Milk protein—likely contributing more than just amino acids to human health

Background  Milk is universally considered a nearly perfect food. In particular, dairy products are excellent protein sources. However, researchers have learned that dairy foods provide more than just essential nutrients (like protein). Indeed, they contain other “biologically active” components that may affect overall health. For instance, some milk components may modulate our intestinal bacteria, whereas others may influence the nervous system. Until recently, however, little was known about whether these dairy components survive chemical breakdown by our digestive juices long enough to affect health. In a recent article published in the June 2013 issue of The American Journal of Clinical Nutrition, a research team led by Joëlle Leonil at the Institut National de la Recherche Agronomique reports their finding that many of these proteins might very well be active in regions of the small intestine. Their article is accompanied by an editorial by Paul Ross and colleagues, who argue that the “black box” of human protein digestion has clearly now been opened.

Study Design  Healthy men and women were randomly assigned to consume specially prepared beverages containing either whey or casein proteins. These broad classes of protein are both derived from milk but differ in how they respond to acidic conditions (such as what they encounter in the stomach). After consuming their assigned protein-rich drink, subjects provided a series of intestinal fluid samples collected via nasogastric tube. The researchers were then able to quantify and identify various breakdown products of the whey and casein proteins and determine which biologically active portions were present.

Results  The presence of biologically active proteins in intestinal fluid was greatly influenced by whether the subject consumed whey or casein. In general, more were present after casein consumption. In addition, many were present in amounts thought to cause effects in humans. For example, the researchers identified significant quantities of “β-casomorphins,” which some scientists believe may cause opiate-like calming effects in some people.

Conclusions  The scientists concluded that their data provide evidence that some biologically active substances released during protein digestion are indeed present in the intestine. Ross and colleagues agree. They also remind us that, like everything else related to human health, this issue is likely far more complex than meets the eye. Indeed, we do not eat nutrients—we eat foods. The components of these complex foods interact with each other in the body, so that the whole is not necessarily simply the sum of its parts. As such, future work in this area will likely need to show how dietary patterns influence the presence and bioactivity of these potentially important components of dairy foods.

References  Boutrou R, Gaudichon C, Dupont D, Jardin J, Airinei G, Marsset-Bagliieri A,
Africa: seasonal maternal diet patterns may drive long-term health of infants

Background  Of the choices we make regarding health, what we eat (or choose not to eat) may be the most important. One area of intense interest in this regard is the growing evidence that maternal nutrition during pregnancy can affect the health of the offspring in adulthood. These effects are thought to be, at least in part, driven by very early “programming” via epigenetics—in other words, alterations of gene expression not mediated by changes in DNA sequence. One of these mechanisms, DNA methylation, relies on the presence of nutrients that mark genes with carbon-containing methyl groups that switch off the gene, preventing its expression. Among these nutrients are folate (common in fruit and vegetables), vitamin B-12 (in animal products), and betaine (from whole grains, beets, spinach, and a variety of other plants). Recent work in Sub-Saharan Africa suggests that children conceived during seasonal food shortages (rainy season) have several genes that are more methylated (less likely to be expressed) than those conceived when food is more available (dry season). To determine whether this may be due to differences in maternal nutrient intake, a research study led by Paula Dominguez-Salas (London School of Hygiene & Tropical Medicine, United Kingdom and MRC Keneba, The Gambia) tracked dietary intake among women living in rural Gambia (West Africa). Their results, along with an editorial penned by Christopher Kuzawa (Northwestern University), are published in the June 2013 issue of The American Journal of Clinical Nutrition.

Study Design  The dietary intake of nonpregnant, nonlactating women living in rural Gambia was carefully monitored by weighing everything they consumed over a 2-day period once every month for 1 year. Samples of commonly consumed foods were chemically analyzed for their nutrient contents. Blood samples were obtained and tested for concentrations of nutrients involved in methylation, as well as their byproducts.

Results  As expected, season profoundly influenced dietary intake. Seasonal variation was also observed for women’s nutritional status as measured by blood biomarkers. However, the researchers were surprised to learn that blood concentrations of some nutrients such as betaine were actually higher during the “wet season” when food was scarce. Correlations between dietary intake and blood biomarker concentrations were seen for some, but not all, nutrients and their metabolites.

