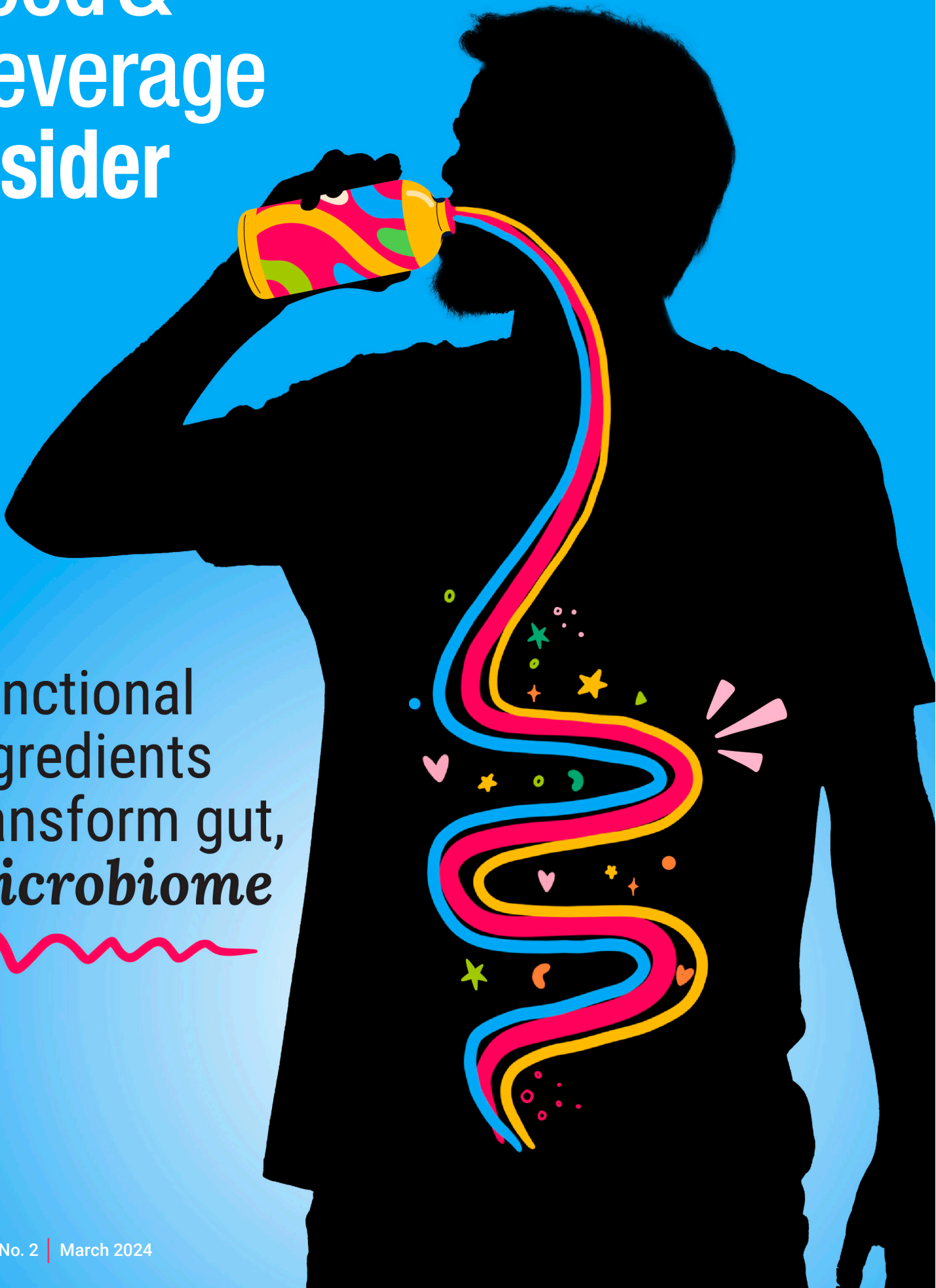
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Functional ingredients transform gut, *microbiome*

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A new generation of fermented foods balance nutrition and flavor

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by Kimberly J. Decker

Producing tasty options that promote a healthy microbiome is no easy feat, but companies are developing numerous strategies to overcome the challenges. The overall goal? Making sure biotic ingredients survive processing and storage and reach the gut alive and in sufficient numbers.

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Gut instinct: Functional beverages, snacks target the microbiome

by Melissa Kvidahl Reilly

The market for gut-friendly options continues its climb, and brands are turning to functional ingredients like prebiotic fibers and botanicals to promote more diverse microbiota. Brands BelliWelli, Health-Ade and OLIPOP touch on trendy nostalgic flavors and natural ingredients in this Q&A.

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Delicious snacks deliver a dose of probiotics



I'm a kid at heart when it comes to certain things. I still love double Dutch and jumping jacks. I instinctively want to run outside whenever I hear the familiar jingle from an ice cream truck. And I prefer my supplements in fruity gummy form or in a functional beverage or snack.

That's why I was instantly drawn to Yoggies, the yogurt-covered real fruit snacks that boast fiber and billions of probiotics in each miniature package. Launched last spring by natural foods company Cibo Vita through its flagship Nature's Garden brand, they come in strawberry and mixed berry. The company will soon introduce new flavors in mango-peach, lemon-berry and strawberry-banana.

