Cheers to your health: Feeling good about beverage formulation

by Kimberly J. Decker

There was a time when the notion of a "healthy" beverage might've brought to mind something like milk, orange juice or maybe tap water?

And each still makes a strong case for being a prudent hydration option. But, noted Brian Zapp, creative director, Applied Food Sciences, "Our idea of what constitutes a 'healthy beverage' has certainly evolved over the last decade or so."

"Not long ago," he continued, "a simple 'better-for-you' drink like Coke Zero or lower-sodium V8 would've counted as a healthy beverage. But as brands continue to push the narrative of what's possible in beverages, we've watched the idea of 'healthy' come to include more functional elements as well."

And consumers are drinking it up. The Hartman Group, in its "Modern Beverage Culture 2018" report, noted 44% of consumers prefer beverages that "do something for me (like provide energy, nutrients, or other benefits)," while 62% claimed beverages play "a very important role" in their health and wellness.

That signals opportunity for beverage brands primed to deliver targeted nutrition to a thirsty audience. As Zapp said, "From 'free-from' to 'better-for-you,' both the market and consumer preferences are really pivoting toward beverages with on-trend health benefits."

Cheers to health

The pace of healthy beverage innovation is so fast that even avid category watchers must work to keep up.

"So many unique formulations have hit the beverage market over the past few years that it's hard to remember them all," said Elyse Lovett, senior marketing manager-nutrition, pharmaceutical and CCM, Kyowa Hakko USA. "I think it started with functional sports beverages and drinkable yogurts, then got more creative and targeted with enhanced waters, kombucha and fermented drinks, cold-brew coffees, infused teas—all the way to functional creamers."

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And it's no mystery why. As John Quilter, vice president and general manager, Kerry, pointed out, "Healthy beverages resonate with two major trends: proactivity and convenience. Consumers increasingly take a positive, preventive approach to health, and they want convenient, on-the-go products. Drinks with functional benefits are a perfect fit."

Healthy evolution

As for which functional benefits fit perfectly for consumers, the answer depends on whom you ask.

"The rise of technology has enabled widespread access to information about health, ingredients and the link between diet and wellness," said Micah Greenhill, beverage marketing manager, ADM. The upshot: "Consumers are shaping their own opinions about what's healthy."

"For one person," he said, "that may look like a protein-rich formulation made with organic ingredients. Another may consider a plant-based beverage with added fiber the ideal." Either way, "Today's consumers demand more than reduced sugar and calories; they seek better-for-you products enhanced with wholesome ingredients that support a holistic approach to health and wellness. And growing demand for sustainably sourced and packaged products sets the bar even higher."

He can say that again. It's as if healthy beverages have to tend to mind, body and soul—a heavy lift for any CPG. But, said Lovett, "While current options for functional beverages are endless, the key is understanding what consumers are looking for in terms of health benefits, ingredients and overall appeal."

Planting roots

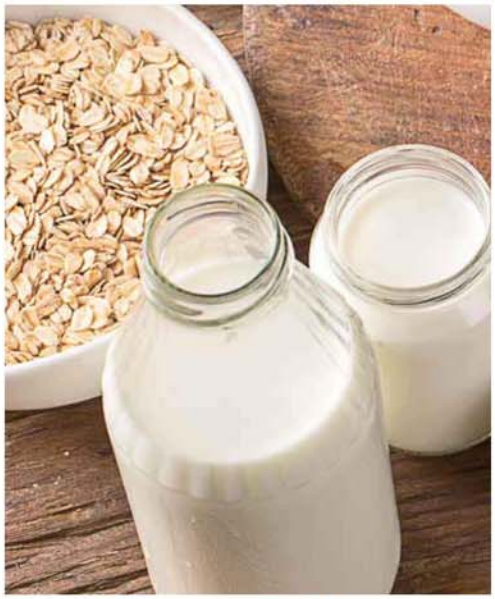
Many are looking for products with a plant-based pedigree. Plant-based milks, in particular, are in bonanza mode, with domestic sales growing 61% from 2012 to 2017, according to Mintel, even as U.S. sales of dairy milk fell by about US$1.1 billion from 2017 to 2018, per the Dairy Farmers of America.

