakfast consisting of 430 ml (1.8 cups) of milk plus 10 unfortified biscuits. Blood samples were taken 90 min. later and hourly for 5 hours. All subjects tested all three milks in random order a week apart. Results showed that “Plasma folate concentration was significantly increased, when compared to baseline values, 1.5 hours after ingestion of skimmed fortified milk, and 2.5 hours after whole fortified milk, and remained significantly higher than baseline values for up to 6.5 hours after both treatments.” The acute absorption of folic acid as indicated by plasma folate concentration (area under the curve) “was significantly higher from skimmed fortified milk compared to fortified and unfortified whole milk.” the authors conclude, “These findings indicate that skimmed milk could be considered an efficient food matrix for folic acid fortification.” [Achon M, et al., *European Journal of Nutrition*, published online June 26, 2010]

DIETS WITH 54 G OF WHEY PROTEIN IMPROVE BLOOD PRESSURE AND VASCULAR FUNCTION IN OVERWEIGHT AND OBESE ADULTS

Previous studies have shown that whey proteins may reduce blood pressure and improve cardiovascular health. Australian researchers evaluated the effects of whey protein supplementation on blood pressure, vascular function, and inflammatory markers compared to casein and glucose (control) in 70 overweight/obese adults (18-65 years). Participants were randomly assigned to consume 27 g of whey protein isolate, sodium caseinate, or glucose mixed with a cup of water twice a day (30 minutes before breakfast and 30 minutes before dinner) for 12 weeks. They were instructed to follow their usual diet, but to reduce their calorie intake by the amount of calories in the supplements to avoid gaining weight. Participants were also instructed to limit their dairy intake during the study period to about one serving per day.

Results:

- “Systolic blood pressure decreased significantly at week 6 compared to baseline in the whey and casein groups.”
- At week 12, diastolic blood pressure in the whey and casein groups decreased significantly compared to baseline and the control group.
- The augmentation index, a surrogate measure of arterial stiffness and vascular function, “was decreased in the whey protein group at 12 weeks compared to baseline.” It was also significantly decreased compared to the casein and control groups.
- “Casein or whey supplementation had no effect on inflammatory markers.”

“This study demonstrated that supplementation with [54 g] whey protein improves blood pressure and vascular function in overweight and obese individuals,” conclude the authors. “Therefore,” they say, “whey protein supplementation has the potential to be used as an added component in dietary plans and in functional foods aimed in the management of the metabolic syndrome risk factors.” [Pal S and Ellis V, *Obesity*, 18(7): 1354-1359, 2010]

EARLY EXPOSURE TO COW'S MILK PROTEIN AS A SUPPLEMENT TO BREAST FEEDING MAY PROMOTE TOLERANCE

This large, population-based prospective study of 13,019 infants born over a two-year period in a medical center in Israel determined the prevalence, cross-reactivity with soy allergy, and risk factors for the development of cow's milk allergy (CMA) that are mediated through a component of the immune system (IgE-CMA). A feeding history of the infants was obtained by telephone interview and questionnaire. Infants who were reported to have adverse reactions to milk were examined, given a skin prick test, and an oral milk challenge. Results of this testing indicated that the incidence of IgE-mediated CMA in this population was 0.5% -- which is similar to the prevalence reported from a large cross-sectional study in Israel, but is significantly lower than the 1.5% prevalence rate for IgE-CMA reported in other countries. The authors say some studies may have included infants with milk-related adverse events but who do not meet the criteria for diagnosis with IgE-CMA. In addition:

- Sixty-four out of the 66 patients with IgE-CMA tolerated soy, and none were proved allergic to soy. The authors say, "Soy is a reasonable feeding alternative in patients with IgE-mediated CMA," in contrast to a [position statement](#) of the American Academy of Pediatrics.
- "The average age of cow's milk protein introduction was significantly different between the healthy infants and those with IgE-mediated CMA." For example, "Only 0.05% of the infants who were started on regular CMP formula within the first 14 days versus 1.75% who were started on formula between the ages of 105 and 194 days [4 to 6 months] had IgE-mediated CMA." The odds of developing IgE-CMA was 19 times higher in infants who were first exposed to cow's milk protein at 15 days of age or older, compared to earlier exposure.