Conclusions  The authors concluded that their data support the possibility that seasonal effects on offspring DNA methylation patterns may be driven by fluxes in maternal nutrient intake. Kuzawa concurs but cautions against directly extending these intriguing findings to other more well-nourished populations. Indeed, these complex nutrient-gene relations may be modified by a host of poorly understood sociocultural and environmental factors.
Urine magnesium may prove to be powerful predictor of heart disease risk

Background Magnesium, an essential mineral found in a multitude of foods such as halibut, spinach, pumpkin seeds, and legumes, is abundant in our bones. Magnesium also stabilizes enzymes and plays a role in energy metabolism. Although clinical deficiency is typically only seen in alcoholics and others with impaired magnesium absorption (e.g., Crohn disease), there exists some evidence that higher intakes may lower risk of heart disease. However, not all studies support a relation between magnesium status and heart health. One reason for the discrepant results may be that blood concentrations of magnesium are typically used to assess status. However, magnesium concentration in the bloodstream is highly regulated by the body and may not be an appropriate indicator of magnesium consumption. In an article published in the June 2013 issue of The American Journal of Clinical Nutrition, a research team headed up by Michel Joosten (University Medical Center Groningen, Netherlands) reports that urinary magnesium excretion, as an indicator of dietary uptake, may be more suitable in this regard. Their article is accompanied by an editorial by Susanna Larsson (Karolinska Institutet, Sweden).

Study Design Data and samples for this study were obtained as part of a larger investigation conducted from 1997 to 2009 documenting various factors (particularly kidney function) related to cardiovascular disease. A total of 7664 men and women (mean age: 50 years) with no history of cardiovascular disease were followed. At the beginning of the study, 24-hour urine collections and blood samples were analyzed for a battery of dietary minerals and other substances known to be associated with cardiovascular health. Occurrences of heart-related outcomes during the follow-up period were then statistically related to urinary and blood magnesium concentrations.

Results After statistically adjusting for a comprehensive list of potentially confounding factors (e.g., age, smoking, body weight), the researchers found that individuals with the lowest concentrations of magnesium in their urine experienced the highest rates of heart-related problems. Importantly, those with the lowest concentrations had a 60% higher risk of ischemic heart disease than did subjects with higher urinary magnesium excretion. These relations were not found when plasma magnesium was considered.
Conclusions The scientists concluded that increased dietary magnesium might reduce the risk of heart disease, although further intervention studies will be required to test this hypothesis. In her related editorial, Larsson whole-heartedly agrees, although she reminds us that other factors (such as poor magnesium absorption) might be involved. Larsson, too, urges targeted human research to tease out both the biology and potential interventions implied by this study.

References

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Kindergartner overweight linked to myriad maternal, caregiving, and environmental factors

Background Perhaps our most pressing health concern is the continued rise in childhood obesity rates. In the United States, 27% of children 2–5 years old are overweight or obese, and high rates occur in the United Kingdom and Australia. Impoverished children are at particularly high risk. Although we know that being overweight results from excessive calorie intake, inadequate physical activity or both, little is known about parental, prenatal, pregnancy, and early childhood factors that predispose our youngest children to excessive weight gain. To get a better understanding of this, Glenn Flores and Hua Lin at the University of Texas Southwestern Medical Center and Children’s Medical Center in Dallas analyzed data from a large cohort of infants from preconception through the start of kindergarten. You can read more about their research in the June 2013 issue of The American Journal of Clinical Nutrition.

Study Design This study included 6800 US children born in 2001 and followed until they entered kindergarten. Information related to 131 factors was monitored, including maternal prepregnancy weight, pregnancy complications, newborn characteristics, child development, weight and height, health care, nutrition, and physical activity. The primary outcome was being overweight/obese at kindergarten enrollment. A child was classified as overweight on the basis of the standard definition of a body mass index (calculated as weight divided by height squared) that placed him or her in the upper 15% of children nationally.

Results A startling 32% of kindergarteners were found to be overweight or obese, and many factors, such as having an overweight or hypertensive mother, being overweight at an early age, being Latino or African American, drinking coffee or tea between meals or before bedtime, sugary beverage consumption, and being put to sleep with a bottle, placed children at increased
risk. In contrast, sleeping more, drinking whole milk, and maternal support of the idea of feeding infants when they are hungry instead of on schedule were related to lower risk of being overweight. Especially high rates of being overweight were noted in kids with a combination of characteristics that included being overweight at 2 years, being non-white, maternal gestational diabetes, high birth weight, early introduction of solid foods, and having been able to pull up to standing at an early age.

**Conclusions** The scientists concluded that their results may provide insight into windows of opportunity for childhood obesity prevention. For instance, delaying introduction of solid foods for infants and helping children maintain healthy body weights during the first 2 years might prove particularly useful. Of course, correlation does not necessarily imply causality, and these observational data should be considered carefully before implementing intervention strategies.

**Reference**

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