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Is Less Really More?

Back in our January/February 2018 issue, I wrote about how lifestyle and beauty companies such as Gwyneth Paltrow’s Goop or any number of brands sold in Sephora stores are getting into the business of selling dietary supplements.

While most of these brands are selling nutricosmetic supplements that work from the inside out, what’s on the outside—the supplement packaging—is also very important to this audience especially. Often (but not always), packaging that appeals to the lifestyle or beauty set is less cluttered and more streamlined—in short, an aesthetic that is a natural extension of the brand.

Libby Rodney, chief strategy officer for market researcher Harris Insights & Analytics (Rochester, NY), whom I interviewed in my earlier article, spoke about how some of these brands purposely forgo overloading their labels with product information. Instead, they prefer to provide information to customers elsewhere—such as, say, on a brand’s lifestyle blog.

“What they’re doing is putting all of that detail and the ‘why purchase’ in other elements of the marketing,” Rodney says. “They’re not looking at [packaging] as ‘my only sell is when you pick up this product.’ They’re looking at it like, ‘Hey, I’ve created this fan base with you, and I’m going to send you this e-mail about [the product]. I’m also going to talk about it on my podcast, and I’m going to put little elements of why it’s effective on my Instagram.’

“They think about it more holistically,” she continues. “How do I slowly convince you that this is the right product for you, versus featuring every product implication or efficacy element on the packaging.” Those constant, gradual touchpoints can build a powerful sense of trust that customers bring with them when it comes time to purchase.

Also, just because these customers may prefer simpler labels doesn’t mean they aren’t concerned about what’s in the product. On the contrary, Rodney says, these customers are doing the research to find out what’s in the product before they purchase, and they’ll often get that information from the brand itself, through alternative media streams as mentioned above. In fact, “that minimalism in packaging and less detail is actually seen as something that’s more trustworthy, because something that’s overly detailed makes customers think that there might be ‘fine print’ involved” that might disadvantage them, Rodney says. “So, you might just paralyze the person, and they walk away from the experience.”

This approach is different than that of “legacy supplement brands,” says branding and design expert Yadim Medore, founder and CEO of Pure Branding (Northampton, MA). “Those supplement brands...have built their brands around structure/function and features and benefits. It’s a battle of value and equity of a ‘lifestyle’ brand versus the legacy supplement brands that are about merely solutions and that lead with the science.”

The old way isn’t always the best way, though. Ultimately, Medore says, many brands make identical claims that end up neutralizing each other. “Over the past 20 years, we’ve identified classic pitfalls that supplement brands fall into time and again—they lead with science, they believe their technology differentiates them, they believe their solution is the best and highest quality,” says Medore. “These are all merely cost of entry, and when every brand is making these same claims, it’s just noise.”

Lifestyle brands that “know what their brand stands for” may have the advantage here. “These fashion or hip celebrity brands come with a fully evolved and differentiated positioning that speaks directly to their constituency,” says Medore. “A lifestyle brand, at its core, is one that seeks to inspire, guide, and motivate—and, in its largest sense, inspire a movement that defines a way of life. They position their supplements as part of that lifestyle. They don’t need to lead with the science”—although, he adds, a company better have the goods (the science and the efficacy) to back its product.

“The issue is not about how much or little the scientific evidence is included in the packaging,” Medore continues. “It’s how it’s positioned in relation to gaining the trust of the consumer. We know from our research that credibility ultimately comes from the brand meaning, and not the science. The science just adds assurances.” In general, he says, “The clarity of a successful lifestyle brand allows us to connect with it beyond the clutter of competing claims and features and meet it more authentically.”

The emergence of lifestyle brands in the supplements space could ultimately end up giving legacy brands a needed push to look within. “I see this as positive disruption,” Medore says, “which will force legacy supplement brands to really examine what is the meaning of their brand.”

Jennifer Grebow
Editor-in-Chief
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New Bill Opens Legal Doors for U.S. Hemp, CBD

On April 12, Senate Majority Leader Mitch McConnell (R-KY) introduced the Hemp Farming Act of 2018, a bipartisan bill that would see industrial hemp regulated as an agricultural crop and remove it from Schedule I of the Controlled Substances Act.

The predecessor 2014 Farm Bill, signed into law by President Obama, legalized hemp growing solely for research purposes—for instance, by state departments or universities. But the Hemp Farming Act of 2018 goes much further, classifying hemp ingredients (with THC levels under the 0.3% threshold) as an agricultural commodity and removing federal roadblocks to growing industrial hemp across the U.S. Accordingly, hemp formulated into food and beverages would be considered agricultural ingredients. The hemp phytocannabinoid cannabidiol (CBD) would also be considered an agricultural commodity, said the lobbyist group U.S. Hemp Roundtable, which represents a coalition of hemp companies.

Hemp industry advocates strongly support the 2018 Hemp Farming Act. U.S. Hemp Roundtable said on its website that the bill “would clarify that nothing in the Controlled Substances Act would alter the status of hemp or hemp products—an important provision for this once-controversial topic.”

Grassroots hemp advocacy group Vote Hemp also expressed enthusiastic support for the bill, saying that it is “strongly poised to pass” in the 115th Congress. “If passed, the bill would remove roadblocks to the rapidly growing hemp industry in the U.S., notably by authorizing and encouraging access to federal research funding for hemp, and remove restrictions on banking, water rights, and other regulatory barriers the hemp industry currently faces,” the group said.

Vote Hemp noted that in 2017 alone, under the authorization of the 2014 Farm Bill, 25,541 acres of industrial hemp were “lawfully cultivated” in 19 states. “To date, 34 states have defined industrial hemp as distinct and removed barriers to its production,” it said.

A spokesperson from CV Sciences, a CBD pharmaceuticals and consumer products supplier based in Las Vegas and a founding member of the U.S. Hemp Roundtable, spoke to Nutritional Outlook on behalf of the CBD community, stating: “This is a monumental step in the right direction for the future of hemp in the United States. Seeing such strong support from legislators on both sides of the aisle is encouraging for this once-controversial topic and proof that, once [people are] educated about the crop and the innovative products it can create, this is something that becomes a commonsense bill for those who are willing to listen and learn. Passage of this legislation will allow farmers and U.S. companies a true opportunity to operate freely and scale appropriately as the market continues to grow at rapid rates.”

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T  ose items include:

- De-scheduling hemp—specifically, the parts of the *Cannabis sativa* L. plant with THC concentrations less than 0.3%—from the Controlled Substances Act, meaning that these hemp parts would no longer be considered Schedule I drugs.
- States will be able to oversee hemp growth and cultivation, expanding growth beyond what was allowed under the 2014 Farm Bill’s pilot programs. The bill also legalizes hemp growing in tribal lands, reservations, and U.S. territories—areas previously excluded by the 2014 Farm Bill.
- As an agricultural crop, hemp would be considered agricultural commodities, not controlled substances.
- States will be able to oversee hemp growth and cultivation, expanding growth beyond what was allowed under the 2014 Farm Bill’s pilot programs. The bill also legalizes hemp growing in tribal lands, reservations, and U.S. territories—areas previously excluded by the 2014 Farm Bill.
- As an agricultural crop, hemp would be required to provide FDA with details about their hemp program plans. "The states would submit a regulatory plan to USDA, which must demonstrate policies to pinpoint locations of hemp production, to test for THC, and to destroy uncompliant plants," said U.S. Hemp Roundtable, adding that many states have already developed such processes under their hemp pilot programs and that these could easily transition to meet the new bill’s requirement.
- The bill "would clarify that nothing in this Act authorizes interference with the interstate transportation or commerce of hemp or hemp products—an important statement to protect hemp farmers and businesses from misguided regulatory overreach," U.S. Hemp Roundtable said.

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The Enduring Energy Drink

Despite a slowdown in product innovation, energy drink sales continue to rise.

BY INNOVA MARKET INSIGHTS

Good news for energy drinks! They continue to outperform the overall soft drinks market in terms of value, with their share of the category rising to 8% in 2017 and their global value reaching about €44 billion. This growth is happening despite an apparent slowdown in product innovation. Fewer new energy drinks have launched over the past five years. In 2017, energy drink new product launches accounted for less than 2.7% of global soft drink launches, an even smaller share than 5% in 2012.

There are a few reasons for this slowdown. One is the fact that there is likely relatively limited innovation opportunities in the category. Another factor is the dominance of multinational brands in many regions. As the market has become more established, and mainstream soft drink companies have entered and acquired or developed global energy drink brands, the number of smaller, diverse brands entering the market has shrunk substantially in the face of the global brands investing in high levels of product promotion.

The U.S., with its relatively mature market, has followed a similar pattern as the global market, with energy drink launch numbers falling to account for just 2.8% of total soft drink introductions in 2017, putting it only marginally ahead of the global figure. The U.S. market is dominated by non-aseptic, mainly canned drinks from iconic brands such as Red Bull, Monster, and Rockstar. These giants are focusing heavily on adding new formats and flavors.

Red Bull, for example, has continued to develop its Editions range, with sugar-free Purple (açai berry) and Lime (limeade) flavors added to the range in early 2017. They join the existing Red (cranberry), Blue (blueberry), Yellow ("tropical"), Orange (tangerine), and Green (kiwi) flavors. The company has already lined up its limited-edition flavor for the summer of 2018: a Coconut Twist in a white and silver can.

Ongoing Trends

Among the new energy drinks that are launching, there are a few notable, continuing trends.

A continued focus on sugar-free formulas is no surprise in the light of rising global pressure to reduce sugar content in soft drinks. "Low" and "light" versions of energy drinks—including what several energy drink brands are marketing as "zero" drinks (meaning either zero calorie or zero sugar)—accounted for over 40% of U.S. energy drink launches in 2017. Low-calorie claims were used on 39% of new energy drink launches, and sugar-free claims were used on 25% of new launches, indicating the considerable overlap and the rising popularity of these "zero" products.

"Low" and "light" claims were the most commonly used health claims for launches, after energy/alertness claims, which, perhaps not surprisingly, were featured on virtually all introductions.

Clean-label claims took third place, used by nearly 35% of launches in 2017. Here, organic claims were the most popular, featured...
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on nearly 25% of introductions. Organic claims tend to be used alongside a range of other health claims, as exemplified by Core Hydration’s Core Organic Energy range, which also highlights other features such as low calorie, gluten free, and vegan.

Unique Flavors: Coffee on the Rise

Energy drink launches are also featuring more upmarket and on-trend flavors. The aforementioned Core Hydration products are sold in a range of exotic superfruit flavors such as Lemon & Ginger, Pomegranate Blue Acai, Tropical Berry, and Tropical Coconut. Meanwhile, Zola Organic Hydrating Energy Drinks all feature coconut water and have fashionable flavors such as Acai Berry, Pineapple-Coconut, and Matcha Green Tea.

Coffee flavors are also very much in vogue. Natural caffeine ingredients from coffee have been part of energy drinks for some time as the clean-label trend gains momentum, but many products are now highlighting coffee as a significant ingredient or flavor. The trend toward more upmarket cold-brewed coffee has also reached the energy drinks market, with launches including Wonder Fuel Coconut Oil MCT Super Drink with Cold-Brewed Coffee, which bases its energy properties around medium-chain triglycerides from coconut, and caffeine from coffee.

Energy Claims

Consumers’ overall interest in beverages that provide energy benefits is not just confined to the energy drinks market. In fact, 7.6% of overall U.S. soft drink launches featured energy claims in 2017. And while energy drinks obviously make up the largest sector of drinks making energy claims (accounting for 35% of the total), it’s notable that more iced coffees are also making energy claims. Over 14% of U.S. iced coffee launches used energy/alertness claims in 2017, compared with less than 6% of iced tea launches and just 2% of juices/ juice drink launches using energy claims.

While caffeine is a naturally present energy source for iced coffee products, beverages such as juice drinks have to look to other ingredients to supply energy, with increasing focus on ingredients such as yerba mate and green matcha. In juices and juice drinks, there is a focus on natural sources of energy, including so-called superfruit and vegetable blends and green formulations.

The demand for energy sources seems set to continue. Energy drinks have risen in popularity with demand for quick, easy, and widely available sources of physical and mental energy for increasingly busy lifestyles and continue to offer particular appeal to younger people, too.

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How will suppliers increase the supply of in-demand glycosides like Reb M and Reb D?

BY JENNIFER GREBOW, EDITOR-IN-CHIEF

S
tevia (Stevia rebaudiana) has made great global strides in just a decade as a zero-calorie food and beverage sweetener. In March, stevia supplier PureCircle (Chicago), together with market researcher Mintel, reported that the worldwide number of foods and beverages launched with stevia grew by more than 10% in 2017 over 2016, with 3500 such products launched in 2017 alone. Overall, they estimated, stevia is now present in more than 16,000 food and beverage products across the globe. Also, as stevia use grows, this plant-based sweetener is taking market share from other high-intensity, low-calorie sweeteners like aspartame, sucralose, and acesulfame potassium. In 2017, Mintel said, stevia was more widely used than aspartame in foods and beverages containing high-intensity sweeteners.

The drive toward stevia is the direct result of growing global concerns about obesity and diabetes prevalence, and a subsequent effort to reduce sugar consumption among consumers young and old. Mintel noted that the number of stevia-containing food and beverages launched specifically for young children grew a whopping 16% between 2016 and 2017.

Whether it’s in beverages, snacks, dairy products, or confectionery, the opportunities for stevia are ripe—and ripening further as suppliers improve the taste of their stevia ingredients.

