THE NEW GUARD

What does the next chapter look like for plant-based drinks?
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Can Small Brands Also Build Traceability Platforms?

In March, I wrote about how the new Amazon Elements supplements line is promoting traceability, including featuring a QR code on packaging so customers can verify where a product’s ingredients were sourced, when the supplement was made, and how it was tested. Amazon is a giant, with significant resources, one assumes. Can smaller brands also afford to create ambitious traceability initiatives like this?

The quick answer is yes. It can be done, and it has been done. In fact, as I pointed out in March, Amazon was actually not the first dietary supplement company to roll out a QR-code traceability program; Gaia Herbs, a smaller firm, was actually the first way back in 2010 with its Meet Your Herbs program, complete with QR code. During that time, Gaia’s founder and CEO Ric Scalzo says, “we were not the $50 million company we are today. We were substantially less than that, so that probably put us at a small company (but certainly not a start-up, by any stretch).

For Gaia, says Scalzo, establishing a traceability platform was challenging but doable because the company controls its entire supply chain. “We’re a seed-to-shelf company, meaning we control the seed selection, the supply chain, horticultural development, the farms, the extraction, the testing, the whole process—everything that’s building up to the pinnacle of the quality of the finished product,” Scalzo explains. “We had all of the inputs already controlled here at Gaia. All of that data had already been collected for years and years, and the challenge for us was figuring out how to compile it, report it, and bring it all under one platform.”

Scalzo says, “It took us a long time to write a software program to harness all this data, from several locations. Most of it was coming from our operational management system, but some of it was coming from separate types of data platforms, and we had to link it all together and then somehow command access to the data and then report it in a way that was meaningful to the consumer.”

Scalzo does acknowledge that for an “emerging” brand, implementing this kind of traceability can be a challenge because most start-ups and smaller companies do not have control back to the field like Gaia does; instead, companies are more likely buying finished extracts from a raw-materials supplier or distributor, and because of that, “a big part of the traceability story [may be] cut off,” Scalzo says.

Traceability is still possible for some companies because they are doing it on a smaller scale. In March, boutique freeze-dried fruit and veggie brand Crunchies announced that it had launched its own traceability platform that allows customers to learn about the region, including climate and topography, where each bag of fruit/veggie was grown by entering a lot code from the packaging on a website. CEO Scott Jacobson says, “I think a larger corporation would have a tougher time implementing a project like this. We are a one-ingredient snack, so from a practical standpoint, we have a lot less to track.” He adds that once Crunchies figured out how to get the technology to jive with its current lot-tracking and production procedures without duplicating data entry, “it came together quite well.” And, he says, moving forward, “with the infrastructure in place, our next phase should be a little easier.”

Both Scalzo and Jacobson say their companies have seen the payoff from investing in traceability. “It continues to separate us from our competitors,” says Jacobson. “Since we are the only vertically integrated freeze-dry brand in the U.S., we wanted a way to clearly highlight that benefit to our customers and, more importantly, the consumer.”

Scalzo says the investment in Meet Your Herbs has benefitted Gaia Herbs “in every way,” sales included. “It definitely catapulted the brand to a much, much higher status of respect and as a brand leader for quality and certainly traceability,” he says. Not only that, he says, “We saw how outside companies began to look at Gaia from a point of reputation. We also saw how FDA began to look at Gaia” as a responsible leader.

“All around, at every level, everything was lifted up in terms of brand integrity,” he concludes. Can traceability do the same for your company?

Jennifer Grebow
Editor-in-Chief
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Physicians’ Health Study II Releases New Findings on Multivitamin Use, Reduced CVD Risk

In a newly published, secondary analysis of the Physicians’ Health Study II, researchers posited that multivitamin supplementation did not help to prevent the risk of cardiovascular disease (CVD), even in subjects who were found to have less-nutritious diets.

The Physicians’ Health Study II was a large, randomized, double-blind, placebo-controlled study started in 1997 examining whether dietary supplements, including a multivitamin, could help to prevent CVD, cancer, age-related eye disease, and cognitive decline in study subjects comprising 14,641 U.S. male physicians aged 50 years and older. In 2012, researchers published results finding that daily multivitamin supplementation “modestly but significantly” reduced the risk of cancer.