"Innovation in the plant-based beverage space has taken off as consumers look to alter their diets for health and environmental reasons," said Niki Kennedy, senior strategic insights and analytics manager, Glanbia Nutritionals. Alongside classics like soy milk and almond milk, "Pea milk, oat milk, flax milk, hemp milk and others will continue to emerge as technology improves taste and texture," she said.

Protein passion

Plant-based beverages' sustainable reputation no doubt drives appeal. But so, too, does the convergence of their healthy halo with the continuing passion for all things protein.

Nearly three-quarters of consumers consider plant-sourced protein healthy, per the International Food Information Council (IFIC) Foundation's "2019 Food & Health Survey". "And brands recognize this," said Melissa Machen, senior technical service representative, Cargill. "So, we continue to see substantial interest in formulating beverages with plant-sourced protein."



Such proteins haven't always fared well in beverages, with taste, texture, solubility and stability limiting finished products' success among mainstream consumers. "Many proteins carry an earthy aftertaste, or sometimes a gritty mouthfeel," Kennedy noted. "And effective formulation with protein in any beverage involves a lot of factors—storage, processing, packaging and ingredient interactions are just the beginning."

But industry has moved mountains to develop technologies—on the farm and in processing—that make today's plant proteins more plug-and-play than their predecessors.

"Pea protein is particularly suited to beverage applications, with a better flavor profile and greater solubility than most other plant proteins," Machen said. Her company offers two beverage-friendly pea-protein ingredients under the PURIS label, including a mildly hydrolyzed option with improved solubility. The proteins are processed without hexane solvents, and Machen said their clean flavor and smooth texture appeals to formulators as well as fans.

Nevertheless, even the latest plant proteins function best at what Machen called "low to midrange levels"—think 8 g to 12 g per serving. "It's harder to use plant proteins alone and still achieve ultra-high levels of 20 g to 30 g," she noted, as those texture, viscosity, stability and flavor issues reemerge at that high a protein level.

Even so, Jacquelyn Schuh, product marketing director for alternative proteins at ADM, offered formulation workarounds for managing plant proteins' flavor flaws.

"Choosing the right flavor profile for the application is key," she said, as robust beverages pose less challenge than those with a lighter profile. "Chocolate, berry and tropical flavors have been successful for some applications, and vanilla and sweet-brown flavors—caramel, custard, butterscotch—have worked well in low- to medium-protein systems," she noted.

Her team has even used its Fibersol soluble corn fiber to balance flavor profiles in plant-based protein beverages and enhance mouthfeel in applications sweetened with alternative sweeteners, she added.

Protein animal-style

Plant proteins' currency notwithstanding, "The truth is that nothing can beat the nutrition of animal proteins," said Stephanie Lynch, vice president of sales, marketing and technology, International Dehydrated Foods Inc. (IDF).

The main source of those animal proteins in beverages is usually dairy, but IDF's CHiKPRO chicken protein isolates offer a novel—and nutritionally compelling—alternative. The isolates supply the same nutrition per 100 g serving as a piece of chicken, including essential amino acids, electrolytes, zinc and iron, Lynch said. And thanks to the isolates' complete amino-acid profile, every gram counts toward the labeled daily-protein value. By contrast, Lynch said, "Plant-based options aren't complete, and much higher levels are required to contribute the same amount of protein."

But dairy still reigns in protein beverages, Kennedy maintained. She pointed to November 2019 Mintel data showing that over the past three years, more than half the beverage launches in Europe with a high- or added-protein claim were formulated with dairy proteins. For mainstream consumers, she said, dairy protein's taste, smooth mouthfeel and high nutritional quality seal the deal.

For beverage formulators, it's often the proteins' ease of use. Anne Louise Friis, sales development manager, health and performance, Arla Foods Ingredients, noted her company's HYDRO.PowerPro 100% whey protein hydrolysate is pH flexible, UHT (ultra-high temperature processing) stable and half as bitter tasting as proteins with a comparable 21% to 27% degree of hydrolysis. She said Arla's ISO. Water whey protein isolate not only works well in clear protein waters but "can be used in both flavored and unflavored waters thanks to its excellent taste and mouthfeel, unlocking new potential in the category."