The authors say that early tolerance of dietary proteins is gaining recognition among researchers, but the exact timing and mechanism for developing tolerance is not yet understood. They say breastfeeding should not be discouraged, but that "it seems reasonable to consider early complementary feeding of cow's milk protein along with breast feeding to promote oral tolerance, especially in high-risk infants." [Katz Y, et al., *J Allergy Clin Immunol*, published online June 10, 2010]

FERMENTATION BY LACTIC ACID BACTERIA MAY REDUCE THE ALLERGIC POTENTIAL OF SELECT MILK PROTEINS

The whey proteins α -lactalbumin and β -lactoglobulin are the main allergens in cow's milk. Lactic acid bacteria possess the ability to enzymatically hydrolyze (breakdown) proteins which can have an important effect on digestibility and health through the formation of biologically active peptides. In this study, Chinese researchers evaluated the effects of fermentation by two starter cultures (*Lactobacillus bulgaricus* and *Streptococcus thermophilus*) and one functional probiotic (*Lactobacillus helveticus*) on the estimated allergic potential (antigenicity) of α -lactalbumin and β -lactoglobulin. These whey proteins from skim milk were incubated with the protein-specific antibodies produced in rabbits. The antigenicity of the whey proteins was determined after fermenting them for 12 hours with each strain individually or combined. Results showed:

- "After the fermentation with lactic acid bacteria, the antigenicity of whey proteins significantly decreased, with an inhibition rate of 53-87% for α -lactalbumin and 86-95% for β -lactoglobulin when compared with unfermented milk."

- “In addition, the fermentation with combined strains of *L. Helviticus* and *S. thermophilus* was the most effective way to reduce the antigenicity of α -lactalbumin and β -lactoglobulin compared with *L. Helviticus* alone and *S. thermophilus* alone in this study.”
- After 6 hours of fermentation with *L. Helviticus* and *S. thermophilus* and a half day of cold storage, the antigenicity of α -lactalbumin and β -lactoglobulin had decreased significantly. Antigenicity gradually decreased over time up to 18 hours, after which the changes were minimal.

The authors conclude, “Lactic acid bacteria fermentation could significantly decrease the antigenicity of whey proteins in skim milk.” The combined strains acted synergistically, and were the most effective. Future research will test more strains of lactic acid bacteria with the goal of developing hypoallergenic milk products. [Bu G, et al., *J Sci Food Agric*, published online June 25, 2010]

MATERNAL AND PERINATAL RISK FACTORS FOR COW’S MILK ALLERGY

This nested case-control study examined whether maternal background and perinatal factors were associated with the risk of cow’s milk allergy (CMA) in 16,237 infants up to two years of age who were diagnosed with CMA according to the Medical Birth Register in Finland. A matched healthy control was selected for each case of CMA. Results showed that Cesarean section and high maternal age were associated with increased risk of the child having CMA. Low maternal socioeconomic status, smoking, a high number of previous deliveries, and having multiple pregnancies were associated with a decreased risk of CMA. More research is needed to confirm these associations and identify their mechanism of action. [Metsala J, et al., *Am J Epidemiol*, 171(12): 1310-1316, 2010]