In the new, secondary analysis published in April in *JAMA Cardiology*, researchers determined overall, based on 11 years of follow-up, that multivitamin supplementation did not reduce subjects’ risk of CVD, including nonfatal myocardial infarction, nonfatal stroke, and CVD mortality; in addition, the researchers also did not find any clear benefit that multivitamin supplementation helped to reduce risk in subjects with poor baseline levels of nutrition.

Based on their analysis, researchers concluded, “The results suggest that baseline nutritional status does not influence the effect of randomized long-term multivitamin use on major CVD events.”

“Intuitively, many had thought that men with ‘poor’ nutritional status at baseline may benefit more from long-term multivitamin use on cardiovascular outcomes; however, we did not see any evidence for this in our recent analysis,” said one of the study’s authors, Howard Sesso, ScD, MPH, of the Division of Preventive Medicine and the Division of Aging at Brigham and Women’s Hospital (Boston, MA), which conducted the study. “Given the continued high prevalence of multivitamin use in the U.S., it remains critical for us to understand its role on nutritional status and other long-term health outcomes through clinical trials such as PHS II and other new research initiatives.”

The researchers did note, “Future studies are needed to investigate the role of baseline nutritional biomarkers on the effect of multivitamin use on CVD and other outcomes.”

The Physicians’ Health Study II was funded by the National Institutes of Health and other sponsors, including the Council for Responsible Nutrition (CRN; Washington, DC).

Responding to the study’s findings, CRN’s senior vice president of scientific and regulatory affairs, Duffy MacKay, ND, cautioned consumers to “manage their expectations” when it comes to multivitamins and to remember the benefits multivitamins can provide. “Science has already demonstrated the value of the multivitamin, and so while we are disappointed to see the null results of this study, by no means are we discouraged,” MacKay said in a press release. “The multivitamin serves many roles—from filling nutrient gaps to preventing neural tube birth defects—and is trusted as a go-to nutrition insurance policy by nearly a hundred million Americans each year. Only four years ago, the Physicians’ Health Study II found the multivitamin may have potential benefit for the prevention of cancer in a well-nourished male population. The multivitamin can do a lot, but we must remember that it cannot do everything, and this well-designed study, which found no consistent impact of nutritional status on the effect of multivitamin use on cardiovascular disease risk, reinforces this fact and reminds us to manage expectations for the role of multivitamins.”

In addition, MacKay posited that the U.S. physicians included in the Physicians’ Health Study II may have already had healthier diets than the general U.S. population, “which could be why the researchers did not find any additional benefit from a nutritional intervention.” He suggested that the study could have had different results if it was conducted in subjects “that represented a wider range of America’s dietary habits.”

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The Healthier Energy Drink

Clean-label marketing and “low” and “light” claims drive energy drink interest.

BY INNOVA MARKET INSIGHTS

Consumer desires to maintain energy levels in the face of increasingly fast-paced lifestyles has driven ongoing interest in the energy drinks category. But relatively limited innovation opportunities, alongside an increasingly concentrated and consolidated market, have resulted in relatively limited levels of launch activity overall. In 2016, energy drinks accounted for just 3% of total global soft-drink launches recorded by Innova Market Insights, down from 4% five years previously. In the United States, this 2016 figure is only slightly higher at 3.3%.

As the energy drinks market became more established and mainstream, soft-drink companies engaged in acquiring or developing global brands. Over the years, the large number of diverse entrants in the early years has whittled down to just a few, larger remaining brands. The U.S. market is dominated by iconic names such as Red Bull, Monster, and Rockstar, and these giants have focused largely on diversifying their product ranges by adding new formats and flavors, including seasonal launches and limited editions.

Emerging Health Claims in the U.S.
Apart from energy/alertness marketing claims, the leading claims used for U.S. energy drink launches in 2016 advertised “low” and “light” alternatives. “Low calorie” claims were used in nearly 47% of new product launches in 2016. Use of the term zero—as in “zero calories” or “zero sugar”—are particularly popular.