Simply put, they're delicious. I cannot get enough of them, and I pop the little yogurt balls in my mouth like candy. I know that I'm not alone.

I also know that as simple as Yoggies appear to be, a lot of effort went into the innovation behind them. According to Cibo Vita CEO and founder Emre Imamoglu, it took about 10 years to develop them because of the patented technology.

It's a "vegan-based microencapsulation," he explained about the process in which active substances are coated by extremely small capsules. "We can encapsulate any type of vitamins, omegas, zinc, elderberry, probiotics, proteins, anything. Some beverage companies are using this technology, but we hold the licensing and full rights on this technology for the snacking category."

To develop Yoggies into a functional, shelf-stable food, Imamoglu continued, fiber and probiotics are microencapsulated so that when they "travel all the way to our gut, they dissolve so we can get the right benefit of the product without changing its taste … the whole idea is to have the innovation behind it while making sure that it is approachable for the consumer."

Improving gut health is an ongoing conversation in the natural foods industry, which is why this digital magazine is dedicated to the microbiome and innovation concerning it. First, Cindy Hazen recommends factors food developers should consider when working with difficult probiotic formulations.

Also, Kimberly J. Decker focuses on a few new developments that may help to extend the shelf life of probiotic foods and beverages. Nick Collias writes about how a new generation of fermented foods balance nutrition and flavor. And, as always, Melissa Kvidahl Reilly's brand roundtable column spotlights CPG innovation. This time around, leaders from biotic-powered products BelliWelli, Health-Ade and OLIPOP share insights on functional ingredients, formulation and flavor.

The variety will have you feeling like a kid in a candy store.

Be well. Eat well.



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Boosting health from the inside out: The science of biotics

by Cindy Hazen



Countless studies are finding strong connections between the gut and multiple health benefits. Pro-, pre- and postbiotics may be one of the keys to unlocking these benefits. But biotics are not simple drop-in ingredients: Formulating with them requires know-how. The help of a knowledgeable supplier can be invaluable.

PROBIOTICS 101

In 2014, the World Health Organization (WHO) defined probiotics as live microorganisms, which when administered in adequate amounts, confer a health benefit on the host. For companies looking to highlight probiotic content in a product, scientific evidence for any potential health benefits should be documented.

Camille Binachon, product manager at Lallemand Health Solutions, noted over 900 clinical studies exploring health benefits of probiotics were registered in the past three years. *Lacticaseibacillus rhamnosus* is one example of a heavily researched probiotic. Studies have linked it to cardiovascular health, neurological health and liver health.

In addition to physical health benefits, consumers are also interested in their mental health. Communication through the gut-brain connection intensifies in times of stress. Psychological stress can impact gastroenteric well-being and vice versa. "Recently, the microbiome has been recognized as a third interlocutor in this relation and the microbiome-gut-brain axis concept has emerged," Binachon said. She pointed to Lallemand's Cerebiome (*Lactobacillus helveticus* Rosell-52 and *Bifidobacterium longum* Rosell-175) as a well-documented probiotic shown to support a healthy response to normal stress.

Binachon cautioned that strain-level differences can be significant. "Different strains within the same species can have varying effects on the body, such as supporting digestion, immune function and overall gut health," she explained. It's important for food developers to carefully consider strain information.

Formulating foods with probiotics is also challenging because the microorganisms must survive all the stressors from the manufacturer's plant to the consumer's gut. Microencapsulation can help protect probiotic strains from physical food processing conditions such as compression, thermal shocks and high acidity. Lallemand's Probiocap technology can be applied to *L. helveticus* Rosell-52, *L.* Rosell-11, *B. longum* Rosell-175 and *L. helveticus* LAFTI L10.

Chr. Hansen offers several trademarked strains, including *Bifidobacterium* BB-12. This probiotic

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has been described in 130 human clinical studies as offering multiple benefits, ranging from pathogen inhibition and barrier function enhancement to immune interactions. *L. rhamnosus* (LGG) is not only beneficial to the gut, but is also one of the most widely used probiotic strains, as it was the first strain belonging to the genus *Lactobacillus* to be patented in 1989. Nomenclature continues to evolve, along with research. In recent years, per the International Probiotics Association (IPA) website, the probiotic strain *Lactobacillus rhamnosus* was renamed *Lacticaseibacillus rhamnosus* by a consensus of scientific experts, as DNA analysis revealed genetic differences among *Lactobacillus* species. This can help make identifying and understanding certain strains easier.

Lars Bredmose, senior director of dairy health at Chr. Hansen, said his company applies its skills in combining acidifying yogurt cultures with the world's best documented probiotic strains like BB-12 and LGG to ensure both taste and probiotic cell counts at the end of shelf life. "This requires a detailed understanding of the physiology of the bacteria, as well as advanced technological knowledge of how to grow the probiotics to make them ready for life in different foods," he said. Although these probiotics are seen mainly in dairy and plant-based alternatives, Bredmose noted they are also emerging in beverages and healthy snacking.

