Nutritional bars, sports bars, breakfast bars, snack food bars, meal replacement bars—blueberries are identified positively in all categories. Bars are enjoying a resurgence of popularity for many reasons, including their grab-and-go ease, single-serve practicality, and portion-controlled, diet-friendly design. The incorporation of nutritious blueberries in these formulations is yielding innovative, groundbreaking opportunities for healthy, convenient, and flavorful cereal food products.

Thomas E. Edison, whose invention of the electric light bulb forever improved living conditions around the world, was a prolific American inventor. He operated the first industrial research laboratory in Edison, NJ, U.S.A., where he applied the principles of mass production and teamwork to the process of invention. Edison once stated that, “Because ideas have to be original only with regard to their adaptation to the problem at hand, I am always extremely interested in novel ideas others have used successfully” (3). The same approach can be applied to a range of opportunities in the cereal bar category.

America’s growing appetite for a healthy and nutritious diet has aided in boosting demand for blueberries, according to a report from the USDA’s Economic Research Service (16). Phytochemicals found in fruits, such as blueberries, continue to be investigated for their health benefits in the prevention of a range of diseases, such as cancer and heart disease, and urinary tract infections. Another benefit is its ability to slow the aging process, including memory loss. Blueberries are low in calories and a good source of vitamin C and manganese. A native of North America, blueberries are hearty, bountiful producers. In fact, highbush blueberries represent 57% of total North American production. This true-blue fruit comes from known sources for good traceability.

Blueberries are a convenient choice for no-fuss ease of formulation, year-round availability, and versatility in a multitude of formats. Health and convenience factors have even “boosted consumer demand for processed and frozen blueberries” (16). Perhaps Edison’s prediction is on the threshold of coming to fruition.

Blueberries in Novel Bar Formulations

In consumer research on blueberries, two prevalent themes emerge (4). Consumers say that blueberries taste good and they provide health benefits (e.g., antioxidants, fiber, nutrition). Parents also commented that blueberries and products containing blueberries were favorites with their children. Below are several good reasons for using real blueberries.

Wide Appeal

For food product designers, blueberries are an excellent choice. With their fruity burst-in-the-mouth flavor, blueberries give products their lush taste, instant attractiveness, and clean labels. Without a doubt, blueberries are appealing. Consumers recognize and value all-natural blueberries and blueberry products without the need for elaborate explanations. Consumers love blueberries; U.S. per capita blue-

Most consumers agreed they would be willing to pay extra for products that contained real blueberries.

Blueberries’ identity as a healthy food provides food product innovators myriad opportunities to showcase blueberries in a range of concepts enhanced by the fruit’s reputation, authenticity, and honest benefits.

Formulating bars with blueberries, which consumers view as a nourishing ingredient with many health benefits, is yielding innovative, groundbreaking opportunities for bars as well as new and untapped markets for product development.
berry consumption has increased more than 150% in the last 10 years. USDA figures show 2008 per capita consumption at 0.80 lb per person (25).

Consumers Willing to Pay More
Consumers view blueberries as value added, wholesome, and natural ingredients. Consumer blueberry research conducted in four areas of the United States found a willingness to pay more for products containing real blueberries (4). In key-person interviews, a majority of consumers are willing to pay 50 cents more (and up) for products with real blueberries. Focus group respondents would pay 15–25% more for products containing real blueberries.

Authenticity
Fillings with substantial amounts of blueberry offer special eye appeal. Blueberries’ blue color adds interest and excitement—blue food continues to be a popular choice among children and young people because of its uniqueness.

Interestingly, in focus groups almost no one was bothered by blueberries “bleeding” in baked products, such as waffles or muffins (4). Most expected to see the natural blueberry color and saw this as a positive indication that real blueberries were used in the product. Participants agreed that real blueberries add value to almost any product.