The launch of Zevia’s Zero Calorie Energy drink in the summer of 2016 is a testament to this trend. This launch was also notable because it marked Zevia’s debut in the energy drinks market for the first time. (Previously, the brand had only played in the natural, zero-calorie soda market.) Zevia was one of the first drink companies in the U.S. to use the natural sweetener stevia, and it now also does the same for its zero-calorie energy drink, which is sweetened with stevia and no sugar or artificial sweeteners. It also contains 120 mg of caffeine from coffee extract. Zevia’s energy drink flavors are also more unusual and fairly upmarket: Grapefruit, Raspberry-Lime, Kola, and Mango-Ginger.

Like the rest of Zevia’s naturally sweetened sodas and sparkling waters, the brand’s new energy drinks are also sweetened with stevia leaf extract. Each energy drink contains 120 mg of natural caffeine.

Given the ongoing interest in sugar reduction, most of the leading energy-drink players have at least one zero-sugar range within their portfolios. But despite the growing interest, market penetration for zero-sugar drinks remains lower than market penetration for drinks with “low calorie” claims. In 2016, 28% of energy drink launches used “sugar free” claims, rising to 35% if “low sugar” and “no added sugar” claims are also included.

Beyond “low” and “light” claims, there is also ongoing interest in clean labeling, with 23% of energy drink launches in 2016 carrying “natural,” “no additives/preservatives,” or “organic” claims. The use of natural ingredients such as honey, coffee, green tea, guarana, and ginseng is ongoing. The use of non-GMO claims is also increasing. Nearly one-fifth of launches used this type of claim.

Product Formats
The majority of products in the energy drinks market are now packaged in aluminium cans in sizes of 325 ml or more, unlike the original
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250-ml slim cans that Red Bull was originally packaged in (and still is in many parts of the world).

At one time, great success was forecasted for energy shots in small packages, but these products continue to perform behind energy drinks in the U.S. Energy shots accounted for just under one-fifth of launches recorded by Innova Market Insights in 2016. Interestingly, one brand, NVE Pharmaceuticals, offers a Stacker 2 Extra energy shot—a bottle containing two shots. The brand also extended this range with a vitamin B12 version to give consumers “what you may be missing in your daily diet.”

Other Categories Interested in Energy Claims
Interest in the energy category is not limited to the energy drinks market alone. In fact, in 2016, 9.5% of overall U.S. soft-drink launches used an energy/alertness positioning. While energy drinks comprise the largest number of products making these claims (32% of the total), there are other products using energy/alertness claims—most notably, iced tea (with a 25% share of the total). This means that just over 17% of total iced tea launches now make some kind of energy/alertness claim.

Although some teas claim energy benefits simply by including energy-supporting natural ingredients such as yerba mate and guayusa, some teas take an even stronger approach by actually calling themselves “energy teas.” One example is BluePrint Organic’s Energy Tea range, with flavors such as Mindful Ma-Tay, Mo-Jo Matcha, and Guaya-Fiyah launched in early 2017.

Juice/juice drinks took second place behind iced tea in terms of the number of launches using energy claims. Juice/juice drink launches with an energy positioning in recent months have included Ocean Spray’s Cran Energy Pomegranate & Cranberry and Raspberry & Cranberry Energy juice drinks, as well as a number of coconut water–based drinks and some so-called super juice blends featuring ingredients such as beetroot.

Bright Future
Interest in energy options seems set to continue. Although drinks may not always be the most popular source of energy, with meal replacements and snacks more often cited by consumers as a source of energy, they remain a convenient and readily available option for refreshment and functionality for modern lifestyles.
† Results compared to baseline


5. Kalman D, Perez Ojalvo S, Komorowski J. Comparison of cellular nitric oxide production from various sports nutrition ingredients. *J Int Soc Sports Nutr.* 2016;13 (Suppl 1):P33. ©2017 Nutrition 21, LLC Nitrosigine® is a registered trademark of Nutrition 21, LLC. Nitrosigine is protected by a number of patents and pending patent applications on compositions, their manufacture, and/or their uses, including, but not limited to: U.S. Patent Nos.: 5,707,970; 6,156,735; 6,344,444; 6,803,456; and 7,576,132. DRA951032317

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PLANT POWER

The next chapter for plant-based beverages looks bright.

BY MAUREEN KINGSLEY

Plant based is more than a buzzword. It’s a lifestyle trend driven by consumer interest in both personal wellness and concern for the global ecosystem, and it’s got staying power, according to those monitoring the food and beverage industries and those marketing plant-based brands.