Culture club

While consumers value protein for its muscle growth, satiety and weight-management benefits, any search for digestive health usually points them toward probiotics.

And, noted Quilter, "Research has shown 57% of consumers want to use beverages as a vehicle for digestive-health benefits." Probiotic pills and tablets, by contrast, are the preferred vehicle for only 23%. His conclusion: "The phenomenal growth in digestive-health interest will continue to drive demand for functional beverages featuring probiotics."

Quilter is especially bullish on spore-forming strains' potential to remake the probiotic beverage space. His company's GanedenBC30 *Bacillus coagulans* probiotics "are hardy, spore-forming bacteria with a structure that's highly resistant to extremes of pH, heat, cold and pressure," he said. The bacteria's protective shell not only shields it from stomach acids, but from most food-processing conditions, too, including high shear and HTST (high temperature/short time) and HPP (high pressure processing).

The strain has appeared in a range of beverages from hot teas and coffees to their iced equivalents, refrigerated smoothies and juices. "Spore formers are a big reason why the number of beverage launches featuring a probiotic or digestive-health claim has increased," Quilter added.

Sabinsa also offers a shelf-stable, spore-forming probiotic—brand named LactoSpore—that survives extreme processing and storage conditions and has the documented research to back it. "Few probiotic strains are listed in the FDA GRAS [generally recognized as safe] Notices inventory database and have the ability to withstand temperature extremes during processing and storage, as substantiated by multiple studies for stability and other benefits," noted Shaheen Majeed, Sabinsa's worldwide president. "Those are important merits to consider when developing a probiotic beverage."

DuPont Nutrition & Biosciences is also launching a strain of spore formers—Bss-19 *Bacillus Subtilis*—"to address the need for a more robust strain to use in more difficult formats," said Mindi McKibbin, principal beverage scientist at the company. "It may be possible to use the strain in lower-pH beverages or those with long shelf-stability needs."

Even so, incorporating probiotics of any strain into beverages "can be complex," McKibbin cautioned. Manufacturers must account for everything from the formulation's water activity, pH level and active ingredients to finished beverage shelf life and processing temperatures, humidity and mechanical stress.

All factors considered, traditional fermented and cultured beverages remain ideal probiotic platforms. "Manufacturers can add the probiotics at the same time as the fermentative culture, and it's been shown that the fermentation process gives 'natural' protection to the live probiotics, helping guarantee their survivability through the end of shelf life," McKibbin said.

But non-fermented refrigerated beverages are viable applications, too, provided the probiotics enter production after heat treatment—particularly in the case of lactic acid bacteria—and that product pH, shelf life and functional ingredients are factored into the formulation and production equation.

Even dry-blend beverage mixes are probiotic friendly, as powdered strains remain stable over as long as a year when water activity levels are below 0.2 and moisture-barrier packaging is used. "Multi-serving tubs are popular," McKibbin said, "but it's ideal to pack dry-blend probiotic beverages into single-serving sachets to reduce moisture impact and provide accurate dosing."

Sporting chance

"Sports beverages are another category where consumers are looking for a wider range of functional benefits," Quilter noted. Indeed, Euromonitor International pegged the 2018 value of the sports-beverage market at $24.3 billion, and foresees a compound annual growth rate (CAGR) of 1.8% through 2022.

While protein continues to dominate, "That won't necessarily always be the case," Quilter predicted. Sports nutrition's mainstreaming has broadened the needs, goals and health concerns the category's beverages must satisfy, "and not everyone is interested in muscle-building," he said.

For example, when athletes at all levels focus on a sporting goal, "areas such as immune health become even more important," Quilter said. He suggested working with proprietary baker's yeast beta 1,3/1,6 glucan—brand-named Wellmune—which he called "perfect for sports-nutrition beverages, where it can help meet the growing demand for immune health benefits among both serious athletes and weekend warriors."

A recent study involving marathoners found that consuming a Wellmune-fortified beverage reduced the severity of subjects' upper-respiratory tract infections by 19% compared to placebo, yielded a 10% decrease in total symptomatic days and allowed the runners to miss fewer post-marathon workouts (*J Diet Suppl*. 2020;17(2):200-210).