Some suppliers are now working on producing greater quantities of the stevia leaf’s minor steviol glycosides, like rebaudiosides M and D, which are said to taste more sugar-like compared to the more common steviol glycoside rebaudioside A. (Some Reb A sweeteners are said to have a bitter, or licorice-like, aftertaste.)

Unfortunately, minor glycosides like Reb M and Reb D are still in smaller supply compared to a major glycoside like Reb A. This is chiefly because there is a much smaller quantity of these minor glycosides in the stevia leaf compared to a glycoside like Reb A.

For suppliers, the question right now is how best to increase access to glycosides like Reb M and Reb D. Some believe the answer is still rooted in stevia leaf extraction—namely, gradually breeding stevia leaves that yield higher percentages of the minor glycosides. (As discussed later, some companies are also further enzymatically treating their stevia leaf extracts to improve taste.) This kind of plant breeding takes time, however, and, as one can imagine, significant scale-up of these glycosides within the leaf can take years, often decades, to achieve.

On the other hand, one company, Cargill (Minneapolis), has finally come to market with a stevia ingredient it’s been developing for years—one that does not involve traditional leaf extraction at all. Dubbed EverSweet, this Reb M and Reb D sweetener is produced using fermentation. (Cargill worked with fermentation ingredient specialist Evolva in Reinach, Switzerland, to produce EverSweet.) While EverSweet is not extracted from the stevia leaf, that is exactly the point, the companies would say. EverSweet’s Reb M and Reb D glycosides can be produced through fermentation alone (in fermentation tanks), meaning one does not have to rely on plant breeding, agricultural farming, or on land and water use to make it.

Opinions remain mixed on the best way to scale up production of Reb M and Reb D. For instance, the companies that remain committed to the notion of leaf-based stevia say that adhering to leaf-based extraction is key to preserving stevia’s biggest selling point: the fact that it is a natural, zero-calorie plant-based sweetener. (Other major zero-calorie sweeteners like aspartame, sucralose, and acesulfame potassium cannot say the same.)

But, in the face of growing demand for these minor glycosides, is it truly possible,
through traditional leaf extraction, to sufficiently increase supply and to do so in a timely manner? Or, will more food and beverage makers seek ingredients like Cargill’s EverSweet that are produced using alternative methods?

**Why Reb M and Reb D?**

First, let’s review again why minor glycosides like Reb M and Reb D are so darned desirable.

Listen to how ingredient supplier Ingredion (Westchester, IL) describes the Bestevia brand of Reb M and Reb D ingredients it supplies. Bestevia Reb M, launched in 2017, "is 300 times sweeter than sugar and offers a sweet taste experience that is very sugar-like," says Afrouz Naeini, senior marketing manager, sweetness and beverage, Ingredion. "The clean sweetness, coupled with the lack of bitter aftertaste that is typically associated with stevia sweeteners, enables formulators to replace up to 100% sugar in their product design using a naturally based stevia sweetener." (Ingredion distributes the Bestevia line on behalf of the ingredients’ developer SweeGen, which is located in Rancho Santa Margarita, CA.)

Bestevia Reb D offers similar benefits, says Kurt Callaghan, marketing manager, global sweetness innovation, Ingredion. "Reb D has a cleaner taste than traditional stevia sweeteners, and sensory mapping shows that Reb D has a sweetness time intensity closer to sucrose than other stevia products," he says.

Because steviol glycosides like Reb M and Reb D taste more like sugar, formulators can more easily use them to replace a greater amount of sugar—and cut more calories in the process—without negatively impacting product taste. The glycosides’ better taste also reduces the necessity of using taste modulators, points out Katherina Pueller, director, natural sweetener business, SweeGen. "By using Bestevia Reb M and Reb D with that clean, sugar-like taste in their applications, formulators save cost on bitter-maskers," Pueller says. And because these glycosides are 200-300 times sweeter than sugar, even “small amounts have a huge impact” on sweetening, she says.

Benefits like these are why Reb M and Reb D have come to the fore, say Ingredion and SweeGen. (Last November, the companies jointly announced that Bestevia Reb D received a "no objections" Generally Recognized as Safe (GRAS) response from FDA, clearing its use in U.S. foods and beverages.)

In order to get consumers to permanently switch to lower-sugar foods and beverages, formulators must ensure that these products don’t sacrifice taste. As such, it would not be surprising if companies that are already engaged in formulating with stevia—including CPG giants like The Coca-Cola Co., Kraft Heinz, Nestlé, Groupe Danone, and PepsiCo—increasingly demand greater supplies of better-tasting steviol glycosides.

**Starting with the Leaf**

Currently, suppliers have different ways of producing Reb M and Reb D. Some suppliers start with stevia leaf extraction and further employ the use of enzymes to refine taste.

Of the Bestevia process, SweeGen’s Pueller says, "Our Reb M and Reb D are produced by a proprietary bioconversion process. Starting with extracts from the stevia leaf, we use enzymes as processing aids to increase the amount of the preferred, best-tasting components. Our bioconversion process is unique and enables us to produce Reb M and Reb D in great quantities."
In short, she says, “We combine nature, science, and bioengineering to produce sustainable products.”

FDA’s recent “no objections” GRAS letter for Bestevia Reb D describes the process even more specifically: “The process uses a non-pathogenic and non-toxicogenic strain of *Pi-chia pastoris* (derived from *P. pastoris* ATCC 20864) expressing a uridine-5’-diphospho-(UDP) glucosyltransferase that catalyzes the conversion of rebaudioside A to rebaudioside D and a sucrose synthase that catalyzes the conversion of UDP to UDP-glucose.”

PureCircle also uses enzymes to produce some of its stevia ingredients. In a 2016 *Nutritional Outlook* interview, Faith Son, PureCircle’s vice president of marketing and innovation, described the process the company uses for some of its ingredients this way: “Within our portfolio, we also have leaf-based ingredients that are glycosylated,” she said. “These ingredients start with a traditional stevia leaf extract that’s purified to 95%, and with the use of natural enzymes, add glucose or other sugar molecules to improve taste. We are very transparent about how these products are made and how they differ from our other leaf-based product.”

For this article, she adds, “As the industry-leading innovator and supplier of great-tasting stevia ingredients for the global food and beverage industries, we have a responsibility to understand the various alternative technologies used to produce stevia ingredients. We have specific products we offer which leverage glycosylation, which is processed similar to traditional stevia leaf extracts, as it all begins with the stevia leaf.”

Companies extracting stevia from the leaf say that improving the taste of stevia sweeteners begins with breeding leaves that contain higher amounts of minor glycosides like Reb M and Reb D. Several of the stevia suppliers we interviewed for this article are now focused on 1) breeding leaves with higher contents of Reb M and Reb D, and 2) increasing acreage of these improved leaves.

In February, for instance, PureCircle announced plans to significantly increase its acreage of StarLeaf, PureCircle’s proprietary stevia plant developed through its PureCircle Agronomy Program and its expertise in traditional cross-breeding. The company says StarLeaf “yields roughly 20 times more of the newest and best-tasting stevia leaf sweeteners than conventional stevia varieties.” Son specifies that StarLeaf provides higher concentrations of Reb M and Reb D, along with some other rare glycosides. It also contains Reb A.

A lot of the StarLeaf scale-up is happening in North Carolina, where lands once used to grow tobacco are now being used to grow StarLeaf. Sweet Green Fields (Bellingham, WA) is another stevia supplier who has grown stevia in North Carolina.

Son says PureCircle’s agricultural partnerships are providing economic opportunities to farmers in the area. “We discovered that the skillset for growing tobacco translates extremely well to growing stevia,” she

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says. “North Carolina also has the soil and climate conditions conducive to growing stevia plants. We are also able to provide North Carolina’s tobacco farmers with new economic opportunities due to the declining demand for tobacco.”

In a press release, PureCircle stated, “Expanding the planting and use of [our] proprietary StarLeaf stevia leaf will enable the company to meet the increasing demand of [the] food and beverage industries for the best-tasting—and most sugar-like—zero-calorie stevia sweeteners.”

Son says PureCircle’s long-term plan is to convert all of its stevia crop to StarLeaf. The conversion process is happening in stages. The company said it plans to plant 16,000 tons of StarLeaf this year and estimated that 80% of the stevia plants it uses this year will be StarLeaf; by next year, it said, this percentage could be as high as 90%.

In a press release announcing the new StarLeaf plantings, James Foxton, PureCircle’s vice president of agriculture operations, said, “We look forward to providing food and beverage companies access to the most sugar-like content from the leaf, at a scale which has never before been possible.”

Other stevia suppliers are also focusing on agronomy improvements to produce more of the minor glycosides. Elaine Yu, president of stevia and monk fruit supplier Layn USA Inc. (Newport Beach, CA), says her company has an innovation center in Shanghai “focused on increasing the yield of exotic steviol glycosides like Reb C and Reb D.”

In February, two companies, natural-sweeteners supplier GLG Life Tech Corp. (GLG; Richmond, BC, Canada) and ingredients firm Archer Daniels Midland (ADM; Decatur, IL), jointly announced the debut of their new Reb M ingredient, which is produced from GLG’s proprietary Dream Sweetener stevia leaf. They said this leaf is “exceptionally high” in Reb M, in addition to containing Reb A and Reb D. Brian Meadows, GLG’s president, says this is the first time the company is supplying a Reb M ingredient.

GLG and ADM take care to point out that this new Reb M product line is physically extracted from the stevia leaf and produced without the use of fermentation or enzymatic processing. A press release from the companies states: "Other competing products in

IMPROVING THE TASTE OF REB A INGREDIENTS

By now, most would call Rebaudioside A a commodity glycoside. Reb A is the steviol glycoside that has been used in the stevia market the longest. It was the first steviol glycoside approved in the U.S. back in 2008. It’s the steviol glycoside most present in the stevia leaf. It is produced at largest scale and, as such, is supplied at commodity prices. However, one of the common challenges associated with formulating with Reb A is that Reb A has a bitter, lingering aftertaste. Last fall, however, stevia supplier Sweet Green Fields (SGF; Bellingham, WA) announced a new development: its new Optimizer Stevia line that aims to retain the affordability of Reb A but provide a better-tasting ingredient.

How did the company improve Reb A’s taste? Namely, by blending Reb A with other glycosides. Mel Jackson, PhD, chief science officer for Sweet Green Fields, explains that there are “two paths” to improving Reb A’s taste. The first is to improve the ingredient’s purification. “Purifying Reb A above 97% and eliminating the impurities from the leaf to the largest extent helps obtain a purer sweetness than the crude extracts.” The second way, he says, is to include “Reb A in a proprietary combination with other steviol glycosides,” which is what SGF has done with its new Optimizer Stevia line.

Jackson says this approach enabled the company to create Optimizer sweeteners that are more sugar-like and that outperform standard commodity stevia grades (Reb A 80–Reb A 97), while also preserving Reb A’s cost advantages. Optimizer Stevia’s cost is up to 30% less than that of a more expensive, high-purity Reb A grade like Reb A 99. “Optimizing the blend to produce a desired sensory outcome at an affordable price has resulted in compositions that can easily outperform Reb A–dominated stevia extracts and provide a cost savings,” he says. He adds that the four ingredients in the Optimizer Stevia line are best suited to “formulators who are aiming to achieve a medium level of sugar reduction, typically up to 6 brix.”

Last April, Sweet Green Fields entered into an exclusive distribution partnership with ingredients distributor Tate & Lyle (London). Tate & Lyle is distributing SGF’s stevia products, including the new Optimizer Stevia line.

Jackson says that while he believes highly purified Reb A products are “losing market share to some proprietary stevia extracts that are promoted heavily by the leading stevia suppliers in recent years,” Reb A ingredients still have their place in the market, and they are not going away anytime soon.

“For now, Reb A is prevailing due to cost considerations and partially the time it takes to test and commercialize a new ingredient in consumer products,” he says. Combinations are likely the way forward, he says, as “more customers are trialing and starting to like the taste profile of the steviol glycosides compositions—for example, Reb A with Reb B, Reb C, Reb D, Reb M, stevioside, and others.”
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the market use chemical treatments or are produced using fermentation processes that employ non-natural, bioengineered fermentation organisms and enzymes. The companies say that because their ingredients do not use fermentation or enzymatic processing, they give formulators greater leeway to use them in countries “that otherwise do not permit use of stevia extracts when produced using bioconversion or fermentation methods.” In addition, they say, “Because there are no enzyme enrichment or fermentation techniques employed in the production of GLG’s Reb M product line, they are also clean-label ingredients, an added benefit to formulators looking to meet the growing demand for clean and clear labels…”

Meadows provides a quick overview of the process GLG went through to develop the Dream Sweetener leaf. “GLG developed its high-Reb M Dream Sweetener seedling over the past five years,” he says. The company first publicly announced it had created a high-Reb M seedling back in 2015. That seedling contained 4% Reb M as a percentage of total steviol glycosides. “Historically, stevia seedlings contained less than 1% of Reb M as a percentage of total steviol glycosides,” Meadows says. For comparison, he says, “This high-Reb M seedling was a 1000% increase in Reb M compared to the levels contained in GLG’s Reb A seedlings.”

A year later, in 2016, GLG announced an improved version of the seedling, one that contains 8% Reb M as a percentage of total steviol glycosides. In 2017, GLG began planting this 8%-Reb M seedling, and it now serves as the source of the new Reb M ingredient GLG and ADM are selling commercially.