Hope Lee, senior analyst for Euromonitor, explained in an August 2016 podcast on this topic that consumption of plant-based foods and beverages is increasing because consumers tend to perceive them as natural, safer, and more sustainable than animal products. A cultural paradigm shift away from meat-centered meals is evident in a number of high-profile consumer cooking magazines, health and wellness books, restaurants, and cookbooks, and has given rise to the “flexitarian” eater: a person who chooses a predominantly vegetarian diet but who does still eat some meat. The emergence of the flexitarian lifestyle, Lee says, “has created opportunities for plant-based food and beverage products in terms of innovation and new-product development.” She adds, “Manufacturers are actively looking for and exploring traditional plants to make them into delicious and nutritious food and beverage products.”
Got Milk? Yes, but Now It’s Plant Based
Indeed, “the steady growth of the plant-based food and beverage industries shows that consumers continue to shift away from animal products toward plant-based options,” agrees Michele Simon, executive director, Plant-Based Foods Association (PBFA; San Francisco, CA), citing a recent Mintel report that estimates annual sales of plant-based non-dairy beverages at $2 billion, with that figure forecast to climb to $3 billion by 2020.
Consumers seeking plant-based alternatives to traditionally animal-based nutrition are, based on the data, finding their entrée in these non-dairy “milks”: beverages made from nuts, soybeans, legumes, and seeds that are marketed as cow’s milk replacements for use with breakfast cereals, coffee, smoothies, and cooking, and for drinking on their own straight from a glass. (For more on the term milk as it relates to dairy versus plant-based beverages, see sidebar, “When Is a Milk Not a Milk?” on page 22.)
“For a long time, soy milk was the only game in town for dairy alternatives,” Simon says. (The non-dairy sector is well represented in PBFA’s membership.) “That’s not true anymore. There are many more options on the market now” for non-dairy, plant-based beverages, Simon says. “Almond milk has become a large category, for example.”
Data gathered by Innova Market Insights, which tracks global new-product launches in various health, wellness, and nutrition categories, illustrates the rise of dairy-alternative...
plant-based beverages, particularly from sources other than soy. “There has been a phenomenal growth of plant-based drinks” in general, the firm’s director of innovation, Lu Ann Williams, finds, demonstrated by “a 32% increase in global new-product-launch activity tracked for the dairy-alternative drinks category in 2016.” Furthermore, the United States was the leading country for new-product-launch activity in this category in 2016, Williams adds, representing 10% of all new dairy-alternative drink launches tracked.

These launches do, in fact, venture way beyond soy. Williams lists tree nuts (almonds, hazelnuts, cashews, walnuts, macadamias, pistachios, pecans), coconut, grains (rice, oats, barley), chia, hemp, and flaxseed as currently trending plant-based-beverage components. And “one of the more innovative ingredients to date to emerge is yellow peas, used as a base for the Ripple plant-based range of milks launched in the United States” about a year ago, she adds. “Manufacturers are also getting more creative in blending [plant-based] milks, with Silk’s Protein & Nut Milk Almond & Cashew beverage being a good example of this trend.”

As competition in the non-dairy, plant-based-milk market grows, there is “no shortage of flavor profiles that companies—big and small—are experimenting with,” PBFA’s Good Karma Foods first launched its flax-based milks in 2012; since then, the brand has introduced flax milks with added protein (pictured) as well as dairy-free yogurts. CEO Doug Radi says, “We’ve seen a strong response to our SKUs that provide not only our neutral flavor but also a strong nutritional profile, like our Flaxmilk + Protein, as consumers are looking for more nutrient-dense, plant-based options.” Like the brand’s original flax milk, which the brand says is made with cold-pressed, omega-3-rich flaxseed oil plus the same calcium and vitamin D as dairy milk, the newer Flaxmilk + Protein product also ensures 8 g of plant-based protein per serving.
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Simon says, “It’s great to see this explosion of companies wanting a piece of the action when it comes to dairy alternatives. They are getting very creative and innovative with their various offerings.” Califia Farms has introduced a Toasted Oats ’N Almond flavor of almond milk, for example, and the company also recently introduced a line of new non-dairy almond-milk coffee-creamer flavors, including Irish Cream, Mexican Cocoa, and Dulce de Leche.

