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NATIONAL DAIRY COUNCIL

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Formulating Reduced Calorie / Reduced Sugar Flavored Milks

Rising obesity rates among children and adolescents have prompted public health and government regulators as well as school administrators to take a critical look at all foods provided in schools. While the initial targets were sodas and other foods of minimal nutritional value sold in school vending machines; all foods and beverages sold in schools – including flavored milks – are being reviewed for reductions in fat, sugar, sodium and calorie levels.

School Wellness Policies Create New Challenges and Opportunities

The call for change in the school environment, as it relates to the health and wellness of children, is presenting new challenges and opportunities for the milk industry.

The beginning of the 2006-07 school year marked the legal requirement of each local school district offering federal meal programs (e.g. school lunch) to establish a local wellness policy. Today, these policies differ across the country, with many incorporating guidelines specific to flavored milk sold in schools, including milk offered through reimbursable school meal programs, a la carte lines, vending machines, student stores and fundraising activities.

Formulating Flavored Milk for Schools

Just as there are wide variations in school wellness policies today, there are variations in the flavored milks that are made available to schools. While research shows that children prefer flavored milk to white milk, it is not clear at what minimum level of added sugar is needed to make flavored milks maintain their appeal.

To maintain its dominant place in schools, the milk industry is being encouraged to reformulate flavored milks with lower levels of sugar and calories that meet the changing guidelines of schools and parents, but still deliver the great taste that kids expect. To help the industry understand kids' preference in flavored milk, Dairy Management Inc. conducted a series of sensory tests[1] using brands of flavored milk available in schools and the marketplace. They developed and tested formulas for flavored milks with lower levels of calories and sugars. This research showed that moderate levels of added sugar and calories may be key to providing healthier milks that score high on kid appeal.

SWEETENER ALTERNATIVES

The dairy industry can choose from a wide variety of caloric and non-nutritive sweeteners although caloric sweeteners may be considered more acceptable in schools. DMI research indicated that there was not a direct relationship between the amount of sugar and overall liking of the product, particularly when sugar levels were above 25 grams per serving. Their research also showed that students generally preferred milks sweetened with high fructose corn syrup. Products with sucrose and fructose were also well-liked. The least-liked milks contained non-nutritive sweeteners. The choice of sweetener may be dictated, not only by nutritional and functional properties, but also by consumer confidence issues and guidelines published by third-party organizations. And, ultimately, cost and plant equipment may determine the use of fluid vs. granular sweetener.

Nutritive Sweeteners – Sucrose generally has the highest consumer confidence level, and provides clean taste, slight viscosity and surface sheen. Modern dairy plants are often configured to use liquid sweetener systems including **Liquid Sugar**, a 67/33 sugar/water solution, and **High Fructose Corn Syrup** (HFCS). HFCS provides cost efficiency and a pleasant sweetness profile. First introduced in the late 60s, HFCS usage rates increased at the same time as U.S. obesity rates, and although no causal relationship has been established, HFCS has come under attack from vocal consumer advocates. **Fructose** is a granular sweetener, which offers an alternative to HFCS with maximum sweetness per calorie.

*FORMULATION TIP[2] – For **reduced sugar** flavored milks, use a combination of sucrose and fructose in a ratio of 3:2 (or greater) to produce a product that is sweeter than sucrose alone, but not as overly sweet as a product made with only fructose or high fructose corn syrup.*

Non-Nutritive Sweeteners – While a large variety of alternative sweeteners exist in the marketplace, they do not have acceptance for use in milk beverages. Popular approved sweeteners include **Sucralose**, **Acesulfame-K**, and **Neotame**. The Food and Drug Administration (FDA) recently reaffirmed the safety of non-nutritive sweeteners, which provide a useful tool for lowering sugar and calorie levels. However, the IOM report discourages the use of non-nutritive sweeteners for children. Plus study results show that aftertaste issues may also limit acceptance.

OTHER FORMULA INGREDIENTS

Cocoa Powders – Natural cocoa has a pH around 5.5, is light brown and slightly astringent and bitter with fruity notes. Alkalizing the cocoa increases the pH, intensifies the chocolate flavor and reduced bitterness. Lowering cocoa levels may reduce the need for added sugar to balance the natural bitter notes of cocoa, and a blend of cocoa powders may provide the ideal cocoa intensity for reduced-sugar chocolate milks.

*FORMULATION TIP – For **chocolate** flavored milks, use a lightly roasted, higher quality dutched cocoa powder to decrease bitterness, thus increasing the perception of sweetness and possibly creaminess (due to decreased astringency and bitterness).*

Flavors – The type of flavoring used in the recipe may play an important role in driving liking, especially in strawberry milks. In chocolate milks, reducing the level of cocoa slightly and using a combination of flavors, including cocoa and chocolate may allow the dairy process to use less cocoa and ultimately less sugar. Flavorings such as vanilla and cream may give the consumer the impression of a sweeter, richer product.