Spore-forming *Bacillus* strains are intrinsically resistant to harsh conditions because they form a protective endospore. Binachon explained that when the environment becomes favorable, the endospore can reactivate itself into a vegetative cell. Spore-forming probiotics are naturally capable of surviving thermal shocks, high pressure, pH variations, gastric acidity from digestion and long-term storage.

Kerry's BC30 probiotic, *Weizmannia coagulans*, GBI-30, 6086, is a spore-forming probiotic ingredient with many researched health benefits, such as digestive health, immune health and protein absorption. Mindy Leveille, senior global manager of probiotics at Kerry, said the ingredient is supported by "more than 45 published research papers, including clinical, preclinical, applications stability and biomarker studies."

Because of BC30's unique structure, she suggested it's a good fit for applications such as hot and cold beverages like teas, as well as cold foods such as yogurts and ice creams. BC30's stability also makes it a good choice for formulating products that have longer shelf lives.



5 QUESTIONS FRIDAY: PREBIOTICS, PROBIOTICS AND POSTBIOTICS 101 – ARTICLE

Abena Foli — a food scientist with more than a decade of experience, and also a member of the Food & Beverage Insider Editorial Council — offers her expertise about the emerging biotics category of ingredients.

READ



Chicory root fiber intake (starting at 3 g/d) promotes significant growth of *Bifidobacteria* in the gut microbiome in all age groups and improves bowel function.

ABOUT PREBIOTICS

Prebiotics promote a healthy microbiome by nourishing probiotic bacteria. The International Scientific Association for Probiotics and Prebiotics (ISAPP) defines a prebiotic as a substrate selectively utilized by host microorganisms conferring a health benefit.

According to Denisse Colindres, North American manager of nutrition communication at BENEO, proven prebiotics such as inulin and oligofructose shape the composition and the function of the gut microbiome for overall health. Fermentation of prebiotic fibers by the gut bacteria produces short-chain fatty acids (SCFAs) and other metabolites. SCFAs play a crucial role in maintaining gut integrity and the intestinal barrier. They also support nutrient absorption and the immune system and provide protection against pathogens.

BENEO offers Orafti Inulin and Oligofructose derived from chicory root. Colindres said the comprehensive body of scientific research available for chicory root fiber is very strong among fiber ingredients. "When it comes to prebiotics and the microbiome, research is becoming increasingly precise on which bacteria are boosted and how much of the ingredient is needed to achieve a desired result," she shared. "For example, via a systematic literature review with meta-analyses — considered the strongest methodology in the hierarchy of scientific evidence — it has been demonstrated that chicory root fiber intake (starting at 3 g/d) promotes significant growth of *Bifidobacteria* in the gut microbiome in all age groups and improves bowel function."

Colindres also noted, "Scientific research has established other benefits provided by chicory root fibers related to blood sugar management, immune health and calcium absorption for bone health. A recent study also demonstrated that the intake of the prebiotic dietary fiber oligofructose alone, or in combination with the human milk oligosaccharide (HMO) 2'fucosyllactose, can result in substantial improvements in mood."

BENEO's chicory root product can be incorporated into a wide range of food and drink products while maintaining — or, the company



MIGHTY POP REDEFINES SODA WITH INNOVATIVE BEVERAGE CONTAINING PRE-, PRO-, POSTBIOTICS – ARTICLE

Beliv, a global beverage brand, explains to Rachel French the flexible, consumer-centric approach to product development behind its Mighty Pop carbonated beverage brand.

READ



suggests, even improving — taste and texture. At only 2 kcal/g, chicory root fibers also benefit reduced-calorie formulations while at the same time adding prebiotic fiber, nodding to digestive health.

A new product from NutriLeads is made from upcycled carrot pomace — millions of pounds of carrot pomace are produced each year as a side stream from juicing. BeniCaros is a patented pectin-derived polysaccharide known as rhamnogalacturonan-I that is derived from this byproduct.

Robin Hesdahl, commercial director at NutriLeads, calls BeniCaros a precision prebiotic. He pointed out that not all prebiotic fibers affect the gut microbiota equally because each person's gut has its own unique mix of microorganisms. A prebiotic that has beneficial effects for one person might have notably limited benefits for another.

"The key to consistent and predictable gut health benefits lies in the structure of prebiotic fibers," he explained. "Many prebiotics have relatively simple molecular structures that can be fermented by a wide range of microorganisms, leading to a competitive fermentation process. The outcomes of this competition are strongly influenced by the existing composition of the gut microbiota, causing the potential health benefits of these simple prebiotics to vary significantly from person to person. In contrast, prebiotics with a structural complexity like BeniCaros enable selective stimulation of select groups of collaborating (cross-feeding) beneficial microorganisms present in the gut of most people. Consequently, these prebiotics ensure robust, consistent and predictable gut health benefits."