LACTASE PERSISTENCE IS LINKED TO OVERALL HIGHER MILK AND DAIRY INTAKE IN CHILDREN/ADOLESCENTS

When the lactase enzyme that is needed to digest milk sugar (lactose) does not persist (lactase non-persistence or LNP) an individual may be lactose intolerant (experience symptoms after consuming lactose) and may be more likely to restrict milk and milk products intake as compared to individuals who are lactase persistent (LP). Previous studies have reported inconsistent results regarding the effect of dairy foods on children’s weight/fatness. This study examines whether LP and LNP children and adolescents – as defined by the presence of a genetic variant of the lactase gene – differ in milk/milk product intake, and measures of body fat mass. The study population consisted of 298 children (average age 9.6 years) and 386 adolescents (average age 15.6 years), who were enrolled in the Swedish cohort of the European Youth Heart Study. Results showed that 87% of the children and 85.2% of the adolescents were LP, and 13% of children and 14.8% of the adolescents were LNP, based on their genotype. Although six participants were reported to be “lactose intolerant” by their parents, genotyping did not confirm LNP. LNP in children/adolescents was associated with a statistically significantly lower intake of total milk, reduced fat milk, soured milk, and yogurt. “Milk intake was significantly lower in LNP children and in LNP adolescents compared to LP children and adolescents.” Lactase genotype was not associated with percentage of body fat or dairy energy intake. The authors conclude, “LP is linked to an overall higher milk and dairy intake, but is not linked to higher body fat mass in children and adolescents.” [Almon R, et al., *Food & Nutrition Research*, 54: 5141-5146, 2010]

REVIEW OF WHEY PROTEIN SUPPLEMENTATION AND ITS EFFECTS ON SKELETAL MUSCLE MASS

“Regardless of age or gender,” say the authors of this review, “resistance training or provision of adequate amounts of dietary protein or essential amino acids can increase muscle protein synthesis in healthy adults.” A growing body of evidence suggests that whey protein, in particular, may stimulate the greatest rise in muscle protein synthesis, result in greater muscle cross-sectional area when combined with resistance exercise, and enhance exercise recovery (at least in younger individuals). This paper reviews the scientific literature on the effects of whey protein supplementation on skeletal muscle mass when combined with heavy resistance training. The authors conclude, “Most, but not all studies have shown that supplementation of whey alone or with carbohydrates immediately after and possibly before and during resistance exercise can enhance the muscle hypertrophy response to resistance training in healthy adults.” Future research is needed to assess the effects of dose and timing of protein ingestion, compare the effects of different forms of whey, and assess the effects of whey protein in muscle atrophying diseases. [Hulmi JJ, Lockwood CM, and Stout JR, *Nutrition & Metabolism*, 7: 51, 2010]

STUDY FINDS 45 G WHEY PROTEIN SIGNIFICANTLY REDUCES BLOOD TRIGLYCERIDES AFTER A HIGH-FAT MEAL IN POSTMENOPAUSAL WOMEN

This randomized, single blind, three-way crossover design study investigated the acute effects of dietary whey proteins on blood lipids, glucose and insulin, and resting energy expenditure in 20 overweight and obese post-menopausal women. For 4 weeks before the study started, participants were asked not to take any supplements and to limit dairy foods to 1 serving per day. Participants were told to maintain their usual diet and physical activity during the study. On three separate intervention days, separated by one week, participants were assigned to consume in random order 45 g of one of three supplements mixed with 400 ml (approximately 1.5 cups) water: 1) whey protein isolate; 2) sodium caseinate; or 3) glucose control. They consumed the supplement with a breakfast test meal of bread and margarine, and blood samples were taken at regular intervals for 6 hours. Results showed:

- A significant decrease in blood levels of triglyceride by 21% and 27% after consuming the whey meal compared to control and casein meals, respectively.
- There was no significant change in other blood lipids measured (i.e. total cholesterol, LDL-cholesterol, HDL-cholesterol, non-esterified fatty acids, Apo B48, insulin, and leptin) between groups.
- “There was also a significant reduction by 27% and 32% in the area under the curve for TG:ApoB48 ratio [triglyceride to Apo B48 protein ratio] in the whey group compared to the glucose and casein groups, respectively.” The triglyceride to Apo B48 protein ratio is an indicator for smaller chylomicrons and chylomicron remnants in the blood.
- “There was a significantly lower area under the curve for blood glucose after the consumption of the whey and casein meal compared to glucose meal.”