Williams’s analysis aligns with Simon’s: Innova Market Insights singles out the 2016 launch of Bolthouse Farms’ blueberry-banana almond-milk beverage as a recent example of flavor innovation, as well as Trader Joe’s seasonal Pumpkin Spice almond milk.

Elixirs are also getting in the plant-based mix. The Immordl brand blends coffee, coconut milk, ground chia seed, guarana seed, and maca in a nutrient-rich, plant-based beverage.

Ingredient Mixer: The Elixir

Innovation in plant-based beverages is also occurring through the incorporation of “functional, value-added ingredients,” as Innova Market Insights calls them, such as herbs and spices, to offer potential health boosts. “The elixir,” says Jim Tonkin, president and owner, HealthyBrandBuilders, a beverage consulting and development firm, “is a new derivation category that’s growing. It marries the traditional plant proteins and compounds that you would think of going into beverages [including, in some cases, coffee] with the traditional herbs-and-spices side of the business, such as the turmerics and gingers.” Elixirs, such as Immordl, which Tonkin (who sits on Immordl’s board and serves as strategic consultant) called “a huge hit” at Natural Products Expo West this past March, combine protein, fiber, spices, herbs, and other botanicals, and “make them taste good,” Tonkin says, “putting enough of them into the beverage to make an efficacious dose, so you don’t just get a taste bang, but you feel something when you drink it.”

Immordl’s mélange of ingredients includes coffee, coconut milk, ground chia seed, guarana seed, maca root, and others. Additional brands emerging in this category include Rebbl, with its varied line of elixirs that contain such wide-ranging ingredients as turmeric, reishi, matcha, maca, ashwagandha, pea protein, sunflower protein, coconut milk, and coffee; and, in the UK, Plenish Elevate Organic Dairy Free Nut Milk with turmeric, almonds, coconut nectar, ginger, and pepper.

Non-Dairy Creamers: Plant-Based Beverages’ Dark Horse

Reporting from the show floor in a video recorded during Natural Products Expo West 2017, BevNet founder and CEO, John Craven, made this telling comment about non-dairy coffee creamers: “It’s one of those spaces I think a lot of people in the beverage industry don’t think about all that much. But it is a good application, certainly, for their products.” Indeed, with about 64% of Americans drinking at least one cup of coffee per day, according to a 2015 Gallup poll, and the aforementioned rise of flexitarianism, plant-based non-dairy...
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creamers and half-and-half products would seem to have a built-in customer base ripe for tapping. Califia Farms seized this opportunity early and, fortuitously, saw sales of its almond-based Nutmilk Creamer grow a stunning 138% in 2016, according to Califia’s vice president of marketing, Vilma Livas, making it the fastest-growing non-dairy creamer brand in the refrigerator case. As mentioned, Califia Farms debuted several new creamer flavors earlier this year at Natural Products Expo West.

Another successful key player to emerge in the plant-based non-dairy creamer space is Nutpods, which launched its shelf-stable, unsweetened, coconut- and almond-based product in May 2015 on Amazon.com and in Pacific Northwestern retail establishments. According to Michele Silbey, senior marketing manager for Nutpods, sales have increased every month since launch, and the product is the current (as of March 2017) bestselling alternative creamer on Amazon, “with customer review levels similar to those of Coffee-Mate,” Silbey says.

Other brands venturing into the coffee-creamers domain include Ripple, whose co-CEO Adam Lowry says his brand of pea protein–based beverages will launch a half-and-half product this year, and both Austin, Texas–based MALK and California-based New Barn, which have “barista blend” creamer products they showed off at Natural Products Expo West this past March.

**A Word About Waters**

While the big plant-based-beverage story is in dairy alternatives, plant-based water brands—likely encouraged by the runaway success of coconut water—are gaining more attention and distribution. Treo Brands, for instance, based in New York and founded by the son of one of Snapple’s co-founders, is working to make a name for birch water in the United States. Its Organic Birch Water Infusions launched at 2016’s Natural Products Expo East and were the first fruit-infused birch waters in the U.S. market. They are currently sold online and in New York City retailers.