Meadows says GLG’s goal is to continue increasing the percentage of Reb M in the leaf. “GLG is focusing on developing even higher concentrations of Reb M in the Dream Sweetener leaf and has two agricultural programs focusing on achieving this.” He says the company is also working with “a leading agricultural university” to increase Reb M yields. Last year, the research partnership achieved a “major breakthrough;” seedlings that contain more than 50% Reb M as a percentage of total steviol glycosides, he says. GLG may commercialize this new variety in the future, Meadows says, and also plans

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**STEVIA, NOW WITH ALLULOSE**

Allulose, or D-allulose, is an up-and-coming ingredient in the sweetening world. This low-calorie sweetener, which naturally occurs in sources like wheat, figs, raisins, and jackfruit, is molecularly similar to fructose and glucose, but it has an outstanding quality: because it is not rapidly digested, metabolized, and absorbed by the body like fructose and glucose are, it does not impact blood sugar and insulin levels and thus is safe for use by those controlling blood sugar levels, such as those with diabetes, in addition to being attractive to people following low-sugar/low-carb or ketogenic diets.

While allulose is only 70% sweet when used alone, one company, Icon Foods (formerly Stevia Ingredients; Portland, OR), is combining allulose with high-intensity sweeteners stevia and monk fruit. The resulting blends can be used to replace sugar as a sweetener, while being lower calorie and blood sugar friendly. The company is supplying the ingredients under the brand name KetoseSweet. (The purely-allulose ingredient is called KetoseSweet, while versions including monk fruit, stevia, or both are called KetoseSweet+.)

Thom King, president and CEO of Icon Foods, describes how the KetoseSweet+ ingredients containing stevia and/or monk fruit formulate similarly to sugar, while providing good mouthfeel. “The KetoseSweet+ flavor profile is very neutral, with a mouthfeel very similar to sugar. Allulose on its own is only around 70% as sweet as sugar, so a high-intensity sweetener is required to bring it to just about parity,” he adds. When combined with stevia and/or monk fruit, he says the combination is a “one-for-one plug-in replacement for sugar.”

As such, he says, “since KetoseSweet+ is nearly identical to sugar in every way, including functionality, replacing sugar is really easy.” It can be used in carbonated and non-carbonated beverages, baked goods, frozen desserts, syrups, gums, confectionary, and more, and it can even contribute functional improvements such as moisture binding and browning via Maillard reaction.

As far as KetoseSweet+’s calorie content, the company says it is comparable to the sugar alcohol (polyol) erythritol, but sidesteps any laxative effects or cooling effect. “Compared to sugar’s 4 calories per gram, KetoseSweet+ [both stevia and monk fruit versions] has only 0.2 calories per gram,” King says. He adds that researchers in Japan recently found that allulose may also enhance fat metabolism and help maintain a healthy body weight.

The composition of KetoseSweet+ is in the neighborhood of 85% allulose and less than 15% stevia and monk fruit, King says. All three sweeteners, when combined, “pass through the digestive system unmetabolized,” he says.

King says his company is finally moving to allulose now that supply is stabilizing. “This is the first allulose-based sweetening system Icon Foods is offering,” he says. “We considered it for the past five years, but we didn’t feel like the supply chain was solid enough, and the price was too high. Now, it is at parity with most polyols, and cheaper than some, so it is now a viable option.”

King says that one of Icon’s supply chain partners, Tate & Lyle (London), which supplies the Dolcia Prima allulose line, is now petitioning FDA to exclude allulose from being listed as an added sugar on U.S. Nutrition Facts labels because, unlike other sugars, it is not metabolized by the body and has “negligible” calories. At the time of publication, an FDA response was still pending.
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Sweeteners

Breeding Takes Time
Agronomy advancements via traditional plant breeding don’t happen overnight. Dean Francis, CEO of supplier Sweet Green Fields, says his company has been “naturally breeding [its] stevia varieties to improve yields and the taste for over a decade.” He briefly touches on some of the breeding challenges suppliers can encounter. For instance, he says, “It’s known that a variety that shows a high content of steviol glycosides or strong resistance to diseases in one region may not be able to perform equally well if it is grown in another region.”

Farmers also grow these leaves at the mercy of Mother Nature. In its press release announcing the scale-up of StarLeaf, Pure-Circle cautioned that, “as with any agricultural crop,” the scale-up of StarLeaf plantings is “subject to various conditions such as weather.”

Enter EverSweet
Cargill says that its EverSweet sweetener sidesteps agricultural challenges because it doesn’t rely on land use and plant breeding to produce. Instead, through fermentation, the company says it can quickly scale up production of Reb M and Reb D.

EverSweet’s development did not happen overnight; on the contrary, Cargill and Evolva have been refining its production process for years. Finally, this March, the companies announced that the ingredient is officially in commercial production.

EverSweet contains the glycosides Reb M and Reb D. Mandy Kennedy, Cargill’s senior marketing manager, describes EverSweet’s advantages: “Only a tiny fraction (less than 1%) of these sweetest steviol glycosides, Reb D and Reb M, are found in the stevia leaf. With such small quantities available in the plant, it would require significant land use and produce too much waste”—meaning, any unused parts of the leaf—“to be commercially or environmentally viable.”

She concludes, “Producing them through fermentation is an inherently more sustainable and cost-efficient way to make the best-tasting steviol glycosides available in sufficient quantities in the mass market.” Fermentation, the firm says, means there is “flexibility to expand [EverSweet’s production] rapidly and cost-effectively.” Cargill says supply is also consistent; by taking place in fermentation tanks, EverSweet’s production isn’t affected by variables that impact traditional agriculture, like poor weather.

Kennedy describes EverSweet’s process thusly: “We feed dextrose (a simple sugar made from corn) to the yeast during the fermentation process. The yeast produces two of the sweetest steviol glycosides found in the leaf, Reb D and Reb M. We separate the yeast from the Reb D and Reb M compounds during the purification process.”
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An Alternative

Cargill emphasizes that it does not propose EverSweet as a complete replacer of leaf-based stevia ingredients. In fact, the company still offers and continues to grow its own portfolio of leaf-derived stevia ingredients, including its ViaTech line. The company also continues to work on breeding improved stevia leaves—and, in fact, Kennedy points out that Cargill’s expertise in growing canola crops also informs the company’s best practices for breeding stevia plants.

Instead of replacing leaf-based stevia, Kennedy says, “EverSweet is meant to open new market opportunities where stevia leaf extract does not play today. Our new sweetener will give consumers more options for great-tasting, reduced- and zero-calorie products.”

At the Natural Products Expo West trade show in Anaheim, CA, in March, Kennedy said the market could even see products launching with EverSweet in the next year or two. She added that, like with stevia sweeteners in general, beverages are often an easier place to start because, unlike with food products, formulators do not have to worry as much about the bulking properties and texture that are lost when replacing sugar with a high-intensity sweetener like stevia.

The EverSweet launch was postponed initially, chiefly because Cargill and Evolva needed to further improve the process’s glycoside yields and cost parameters, Kennedy told Nutritional Outlook at Natural Products Expo West. “Over time, we’ve increased the efficiency of the yeast turning basic sugars into steviol glycosides, as well as improved the efficiency of the purification step. This has allowed us to produce EverSweet sweetener cost-efficiently.”

Now, she says, “Cargill has achieved a suitable scale and cost-efficient supply of the sweetest steviol glycosides, Reb D and Reb M, through fermentation.”

Exploring All Avenues

Moving forward, Cargill’s stevia portfolio looks like it will comprise a combination of leaf-based stevia ingredients and stevia ingredients produced through alternative means.

Other industry leaders are also evaluating their own production processes. In April, PureCircle published a press statement noting that, in addition to focusing on extracting higher amounts of Reb M and Reb D from StarLeaf, the company is also exploring other avenues in an attempt to produce more of those glycosides.

In the statement, the company said it “now has two ways” of producing Reb D and Reb M. It said: “PureCircle continues to produce Reb D and Reb M by extracting them from its proprietary StarLeaf plants. But now it can also produce Reb D and Reb M in much greater scale, directly using the more abundant Reb A in the production process. The Reb D and Reb M produced from the two processes are from the stevia leaf and are identical in great taste.”

Carolyn Clark, PureCircle’s director of global marketing, says that the details of the process involving Reb A are proprietary, but adds, “The most important takeaway is all the Reb M and D we produce are from the stevia plant and are identical in great taste.”

In its public statement, the company further noted that more consumer brands are “already using PureCircle’s Reb D and Reb M in their products” and that “PureCircle’s expansion in production of Reb D and Reb M will increase the supply of these stevia sweeteners with the most sugar-like taste.”
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The company said it’s already begun “ramping up” production of Reb D and Reb M, with PureCircle CEO Maga Malsagov stating that “large-scale volumes are now available at attractive prices.”

“That will help the beverage and food companies get access to an ingredient they need, as they continue to respond to their consumers’ desires for more zero- and low-calorie products using plant-based sweeteners,” the company added.

**To Market, To Market**

As stevia suppliers introduce different types of Reb M and Reb D sweeteners, in the end, formulators—and, possibly, well-informed end-use customers—will determine which type is right for them. Each has its advantages.

For instance, Sweet Green Fields’ Francis says, “In the long term, it is likely that stevia sweeteners produced by fermentation and/or bioconversion may be lower cost versus traditional stevia extracts.” However, he says, “although bioconversion starts with the stevia leaf and converts to a targeted glycoside, fermentation is a completely different process” and that “to produce a stevia glycoside from fermentation does not even use stevia leaf whatsoever.”

Meanwhile, Kennedy says that EverSweet gives formulators who may have had trouble sourcing Reb M and Reb D another option. “What we’ve been hearing from formulators is, ‘I really want to get my hands on Reb M or Reb D, but I can’t track any down from leaf,'” Kennedy said at Natural Products Expo West. These formulators might now try EverSweet instead.

“What we’d been hearing from formulators is, ‘I really want to get my hands on Reb M or Reb D, but I can’t track any down from leaf,’” said Mandy Kennedy, Cargill.

Companies also have another option for improving stevia-sweetener taste, which is to formulate with a blend of glycosides, both major and minor. As Layn’s Yu says, “Today, we are seeing more and more CPG companies combining multiple steviol glycosides because the combination provides a better customized sweet solution.”

Many stevia suppliers agree that blends are a good answer. This includes blends with various glycosides as well as with other kinds of sweeteners.

At Natural Products Expo West, for instance, Kennedy said that while EverSweet can serve as the sole sweetener in some product applications, “I think we’re going to see combinations with EverSweet”—such as those marrying EverSweet and leaf-derived stevia ingredients. Products containing both could be labeled as containing both “stevia

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leaf extract” and “steviol glycosides” (from EverSweet), she said.

“We have research that shows that when you combine stevia leaf extract with steviol glycosides on a label, there’s an overall improvement in purchase intent and the overall halo of healthfulness,” she added. Other Cargill sweetening ingredients, such as chicory root fiber, can also pair with stevia.

GLG/ADM point out that their high- Reb M ingredient “blends well with other sweeteners, such as monk fruit and sugar alcohols, to create balanced sweetness.”

As for PureCircle, Son says, “Through all of our research at the application level, we’ve found that a combination approach—blends of glycosides—is often what is most successful.”

She continues, “We have learned there is tremendous advantages to using the entirety of the stevia leaf in formulations. When blends of the individual stevia ingredients come together, they produce certain taste synergies, which can result in improved taste performance and negate the need for masking agents.”

Blends are also likely necessary, frankly, while suppliers work on optimizing Reb M and Reb D’s production and cost in use. Son says, “As we scale, these ingredients are going to become more readily available for use by companies operating globally or on a smaller scale.” In the meantime, she emphasizes, “We believe it is important to look at how combinations of various steviol glycosides can provide synergies and the most sugar-like taste within various applications. Often, it is blends of stevia ingredients which yield superior taste performance compared to single-ingredient solutions.”

And, lest we forget: applications expertise is also key. A supplier’s ability to pair the right type of glycoside and sweetener blend with the right type of product application in order to maximize efficacy as a sugar replacer is invaluable. Stevia suppliers with expertise offering specific sweetening solutions tailored to specific types of products, whether it be dairy products, beverages, or others, will find themselves a step ahead of the competition.

From Minor to Major

Within the stevia leaf is a world of sweetening possibilities waiting to be discovered. As stevia suppliers tap into the leaf’s next generation of steviol glycosides, they will continue teasing out better-tasting glycosides and figuring out ways to produce these glycosides at commercial scale. In short, one day, these minor glycosides could be major.

Son describes PureCircle’s dreams for the future stevia market, and it sounds like the dreams of many a stevia supplier. “Our vision has always been to create a global mass market for a natural-origin sweetener, and to make it affordable for global brands. The key to doing this is to increase the global supply of the very best-tasting stevia ingredients.”

If suppliers can figure out how to scale up supply of these glycosides in a way that’s successful in the market, there’s no telling how far stevia can go.
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MAKING SENSE of the Microbiome

Interest in the human microbiome is going mainstream. Here are some of the takeaways researchers have gleaned so far.

BY KIMBERLY J. DECKER

Now that startups can deliver at-home microbiome testing kits straight to your door, and with do-it-yourself fecal transplants a topic of polite conversation, we can safely say that consumer interest in the vast community of organisms that inhabit our bodies—that is to say, the microbiome—has hit mainstream status.

But rank-and-file civilians are merely catching up with the scientific community, which has been intrigued by the identity—and the implications—of the bacteria, fungi, and even viruses that make us...well, us since long before the National Institutes of Health launched the Human Microbiome Project in 2008.

And all along, research findings have had no trouble keeping investigators’ attention rapt—or keeping the dietary supplement space licking its chops at the prospect of products that can harness the microbiome’s benefits. As Joseph Petrosino, PhD, professor, Baylor College of Medicine (Houston, TX), notes, “Excitement exists because the microbiome is being shown to impact health and disease broadly, and may be readily modified to treat a specific disease state without the side effects attributed to other drug treatments.”