The authors conclude, “This study demonstrates that whey proteins can significantly reduce postprandial [after a meal] TG [triglyceride] concentrations after consumption of a fat-rich meal when compared to casein and the glucose control in overweight, post-menopausal women, a population susceptible to cardiovascular disease.” They say a single dose of 45 g whey protein has the potential to reduce lipid levels after a meal, which in turn may improve cardiovascular risk factors. [Pal S, Ellis V, and Ho S, *Atherosclerosis*, published online May 31, 2010]

In Brief...

Alpha-lactalbumin-enriched and probiotic-supplemented infant formula helps reduce feeding gastrointestinal side effects in colicky infants

This double-blind, placebo-controlled study evaluated the nutritional adequacy, the gastrointestinal tolerance, and effect on colic of an α -lactalbumin-enriched and probiotic-supplemented infant formula in 66 healthy infants (3 weeks to 3 months old) with colic. The infants were randomly assigned to receive either the experimental formula (Modilac Digest 1) or a control formula for one month. The experimental formula was enriched with α -lactalbumin (the dominant whey protein in human milk) and the probiotics *Lactobacillus rhamnosus* and *Bifidobacterium infantis*, and reduced in protein and lactose, and thickened with corn starch. The control formula, which was not enriched in α -lactalbumin, had a higher quantity of proteins and lactose, and was without probiotics and starch. Results showed that duration of crying did not differ between groups, though other feeding-related gastrointestinal side effects (i.e., vomiting, constipation, colitis, regurgitation, flatulence) were significantly lower in the experimental formula group. The authors conclude, "An α -lactalbumin-enriched and probiotic-supplemented formula provide to be adequate for infants with colic in terms of growth and of reduction in gastrointestinal side effects." [Dupont C, et al., *European Journal of Clinical Nutrition*, 64, 765-767, 2010]

Consuming a yogurt-based probiotic drink did not reduce days missed from day care or preschool

This double-blind, randomized, placebo-controlled trial evaluated whether consumption of yogurt containing a high dose of probiotics improves health in 182 healthy children ages 1-3 years attending day care/pre-school centers in the Washington D.C. area at least 3 days/week. The children were randomly chosen to consume 4 ounces per day of a strawberry yogurt-based drink supplemented with *Bifidobacterium animalis ssp lactis* (*B. lactis*) BB-12 containing a minimum of 10^{10} colony-forming units/serving, or a placebo yogurt drink without the probiotic BB-12. Results showed there were no significant differences between groups in the days of missed school – nor were there any differences in any secondary outcomes (i.e., presence of diarrhea or respiratory infection, consistency of stools, missed parental work, doctor visits, bshowed that BB-12 fortified yogurt is safe and well tolerated for children 1-3 years old but did not reduce illnesses and daycare absences." The researchers are now conducting studies that employ the yogurt drink in different settings and with different patient populations. [Merenstein DJ, et al., *European Journal of Clinical Nutrition*, 64: 685-691, 2010]

European working group defines sarcopenia

The European Working Group on Sarcopenia in Older People recently developed a practical clinical definition and diagnostic criteria for age-related sarcopenia. The working group included representatives from four participating organizations that endorsed the findings of the final document. The working group defined sarcopenia as "a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes such as physical disability, poor quality of life and death." The paper identifies how muscle mass, muscle strength, and physical performance can be measured in clinical practice or in a research setting to identify sarcopenia and evaluate treatment effectiveness. The authors say, "the ultimate goal is to identify dietary strategies, lifestyle changes and treatments that can prevent or delay the onset of sarcopenia." [Cruz-Jentoft AJ, et al., *Age and Ageing*, 39: 412-423, 2010]