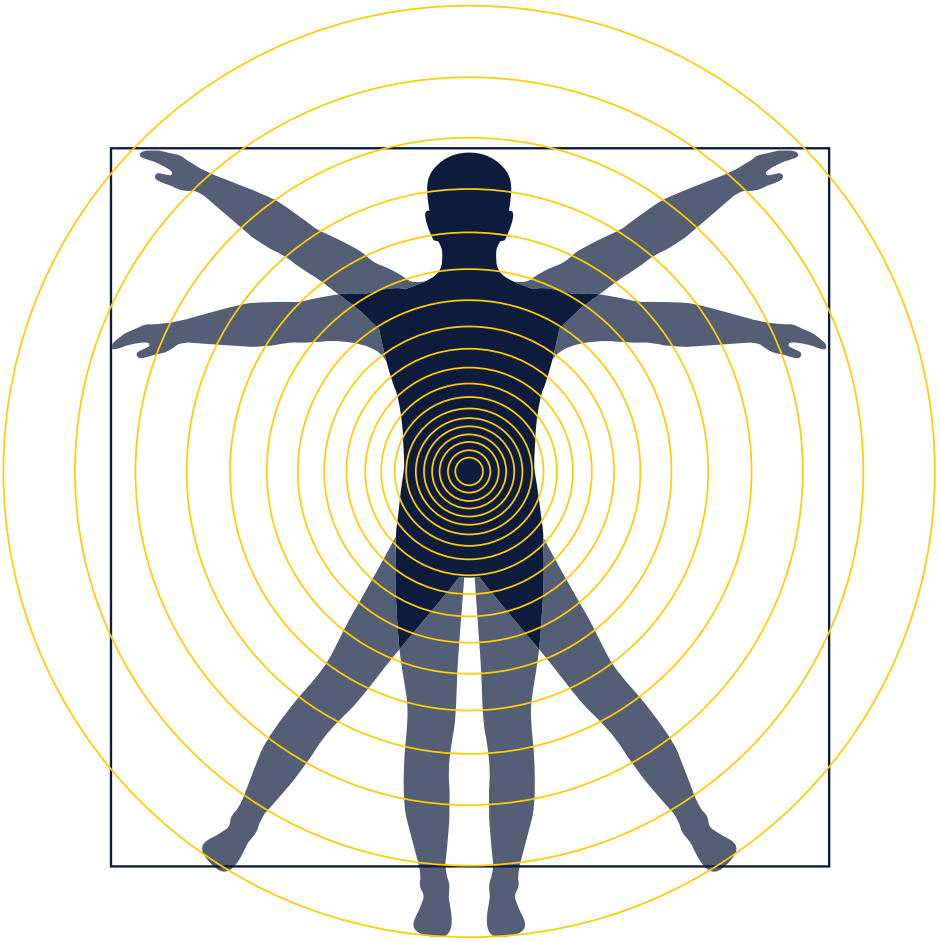
A 2023 ex vivo study comparing the effects of three prebiotic fibers (inulin, xanthan and BeniCaros) in 24 human subjects found that only BeniCaros consistently enhanced the growth of targeted beneficial gut bacteria across all subjects and improved the composition of their gut microbiota.

BeniCaros can be formulated in a variety of applications, and the daily serving size is 300 mg.

POSTBIOTICS

As defined by ISAPP, a postbiotic is a preparation of inanimate microorganisms and/or their components that confers a health benefit on the host. "While probiotics contain living microorganisms, postbiotics do not. Yet, they can come from the same microbial strain," explained Vaughn DuBow, ADM's global director of marketing for microbiome solutions. The



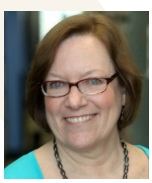


> Bringing together the ***trifecta of biotics*** — prebiotics, probiotics and postbiotics — can be incredibly complementary toward achieving wellness goals.

company's BPL1 (*Bifidobacterium animalis* subsp. *lactis* CECT8145) and ES1 (*Bifidobacterium longum* CECT7347) strains undergo a heat-treated process, making them available in postbiotic form.

DuBow believes having probiotic and postbiotic versions of BPL1 and ES1 enables key formulation flexibility for incorporating functional benefits in a range of foods, beverages and dietary supplements. "Formulators do not have to make adaptations for live colony-forming units (CFUs) when using postbiotics, making postbiotics suitable for applications that experience harsh processing conditions, such as high heat or water content. Think beverages, baked goods and gummies," he said. Research has shown BPL1 probiotic and postbiotic target factors relevant to metabolic health.

In closing, DuBow made an important point. "Manufacturers must also keep in mind the vastness of the microbiome. With trillions of microorganisms within an individual, bringing together the trifecta of biotics — prebiotics, probiotics and postbiotics — can be incredibly complementary toward achieving wellness goals."✦



Cindy Hazen is a food industry professional with decades of experience in food formulation and food safety. She is PCQI, HACCP and ISO 22000 trained.



A new generation of fermented foods balance nutrition and flavor

by Nick Collias

Perhaps more than any other type of food, fermented foods link the ancient roots of human nutrition with the future of sustainable eating.

On one hand, humans have been consuming fermented foods and beverages worldwide for over 10,000 years. On the other, the futuristic process known as "precision fermentation" has quickly become a key component of modern food tech, allowing food scientists to create protein-heavy, nutrient-rich ingredients in just a matter of hours.

The big question is: Are today's consumers ready to support this fermentation revolution?

Industry experts say yes. A recent survey conducted by The Hartman Group concluded that 40% of U.S. adults and more than half of Millennial and Gen Z buyers are ready to try fermented foods right now, as a component of a larger health and climate-aware nutrition plan.