But it’s a long way from here to there, with plenty still to learn. Nonetheless, experts agree: No matter how long it takes to put the puzzle together, the pieces are already falling into place.

Beyond the Belly

A sure sign that “good gut bugs” have arrived is the fact that nobody still associates their benefits solely with the gut. “While I try to avoid piling on the hype,” Petrosino says, “there are microbiome studies that show associations with diseases throughout the body—skin, oral, lung, vaginal, etc.—in addition to gut microbial associations with diseases that aren’t gut-centric.”

The gut-brain axis is one example of these associations, with central theory being that the biome in the gastrointestinal tract can influence cognitive and mental states, including...
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In many cases, “it’s not clear if a microbiome that’s associated with a disease is a contributing factor or just a consequence of that disease state,” says Tate & Lyle’s Mervyn de Souza.

asocial behavior, anxiety, and depression, as well as suicidal tendencies, autism spectrum, and even Alzheimer’s disease.

Adds Petrosino, “The field is currently moving beyond association studies—which microbes or microbial-community features are associated with health?—to attempting to identify the functions encoded by bacteria and bacterial communities that are responsible for the effects observed.” The goal: identify bacterial targets for the development of new therapeutics or even diagnostic biomarkers. “In some cases, individual organisms may have a profound therapeutic impact,” Petrosino says, “or a community of organisms may be important to maintaining or promoting a healthy outcome.”

Known Knowns

Ralf Jäger, FISSN, CISSN, consultant, Pharmachem Laboratories Inc. (Kearny, NJ), agrees—to an extent. “We now have a good understanding of the makeup of the human gut microbiome,” he notes. “Yet the question still remains: Can we make short- or long-term changes to the overall makeup of the gut microbiome, and do those changes result in meaningful long-term health benefits?”

Mervyn de Souza, PhD, vice president, health and wellness, NPD, innovation and commercial development, Tate & Lyle (Hoffman Estates, IL), also notes “an acknowledgment by many microbiome researchers regarding the need to focus on causality versus correlation.” While data is rife with relationships linking, say, microbiome compositions and activities and certain health or disease states, in many cases, de Souza says, “it’s not clear if a microbiome that’s associated with a disease is a contributing factor or just a consequence of that disease state.”

What is certain, he says, is that the microbiome “has an important impact on us humans—that’s been established and, for the most part, accepted.” And the complexity of its interactions with its hosts, as well as with external factors like diet and geography, is equally undeniable. But going forward, the field will need “collaboration across broad areas of expertise to drive analysis and interpretation of the massive amounts of existing and new sequencing information,” de Souza says.

Translation to Formulation

That’s a steep hill for science to climb, and the summit’s still a hike away. Yet if researchers and patients are impatient, dietary supplement marketers might be even more so. After all, with public curiosity about the microbiome—to say nothing of good old-fashioned probiotics—as robust as ever, companies that can formulate microbiome benefits into their products stand to win. And to hear Petrosino tell it, “the translation to products or interventions is already starting to happen.”

“We already have probiotics, prebiotics, synbiotics, immunobiotics—dead ‘probiotics’—and fermented foods like sauerkraut, kimchi, and kombucha to improve gut health,” Jäger concurs. “But if the microbiome allows us to identify a specific deficiency in the gut microbiome makeup, specific and targeted probiotics might be the best way to improve health.”

Which product category will benefit most from current gut microbiome work is anyone’s guess. “But as knowledge progresses,” Jäger says, “we’ll find more ingredients that either beneficially or negatively influence the gut microbiome.”

Petrosino wagers that an advantage will accrue to products able “to distinguish themselves from the probiotics that existed before the microbiome started to be explored rigorously,” as earlier products were often “poorly formulated” or unable to deliver live organisms to the gastrointestinal sites where they’re active. And he believes that prebiotics designed “to ‘fertilize our bacterial gardens,’ as it were, will be among the first products we see emerging.”

Stepwise Process

Bringing such development to fruition “will be a four-step process,” Jäger predicts, with the first step continuing the microbiome mapping and sequencing that’s already taught us so much.

But in addition to sequencing, de Souza advocates for mechanistic studies to reveal how microbiome metabolites, for instance, might mediate important host-microbe and microbe-microbe interactions. For example, he says there’s “solid data” on the production of short-chain fatty acids in the colon that impact mineral absorption; research his company has conducted with Connie M. Weaver, a professor in the department of nutrition science at Purdue University, has found that the microbiome, in concert with a branded form of Tate & Lyle’s soluble fiber, mediates calcium absorption and bone strength. “We could use more information on the breadth of microbiome-derived natural products, the functional roles of these metabolites and corresponding host impacts, as well as the influence of diet,” he says.

After sequencing and mechanistic work, Jäger continues, we’ll still need to identify “unique features of the microbiome for specific subgroups of the population,” while also defining what’s “normal,” and how variations on that norm can still have a meaningful—though not negative—effect.

“Third,” he says, “we have to answer the chicken-or-egg question: Is a unique microbiome the reason for superior health or disease, or is it simply a byproduct of such status”—again, teasing correlation from causation. And the last step, Jäger says, answers this question: “Can we change the microbial makeup, and does this indeed have a beneficial effect on health?”
But even then, neither academia nor industry’s task will be complete. As Jäger says, “What will it take to translate our increasing knowledge of the microbiome into dietary supplements or functional foods? Clinical trials. Microbiome research allows us to pick the best-suited strains for specific target groups—but any potential benefits need to be validated in human clinical study.”

So, hurry up and wait. But as you do, explore the following areas to see lessons we’ve learned, and longer-term questions we still have to answer.

**Methods and Models**

One basic lesson we’ve learned from research on the human microbiome is that not all strains of gut microbes are the same—nor, even, are all species or subspecies. Yet because getting the isolate just right is important if you want to develop a probiotic that performs the desired functions, it’s a relief to know that laboratory technology keeps marching on.

“Technologies are improving the resolution with which we can identify bacterial strain-to-strain variance in individuals and the functions that some strains encode to benefit health,” says Petrosino. “These differences will have important ramifications in the selection of microbes used to treat disease and promote health.”

And that’s not all. “Improvements in cultures and animal-model systems are enabling us to understand what the microbes we associate with health and disease are doing in the host environment,” he adds. “Recent improvements in identifying viruses, fungi, and other members of the microbiome and their roles in health and disease will further impact this field.”

One basic lesson we’ve learned is that not all strains of gut microbes are the same—nor, even, are all species or subspecies.

**One Size Does Not Fit All**

What makes the “perfect” human microbiome? Turns out there is no such thing. Notes de Souza, even when looking at microbes from the same genera, “scientists have found significant variations in number among healthy individuals. These findings challenge the concept of an ideal ‘healthy’ microbiome.”

A more enlightened goal to pursue is what de Souza calls a healthy “functional core”—that is, a subset of metabolic and other molecular functions that the microbiome performs within a particular habitat, “but that can be provided by different organisms in different people,” he says. “Having the ability to maintain a healthy microbiome regardless of the definition, and potentially to identify, enrich, and maintain those microbe groups...
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Probiotics/Prebiotics

required to maintain a ‘functional core’ through dietary inputs as well as identification of critical probiotics would be hugely beneficial.”

Prebiotic Power
Probiotic R&D might appear to be the primary beneficiary of a well-mapped and -understood microbiome. But, says Petrosino, “Don’t underestimate prebiotics. To date, diet is one of the greatest means by which to impact the microbiome, and supplements harnessing the best part of our diet—insoluble fiber—will have a positive impact on our microbiome without having to worry about whether the strains in a particular probiotic will be accepted or sustained by the community of microbes that currently reside in the gut—that is, tolerated by the immune system.”

For his part, de Souza is “personally excited” about the opportunity to use specific soluble fibers and prebiotics to target specific beneficial members of the microbiome, or “guide populations toward more natural assemblages to mitigate disease symptoms, maintain healthy states, and proactively address health imbalance without compromising our pursuit of convenience, improved health, and wellbeing.”

Smarter Antibiotics
Anyone who’s had a bacterial infection owes a debt to our modern catalogue of antibiotics. But “while we’ve benefitted greatly from antibiotics,” de Souza says, “what has their true impact on the current microbiome been, and have some of our best microbial allies gone extinct as collateral damage in the war against microbial pathogens?”

Perhaps an even more interesting question is whether or not we could “harness the collective power of the microbiome to maintain the balance in our favor when it comes to general health and wellbeing,” he continues. As antibiotic-resistant bugs emerge, he sees increasing knowledge of the microbiome and prebiotics as offering an “opportunity to address this issue in a smarter way that’s more sustainable, and just as effective.”

Good Start
If he could wake up one morning and answer any pressing question about the microbiome’s effects on human health, Petrosino would pose this: “What single-best measure can be taken to ensure that you set your microbiome on the right foot immediately after birth? Or is it actually even during pregnancy?”

That’s because mounting data show that the seeds of everything from mental health, obesity, and BMI to asthma and more may germinate under the influence of early microbiota/microbiome exposure and development. “And the means to establish, protect, ensure, or correct these early-life exposures so that we all set off on the right foot toward ideal health may have a great impact on quality of life, and may also have a positive impact on the cost of healthcare,” he says.

Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.
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Prebiotics

Here’s a quick round of word association: I say “prebiotic” and you think..."Fiber," right? If that was your choice, you’re not alone. Nor are you without reason: In 2006, FDA guidance not only reinforced the prevailing definition of prebiotics as “nondigestible food ingredients that beneficially affect the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon”—that is, “fiber”—but singled out oligosaccharides as “commonly used” prebiotics, to boot. So it’s not surprising that when most of us think about what feeds our friendly intestinal flora, we think of fiber.

Now, however, emerging research suggests that this definition may in fact be too narrow. In short, it’s possible that some probiotic bacteria may receive aid and comfort from compounds that don’t fall under the historically fibrous prebiotic rubric. Case in point: polyphenols, which “are being recognized for their prebiotic potential in addition to their wider range of health benefits,” says Shaheen Majeed, president worldwide, Sabinsa (East Windsor, NJ).

Though evidence for polyphenols’ prebiotic potential remains nascent, the possibility it holds for synbiotic formulation deserves attention. So those in the know are keeping their eyes on polyphenols and the prebiotic science surrounding them. As Majeed says, “These effects are real, and polyphenols are here to make a difference in the prebiotic category.”

**Polyphenolic Protection**

It’s not as if polyphenols didn’t already deserve our love. These naturally occurring antioxidant phytochemicals—more than 8,000 of which have been identified in sources ranging from fruits and vegetables to tea, wine, chocolate, and olive oil—are the second-most abundant compounds in plants, trailing only carbohydrates.

As a class, they comprise stilbenes, lignans, phenolic acids, and flavonoids, and they exist, more or less, to protect their plant parents. But over the years, says Majeed, “research has suggested that polyphenols play a vital role in promoting our vitality and optimal health and wellness,” too, along with those of plants.

Researchers are digging into the possible prebiotic potential of polyphenols, including those from cranberry.

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According to researchers, polyphenols' bill of human health particulars runs from cardiovascular benefits, possible cancer prevention, and metabolic and blood sugar balance, to cognitive support, joint and bone health, weight management, a healthy inflammatory response, and—new to the list—optimal gut health.

Fiber Fundamentals
That’s a change of pace, as gut health had primarily been the province of probiotic bacteria and the prebiotic fibers that feed them. And that makes sense, because a preponderance of evidence affirms that probiotic bacteria are instrumental to a well-functioning gastrointestinal tract, and that prebiotic fiber encourages their proliferation.

“These bacteria are important as they may have several beneficial effects on the host, especially in terms of improving digestion and the effectiveness and intrinsic strength of the immune system,” says Stephen Lukawski, BA, MEd, global sales and marketing consultant, product development and partner, Fruit d’Or Nutraceuticals (Villeroy, QC, Canada). ‘Preliminary research has also demonstrated potential effects of probiotic bacteria on the absorption of calcium and other minerals, bowel acidity, and inflammatory bowel disease.”

As for the fibers that fuel them, those with the highest profiles as prebiotics include inulin, fructooligosaccharides (FOS), guar gum, and resistant starch. And the high profile these specific prebiotic ingredients enjoy, Majeed notes, is thanks in no small part to the “leverage given by FDA” in its aforementioned 2006 guidance on what a prebiotic is.

New Compound on the Block
“However,” Majeed continues, “over the years, newer ingredients have caught the attention of the industry, owing to their prebiotic benefits.” In fact, the International Scientific Association for Probiotics and Prebiotics in 2016 updated its definition and scope of prebiotics to encompass non-carbohydrate ingredients, Majeed notes.

And that’s where polyphenols come in. “Several studies have demonstrated that polyphenols play an important role in improving gut health by boosting the growth of beneficial bacteria in the intestine,” Majeed says. And whereas poor absorbability is often a drawback for a nutritional ingredient, the poor absorbability of polyphenols “becomes an advantage, as far their prebiotic positioning is concerned,” Majeed adds.

So how do polyphenols perform prebiotically? Their effectiveness, Majeed says, “is suggested to be due to their ability to stimulate the growth of beneficial microbiota while inhibiting that of pathogenic strains, and to their anti-adhesion activity against harmful pathogens. Overall, they’re believed to confer positive benefits by modulating gut microecology.”

Here Comes Cranberry
And while researchers have focused mainly on the flavone, flavonol, anthocyanidin, and
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“In comparison to oligosaccharides, the number of studies done on polyphenols is limited and, hence, more research is needed to ascertain their prebiotic potential,” says Sabinsa’s Shaheen Majeed.

catechin polyphenols found in fruits, vegetables, red wine, and green tea, Lukawski says it’s time for these compounds to “move over, as here comes cranberry, and it’s showing prebiotic benefits in the gut.”