*FORMULATION TIP– For **chocolate** flavored milks, use a small amount of caramel flavor to give the consumer the impression of a sweeter, "candy-like" product.*

Stabilizers and Miscellaneous Ingredients – A variety of stabilizers can be used in flavored milks. Most commercial chocolate milks are stabilized with carageenan or a combination of carageenan and corn starch. Chocolate milks with these stabilizers scored well on acceptance by school-age children. Strawberry milks with carageenan or no stabilizer were also well accepted. In no sugar-added flavored milks, fortifying with 0.75-2.00% nonfat dry milk helped to both increase sweetness and mask the artificial aftertaste of the non-nutritive sweeteners. Reducing the amount of added salt can minimize the masking effect that excessive salt has on sugar sweetness.

FORMULATION TIP – Increase the amount of thickening agent(s) used to prolong the duration that the tongue's sweet taste receptors are stimulated by the sugar molecules.

PUTTING IT ALL TOGETHER

Processing and Packaging – Milks that used standard (HTST) processing methods were generally preferred by school-age children. However, newer dairy technologies include ultra-pasteurization, which produces milk with up to 60 days of refrigerated shelf life; and aseptic processing, which produces dairy beverages that can be shipped and stored at room temperature, and which may have a shelf-life of up to 180 days. These milks expand the opportunities for use in school vending and fund-raising programs. UHT milks are currently being used in special situations such as field trips. In addition, a 2005 DMI study[3] revealed that 83 percent of school children said the school milk in the plastic bottle was "better overall" compared to the identical school milk packaged in a paper carton.

Labeling Issues – School wellness policies sometimes define their standards in terms of the amount of added sugars. In contrast, food labels address total sugar content. As defined by the FDA, the terms "Reduced Sugar" and "Reduced Calorie" mean a 25% reduction in total sugars or calories, as compared to an appropriate reference food. The term "No Sugar Added" can be used on flavored milk that does not contain added caloric sweeteners.

The standard of identity for milk specifies that flavored milks contain nutritive sweeteners. If the addition of non-nutritive sweeteners would allow for the use of a nutrient content claim (e.g. reduced sugar, no sugar added), the regulations provide flexibility in ingredients, including the addition of non-nutritive sweeteners. However, milks sweetened with non-nutritive sweeteners are sometimes discouraged in milk when served as part of the reimbursable meal.

A Nutritious Choice – Unlike many soft drinks and fruit juices, flavored milk provides at least 8 grams of protein per serving and essential nutrients such as calcium, Vitamin A, Vitamin D, Vitamin B_{12}, potassium, phosphorous, riboflavin, and niacin. The Dietary Guidelines for Americans recognized this unique nutrient profile and noted that small amounts of sugar added to nutrient-dense foods, such as reduced fat milk products, may increase intake of such products by enhancing their palatability, thus improving nutrient intake without contributing excessive calories.[4] In fact, children who consume flavored milk have higher calcium intakes, but similar total fat and added sugar intakes as children who do not drink flavored milk.[5]

RESOURCES FOR DAIRY PROCESSORS

Dairy Management Inc. provides numerous resources to assist dairy processors, including:

- Centers for Dairy Research – cutting edge research on milk and dairy beverages, plus dairy pilot plants
- Dairy Application Labs – assistance with formulation, sensory evaluation, testing and production scale-up
- Nutrition and Labeling Assistance – the latest nutrition research, plus a quick-reference guide to nutrition claims on dairy products

To access formulas for flavored milk and other DMI resources, visit our website www.innovatewithdairy.com.

An Evolving School Nutrition Environment

In April 2007, the Institute of Medicine (IOM), an advisor to the federal government on scientific and technical matters, released a report, *Nutrition Standards for Foods in Schools*, that included a specific recommendation for schools nationwide to increase the availability of low-fat and fat-free white and flavored milk and yogurt with *moderate* amounts of added sugars. It is notable that the report made exceptions for flavored milk and yogurt that are consistent with the Dietary Guidelines, yet sugar was capped at 22 grams per 8 oz. milk and 30 grams per 8 oz. yogurt. The report also recommends that beverages containing non-nutritive sweeteners only be allowed in high schools **after** the end of the school day. On the heels of this report, Senator Tom Harkin, announced plans to use the IOM recommendations as the basis for his legislation on the *Child Nutrition Promotion and School Lunch Protection Act*. While not the case today, there is the possibility that the Dietary Guidelines, as suggested in the IOM report, will be adopted as nutrition standards in schools across the country.

Endnotes

[1] For more details on DMI's sensory research on flavored milks, contact techsupport@innovatewithdairy.com.

[2] FORMULATION TIPS provided by Jessica Morton, Dairy Ingredients Applications Specialist, Dairy Products Technology Center, California Polytechnic State University, San Luis Obispo, CA.

[3] June 2005 survey of more than 300 school-aged children conducted by Peryam & Kroll Research Corp. on behalf of the National Dairy Council.

[4] Dietary Guidelines for Americans, 2005 [6th Edition]. www.healthierus.gov/dietaryguidelines.

[5] Johnson, et al. The nutritional consequences of flavored milk consumption by school-aged children and adolescents in the United States. Journal of the American Dietetic Association, 2002; 102(6): 853-856.