Review discusses dietary patterns and risk of colorectal cancer and adenomas

Many dietary components have been associated with risk for colorectal cancer. This Special Article reviews 32 epidemiological studies that investigated the association between dietary patterns and the risk of colorectal cancer and adenomas (colon polyps). According to this paper, the dietary patterns associated with reduced risk of colorectal cancer (risk reductions ranged between 10-55%) were named, healthy; prudent; fruit and vegetables; fat-reduced/diet foods; vegetable/fish/poultry; fruit/whole grain/dairy; and healthy eating index-2005; recommended food and Mediterranean diet scores. "In contrast," say the authors, "diets named Western; pork-processed meat-potatoes; meat-eaters; meat and potatoes; traditional patterns; and dietary risk and life summary scores were associated with increased risk of colorectal cancer with risk estimates varying from 1.18 to 11.7." Dietary patterns associated with adenoma risk were similar to those identified for colorectal cancer. [Randi G, et al., *Nutr Revf*, 68(7): 389-408, 2010]

Review discusses mechanisms whereby dairy and non-dairy calcium may help regulate body weight

The authors say, "There has been much interest in the mechanisms by which calcium may attenuate weight gain or accelerate body fat loss." This paper reviews 11 randomized, controlled trials of higher calcium intake on energy metabolism after a meal, concluding that "dietary calcium increases whole body fat oxidation after single and multiple meals." The authors also conclude overall, "It is our opinion that calcium modulates human energy metabolism." They say "There is however convincing evidence that higher calcium intakes promote a modest energy loss through increased fecal fat excretion." They recommend additional randomized controlled trials to determine the threshold of calcium intake needed to see an effect on energy metabolism or in gastrointestinal function. [Soares MJ and She-Ping-Delfos WLC, *Nutrients*, 2: 586-598, 2010]

Other Publications of Interest

- *Fatness leads to inactivity, but inactivity does not lead to fatness: a longitudinal study in children (EarlyBird 45).* [Metcalf BS, et al., *British Medical Journal*, published online June 23, 2010] According to the authors, "It is widely believed from cross-sectional studies that childhood obesity is caused by physical inactivity." This prospective cohort study in 202 children that measured physical activity and body fat annually from 7 to 10 years, found that "Physical inactivity appears to be the result of fatness rather than its cause."
- *Phosphate and carbonate salts of calcium support robust bone building in osteoporosis.* [Heaney RP, et al., *Am J Clin Nutr*, 92: 101-105, 2010] This 12-month randomized clinical trial in 211 patients treated with teriparatide (a drug used to treat osteoporosis) and 1,000 IU of vitamin D, found that 1,800 mg of tricalcium phosphate or calcium carbonate were equally effective in supporting bone building.
- *Conjugated linoleic acid in adipose tissue and risk of myocardial infarction.* [Smit LA, Baylin A, and Campos H, *Am J Clin Nutr*, 92: 34-40, 2010] This study, that evaluated the association between the 9c, 11t isomer of conjugated linoleic acid (CLA) in fat tissue and the risk of MI (myocardial infarction or heart attack) found that "Adipose tissue 9c, 11t-CLA was associated with a lower risk of MI in basic and multivariate models." The authors conclude, "9c, 11t-CLA, which is present in meaningful amounts in milk of pasture-grazed cows, might offset the adverse effect of the saturated fat content of dairy products."

- *Low-density lipoprotein receptor-related protein 5 polymorphisms are associated with bone mineral density in Greek postmenopausal women: An interaction with calcium intake. [Stathopoulou MG, et al., J Am Diet Assoc, 110: 1078-1083, 2010]* This observational cross-sectional study in 578 healthy Greek postmenopausal women assessed the association of four common polymorphisms of the LRP5 gene with bone mineral density and possible gene x calcium intake interactions. One polymorphism of the LRP5 gene demonstrated an association with bone mineral density in these women which was modulated by a higher calcium intake.