Another tree water brand, Happy Tree, which markets “the leading maple-water product line in the U.S.” according to its press materials, enjoyed an expansion this past summer into about 400 new retail locations nationwide, including some Kroger divisions, Giant Eagle in the Midwest, and Market Basket in New England. The brand is also available at Whole Foods Market, The Fresh Market, Gelson’s, Amazon.com, and additional household-name natural-product grocers.

Verday Chlorophyll Water, which debuted at Natural Products Expo West in 2016, originally launched in three flavors—watermelon, cucumber, and lemongrass and ginger—and is growing. Verday added a coconut flavor to its product line this past July; the brand is available at natural and specialty stores in New York.

And finally, H2rOse, a unique rosewater- and-saffron beverage launched in early 2015 and based in Southern California, is now sold nationwide thanks to a distribution partnership with KeHE announced last summer. The brand’s line of four flavors is available at select VONS, Albertsons, Pavilions, and Whole Foods locations, as well as 7-Eleven Hawaii and others.

**Come One, Come All…to the Plant-Based-Beverage Market**

Simply put, plant-based beverages, in their various forms, are not going away anytime soon. Regarding her 2016 podcast on plant-based products in general, Euromonitor’s Hope Lee says the trend toward plants and away from animal products is “continuing and going strong.” She adds that there’s money available for the taking for those wishing to market plant-based beverages in particular: “From our observation of investors’ interests and movements,” she says, “there is lots of funding around to invest in the growth of these beverages. Young start-ups and big companies alike are coming to nurture the category.”

“Yes,” PBFAs Michele Simon agrees, “there’s room for everybody” in plant-based beverages, particularly in the non-dairy alternatives. And, once brands in this space “get traction,” she says, “they are going to grow.”
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VIRGINIA DARE
America is running a serious deficit—in energy. And we’re not talking about the fossil-fuel kind, either. Judging by their purchasing habits, the nation’s consumers must be one groggy, discombobulated, not-particularly-motivated lot, because they’re rushing to energy-boosting products, from shakes and shots to pills, powders, and packaged snacks, for the vigor they lack and the sharper focus, improved performance—even that long-lost “youthful glow”—they crave.

This is a marked departure from the past, when energy was the province primarily of powerlifters and partygoers. But according to a 2015 Mintel (Chicago) report, energy’s core consumers, at least in the beverage space, may well be parents and maturing Millennials on the verge of parenthood. Which, on one hand, should come as little surprise, as toddler-chasing is an energy-intensive enterprise; not for nothing did Mintel find significantly higher rates of energy drink and shot consumption—58% and 48%, respectively—in households with children compared to those without (27% and 18%, respectively).

On the other hand, energy products—and energy drinks in particular—have caught flack not just for outrageous and unsubstantiated claims, but for the genuine health and safety threats that can accompany their irresponsible or excessive use.

So some wonder if the energy market can sustain its appeal amongst its expanding audience. As Michael Crabtree, technical sales manager, Bioenergy Life Sciences Inc.
The energy market without doubt is one of the most critical markets in the dietary supplement industry, and consumers want options that meet their needs. But with any energy product, he says, the “main point” remains the safe and efficient delivery of energy-boosting ingredients—which always plays well with the consumer.”

Firing on All Cylinders
Energy really is a major driver for the supplement industry writ large. According to a 2015 BCC Research report, the global market for sports nutrition and high-energy supplements hit $37.5 billion in 2014 and looks set to approach $66.0 billion by 2020, holding its compound annual growth rate (CAGR) at 10.1% through the end of this decade. What’s more, the Council for Responsible Nutrition’s (CRN; Washington, DC) latest Consumer Survey on Dietary Supplements revealed a first last year: the desire for energy clinched the number-two spot among consumers’ motivations for taking supplements in the first place, pulling ahead of their need to fill nutrient gaps.

This checks out with Chase Hagerman, brand director, Chemi Nutra (Austin, TX), who believes that energy “is a very easy functional category to sell, the main reason being that it’s perhaps the most tangible function that’s offered. It’s well known that in today’s hectic, always-connecting world, too many of us are overworked and under-rested. A natural solution to coping is to ramp up the energy.”