The real blueberry color is an indicator that products contain real blueberries and no imitation bits. Consumers are increasingly aware that ingredients, such as flavored and colored gum, fat, and grain bits, and even other fruits formed to try to replicate blueberries, are not real blueberries. They do not provide the benefits, lush taste, goodness, and nutrition of real blueberries.

When products with blueberry identity on the label contained no blueberries, consumers became upset when they read the labels to discover the lack of blueberries in the product (4). Real blueberries add real flavor bursts with no off-flavors, chemical undertones, or artificial aftertaste.

Year-Round Availability, Versatility
Good supplies of cultivated blueberries assure availability and exceptional value year round. Positive sales in recent months and ongoing availability make this a win-win situation for consumers and food manufacturers. Suppliers have a range of formats to meet specific needs for year-round availability. Whole berries provide excellent piece identity; crushed blueberries can be swirled throughout a product and blueberry concentrate can provide even more color. Dehydrated blueberry products and concentrates are suitable for bars where low moisture activity is required. A variety of blueberry formats may be used in bar formulations that require ingredients with low water activity. Blueberry suppliers continue to provide formats to fit product development needs.

Sweetness Naturally
These convenient formats also provide sweetness and enrich products naturally. The inclusion of blueberries means the ability to tout the product’s nutritional benefits. Blueberries in the ingredient statement say “wholesome” and “natural,” which consumers view as healthy and good for them. The natural sweetness of blueberries can mean reductions in high-fructose corn syrup and other sweeteners.

Healthful Goodness
The current interest in antioxidants has also put blueberries in the spotlight. Advice like Michael Pollan’s (17) prescriptive—“Eat food. Not too much. Mostly plants”—has been good for blueberries, which consumers equate with antioxidant power and consequently readily accept as an ingredient in almost any product. Food designers and formulators can put blueberries on the label and take advantage of the inherent image of blueberries as a healthy, delicious fruit full of natural goodness. There are already blueberries in a realm of products that make the claim for antioxidants.

Antioxidants are thought to help protect the body against the damaging effects of free radicals and the chronic diseases associated with the aging process. Blueberries contain many of these naturally occurring antioxidants. An assay, called oxygen radical absorbance capacity (ORAC), quantifies the antioxidant capacity of foods (19,26,28,30).

Consumers are increasingly aware of health benefits resulting from eating a diet rich in fruits and vegetables along with whole grains. The 2005 Dietary Guidelines for Americans (27), which provides science-based advice to promote health and to reduce risk for major chronic diseases through diet and physical activity, advised consumers to increase the recommended number of servings of fruits and vegetables daily to 9 servings (2 cups of fruit and 2 and one-half cups of vegeta-

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Table 1. Blueberries in Bars

<table>
<thead>
<tr>
<th>Typical formats for blueberry bars</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frozen blueberries</td>
<td>Formats include individually quick frozen, case frozen, and straight pack. Frozen blueberries are in abundant supply. A stable source of blueberries is expected now and into the future. Take advantage of individual piece identity or use straight pack in toppings and fillings. Storage: 0 to 10°F (18 to –23°C).</td>
</tr>
<tr>
<td>Dried blueberries</td>
<td>Fresh or frozen blueberries are air dehydrated to around 11–18% moisture. Imparts an intense fruit flavor and works well in dry mixes and other applications. Range from 100% blueberries to fruit juice- and sugar-infused formats. Available whole or chopped. May be further processed to dried fruit specs. Moisture: 11–18%; water activity: 0.5–0.6. Shelf stable in a cool, dry place.</td>
</tr>
<tr>
<td>Freeze-dried blueberries</td>
<td>Freeze-dried blueberries have a moisture level of around 2–3%. Freeze-dried blueberries maintain fruit size. Popular in cereal bars. Moisture: unsweetened, 0–2%; sweetened, 9–14%.</td>
</tr>
<tr>
<td>Microwave-dried blueberries</td>
<td>This process evaporates moisture at low temperatures, preserving natural color, flavor, nutrients, and plumpness.</td>
</tr>
<tr>
<td>Osmotic preserved</td>
<td>Fresh or frozen blueberries are placed in a vacuum chamber where they undergo a slow, natural infusion process with a syrup solution and stabilizers. The berries are carefully dried to preserve color and flavor. Moisture: 40% maximum; water activity: 0.5–0.87. Shelf stable up to 10 months from shipping; no refrigeration required.</td>
</tr>
<tr>
<td>Drum-dried and flash-dried powders</td>
<td>Dehydrated blueberry skins and seeds with natural blueberry sugars removed prior to dehydration. Moisture: 4.0% maximum; 24-month shelf life at 60°F (15°C) or below.</td>
</tr>
<tr>
<td>Blueberry fiber</td>
<td>For concentrated blueberry flavor and natural color. Brix: 45.0, 65.0; pH: 2.1–2.7. Storage: 0 to –10°F (18 to –23°C).</td>
</tr>
<tr>
<td>Blueberry juice concentrate</td>
<td>Intense blueberry flavor unmatched by artificial flavoring. Used to boost blueberry flavor in tandem with berries.</td>
</tr>
</tbody>
</table>