Stay sharp and chill out

But with the definition of "sports" changing before our eyes—consider the growth of eSports—so, too, are the nutritional needs that sports beverages should aim to meet.

Noted Greenhill, "The beverage category is evolving as consumers develop a nuanced understanding of what performance means for them. Consumers perceive the concept as more than having energy to participate in a sport; they also link it to mental awareness and emotional health. This expanded view opens opportunities for beverage formulations tailored toward sustained energy, as well as mental clarity and focus."

And you needn't be a gamer to reap the dividends. "I think the next space we'll see functional beverages playing a role in is cognition and mental health, where beverages can help support mental performance throughout the day with botanical stimulants like maca, ginseng and others, and can help you unwind with l-theanine from tea or adaptogens like ashwagandha and valerian," Kennedy said.

Already, Lovett's seen heightened interest in her company's Cognizin brand of citicoline, and she credited the attention to the product's purported cognitive health benefits, including focus and attention. "I think manufacturers are trying to differentiate their products; adding a cognitive-health aspect to their formulation is giving them an edge," she said.

And on the wind-down side, Holly McHugh, marketing associate, Imbibe, said beverages with ingredients that promote relaxation and stress relief like adaptogens, medicinal mushrooms and CBD will "be in the spotlight and expected to grow significantly in the next few years." Even traditional relaxers like chamomile, green tea and lavender are attracting fresh attention, she added.

Cleaning up our acts

But whether you're formulating a traditional sports beverage or a new-wave mind tonic, Antje Collman, food scientist, Wixon, advised keeping it clean.

"It's may seem crazy, but even with energy drinks, consumers still look for—and buy—organic, non-GMO, 'natural' options if they're available," she said. "Even electrolyte beverages are going back to 'natural.' They aren't really reducing sugar content, but they are replacing high-fructose corn syrup with honey, agave and other 'real' sweeteners."

It's all a sign of how the clean label movement continues to influence beverage formulation, even in the historically "unclean" sports and energy segments.

Those segments, said Gary Augustine, director of marketing, Van Drunen Farms, "keep evolving to meet the demands of consumers searching for 'clean' and 'natural' products." He pointed to sustainable and ethically sourced coffee fruit as an example of a winning ingredient "because it delivers both exotic flare and conscious consumption."

"Other innovative energy sources include ingredients that promote internal energy rather than stimulation," Augustine continued. "As the category overlaps even more with other holistic-wellness trends, a beverage that offers an internal boost from whole-food, clean label ingredients will appeal to consumers."

Still, meeting consumers' expectations for clean can confound formulating for quality and stability, especially when clean ingredients replace handy standbys. Squaring that circle "makes formulation hard because convincing consumers about the use of ingredients like silicon dioxide and diglycerides isn't as easy for food companies as it is for, say, Food Babe," Collman said.

Take flavors. Natural options are popular, but they can cost more than artificial, and some are allergenic when naturally sourced—think naturally extracted peanut flavor—or don't exist in nature.

For example, bubble gum is not a natural flavor. So flavorists concoct these unicorns "using different natural flavor components to meet the desired profile," McHugh said. "Fantasy flavors like s'mores, cotton candy or birthday cake require flavor expertise and ingredients to simulate them with natural components."

Similar challenges attend clean coloring. "As consumers ask for healthier beverage options, many companies are replacing synthetic colors with natural ones," noted Cori Satkowski, supervisor, product development, California Natural Color. "But one of the main challenges for beverage formulators is changing from synthetic to natural colors. Formulators must be more cognizant of the effects of ingredients, packaging and storage."

McHugh agreed. Low color strength, incompatible solubility, a tendency to oxidize and occasional flavor effects are all common drawbacks, she noted. "And natural colors are more pH-sensitive and tend to fade during heat processing and light exposure. Product developers must choose natural colors that maintain intensity and vibrancy throughout processing and on the shelf."

ADM's Colors from Nature use a patented clear-emulsion technology to produce "easy-to-use oil-in-water and water-in-oil color emulsions that allow naturally nonpolar colorants to function in aqueous systems and vice-versa," Greenhill said. The technology enables the mixture of two or more immiscible liquids while locking in heat and light stability without opacity and preventing separation.