Those weary consumers’ concept of “energy” is broadening, stretching beyond the capacity to do physical work to encompass mental stamina, too—which is just as liable to flag under stress as is its bodily counterpart. As Karen Hecht, PhD, technical marketing specialist, AstaReal Inc. (Bellevue, WA), notes, “We draw on our reservoirs of energy for both physical and mental tasks that require concentration and coordination. When our reservoirs run low, we feel a lack of motivation, a mental fog, and body heaviness.” And who has time for that?

New Patrons
Fewer of us than ever. Which explains why today’s market for energy is so diverse. “The ‘new’ energy consumer runs the gamut from parents trying to keep up with their kids to weekend warriors seeking a boost at the gym to seniors looking to remain active,” says Jeff Lind, vice president, sales and marketing, Natreon Inc. (New Brunswick, NJ).

But energy’s real engine is the Millennial generation, particularly its older members. “The truth is, Millennials have always been, and still are, the dominant consumers in the energy category,” says Brian Zapp, director of marketing, Applied Foods Sciences Inc. (Austin, TX). Citing

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Mintel data, he notes that 67% of males and 47% of females between 18 and 34 consume energy drinks, making them "by far the largest consumer base."

Factors speaking to this generation include "building trust, telling your story, and turning them into true believers," Zapp continues, adding that Millennials "care about things like sustainability, while taking pride in choosing natural and organic" products. That push has spurred a boom in new energy platforms that aren't just "cleaner," but are more appealing and easier to use, as well.

**New Platforms**

Indeed, says Crabtree, "Energy is a huge driver on the consumer side, so—correspondingly—it's a huge driver on the innovation side." Though beverages and traditional oral supplements remain the "dominant delivery methods," he says, with the recent scrutiny attached to stimulant-based energy drinks due to the adverse effects historically associated with them, alternative delivery methods are seeing more traffic. "Those beverages—along with energy bars—may always be staples," he notes, "but a market reorientation is inevitable."

Where that reorientation takes product development is the next question. As far as Zapp is concerned, "Some interesting and exciting newer delivery systems we've seen are stir sticks and straws, lick strips, mints, and even chocolate chews." He's keeping his eye on the tech space, too, where emerging formats let consumers "customize their energy input through smart bottles and other proprietary technology."

"One application I'm particularly fond of," notes Hagerman, "is gummies." So fond is he that his company partnered with a gummy maker to produce a line formulated with Chemi Nutra’s AlphaSize alpha-glycerophosphoryl choline (A-GPC). Popular as a sports-nutrition pre-workout energizer, the ingredient has a mode of action that's "pretty easy to understand," Hagerman says. A-GPC increases the production of the neurotransmitter acetylcholine, which is involved in the "mind-to-muscle" connection between the central and peripheral nervous systems—or, as Hagerman says, "Just think of it like caffeineating the neurons." He believes gummies are the "ideal delivery mechanism" for the ingredient's flavorless profile, and likes that they "provide a fun sensory experience with myriad flavors and mouthfeels, yet are also compact, portable, and ready to consume."

Just as convenient are Essential Mints, from VitaThinQ Inc. (Davie, FL). As Donald M. Choi, the company's president and founder, describes it, the product is a traditional mint, plus caffeine. Neither concept nor ingredient is new, but "the combination of the two makes this a unique caffeine resource," he says. In cases where a full energy shot supplies too much caffeine—or is literally too much for the consumer to swallow—the mints' "elegant delivery" allows the supplement to slip right into the bloodstream "through highly vascularized oral tissues," he explains. The mint format also gives consumers dose control: each Energizing Peppermint contains 20 mg of caffeine, Choi says, making five equivalent to a single cup of coffee. Put another way, one tin, with 1,600 mg of caffeine (not recommended for consuming in one sitting, of course), equals 16 cups of coffee, eight 5-Hour Energy shots, 10 Monster drinks, or 46 cans of Coca-Cola.

**Energy at the Source**

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And, increasingly, energy consumers themselves are avoiding “artificial” products with sketchy reputations. As Crabtree says, “The target market continues to expand into all-natural, non-stimulatory ingredients and functional markets, where consumers are looking for everyday energy that’s sustainable—not just performance-enhancing.”