But there's a catch. Those consumers were clear that their highest priority is fermented foods must taste good. Here's how today's food scientists are meeting the challenge of providing next-level nutrition that doesn't taste like "health food."

HIGH-PROTEIN BAKED GOODS WITH CRAVEABLE FLAVOR

A major knock against plant-based products has been that they contain low-quality or "incomplete" proteins, meaning they don't contain adequate amounts of the nine essential amino acids (EAAs) that the human body can't produce on its own. Through precision fermentation, microorganisms become tiny factories able to produce specific nutrients, including complete proteins that are nutritionally equivalent to animal proteins.

The benefits extend beyond the nutrition label, though, said food scientist Monica Bhatia, Ph.D., co-founder of the Philadelphia-based fermented baked goods company EQUII. A single slice of bread using the brand's proprietary Complete

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> ***A single slice of bread using the brand's proprietary Complete Protein Blend baking mix contains 10 g of protein and 40% fewer carbohydrates than traditional bread.***

Protein Blend baking mix contains 10 g of protein and 40% fewer carbohydrates than traditional bread. But Bhatia said that what consumers notice first (including Oprah Winfrey in this recent video) is its familiar flavor and soft texture.

"The key to creating better foods comes down to balancing added nutritional benefits with the sensory experience of food," Bhatia explained. "In my experience, the best way to achieve this critical symphony is through fermentation. Positive qualities like protein and micronutrients can be added, but they can actually also enhance a product's flavor and texture."

A whole new customer base is about to taste the difference. In late January 2024, EQUII announced a partnership with Britor, a major baked goods provider to international retail, airline, hospital and food service clients. Britor will release a line of dinner rolls and sandwich breads enriched with EQUII's Complete Protein Blend, starting in spring of 2023.

MYCOPROTEINS: A VERSATILE MEAT ALTERNATIVE

While "lab-grown meat" has made big headlines in recent years, cultivating proteins from animal cells remains a complicated, expensive process in its early developmental stages. A simpler, more scalable alternative can be found in mycoproteins, a fermented protein crafted using the mycelia, the root-like structures of fungus and mushrooms. And according to Doni Curkendall, executive VP of The Better Meat Co., this meat alternative isn't a futuristic pipe dream.

"We actually have the capacity to create better food ingredients and cut our meat consumption right now," Curkendall maintained. "It's not something we have to wait for or look forward to. We're implementing it today."

Mycoproteins like Better Meat Co.'s Rhiza are grown in large steel vessels and fed by agricultural waste products from other industries. In less than a day's time, what results is a dry, shelf-stable ingredient that's neutral in flavor and color — and packed with a laundry list of consumer nutritional wishes.





By weight, Curkendall said Rhiza mycoprotein contains more:

- **Protein** than eggs.
- **Iron** than beef.
- **Fiber** than oats.
- **Potassium** than bananas.

This nutritional heft, combined with mycoprotein's flavor versatility, has helped the Better Meat Co. partner with some of the biggest names in North American grocery meat production, including Hormel Foods, Maple Leaf Foods and Perdue Farms.

Another mycoprotein startup, Colorado-based MycoTechnology, is in the process of making a similar global push. Late in 2023, it started offering "Fermentation as a Service" (FaaS) to other brands utilizing fermentation vessels of up to 90,000 liters. In 2024, it is also set to launch a state-of-the-art facility to scale-up mycoprotein production serving countries in the Middle East, through a partnership with the Oman Investment Authority.

According to MycoTechnology's chief technology officer Ranjan Patnaik, Ph.D., "We did a tasting in June in Saudi Arabia, and what was interesting was that all the food was close to their normal flavors and textures." He continued, "The fibers in mushrooms are actually much closer to animal fibers like chicken meat than they are to plant fiber. So, what we have to do is figure out how to sell mushrooms as animals in their own way."✦



Nick Collias is a writer and editor with more than a decade of experience working in the health and fitness industry. From 2016 to 2021, he was the host of the Bodybuilding.com podcast, interviewing elite athletes and training thought-leaders on a wide range of exercise, nutrition and lifestyle topics. Additionally, he has worked for the last 20 years as a longform print and online journalist, as well as a book author, ghostwriter and editor.



FINA THEATER: HOW TO BUILD A GREAT-TASTING FUNCTIONAL BEVERAGE – VIDEO

Experts deliver the latest strategies when it comes to formulating with cutting-edge functional ingredients, in this education session captured at the SupplySide West and Food ingredients North America show in Las Vegas in 2023.

WATCH

Built to last: Can foods and beverages enhanced with biotics survive for the long haul?

by Kimberly J. Decker



Consumers have truly discovered their guts — *and they're falling in love with 'em.* This budding romance has made the once-obscure microbiome the inspiration for everything from TikTok reels and bestselling cookbooks to — you guessed it — functional food and beverage innovation.

But on that latter front, there's a catch to creating biome-boosting products that consumers will fall for as hard as they've fallen for their "good" gut bugs.

To wit: Biome-boosting products get their "boost" from all the pre-, pro-, post- and synbiotic ingredients believed to promote healthier microbiomes and, subsequently, healthier humans. But biotics can only make good on their promises if they reach the consumer's gut viable, intact and ready for action.