To wit, a Sabinsa-sponsored study published in the International Journal of Food Science and Technology compared the prebiotic effect of Fruit d’Or’s proprietary Cran Naturelle cranberry seed powder versus FOS fiber on Sabinsa’s L- (+)-lactic acid-producing *Bacillus coagulans* MTCC 5856 probiotic preparation, marketed as LactoSpore.

The study’s results showed an increase in the viable *B. coagulans* MTCC 5856 count when the cranberry seed powder served as the sole nutrition source—demonstrating that the bacteria can actually ferment it. Additionally, under anaerobic conditions the cranberry seed powder inhibited growth of undesirable *E. coli* ATCC 25922 while supporting *B. coagulans* MTCC 5856 growth—suggesting that it contributes to a gastrointestinal environment favorable to the healthful probiotic. Finally, *in vitro* galectic acid and pancreatic enzyme digestibility tests showed that the cranberry seed powder resists gastric acid even better than FOS, though its nondigestibility to pancreatic enzymes equaled that of FOS, the companies say.

“It seems that the cranberry seed acts as a natural food source,” Lukawski says. And it’s not unreasonable to suspect that it would do so. The powder contains 20%-25% pure protein, 50% fiber, and, Lukawski continues, “all the essential amino acids. It’s also standardized to contain a minimum of 3% insoluble proanthocyanidin content. It seems to be the fuel the probiotics need to feed from, as it provides the carbon, nitrogen, and amino acids necessary to stimulate the strains hardness and growth.” No wonder he calls the powder “a superfood for various probiotic strains.”

**Cranberry Caveats**

Along with previously published literature, this new study, Majeed says, “is encouraging and certainly expands the concept of prebiotics beyond non-digestible oligosaccharides to include polyphenols as attractive alternatives.” It also adds to a body of evidence suggesting that polyphenols’ health benefits are based on their microbial use—and on the metabolites thus produced—rather than on the parent molecules themselves.

“However,” Majeed concedes, “in comparison to oligosaccharides, the number of studies done on polyphenols is limited and, hence, more research is needed to ascertain their prebiotic potential.” So product developers and ingredient suppliers should exercise the usual caution when promoting polyphenols as prebiotics.

“Like any other synbiotic preparation,” Majeed says, “products including polyphenols as a prebiotic source would require the same level of checklist for the formulators to follow.” That means clean-labels demands still apply, “and when it comes to claims and use levels, companies should have enough research data to back those levels and claims,” he says. “More importantly, formulators should design products that meet customers’ expectations in delivery format, ease of delivery, benefits, and more.”

**To Market, To Market**

Some are already doing just that—starting with Sabinsa. Its LactoCran is a synbiotic preparation combining LactoSpore with Fruit d’Or’s Cran Naturelle cranberry seed powder, and Majeed believes it’s “well positioned to break through in the synbiotic market.”

Lukawski is also bullish on the prospects for the cranberry juice that his own company launched. Called Sun Cran Naturelle, it combines Fruit d’Or’s cranberry polyphenols with Taiyo International’s (Minneapolis) galactomannan-based guar fiber ingredient, marketed as Sunfiber. “When combined with the cranberry juice,” Lukawski says, “we’re now able to deliver a dual-function product for support of a healthy urinary tract and gut health. No one has ever done this combination, and we’re the first to market.” A study exploring its anti-adhesion properties is underway at Rutgers University, Lukawski adds, with results expected “sometime in April.”

Finally, he mentions a collaboration between his company and the International Agriculture Group (Mooresville, NC)—producers of NuBana, a resistant starch extracted from green bananas. “Green banana is a natural prebiotic fiber with scientifically proven benefits surrounding its resistant starch,” Lukawski says. “When formulated with our cranberry seed powder, it becomes a superfod prebiotic that provides a combination of protein, fiber, and amino acids.”

Sabinsa is even combining its *B. coagulans* probiotics with the cranberry-banana ingredient to create what Lukawski calls “a LactoCranBana brand that’s ideal for use in nutrition bars, yogurts, smoothies, shakes, and other dairy products.” He anticipates its availability in early summer.

With all this to look forward to, it’s no wonder Lukawski is “excited for the future of the prebiotic opportunities for polyphenols,” he says. “When combining polyphenol prebiotics with probiotics, we’re entering a whole new space and category.”

**References**


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One of the most valuable skills to have in the health-and-wellness biz is knowing how to separate the novelties from the “new normal”—the passing fads from the real-live future. So as we approach a future wherein the Food and Agriculture Organization of the United Nations predicts we’ll need 70% more food to feed every human on the planet within 30 years, it’s a safe bet that whatever that real-live future has in store, it’ll have a place for plant proteins.

And yet we needn’t gaze that far into the out years to appreciate plant proteins’ impact. These phenomenally popular ingredients are already so ever-present that they no longer qualify as just au courant; they’re a bona fide movement.

But while the public may be ready for plant proteins, are plant proteins ready for the public? And are supply lines sufficiently stocked with options fit for commercial formulation? After all, any novel ingredient goes through “growing pains” as it transitions from trendy to trusted—and some plant proteins have experienced pretty rocky adjustments already.

Regardless, says Samantha Ford, business development director, AIDP (City of Industry, CA), “Whether manufacturers are ready or not, the demand for plant proteins is there and rising. If anything, that market push will drive manufacturers to innovate and ramp up their development work to keep up with consumers’ needs.” And with their wants—for consumers want more protein in their lives, and they want it to come from plants.

Voting with Their Dollars

The Good Food Institute (GFI; Washington, DC) and the Plant-Based Foods Association (PBFA; San Francisco) worked with market research firm Nielsen (New York City) to define the total retail audience for plant-based foods within Nielsen’s Expanded All Outlets Combined Channel, which scans outlets including grocery, drug, mass merchandise, club, dollar, and military stores, as well as Whole Foods Market.

They found that total U.S. retail sales of plant-based meals as well as meat, dairy, and egg substitutes topped $3.1 billion last year alone, with 8.1% growth for the sector year over year—even as sales of all food in the same channel declined 0.2%. Notes Zak Weston, corporate engagement specialist at GFI, “Many of the larger plant-based companies—Boca, Beyond Meat, Impossible Foods—report double-digit growth in sales since last year.”

Similarly, when Innova Market Insights (Arnhem, Netherlands) reported on plant protein trends last year, it found not only that consumers are leaning toward diets with less meat and more plants—fully 44.1% of U.S. shoppers surveyed told Innova that they increased their meat substitute/alternative...
consumption over the prior year—but that industry is listening. To wit, the indexed number of global new food and beverage launches bearing plant-based claims saw a CAGR of 67.6% from 2013 through 2017.

To Your Health
It’s easy to see why the plant-based category is enjoying such growth. “Plant-sourced proteins appeal to so many consumer desires,” says Pam Stauffer, global marketing programs manager, Cargill (Minneapolis). “You name it: non-GMO, organic, sustainable, vegan, non-big-8 allergen, label friendly. Consumers understand what an ingredient like pea protein is, and they feel very confident feeding products like that to their families.”

Concerns about animal welfare, antibiotics in meat, and the general sense that plant-centered agriculture is gentler on the earth than raising livestock also play to plant proteins’ benefit. But “above all,” says Shaheen Majeed, president worldwide, Sabinsa Corp. (East Windsor, NJ), “health benefits established through research are making people turn to plant sources for their protein requirements.”

He cites new Mintel research showing that 76% of Americans believe proteins from plant sources are healthy, with around 28% turning to protein alternatives for weight-management benefits. In addition to that Majeed adds, “People are consuming plant-based proteins for satiety and to build muscle mass and strength.”

Blame Millennials
According to a HealthFocus International survey, plant-based foods’ health halo factors especially strongly into younger consumers’ interest in the category. But Millennials, the survey found, were actually “more apt to cite environmental, sustainability, and social issues among their key drivers,” notes Matthew Jacobs, global product line leader for plant proteins at Cargill.

“Whether manufacturers are ready or not, the demand for plant proteins is there and rising,” says Samantha Ford of AIDP.
Whatever their reasoning, Millennials are a “driving force” in the growing popularity of plant-based foods, says Alison Rabschnuk of The Good Food Institute.

Revolution in the Dairy Case

“Given that Millennials account for 25% of the U.S. population and are estimated to spend over $1 trillion annually,” Rabschnuk continues, “their tastes are already redefining the marketplace and giving the food industry a glimpse of the mainstream foods of tomorrow”—plant proteins included.

Witness the revolution in the dairy case. Plant-based milks were a “miniscule” fraction of the total domestic dairy market until Dean Foods bought WhiteWave and moved its plant-based items to grocery dairy cases, GFI’s Weston says. “Sales exploded, and now plant-based dairy is 10% of the U.S. dairy market and growing as fast as the overall dairy category is shrinking.” And if more mature protein sources like soy, almond, and coconut still dominate milk alternatives, they’re making room for the pea protein, macadamia, pistachio, and even spent barely milks—thank you, beer industry—fast gaining share.

All this has the smart money sizing up potential investment targets. “[Data firm] Crunchbase reported that $250 million in publicly disclosed investments in the ‘alternative protein’ startup space has been made in the last two years,” says Danielle Black, senior product manager, proteins, Glanbia Nutritionals (Fitchburg, WI). But in the nutritional foods category, pea protein wins. Taken together, the two sources’ “high protein content and low-cost nature” makes them popular choices with manufacturers, Black says.

But they’re not alone. “While soy remains most prevalent as a base, along with wheat and pea or bean proteins, growing demand will summon new sources from nuts, seeds, and novel legumes,” Weston wagers. Rice- and potato-based ingredients got the endorsement of a respective 81% and 80%, respectively, of consumers whom Mintel surveyed when asked which plant-based proteins they favor and given the option to choose all that apply. Black adds that this feedback is perhaps “because of the familiarity of side dishes and snacks with those ingredients.”

Even aquafaba, the water left after cooking faba beans, chickpeas, and other legumes, is drawing attention as a plant protein source, says Liz Specht, PhD, senior scientist at GFI. Thus, she concludes, “Picking any one plant protein to highlight is tricky because there’s so much potential in every category.”

Millennials are a “driving force” in the growing popularity of plant-based foods, says Alison Rabschnuk of The Good Food Institute.
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Development Curveballs
But harvesting that potential won’t be easy. “Some plant proteins may be popular in name with consumers,” notes Black, but unless the source is nutritious, high in protein, sustainably low cost, and yields an ingredient with formulation functionality, “it will be hard to scale up production in food for a mainstream audience.” And as it happens, she adds, “The functional properties of plant proteins are still in a development stage.”

Indeed, taste, texture, and mouthfeel are oft-noted drawbacks, with the flavor profiles of some plant sources described variously as beany, bitter, “green,” or reminiscent of cardboard—stark contrasts to the relatively creamy flavor of dairy proteins like whey. Even mild-tasting, highly concentrated powders “can add some off flavors or mute other better-tasting ingredients,” Raban adds. “And whole-food sources of protein that carry a strong fiber quotient can compromise product texture” with their grittiness or graininess.

Specht surmises that the sensory gap separating traditional dairy from plant-based proteins might be an artifact of years of breeding designed to maximize the latter’s usefulness as animal feed or ingredients for “highly processed foods.” So as preferences tilt toward “natural, plant-based, organic, specialty, and healthy foods,” she says, “plant proteins will need to be optimized for a new consumer palate.”

And because consumer tastes are largely grounded in what they find familiar, plant-based alternatives to animal products will have to “find ways to replicate all the sensations of the foods they’re replacing,” Specht continues. “Many animal ingredients have multiple uses in food production, with one providing desirable flavor, texture, or ease of formulation, for example. It can be a challenge to find one-to-one plant-based replacements for such animal ingredients.”

Supply Side
Supply lines pose uncertainties, as well. Brands looking to formulate with novel plant protein “face the common innovation dilemma of sourcing uncommon ingredients in smaller quantities, which makes per-unit costs higher” Specht says. “As the plant-based market continues to grow, economies of scale will make novel plant ingredient prices drop.”

At least that’s the hope. But even here, hurdles remain. “This is sometimes a chicken-and-egg issue,” observes Jon Getzinger, CMO, Puris (Minneapolis, MN). “It’s difficult to spend large sums of money to commercialize a new plant protein source when it isn’t accepted yet by consumers or food manufacturers.” So when a source goes viral and formulators flock to it—think pea protein a few years back—demand invariably outstrips supply until producers increase capacity—“provided,” Getzinger says, “it makes economic sense.”

Work in Progress
Those are a lot of stars to tease into alignment. But the fact that plant proteins continue to thrive indicates that they’re falling into place—albeit sometimes slowly.

As Paige Ties, senior technical service specialist for research and development at Cargill, says, “There’s a development curve throughout the supply chain that new plant proteins will experience. But as processors gain a greater understanding of the variables impacting the functional, nutritional, and sensory attributes of their protein, that learning moves upstream.” The upshot: “From a formulation perspective, our ability to incorporate plant proteins into a variety of applications has grown by leaps and bounds.”

For example, a persistent challenge when formulating with plant proteins has been their fondness for water, which hydrates the protein and increases the density of, say, the puffed cereal, snacks, and baked goods where they appear. Ties says that her team has done “extensive testing” with a range of protein types and blends to standardize rheology “so that formulators don’t have to change the amount of water in their formulas dramatically.”