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phytochemicals present in blueberries gate the protective properties of berries. Researchers continue to investigate soy, onions, broccoli, tomatoes, and blueberries. John Farquhar, describing blueberries as one of his favorite anti-aging foods, stating that “Blueberries lead the charge” (9). His ultimate anti-aging checklist, which includes blueberries, was featured on The Oprah Winfrey Show (15). Research scientist James Joseph, in The Color Code, describes blueberries as the “brain berry,” stating that “This blue jewel is the Lady Di, the Princess Grace, the Sophia Loren of fruits” (19). John Farquhar, founder of Stanford University’s Prevention Research Center, refers to blueberries as “one of nature’s best cancer-preventing foods” (20). Farquhar, a cardiologist, coteaches a popular course called “The Best Diet Ever,” in which he preaches the merits of five foods with strong antioxidant agents: soy, onions, broccoli, tomatoes, and blueberries. Researchers continue to investigate the protective properties of phytochemicals present in blueberries (5,11,12,21,23). As scientists delve further into the beneficial attributes of fruits and vegetables they continue to validate the importance of a healthy, balanced diet. Studies of older laboratory animals consuming blueberry-supplemented diets, for example, have shown measurable improvements in memory, coordination, and balance. Research is also uncovering neuron regeneration in older animals fed blueberries (1,8,10,29). As new research is introduced, blueberries’ popularity continues. The good news is that blueberries are in high supply, and market demand for real blueberry products continues to develop. Best of all, blueberries are easy to use, tasty, and consumer friendly.

Show Your Blueberries

In consumer blueberry research, there was strong consensus that products with real blueberries should identify this fact on their packaging to better inform consumers and, especially on the front of the package, clearly disclose the real blueberry content (4). They said that the use of a seal or logo certifying that the product contained only real blueberries would help to identify real products. Most consumers agreed they would be willing to pay extra for products that contained real blueberries. The U.S. Highbush Blueberry Council’s Real Blueberry Seal is available to manufacturers to help consumers identify products that contain real blueberries. Information on the seal is found at www.blueberry.org.

Blueberries and New Product Development Potential

With the good news about antioxidants and health benefits in the media, positive consumer attitudes, good availability, and a range of formats on hand to meet product development needs, blueberries clearly provide many benefits. Following are a few bar concepts for thought.

Gluten-free bars. Blueberries are synergistic with oats, amaranth, buckwheat, chia, millet, quinoa, sorghum, teff, kamut, farro, spelt, etc. With heightened interest in gluten-free products, blueberries are a popular ingredient; their presence lends itself to gluten-free formulations from gluten-free streusel bars to crumb bars to chewy bars—they are a homey and old-fashioned attraction. Blueberries can also serve as the basis for vegan bars and other special diet bars and are also compatible with nuts and seeds.