And given the trials biotics face en route to that destination — from processing and storage conditions to human digestion itself — that's no forgone conclusion.

What is foregone is the leverage that biotics scientists and suppliers are putting toward protecting biotic ingredients and preserving their benefits for the long haul.

POSITIVE NUTRITION

That contemporary consumers would embrace gut health should come as no surprise to anyone who's lived through the past few years.

"Following the Covid-19 pandemic, there was a shift in mindset toward 'positive nutrition' — a concept where consumers focus on adding beneficial yet tasty foods to their diets, rather than simply removing less nutritious ones," Victoria Davies, global marketing director of performance, active and medical nutrition at FrieslandCampina Ingredients, reflected.

She said the upshot is "we're seeing people set their sights on, for example, chocolate bars rich in proteins, milkshakes with gut-health ingredients and much more."

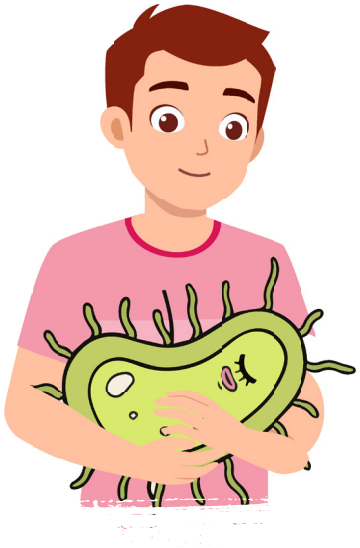
GET THEM IN THE GUT

But consumers seem to find something uniquely compelling about the gut.

"Since rising to prominence a few years ago, gut health has become the indisputable hero in holistic-health trends," Davies contended. "Not only is scientific research consistently finding new ways in which the gut influences aspects of our health from our moods to our muscles, but consumers increasingly see gut health as key to better well-being."



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Alas, it's also an acknowledged R&D challenge, as biotics — probiotics, especially — are notoriously ***delicate creatures.***

EXPANDING AWARENESS

While probiotics remain "the reigning champion" of gut-health ingredients, Davies noted, "In recent years, prebiotics have become similarly well known and well loved."

Consider that IFIC's (International Food Information Council) 2022 "Consumer Insights on Gut Health & Probiotics" survey found prebiotics are approaching probiotics in awareness, with 22% and 32% of U.S. consumers claiming familiarity with — and making conscientious efforts to incorporate into their diets — prebiotics and probiotics, respectively.

BUZZWORTHY BIOTICS

Rebecca Henrickson, category development manager at the beverage and flavor house Tate & Lyle, credited savvy branding with helping spread the word.

Exhibit A: "We've seen a lot of interest in prebiotic sodas, led by brands like OLIPOP," she said. Her theory? The soda itself "connects with consumers' need for beverage options they perceive as 'healthier,'" she contended, while its clever marketing underscores the prebiotic-probiotic relationship.

"I love the way OLIPOP talks about prebiotics on their website," she explained. "They say, 'Who ordered the prebiotic? Your probiotics did!'"

Melissa Kaczmarczyk, principal scientist of nutrition at Tate & Lyle, noted the claim may stray from strict science, but she conceded, "I agree. It's catchy."

POSTMODERN MOLECULES

As for consumer awareness around postbiotics — arguably one of the newer biotics — "We still have a way to go," Henrickson admitted.

The International Scientific Association for Probiotics and Prebiotics (ISAPP) formally defined postbiotics only three years ago, characterizing them as preparations of intact, inanimate microbial cells, fragments and structures thereof (cell walls, membranes, pili, etc.), or microbial metabolites and end products like organic acids, peptides, enzymes, vitamins and bacteriocins — any or all of which must confer a health benefit on the host.

That's a lot even for health professionals, let alone consumers, to wrap their heads around. So, for now, Henrickson suggested, "It's good just for people to see these terms on labels."



DELICATE SUBJECT

Either way, Davies maintained, "The opportunity for brands here is clear: With gut health high on the agenda, including biotic ingredients in modern convenience foods that people find appealing is an obvious choice."

Alas, it's also an acknowledged R&D challenge, as biotics — probiotics, especially — are notoriously delicate creatures.



They *are* living microorganisms, after all. And to do consumers any good, they must reach the gut still living, and at a "minimum therapeutic" level that research suggests lies around 106 colony-forming units (CFUs) per gram of product for the duration of its shelf life.

UNDER ASSAULT

That's a tall order, considering that every step of formulation and production introduces stressors that threaten probiotic viability.

For example, a product's pH, titratable acidity and water activity can all compromise probiotic survival, as can its oxygen levels and redox potential. Other formulation components — from simple salt and sugar to colors, flavors, vitamins and even other bacteria — may also hamper probiotic survival.

High processing temperatures — as encountered during, say, pasteurization or spray drying — are also tough on most probiotics. And the development of ice crystals during freezing can fatally pierce their cell membranes.

Then there're the vicissitudes of storage temperatures and conditions. A package's oxygen- and moisture-permeability, the product's dwell time on the shelf, and other factors may necessitate cold storage, transport and display.