Diversifying plant protein formats—from concentrate powders and fractionated isolates to “whole-food” protein ingredients—has also expanded plant proteins’ applicability—and given formulators options. “For some,” Raban says, “the high concentration of powders makes formulation easier since less product is needed. But for others, the whole form has benefits besides protein.” For example, her company’s chia protein isn’t as high in protein as its pumpkinseed protein concentrate, she says, “but it can add fiber and omega-3 fatty acids. So formulators working on a granola bar might look to a whole ingredient like chia, whereas a protein shake developer might want a mild-tasting concentrated protein form, like our fava bean concentrate.”

Perhaps even more exciting, protein scientists in labs across the country are using tools like hydrolysis to increase plant-protein solubility—a boon to beverage formulation—and enzymes like transglutaminase to “stitch plant proteins together to increase their crosslinking capability,” Specht says, which is critical to plant proteins’ ability to replicate meaty textures.

“Other forms of milling and processing can selectively remove bitter components or anti-nutrients that can impede vitamin absorption and impact both taste and nutrition,” she continues. “There are also tremendous opportunities to leverage advances in sophisticated high-throughput breeding informed by genomics to develop strains for specific applications in plant-based meat, dairy, and eggs.”

And while centuries of breeding have given commodity crops like corn, soy,
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Astragalus is used to promote vital energy and reduce fatigue. It improves immune resistance, cardiovascular health, lung function, and kidney health. Rehmannia is a powerful restorative yin tonic used for improving blood and bone marrow health, adrenal health, stress, heart palpitations, and strength.

Inflammation

Inflammation is a normal response of a properly functioning immune system and is necessary for the body to remove tissue damage before healing and restoration can occur. However, excess or chronic inflammation can delay healing and even lead to major degenerative diseases. Inflammation can negatively affect the joints, skin, muscles, digestive system, and airways. It is involved in conditions such as fibromyalgia, asthma, dermatitis, arthritis, and colitis/IBS among others. Chemical imbalances can worsen inflammation. A carefully crafted botanical anti-inflammatory beverage can effectively reduce swelling and promote healing.

Chinese Skullcap with the anti-inflammatory active constituent baicalin, supports healthy joints by blocking destructive immune system attacks on joint tissue, and supports healthy lung function.

White Peony Root is used in TCM for its sedative, antispasmodic, anodyne, and astringent properties. It helps bring down swelling, while reducing thrombosis and platelet aggregation.

Detoxification

Toxins from air, water, and food pollution can lead to poor health and serious illness. Common symptoms of a high toxicity level are fatigue, fuzzy concentration, skin blemishes, and pain. Toxins can also cause more serious effects such as increased risk of cancer, cardiovascular and autoimmune diseases, impaired cognition and lung issues like bronchitis and asthma.

Natural botanicals for your beverage products can help detox the lungs, skin, and body from pollutants, increase excretion of heavy metals, help the liver metabolize toxins, and provide cell-protecting antioxidants

Burdock root is a blood detoxifier that promotes bile flow, lymph drainage, and sweating, helping clear skin blemishes, and boost joint health.

Cilantro helps protect cells and detoxify them from exposure to mercury and other heavy metals.

Brussel Sprouts increase liver enzyme function.

Schisandra helps support healthy liver function, which ensures it can detoxify harmful environmental compounds. Poor liver detoxification results in accumulation of toxins and causes a sick, tired feeling.

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Immunity

A healthy immune system protects the whole body against the viruses, mold, and bacteria that surround us. The immune system can be weakened by a host of factors including poor diet, aging, lack of sound sleep, emotional/stressful events, and environmental toxins. When the immune system is compromised, acute infections can lead to life threatening situations. Chronic infections can result in disability or auto-immune diseases like lupus or rheumatoid arthritis, and cell mutations resulting in cancerous conditions can gain a foothold.

Reishi mushroom is an adaptogenic tonic that can boost energy and vigor, while also promoting sleep and relaxation. It contains rich polysaccharides that help stimulate the immune system to combat viruses, retroviruses, fungal infections, and allergies.

Turkey Tail mushroom has anti-microbial effects to fight upper respiratory, urinary, and digestive conditions. It supports lung function and increases qi.

Shiitake mushroom increases T cells and natural killer cells, and its Lentinan component stimulates production of antiviral immunoglobulins, helpful for allergies, flu, colds, and fungal infections.

Anti-aging & Beauty

Anti-aging remedies are fast gaining popularity as researchers are discovering botanicals that can help improve age-related cognitive function, skin youthfulness, muscle strength, bone health, and energy.

Antioxidant phytochemicals can help slow the aging process by protecting DNA and cell membranes from damage. Stem cells can be stimulated to regenerate new tissues in the body. Promising research in nutrigenomics shows that some phytochemicals can increase the length of DNA end caps using telomerase activators, allowing cells to divide for longer periods of time.

Goji berry is revered in TCM for its ability to replenish vital essence, and boost liver and kidney yin. It was shown in studies to accelerate DNA synthesis of aging cells, helping prolong cellular life span.

Astragalus is an herb that promotes telomerase activation to maintain or increase the telomere length of cells. Cells grown in an Astragalus extract had an extension of cell divisions and overall life span of roughly double the normal rate.

Sleep & Relaxation

Insomnia is caused by several factors including stress, poor dietary habits, lack of physical activity and psychological influences. It worsens many health conditions, including diabetes, obesity, immunity, and cardiovascular health. Lack of sleep also adversely affects appearance, causing dark circles under the eyes, puffiness of the face, and sallow skin.

Poor sleep increases the stress hormone cortisol which can lead to thinning of the skin, muscle and bone loss, and increased fat storage. Cortisol can accelerate aging by raising blood sugar, leading to increased tissue glycation, followed by inflammation and tissue damage.

Sleep and relaxation herbs with anti-stress and sedative effects can help to decrease cortisol and induce drowsiness, while calming the mind.

Albizzia julibrissin is used in TCM for calming the spirit, easing restlessness, irritability, stress, and insomnia. It also helps with memory and focus.

Reishi mushroom has tranquilizing effects and is used for restlessness and insomnia. Studies showed Reishi to boost both non-REM and total sleep time.
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“By now, most of us realize that there’s simply no way that enough animal-based protein can be sustainably produced to supply the needs of the world’s ever-growing population,” says Jon Getzinger, Puris.

and wheat a head start vis-à-vis high yields, robustness, and streamlined harvest, “these gains can now be realized in previously underexploited crops like peas, lentils, and beans in much shorter time frames and with much lower overall R&D cost because of these technological advances in trait mapping and breeding methodology,” Specht says.

She foresees a day when plant proteins can be tailored to form, say, strong meat-like fibers when extruded, or bind fat and water for a juicier texture. “These approaches can also overcome some sensory issues,” she goes on. “The abundance of bitter and beany components can often be reduced through breeding. More advanced techniques like genome editing may enable breeders to eliminate some of these undesirable compounds altogether.”

Outstanding in Their Field
These possibilities aren’t just science fiction, either: they’re protein processing fact. And the rapid development of the pea protein space is proof. As Ties explains, “It all starts with better plant proteins.”

Cargill recently signed a joint venture with Puris to actualize those improvements in pea protein ingredients. “While most pea proteins bring a host of flavor issues,” Ties explains, “Puris pea protein is decidedly different.” Sourced from non-GMO yellow pea seed varieties specially selected to minimize pulses’ typical off flavors, it’s processed without chemicals “to bring out the best flavor possible,” she claims. “We’ve completed qualitative descriptive analysis testing and our customers have done their own comparison testing—and consistently, our pea protein comes out on top.”

Adds Getzinger, “In just a few years, we’ve shown that pea protein can work well in a variety of applications, helping to deliver solid, plant-based nutrition that tastes great, all with the transparency back to the farm that many consumers are calling for.”

Glänbia has pushed the ball down the field, as well, by developing plant proteins with increased stability and solubility for beverage applications. “We’ve also developed plant protein solutions for bars and bakery systems that increase shelf life and improve texture,” Black adds. The company has even patented a technology that improves dispersibility and flow rate for plant-protein powders. “We are also improving mouthfeel and stability of plant proteins for use in applications such as plant-based yogurts and aseptic beverages.”

But not all new protein technologies are so high-tech. Sabinsa’s newly launched Promond is an all-natural vegan protein sourced from almonds (Prunus amygdalus) standardized to contain not less than 50% protein. Along with a mild taste, the ingredient contributes a complete array of amino acids, including high levels of branched-chain amino acids, says Majeed. Even better, he adds, it’s both lactose and gluten free, “hence no bloating!”

Green Protein?
So as plant protein production keeps escalating to meet demand—and, over time, way in the future, possibly approaches the scale of animal-protein production—does the former run the risk of losing the sustainable “green sheen” that’s helped endear it to so many consumers in the first place?

Probably not. “It takes 9 calories of feed to get one back in chicken meat,” Weston points out, “and chicken is one of the most ‘efficient’ meats to produce!” Hogs, cattle, and lamb take an even higher feed toll per pound of production. “Plant-based meats can be produced much more efficiently from an ecological perspective,” he says, “making them a more sustainable alternative.”

And consider the pea, Getzinger proposes. It returns nitrogen to the soil where it grows, “displacing some or all of the fertilizer that a farmer would need to apply to fields.” Peas also require moderate amounts of water, can act as a cover crop, and minimize use of herbicides otherwise needed to stanch weed growth.

So they, and other plant sources, deserve a place at the table. “By now,” Getzinger concludes, “most of us realize that there’s simply no way that enough animal-based protein can be sustainably produced to supply the needs of the world’s ever-growing population. The numbers simply don’t work. Plant proteins have to be part of the solution.”

References

Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.
As men age, prostate health takes on greater importance—and that means a variety of new opportunities will emerge for supplement companies that serve the men’s health niche. New research is demonstrating that a variety of natural and nature-identical supplements are showing promise in easing age-related prostate symptoms and supporting an overall healthy and active lifestyle.

Supplement manufacturers are also making significant advances in the area of prostate health, with new products and improvements to existing formulations expanding the men’s health market in new ways. Men’s health is a growing concern, these manufacturers say, and one that calls for new strategies for formulation and branding. While the men’s health market is currently fairly stable, growing consumer concerns around product formulation are creating new trends and avenues for manufacturers and brands. Consumer pushes for whole-food solutions and natural products, as well as a demand for a more holistic and diverse approach to men’s health, are driving innovation in what has traditionally been a market dominated by just a few ingredients.

Finally, on the industry side, manufacturers and brands are moving toward more stringent identity testing and more diverse delivery systems in order to bring to market more convenient products that consumers can trust.

Here are just a few of the ways that prostate health products and men’s health ingredients are positioning themselves in order to meet evolving consumer demands.

**Tea Time, with Prostate Benefits**

Emily Fritz, technical service manager at Kemin (Des Moines, IA), says that her company is continually working to better communicate the benefits of its branded and patented tea-based prostate health ingredient, AssuriTea. For the last year, she says, Kemin’s approach to the men’s health space has been to continue educating the public about its existing line of products. “Consumer demand for natural products is increasing,” Fritz says, “which is why we’ve stepped up our marketing of AssuriTea. That’s where most of our energy has been spent when it comes to men’s health.”

A proprietary blend of water-extracted green and black tea (*Camellia sinensis* L.), AssuriTea is designed to reduce lower urinary tract symptoms (LUTS) in men and improve urinary function. One randomized, double-blind, placebo-controlled clinical trial of AssuriTea followed 46 men between the ages of 30 and 70 who scored at least 8 on the American Urological Association Symptom Score (AUASS) test. Participants were randomized to receive either 500 mg of AssuriTea, 1 g of AssuriTea, or placebo, for 12 weeks. This trial found that taking 1 g of AssuriTea...
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per day for 12 weeks caused a statistically significant increase in urine flow relative to a placebo and improved symptoms of LUTS.\(^1\)

A second randomized, double-blind, placebo-controlled clinical trial funded by Kemin examined the effects of AssuriTea on antioxidant concentrations in 43 healthy men between 25 and 70 years of age. Participants were randomly assigned to a placebo or to 250 mg, 500 mg, or 1 g of AssuriTea for 28 days. The study found that a daily 1-g dose of AssuriTea resulted in a statistically significant improvement in cellular antioxidant protection after 28 days relative to the placebo.\(^2\)

Fritz notes the significance of these antioxidant findings: "Prostate health issues are often caused by or exacerbated by inflammation and oxidative stress. That’s why AssuriTea provides both the anti-inflammatory benefits of black tea and the antioxidative benefits of green tea."

AssuriTea is targeted at the active lifestyle consumer, Fritz says, noting that Kemin’s men’s health ingredients fall under the umbrella of active wellness. She says this is no accident: marketing prostate health products, she says, often requires a circuitous approach.

"[Prostate health] is something that a lot of men aren’t comfortable talking about, and a lot of household purchasers are female. So, our marketing campaign last year focused on the overall health and well-being angle," she says. "We talked about how a healthy lifestyle and AssuriTea supplementation work together to provide health benefits."

Fritz says the next big evolution of the men’s health and prostate health supplement market will involve a continuing emphasis on safety. She also notes that botanical ingredients are growing in popularity.

"Men’s health has been a fairly stable space the last few years, but there’s a larger demand for natural products. The entire [nutritional supplement] market is moving in that direction, so I expect men’s health to move in that direction as well."

Managing Pelvic Pain with Flower Pollen Extract

Recent research by urologists in Italy demonstrated the effectiveness of pollen extract as a supplement for men with chronic pelvic pain due to prostatitis, or inflammation of the prostate gland. Italian urological and sexual health supplement company IDIPharma recently published a randomized controlled clinical trial examining the effect of Deprox 500, a branded and patented supplement formulated with Graminex LLC’s (Saginaw, MI) branded and patented Graminex flower pollen extract, on prostatitis-associated chronic pelvic pain in 87 males with a mean age of 33.