Boomer bars (over 60 demographic). Create lower-fat, low-sodium, and fruit-, fiber-, and antioxidant-rich bars with the subtle message of youthfulness—memory, balance, anti-aging benefits. Low in calories and with virtually no fat, blueberries provide familiarity and user-friendly comfort that fit the profile of health-promoting foods and snacks associated with antioxidants.

Millennial bars (younger, tech savvy, on-line shopper demographic). Blueberries communicate safety, responsible sourcing, reliability, trustworthiness, and well-being. The color blue symbolizes peace and tranquility. For the Millennials market segment, blueberries provide a built-in image of a familiar, happy taste, evoking memories of pleasant times and pure, simple satisfaction.

Prebiotic and probiotic bars. Blueberries have had soaring popularity in a range of products, and these days with gut health and digestion in the news, blueberries continue to be used in trendy prebiotic and probiotic formulations.

Savory, hot, crisp, and soft. As product developers explore new concepts and opportunities, such as seared, air-dried, crisp, soft, sweet, and savory bars, blueberries allow food product developers to take advantage of the fruit’s versatility and synergy with a wide range of ingredients, herbs, flavors, and ethnic spices. Potential abounds for creating bar concepts based on salsas, curries, chutneys, and barbecue flavorings, inspired by regional American tastes from Creole, Cajun, and Southwestern to California styles. Blueberries are grown commercially in more than 30 states. The fruit is sold around the world, and because it’s readily identified and enjoyed, its inclusion in regional and international flavor favorites is widely accepted.

Beauty bars. To Edna St. Vincent Millay, beauty was uncomplicated: “And all the loveliest things there be / come simply, so, it seems to me” (22). These days, beauty is big business and beauty products get more imaginative by the day. The market for ingestible beauty, food for the skin, is one of the newest areas and a natural one for blueberries and blueberry bars. Innovative concepts include “fresh” cosmetics and beauty-health bars; bars available in refrigerated or freezer sections formulated using blueberry purees, fresh, and individually quick frozen (IQF) blueberries. Beauty from within is a new product category of ingestibles, sometimes referred to as cosmeceuticals and nutricosmetics. These beauty-driven concepts are often associated with antioxidants. The use of fruit and fruit extracts, such as blueberries, provides food for thought, such as placing bars that boast antioxidants and other “beauty-enhancing” ingredients, in the forefront of the trend for “eating beauty.” There are already blueberries as an ingredient in a realm of products that make the claim for antioxidants. New
niche opportunities exist for pairing shelf-stable beauty bar concepts with cosmetic brands in department stores where food is not traditionally sold.

Bars for my pet and me. Marion Nestle, Paulette Goddard professor of nutrition, food studies, and public health at New York University and author of Pet Food Politics: The Chihuahua in the Coal Mine and Feed Your Pet Right: the Authoritative Guide to Feeding Your Dog, notes that the trend in pet foods is “toward not only making foods that pets will eat but foods that their owners will munch on happily…Every single issue in human nutrition is reflected in pet food, every single one” (13,14,24). Blueberries appeal to pet food manufacturers of human-grade products (as opposed to feed-grade). Treating pets like family is an important aspect of the multibillion dollar global pet food market. Today’s pet owners want the same level of healthy, nutritious foods as they feed themselves. The trend toward the humanization of the pet industry is a good fit for blueberry pet bar formulations in which the blueberry identity reinforces goodness and safety.

Blueberries are an exciting, consumer-appealing addition to an innovative product line. With blueberries in the mix, the pet food product gets attention—it makes a splash on the market, enhances the healthy profile of the product, and pleases pets and their owners.

A Blueberry Format to Match Formulation Needs

Blueberries are available in formats suitable to many different styles and types of bars. Blueberries’ wide appeal, consumer value and acceptance, year-round availability, versatility, great taste, and identity as a healthy food provide food product innovators myriad opportunities to showcase blueberries in a range of concepts enhanced by the fruit’s reputation, authenticity, and honest benefits.

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