ROUGH GOING

Even if a probiotic clears all these hurdles and lands in the consumer's grocery cart thriving, it may meet its match in the very act of digestion.

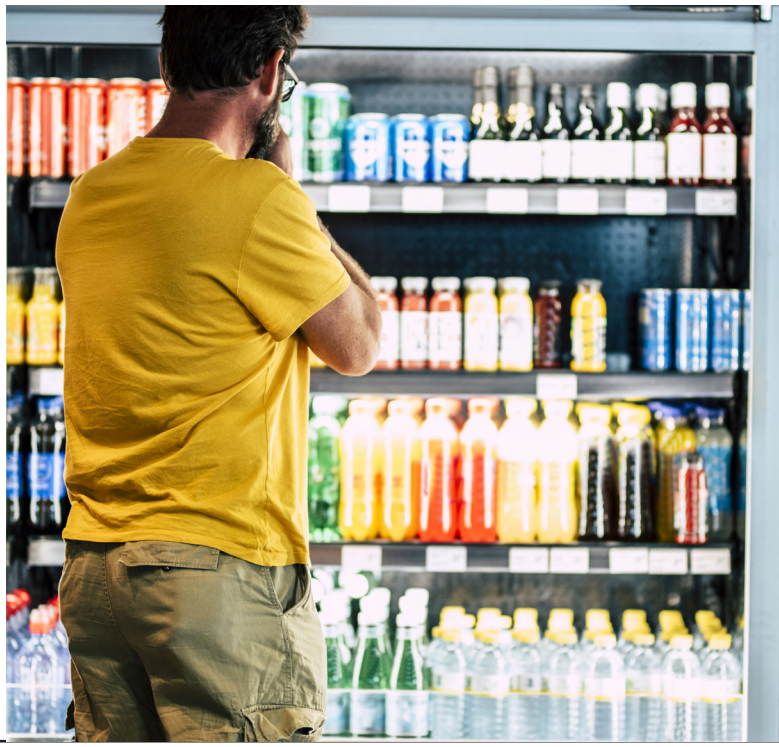
For while probiotics may be good for humans, the human gastrointestinal (GI) tract is inhospitable to probiotics, pummeling them with gastric acid, bile salts, digestive enzymes, oxidative stress, ionic extremes and encounters with the host's native gut flora, which can compete with probiotics for space and nutrients while also releasing metabolites that put viable cells at risk.

DEVELOPING WORKAROUNDS

So, what are biome-boosting formulators to do?

They might explore using probiotics that have been encapsulated — which, while pricey, is perhaps the most popular probiotic stabilization hedge against oxygen, temperature swings and low pH, whether during production, storage or gut transit.

Meanwhile, strategically modified packaging can safeguard probiotics during storage. Brands can reverse-engineer ideal packaging parameters



> We know that the microbiome is important in gut health and immunity, and we now have many methods to produce products in ways that keep biotic ingredients stable.

— from the barrier thickness to the crystallinity of the film matrix itself — to ensure oxygen and moisture permeability that increases probiotic survival odds.

And probiotic suppliers continue to search for hardy strains that tolerate processing and digestive-tract conditions, actively "stress-adapting" some for greater robustness by "pre-culturing" the cells under "sub-lethal" stress conditions before exposing them to truly harsh environments.

TEAM EFFORT

Evidence even indicates that the probiotic-prebiotic pairing that defines synbiotics benefits not just the consumer, but the probiotics, too. The thinking: If a targeted selection of prebiotics can nourish a host's indigenous microbiota once it reaches the gut, perhaps a different but equally targeted selection can fuel the probiotics on their way there, as well.

Grace Kim, technical service category manager of beverage at Tate & Lyle, noted that even prebiotics require careful handling, as "high heat and acidic conditions can test the integrity of many."

"My understanding," she explained, "is that items within this space can break down, or lyse, into components that become ineffective as prebiotics in foods. Fortunately, products like Promitor soluble fiber are fairly robust and can withstand high heat, high acid and alcohol — and still provide prebiotic benefits."

Davies added, when FrieslandCampina developed its Biotis GOS-OP High Purity galactooligosaccharide prebiotic, "the challenge was ensuring that production guaranteed both formulation functionality and ingredient efficacy."

The company ticked that box thanks to "a unique patent-pending process" in which treatment of the GOS with beta-galactosidase hydrolyzed its constituent lactose into simpler sugars that were then removed using sequential simulated moving bed (SSMB) chromatography — a method Davies said "minimizes detrimental effects on GOS composition."

In comparisons with the prebiotic's non-purified counterpart, both displayed equal bifidogenic effects, indicating that the GOS structures key to supporting gut health in both "are, in fact, retained during our gentle purification," she concluded.

EVERYONE WINS

That's good news for brands and consumers.

Kaczmarczyk concurred, "We know that the microbiome is important in gut health and immunity, and we now have many methods to produce products in ways that keep biotic ingredients stable." So, while "the directive may be to eat more whole foods," she said, "not everyone is just going to grab an artichoke. This makes it more feasible that they'll get the nutrition they need."





Kimberly J. Decker is a Bay Area food writer who has worked in product development for the frozen sector and written about food, nutrition and the culinary arts. Reach her at kim@decker.net.