Participants were randomized to take either two 500-mg tablets of Deprox per day or, in the case of the control group, 600 mg of ibuprofen (three 200-mg tablets) per day for four weeks.\(^3\) After one month, both groups saw improvements in scores on the National Institutes of Health Chronic Prostatitis Symptom Index. But the Deprox group saw an approximately 50% reduction in its score, compared to just an approximately 25% reduction for the ibuprofen group.

Colleen May, public relations representative for Graminex, says this study shows that Graminex’s flower pollen extract is effective at reducing prostatitis-associated pain. Says May: "IDIPharma found that our ingredient decreased the concentration of cytokines, specifically interleukins, in men with prostatitis."

May says that pollen extract is gaining popularity as a prostate health supplement thanks to its natural origins and the fact that it represents a complex of compounds found in the raw ingredient, as opposed to, for instance, a pharmaceutical ingredient based on a single isolated compound. May says that she also expects food-based men’s health supplements to continue growing.

"We’re noticing that a lot of formulators want to put our ingredients into foods," she says. "We’ve developed our own protein shakes that have pollen in them. A lot of the people taking our product are older active men with prostate issues, so the protein shake is a good way to deliver all the protein and amino acids needed to recover from a workout while also providing prostate health benefits."

She notes that product identification is becoming increasingly important as the market for men’s health products grows. The next major innovations in the men’s health niche, May says, will involve further improvements in testing and verifying natural ingredients.

“‘There’s a push in the industry for better identity testing,’ she says. ‘There are a lot of products coming from overseas that claim to be from the United States. We’ve developed a lot of methods in house that we can send to our customers to ensure a product is what people say it is.’

Easing Overactive Bladder with Botanicals

New data is emerging to demonstrate the usefulness of botanicals for addressing urinary issues in men. Tracey Seipel, ND, founder of Australian supplements marketer Seipel Group, says that her company recently published a clinical trial on its branded bladder-control supplement Urox, a patented combination of botanicals like Crataeva nurvala stem bark, Equisetum arvense stem, and Linurus aggregata root.

The randomized, double-blind, placebo-controlled trial followed 150 participants (average age 55) over the course of eight weeks. Participants took either 420 mg of Urox or a corresponding placebo once per day. The trial measured urinary frequency by self-report at weeks zero, two, four, and eight. By the end of the trial, the active supplement group reported a 30% reduction in daytime urinary frequency and a 54% reduction in nocturia. ‘The placebo group saw lower reductions of 5% and 7%, respectively. The active supplement group also saw statistically significant reductions in both urgency and total incontinence relative to the placebo group.’\(^4\)

Seipel says that the ingredients in Urox may also assist with symptoms of prostate enlargement, but notes that the bladder-related symptoms typically ease before the prostate symptoms do. Seipel, who was one of the study authors, says that the subjects’ improvements occurred in stages. The urinary urgency symptoms saw statistically significant reductions by week two, she says, but the incontinence symptoms took four weeks to improve.

Seipel Group’s branded and patented Prorox supplement, designed to support overall prostate health, combines the Urox formula with 5-alpha-reductase, lycopene, and saw palmetto (Serenoa repens). Seipel says that botanicals will play an important role in prostate health supplements in the future, in conjunction with lifestyle factors.
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DRUG-SUPPLEMENT INTERACTIONS: CONSUMER SAFETY REMAINS A PRIORITY

Prostate health supplements are a popular remedy for men who are facing age-related prostate difficulties. But the jury is still out on whether it is safe for men who are taking certain prescription medications to also take prostate supplements.

According to Harvard Medical School’s health publishing division, herbal remedies like saw palmetto may interact with drugs like naproxen or anticoagulants to increase the risk of bleeding in men with benign prostatic hyperplasia. However, many of the concerns around saw palmetto and its interactions with prescription drugs stem from isolated case reports and experimental studies of unknown clinical relevance. Further research is needed to clarify the mechanisms of interaction, if they exist, and to determine whether or not saw palmetto causes interactions with antiplatelets, anticoagulants, or NSAIDs.

Beta-sitosterol is gaining in popularity right now,” she adds. “More research is needed, which is difficult with natural products because funds are limited. But over time, I see the men’s health supplement market becoming more comprehensive. Prorior looks at prostate enlargement, but also androgens, nutrition, and other factors. We need to move the public toward a more comprehensive understanding of health issues. Exercise helps to raise testosterone in men, which wards off certain health problems.”

Probiotics Now Entering the Prostate Health Space

For many years, “prostate supplements” typically meant “herbal supplements.” But now, other kinds of ingredients are gaining notoriety in combination with other longstanding prostate health ingredients. Dan Souza, health and nutrition category manager for Naturex (Avignon, France), says that probiotics are now entering the men’s health category and being used in interesting combinations with existing prostate-health ingredients. For instance, Souza says, Naturex recently launched a version of its patented Flowens full-spectrum cranberry powder “that is optimized for use in combination with probiotics.”

“The low-water-activity formulation results in better shelf stability for the probiotics, and when consumed, the microbe-accessible phytochemicals in combination with targeted probiotics may deliver synergistic benefits,” he says. He adds that ingredients like these also avoid the supply chain challenges facing some more traditional prostate health ingredients like saw palmetto. He notes that maintaining an adequate supply of saw palmetto continues to be an issue for the prostate health industry, and that saw palmetto faces both cost challenges and a growing risk of adulteration as supply-management struggles continue. This is why, he says, the industry is now sourcing different botanicals, like cranberry.

Naturex’s Flowens, made from cranberry fruit powder, has been shown in clinical trials to reduce LUTS symptoms in men, making cranberries a good candidate for men’s health and prostate health formulations. One randomized, double-blind, placebo-controlled clinical trial followed 124 men between the ages of 45 and 70 for six months. All participants were assessed using the International Prostate Symptom Score (IPSS) at zero, three, and six months. At the outset of the study, all participants scored between 8 and 19 on the IPSS, indicating that they all had moderate prostate symptoms.

During the study, participants took a once-daily dose of Flowens at either a concentration of 250 mg or 500 mg, or a placebo. After six months, all groups saw reductions in their IPSS rating, but the 250-mg and 500-mg Flowens groups saw reductions in their IPSS ratings of 3.1 and 4.1 points, respectively, while the placebo group saw a reduction of only 1.5 points.

“In their report, the study authors noted that this level of reduction is considered to be clinically relevant under guidelines produced by the American Urological Association,” Souza notes. Flowens has also been awarded six health claims from Health Canada, he adds.

Saw Palmetto Extract as Bioactive as Drug?

Research on saw palmetto has historically been mixed. While saw palmetto’s efficacy has been called into question by reviews and studies published in The Journal of the American Medical Association, among other journals, a recent study was much more positively in favor of saw palmetto. This study demonstrated that saw palmetto was as effective as the prescription drug finasteride at relieving the symptoms of enlarged prostate.

The in vitro study examined the efficacy of both Euromed’s (Presto, PA) branded saw palmetto extract supplement Prosterol and of generic drug finasteride at inhibiting 5-alpha-reductase. Finasteride’s therapeutic effects for enlarged prostate are partly due to the drug’s ability to inhibit 5-alpha-reductase. The study found that a 10 microgram per milliliter dose of the saw palmetto extract resulted in a 91% mean inhibition of 5-alpha-reductase expression. A similar 8-nanometer dose of finasteride resulted in only an 82% mean inhibition, the researchers said.7

The study also found that Euromed’s saw palmetto extract acted through the same mechanisms as finasteride and was as effective as other industry-leading saw palmetto extracts at inhibiting 5-alpha-reductase, but without involving the harsh solvent hexane.

In a press release, Euromed said that its saw palmetto ingredient also offers several benefits due to its roots as a supplement ingredient. “No doctor’s prescription is necessary to obtain a proven bioactive prostate health dietary supplement; it spares the expense of the medical practitioner’s fees; it spares the high costs of prescription drugs; and, most importantly for health, it eliminates exposure to drug-related side effects.”

Euromed’s Director of U.S. Sales, Guy Woodman, says that Euromed recently completed construction of a new laboratory facility in Barcelona. New analytical equipment will improve quality-control measures related to Euromed’s saw palmetto extract, an important step that Woodman says is necessary on the heels of 2016’s saw palmetto shortage.
Active lifestyles, workouts and exercise can lead to temporary muscle and joint discomfort. Patented and clinically studied, Cuvitus is a new and exciting sports nutrition ingredient shown to enhance exercise performance. Cuvitus supports natural recovery through the reduction of TNF-α and other damaging cytokines.

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A global shortage of saw palmetto oil extract opened the door for adulterated products from mainland China to enter the market,” Woodman says. “These adulterated products have the incorrect fatty acid profile and are missing the expected sterols and fatty alcohols. Euromed has been surveying the market and notifying trade organizations and industry stakeholders of this practice.”

**Botanicals for Prostate and General Health Support**

Megan Luu, marketing manager for Gencor (Irvine, CA), says that Gencor is currently in the process of branding and trademarking a new men’s health ingredient derived from a plant native to Brazil. She says that Gencor expects this new supplement to receive GRAS status by the middle of 2018. Says Luu: “We’ve developed a new ingredient, an extract from the leaves of Ageratum conyzoides, that has shown 5-alpha-reductase inhibition activity in *in vitro* studies. This ingredient has also shown good efficacy for prostate health in a human clinical study.”

That human study—a double-blind, randomized, placebo-controlled clinical trial—followed 106 men between the ages of 41 and 76 with medically diagnosed benign prostatic hyperplasia for 12 weeks. Ninety-eight participants completed the study. Participants were assessed on the IPSS scale and were given 250 mg of *Ageratum conyzoides* or a placebo once per day. Secondary outcomes measured included testosterone and PSA levels as well as participant scores on the Aging Males’ Symptom Score and the Derogatis Interview for Sexual Functioning self-report. The trial showed that *Ageratum conyzoides* caused a statistically significant reduction in total IPSS score as well as a statistically significant reduction in day- and nighttime urinary frequency.

Luu adds that, currently, Gencor’s focus is on diversifying delivery systems for men’s health products. “This space has been lacking in innovation, specifically around delivery systems, and has remained stale,” she says. “Most applications are restricted to softgels. We’ve broadened the delivery system space by bringing in an ingredient that can be used in other delivery forms like tablets, capsules, powders, and sachets.”

**Beyond the Prostate: New Opportunities in the Wider Men’s Health Market**

Experts say the men’s health supplement market in general, and the prostate health supplement market in particular, aren’t just in the midst of diversifying product lines; the market is also developing a more comprehensive and holistic approach to and understanding of men’s health problems.

“I see the men’s health market becoming more comprehensive as time goes on,” Seipel says. “There are a few targeted ingredients that tend to dominate the market, and I’d like to see more innovation give way to a more multifaceted approach to men’s health.”

Researchers exploring lifestyle factors may affect prostate health is increasingly important, she adds.

At least one large-scale clinical trial is currently examining the connection between lifestyle factors and prostate health. The trial, dubbed the Men’s Eating and Living Study, is following 464 American men between the ages of 50 and 80 who have early-stage prostate cancer. The phase 3 randomized clinical trial, sponsored by the Alliance for Clinical Trials in Oncology in collaboration with the National Cancer Institute, ended last month. Preliminary results are expected soon.

Prostate health is one of the most established realms of men’s health for supplement manufacturers to target, but new opportunities for manufacturers of men’s health supplements will likely occur both inside and outside the prostate arena. Gencor’s Luu says that the men’s health niche hasn’t seen much innovation in the last 10 years, and while this makes the niche a fairly reliable space for brands, it also means the industry is overdue for a shake-up.

Says Luu, “The men’s health supplement market has excellent growth potential, not just in prostate health, but also in healthy aging, active lifestyle, and andropause.”

Graminex’s May adds this: “The market looks different depending on whether you’re targeting older men or younger men. With older men, you’re talking prostate health ingredients. But with younger men, the products are more oriented around sports health—protein products, amino acids, etc.”

As the men’s health market continues to diversify, new opportunities will call for new formulations and products to meet evolving consumer demands. Manufacturers and brands can capitalize on growing awareness of men’s health issues with innovative formulations, strong research, and targeted marketing campaigns that reach household decision makers.

**Mike Strauss is a freelance journalist living in Kelowna, Canada. He has written for publications including Canadian Chiropractor Magazine, UX Booth, and Iconic Concierge Vancouver.**

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It didn’t take long for the headlines to surface after *JAMA* published the latest data on American obesity rates this March. “American Adults Just Keep Getting Fatter,” cried *The New York Times*. “Public Education Efforts Not Moving the Needle in Fight against Obesity,” was *Kaiser Health News’* takeaway. Even the food blog Grubstreet conceded, “America’s Obesity Epidemic Is Only Getting Worse.”

The responses set a dismal tone—and for good reason. The data to which they respond, taken from the 2007-2008 and 2015-2016 National Health and Nutrition Examination Surveys (NHANES), paint a picture of a nation wherein 33.7% of adults are obese (defined as having a body mass index, or BMI, of 30 or more) and 5.7% are severely obese (having a BMI of 40 or more)—and they reflect an upward obesity trend that’s been in evidence for decades.

All this comes despite ongoing efforts to educate Americans about the risks of—and remedies to—obesity. And it also comes despite the earnest claims of those same Americans that they’re exercising more.

So clearly: Something isn’t working.