And California Natural Color produces its Pure Grape colors from the Rubired grape, which has a complex molecular structure that enhances color stability, making the colors "more stable alternatives to grape-skin extracts and other red fruit colors used in beverages," Satkowski said.

To minimize risk of processing deterioration, she advised adding natural colors to the beverage base immediately before—or as close as possible to—thermal processing. Reducing oxygen pickup during bottling and processing also protects them. And if all else fails, "increase the color dosage."

Steady as she goes

Formulating beverages for clean stabilization may be the trickiest challenge of all. Julie Impérato, marketing manager, Nexira, noted plant-based beverages can be difficult to emulsify and stabilize cleanly, "particularly with respect to managing fat and protein, suspending minerals and particulates like pulp and building mouthfeel."

Yet with consumers taking a magnifying glass to ingredient statements, "some tried-and-true beverages stabilizers and texturants have fallen out of favor," said Paige Ties, senior technical services supervisor, Cargill. These include carrageenan, modified food starches and carboxymethyl cellulose. "For formulators charged with maintaining mouthfeel, texture and stability, losing these tools can be a real blow," she said.

Her company's Vitex line of stabilizers leans on cornstarch and pectin—two clean options—to improve creaminess, body and viscosity in neutral-pH protein beverages while also controlling phase separation. For formulations blending juice and dairy into smoothie-type beverages, she recommended pectins, which coat the protein's surface to prevent precipitation and sedimentation in the beverages' acidic conditions.

Fiberstar Inc. uses a patented, chemical-free technology to increase the surface area of its Citri-Fi citrus fiber, enhancing its functionality in formulation. Without chemical modification, the process imbues the ingredient with a capacity for clouding, emulsification, mouthfeel and particulate suspension.

"Less is more when using this natural citrus fiber," said Brock Lundberg, Ph.D., Fiberstar's president of R&D. Typical use levels range from 0.1% to 1.0%. The ingredient is stable at pH levels as low as 2.5 and tolerates a range of temperature, too, making low-pH, UHT and HTST beverages "suitable applications," he said. "An additional application it's increasingly used is in plant-based beverages to provide stabilization and creaminess that hold up over time."

Nexira's Thixogum G—acacia gum encapsulated in gellan gum—can stabilize insoluble ingredients in plant-based dairy alternatives, adding little viscosity, Impérato said. "It can also be used in fruit juices to maintain a homogenous suspension of fruit pulp." Its encapsulated nature has the benefit of making it easier to dose, disperse and solubilize than gellan gum alone, she added.

In fact, said McKibbin, gellan gum may be "the clean stabilizer of choice, especially in plant-based milks. But we still see dominance of cellulosic ingredients and carrageenan in stabilizing coffee beverages. So, it really comes down to beverage type, stabilization needs and even the drinking occasion or consumer demographic."

How sweet it isn't

Finally, healthy beverage manufacturers should consider sugar reduction. And apparently, many are.

"Whether they're formulating a sports drink or a dairy-replacement shake, it seems like every beverage maker is trying to reduce sugar," said Wade Schmelzer, principal food scientist, Cargill. "At the same time, there's a move toward cleaner, simpler labels, and away from ingredients like artificial sweeteners."

Richard Stewart, project leader, sweeteners technical service, Ingredion Inc., praised "alternative sweeteners found in nature, such as allulose and erythritol," which have cut sugar levels in healthy beverages while delivering clean labels and clean sweetness perception. But to make even deeper sugar cuts, they may need some help.

"Stevia works very well with allulose and erythritol," typically at 100 to 400 ppm, depending on the rebaudioside fraction used, he said. And while Reb D and Reb M have cleaner flavor profiles than Reb A, their limited solubility can be challenging in beverages. In other words, any clean sweetening solution will depend on the sweetener's functionality in the beverage as much as on consumer expectations.

And those expectations are likely to get higher.

"I think we're going to see more innovative formulations in the next few years with unique and targeted health benefits," Lovett wagered. With immunity on everyone's minds courtesy of COVID-19, she predicted "We may see a surge in beverages formulated for immune benefits as early as 2021." Let's hope that by then, we'll actually be able to venture outside to enjoy them. ✦

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