Gut instinct: Functional beverages, snacks target the microbiome

by Melissa Kvidahl Reilly

The gut-friendly beverage market is expected to soar from an already robust $29.3 billion market in 2022, to a whopping $47.4 billion valuation by 2032. That means consumers of carbonated drinks should have an array of innovative options to choose from beyond sodas laden with sugar or artificial sweeteners.

In this Q&A, leaders from BelliWelli, Health-Ade and OLIPOP share insights on functional ingredients, formulation and flavor.

Food & Beverage Insider: As functional ingredients become increasingly mainstream, how did your brand decide which ingredients to use?



BEN GOODWIN, CO-FOUNDER, CEO AND FORMULATOR, OLIPOP: In the development of OLIPOP, I dedicated years to researching nutritional strategies that support ancestral digestive and overall health and are also supported by modern scientific data. Throughout this process, several human clinical studies indicated that the modern industrial food system gut microbiome lacked the diversity and unique bacteria found in hunter-gatherer microbiomes. At the time, a few groundbreaking studies reinforced that both loss of nutrient diversity and low-fiber diets were basically starving our gut bacteria and negatively impacting our metabolic health.

This knowledge prompted me to explore prebiotic fiber and botanicals known for their digestive and microbiome health benefits. The result was OLISMART, OLIPOP's proprietary blend of prebiotic fibers and botanicals (chicory root, cassava root, Jerusalem artichoke, marshmallow root, calendula flower, kudzu root and nopal cactus). By using multiple sources of fiber, prebiotics and botanicals, we're highlighting to consumers the significance of embracing nutritional diversity and adopting a higher fiber intake to bolster overall health.

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CHARLOTTE MOSTAED, CHIEF MARKETING OFFICER, HEALTH-ADE: We listen to our consumers and do extensive research to understand what they're seeking from their food and beverages. Then, we marry this with our mission, which is to provide delicious beverages that inspire consumers to live their healthiest and happiest lives by tapping into the power of their gut. This has resulted in a variety of products with a variety of functional ingredients.



Health-Ade kombucha is made the way kombucha has been made for thousands of years, offering a blend of acetic acid, lactic acid, gluconic acid and tartaric acid.

Our Kombucha Glow Up line is where we offer more benefits than those that exist in our core line. For example, Health-Ade Strawberry Glow delivers a thirst-quenching strawberry kiwi flavor as well as good sources of biotin and bamboo extract (a natural silica) for skin, nail and hair health. The SunSip line offers a gut-healthy prebiotic soda with added vitamins and minerals, since we learned our consumers wanted more from their functional beverages. In addition to the 2 grams of dietary fiber, each can provides a good source of vitamin C, zinc, selenium, vitamin B6 and vitamin B12.

Food & Beverage Insider: What are some challenges you've faced when formulating with these ingredients? How have you risen to these challenges?



CORBIN HOHL, DIRECTOR OF RESEARCH AND COMMERCIALIZATION, BELLIWELLI: Often, functional ingredients can have flavor, texture or stability challenges. Development must be intentional to ensure these factors are balanced. Flavors are an excellent tool for masking and supporting the organoleptic balance of functional ingredients. Shelf life is also a critical stage for determining the [stability] of flavor, texture and function. Accelerated shelf-life studies can be used to get a rapid view into long-term, real-time shelf-life outcomes.



MOSTAED: One of the challenges to formulating with functional ingredients is ensuring that it provides enough value for the consumer, while also not creating an additional barrier to get them to try. For example, previous flavors of Health-Ade have used turmeric and black pepper to provide



NEW PROTEIN MAY BE A SUSTAINABLE SOLUTION TO A MAJOR GLOBAL CRISIS – VIDEO

Audarshia Townsend talks with one of the founders of Nature's Fynd, a brand that claims its accidental discovery of a microscopic fungus in Yellowstone Park may be the answer to feeding the world's growing population in the face of climate change concerns.

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immune support, but we found consumers were less interested in those ingredients than more mainstream sources like vitamin C and zinc.

Food & Beverage Insider: What are some flavor trends that brands should keep top of mind in 2024?

GOODWIN: A trend that greatly influences beverage makers — and serves as the foundation for our flavor development at OLIPOP — is nostalgia. When formulating OLIPOP, I wanted to provide classic soda flavors that offer the timeless and beloved soda flavors from my own upbringing without sacrificing taste or health benefits. Nostalgia, with an innovative and ownable twist, remains at the core of our new flavor development.

HOHL: Less-common complementary flavors offer excellent pairings with core flavors such as vanilla, chocolate and berry. Potent spices and aromatics continue to make a splash with the likes of rosemary, cardamom and less-common citrus such as yuzu and bitter orange. Natural flavors, natural sweeteners and natural colors are also top of the list for many consumer preferences. ✦



Melissa Kvidahl Reilly is a freelance writer with over a decade of experience covering the natural products industry. Her work appears in a number of industry publications, including Natural Products Insider, Food & Beverage Insider, Natural Foods Merchandiser, Delicious Living and more. She lives and writes in New Jersey, and can be contacted at melissakvidahl.com.

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Food & Beverage Insider

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