Yet it’s time we find something that does. Whatever that “something” is, it’ll likely comprise dietary changes, more exercise and education, and possibly nutritional supplementation to address weight management. After all, as Joe Weiss, president, Nutrition 21 LLC (Purchase, NY), points out, “The problem surrounding obesity is only getting worse, which leads me to believe there will continue to be demand around products addressing or reducing the negative impacts of this condition.”

Cracking the Code

We’ve been down this road before, and perhaps we keep winding up here because although solving overweight and obesity may be simple in concept—eat less; exercise more—it’s much harder in fact. As Mark Cope, PhD, applied nutrition manager, DuPont Nutrition & Health (Madison, WI), says, “We all know that weight management requires lifestyle changes, but it’s these changes in diet and exercise habits that make weight management so challenging.”

Add to that the inexorable influence of genetics—and an environment apparently designed to encourage obesity—and it’s understandable why taking weight off and keeping it off is a tough code to crack. Says Mitch Skop, former senior director of new product development, Pharmachem Laboratories Inc., a division of Ashland (Kearny, NJ), “Emotionally charged mindsets often cause binge or stress eating,” and though manufacturers are making healthful choices available, “junk-food manufacturers are doing the same thing,” albeit in the equal and opposite direction.

Weighty Consequences

The consequences of this “toxic food environment” extend well beyond one’s waistline. “Obesity is associated with higher death rates driven by comorbidities such as type 2 diabetes, dyslipidemia, hypertension, obstructive sleep apnea, certain types of cancer, steatohepatitis, gastroesophageal reflux, arthritis, polycystic ovary syndrome, and infertility,” Cope says. “Another important point to make about obesity is reduced quality of life, even among obese individuals without associated comorbidities.”

And don’t forget to account for obesity’s economic toll. Cope points to data showing that the public health burden of excess weight costs the U.S. healthcare system more than $200 billion annually. Moreover, a Johns Hopkins University study concluded that obese individuals who lower their BMI to what’s considered a healthy range could save $28,000 over a lifetime.

Shame on Sugar

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And though such products have traditionally focused on energy, thermogenesis, and metabolism, "more recently it seems a lot of formulas are catering to consumers who need help managing their sugar intake to maintain healthy blood sugar levels, reduce hunger, and increase satiety," says Brian Appell, marketing manager, OmniActive Health Technologies (Morristown, NJ).

Indeed, "Today's diets are loaded with sugar," Appell observes. NPD Group research reveals that while a combination of sugary nonalcoholic beverages and processed grain products contribute the lion's share of sugars in contemporary diets, "even foods many people consider healthy can contain more than 95 grams of hidden sugars," he notes—"more than twice the maximum recommended intake."

No wonder sugar consumption has been climbing over the past 30 years—and contributing to near-epidemic rates of elevated blood sugar and weight gain in the process. "It's the hidden sugars that are largely responsible for this health crisis," Appell adds. So it's also no wonder that when an Omni-Active survey asked consumers which single item they'd eliminate from their diets if they could, more than half cited sugar and/or carbohydrates.

**Exercising Control**

Appell says that because his company's *Salacia chinensis* extract—marketed as OmniLean—can "uniquely balance blood sugar and thereby control appetite," it can help users "make healthier choices." The randomized, double-blind, placebo-controlled three-way crossover CARBS (Carbohydrate Appetite Reduction and Blood Sugar) study was the first to examine the extract's effects on postprandial glycemic indices and gut hormones, and it found that when taken with a meal, the ingredient improved glycemic response and changes in gut hormones in healthy overweight/obese individuals, reduced blood sugar spikes, and influenced appetite and satiety.

Noting that "industry cannot change people's stress or behavior, but we can help them lessen the impact of a carb-laden diet," Skop explains that Pharmachem's white kidney bean extract—brand named Phase 2 Carb Controller—helps delay digestion and absorption of dietary starches by temporarily inhibiting salivary and pancreatic alpha-amylase enzyme. Carbohydrates that thus resist digestion in the small intestine can travel to the large intestine where they act like dietary fiber, feeding microbiota and up-regulating the hormone GLP-1 (glucagon-like peptide-1), which promotes satiety signaling, among other metabolic effects.

Four placebo-controlled human studies published between 2001 and 2004 showed significant weight and inch loss with the product's use. The most recent study on the ingredient—and the largest human trial on it to date—showed that after 12 weeks of supplementation, those taking the extract lost an average of 7 lb more than the placebo group and experienced a statistically significant decrease in the desire, frequency, and strength of cravings for chocolates and other sweet foods; meanwhile the placebo group saw a significant increase in the difficulty of resisting particular types of food. After 24 weeks, 73.5% of participants in the weight-management phase had successfully maintained their body weight.

**Diabetes Connection**

An earlier review of more than a dozen studies also concluded that Pharmachem's kidney-bean extract could potentially induce weight loss and reduce blood sugar spikes caused by carbohydrates. The study's coauthor wrote that the ingredient demonstrated the ability to cause weight loss "with doses of 500 to 3,000 mg per day, in either a single dose, or in divided doses. It also has the ability to reduce the postprandial spike in blood glucose levels."

All of which suggests that it may play a role in addressing blood sugar management and diabetes. And as far as Weiss is concerned, any supplement capable of doing that is just what we need. He cites World Health Organization numbers estimating that 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. "This increasing incidence of diabetes, as well as complications correlating with poor blood sugar, is likely due to an increase in the associated risk factors in individuals, such as being overweight or obese," he says.

Chromium "is commonly regarded as effective in helping control blood sugar and carbohydrate cravings, as well as in fighting body fat and assisting in weight management," notes Jim Komorowski, chief science officer at Nutrition 21. The trace mineral appears to improve insulin's action, boosting the body's ability to manage blood sugar levels. "People often struggle to lose weight even when dieting and exercising due to impaired insulin resistance," he notes. "If the body is successfully keeping blood sugar levels in check, managing weight and appetite is a bit more simplified."

His company's patented Chromax chromium picolinate supplement was the focus of a new 2018 review that the company recently publicized in a white paper, comparing it to other weight-loss products and programs, the conclusion of which was that the supplement yielded the greatest percentage of fat loss and smallest percentage of lean body mass loss relative to total weight loss. As Komorowski notes, "Chromax positively impacts body composition by enabling individuals to lose fat while retaining muscle."

**Fat Still Matters**

A signal implication of the study is that notwithstanding the current fixation on carbohydrates and sugar, fat—or, more specifically, adipose tissue—still matters.

Why? When a body loses primarily lean body mass and not fat in its efforts to shed pounds, it suppresses its metabolic rate, setting up conditions for the subsequent accumulation of more fat. Lean body mass also generates energy, and thus its excess loss can trigger fatigue, poor neuromuscular function, and injury risk. "Therefore," Komorowski says, "satiety promoters and other low-calorie diets may fall in favor over time compared to products and programs that enhance body composition by increasing fat loss while preserving lean body mass."

"Because the body requires a controlled insulin response to convert food to energy rather than store it as fat," Komorowski adds, "having a controlled insulin response is very important" to keeping body composition in healthy balance during any weight-loss program.

Johanna Maukosen, global health and nutrition science lead at DuPont Nutrition & Health, notes that the results of a double-blind, placebo-controlled weight-management trial credited her company's Howaru Shape probiotic (10 billion-CFU *Bifidobacterium lactis* B420 strain)—either alone or administered with 12 g of the company's...
branded Litesse Ultra polydextrose fiber—with controlling body fat mass, core fat mass, waist circumference, and calorie intake in overweight and obese adults. Subjects supplementing with the probiotic/fiber combination had 4.5% less total body fat mass, 6.7% less trunk fat, and a 2.6-cm/1.02-in. smaller waist circumference after six months of supplementation relative to the placebo.

The supplement’s mechanism of action appears to relate to improvements in intestinal integrity, as well as anti-inflammatory effects and, potentially, beneficial changes to the gut microbiota’s composition. “Moreover, Maukonen says, “the unique results were obtained with no changes to diet or exercise habits. And there were no stimulants added, so participants felt like themselves while controlling body fat mass and improving body composition.”

Bye to the Bad Old Days
Going forward, clinically substantiated evidence like this will become more important than ever. As Appell says, “Science on efficacy and safety drive the market by keeping consumers both realistic and optimistic. They want to know how their supplements work and what they can expect. Sound research and messaging that’s easy to understand help them gain the knowledge they need to make educated purchases.”

In other words, “Gone are the days of ‘magic bullet’ pills boasting unfounded claims or using questionable ingredients with potential side effects,” he says. Weight management has undergone a much-needed market correction as manufacturers lean less on sensationalism and more on real, live effects, he adds, and “that can only lead to better formulas that can prosper in this growing market.”

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Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.
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Healthier Chocolate? Sweet!

Innovation in the reduced-sugar healthy-chocolate space means consumers can have their chocolate and reap some health benefits, too.

BY JENNIFER PRINCE, ASSOCIATE EDITOR

There was a time, not so long ago, when the concept of “healthy” chocolate seemed paradoxical. But today’s consumers expect to be able to have it all—and chocolate is no exception. In recent years, chocolate manufacturers have been working to innovate chocolate confections and snack bars that help consumers meet their health goals.

Representatives from Cargill (Minneapolis), Ingredion (Westchester, IL), and cocoa supplier Barry Callebaut (Zurich, Switzerland) tell Nutritional Outlook that sugar reduction remains one of the most popular ways of improving the health profile of a chocolate product. Julie Emsing Mann, global protein program manager, Ingredion, says that sugar content is still a key focus in the chocolate category for reasons including the push for sugar taxes in some countries, the addition an “added sugar” line on FDA’s revised Nutrition Facts label here in the U.S., and the proliferation of front-of-pack calorie claims, among others.

But reducing sugar is tricky because sugar generates much of the sweetness and texture in a chocolate product, says Fatemeh Khadem, senior technical services manager, Cargill Cocoa & Chocolate. Plus, using any sweetener other than cane sugar can increase manufacturing costs. According to Barry Callebaut’s Mark Adriassens, vice president, research and development, Americas, and Laura Bergan, director, innovation and market development, North America: “Any [sugar] replacement or change in sweetening...typically will mean a cost increase with the raw materials.” They state that, at present, polyols such as the low-calorie sugar alcohols erythritol and maltitol are more expensive than cane sugar. So is stevia (Stevia rebaudiana), though stevia “is only used in small percentages within the chocolate recipe,” they say.

Today, stevia is one of the most popular zero-calorie sweeteners. The high-intensity sweetener has come a long way since it first arrived on the scene, and Ingredion’s Mann says that globally, an increasing number of premium low- or no-sugar confectionery products are being formulated with stevia-based sweeteners.

And formulating with stevia has never been easier: “The challenge of balancing taste and meeting sugar-reduction targets with stevia is no longer as daunting as it was for formulators. It requires the best-tasting stevia sweeteners, those without the bitter aftertaste, to allow for higher levels of sugar reduction.” Mann says that SweeGen’s Bestevia Reb M, a 95%-pure stevia leaf sweetener distributed by Ingredion, provides a sugar-like taste, without the bitter aftertaste often associated with alternative sweeteners.

But no matter which lower-calorie alternative sweetener a manufacturer uses, it is “critically important that healthier chocolates still taste good,” say Adriaassens and Bergan. Finding the right ingredients that can serve as one-to-one replacers for sugar or fat, while retaining the same flavor and texture of the original product, is a challenge. Oftentimes, it requires ingredient trade-offs, they say.

For instance, while stevia and other high-intensity sweeteners do a pretty good job of replacing sugar in chocolate, additional ingredients may be needed to achieve some of the other functional properties of sugar, says Ravi Nana, polyols technical service manager, Cargill. Cargill offers its zero-calorie natural Ze-Rose erythritol, which Nana says replaces sugar’s bulk at a one-to-one ratio and pairs well with the company’s ViaTech or EverSweet stevia sweeteners. Both Barry Callebaut and Ingredion also embrace polyols as sugar replacers. Barry Callebaut offers dark and milk no-sugar-added chocolates where erythritol functions as the main sugar replacer.

Ingredion’s polyols can also add sweetness to chocolate sauces and syrups without adding calories, says Afrouz Naeini, senior marketing manager, sweeteners and beverages, Ingredion. Last year, Ingredion launched its portfolio of VersaSweet low-sugar syrups, from both corn and tapioca sources.

Manufacturers can also reduce the sugar content of a chocolate product by adding a functional ingredient like fiber. Adriaassens and Bergan say Barry Callebaut has focused its innovation on growing its Sweet Refrain portfolio of reduced-sugar and sugar-free chocolates, whose sugar content is replaced by Barry Callebaut’s proprietary fiber blend.

Cargill’s Oliggo-Fiber chicory root ingredient can likewise provide formulators with an effective sugar alternative, says Pam Stauffer, global market programs manager, Cargill. “Mildly sweet in its own right, chicory root fiber can help modulate the flavor of some high-potency sweeteners,” she says. Fiber also functions as a bulking agent, she adds, which can help to improve the texture and mouthfeel of a reduced-sugar chocolate product.
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Certified Nutraceuticals is proud to introduce this new invention of invertebrate collagen. Edible Jellyfish are a remarkable source of calcium binding proteins. KollaJell™ is the creation of many years of research and development under the management of the original inventor of Hydrolyzed Collagen. KollaJell™ uniquely supplies special nutrients found only in Jellyfish collagen. Supported by research in vivo and human clinical studies which confirms the amazing health benefits including the fight against the decline in brain functions in age related neurological issues.
NUTRACEUTICAL MANUFACTURING DONE RIGHT.

PRODUCTION

BOTTLING & FULFILLMENT

RESEARCH & DEVELOPMENT

GRAPHIC DESIGN