First, we need to define what sustainable energy is from a metabolic standpoint. As Hagerman says, “Energy, in strict nutritional terms, is calories.” Alas, for a population that’s not just overworked and under stress but locked in a continual battle against overweight and obesity, a focus on caloric energy—which most of us get enough of already—may be misguided.

Besides, not all calories are created equal. “Some energy sources burn fast and leave you feeling exhausted,” Hecht says. “Similarly, sugar is a quick energy source—but spikes and crashes in blood sugar can contribute to fatigue and aren’t a good source of sustained energy.”

So if sugar is out as an energy source, what’s next? “Scientifically, Bioenergy’s Crabtree says, “we quantify biological energy as the amount of adenosine triphosphate—ATP—available to drive biochemical processes.” Though the body contains roughly 250 grams of ATP at any given moment, he notes, it turns over close to its own weight in ATP every day. ATP comprises several constituent compounds, including organic phosphate, adenine, and D-ribose; thus, as such compounds “make a direct impact on the levels of energy available to the body,” he concludes, “D-ribose, the source of all our cellular energy, is the perfect ingredient solution to consider for this market.”

Clean Caffeine

Then again, how scientists, or even our own cells, define energy may not be critically important because most consumers understand what energy implies. Hagerman says—namely, “something that provides mental focus, alertness, the ability to stay awake, and improved physical performance.” And for many, that something is caffeine.

For students stuck “juggling academic responsibilities and social relationships,” VitaThinQ’s Choi says, “caffeine and college go hand-in-hand. Once those students graduate and enter the working world, they also rely on caffeine to work longer hours and achieve the success they’re striving for.” And in addition to these two groups, “we see a unique segment of caffeine consumers in gamers who play video games online for entertainment and even money,” Choi continues.

These constituencies don’t necessarily want the same effect from their caffeine, nor do they necessarily want it from the same source. But “from an ingredient-supply standpoint,” Zapp says, “organic and natural energy sources—especially organic caffeine—are occupying a majority of new business growth.”

He sees this at his own company, Applied Foods Sciences, where most brand marketers “simply want a naturally derived alternative...”
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to artificial caffeine.” The company’s solution: two organic and “natural” caffeine sources standardized to more than 90% caffeine, one based on coffee and the other on tea. "These ingredients are highly water soluble, clear in solution, and designed to have a more neutral flavor profile," Zapp says, with less of the bitterness, astringency, and "chalky" drying effect often associated with caffeine.

Beyond these sources, Zapp thinks the most exciting ingredient in the clean-caffeine field is guayusa, from the leaf of a holly tree (Ilex guayusa) that grows only in the upper Amazon. A cousin of yerba mate, guayusa is “uniquely different” from other caffeine sources in that it has a polyphenolic profile all its own and a sweet, not bitter, taste, says Zapp. Consumers experience its effect “as a bright and clear energy,” he adds, and his company sees it “meeting the growing demand for functional energy and cognitive health products geared toward modern working consumers seeking a calmer nervous system and less agitation to go with alert mental or physical energy.”

Moving Forward: Trust Us

Nothing could be further from cardiac failures and even deaths that provoked an "onslaught of negative media" when they’ve struck consumers who've misused energy products in the past, Hagerman says. However, “it’s very important to note that such adverse events seldom occur,” he says. He cites evidence from SafetyCall International (Bloomington, MN) that a total of 27 adverse event cases associated with energy drinks were reported from 2008 to 2012. “Yet when they looked at the soft drinks/water category,” Hagerman continues, “it dwarfed energy by comparison, at 885 cases reported.”

But the negative association’s stuck, and energy products can continue to carry its burden as a result. Cleaning up the sector’s reputation will require credibility. A 2015 Mintel survey of 168 Internet users aged 18 and above who consume energy drinks found that more than one-quarter claim to drink less because they “don’t trust the artificial ingredients inside,” Zapp notes. By replacing these “synthetic and unrecognizable ingredients with known sources,” he believes, “consumers can more easily draw a connection of familiarity.”

Natreon’s Lind points to science as “the key to reestablishing credibility” and providing support for claims. Companies in the game for the long haul “would be best served by doing clinical studies on the actual finished product,” he suggests, “creating proprietary science and possibly some IP protection” to boot.

And make sure the product works. “As with every segment of the supplement industry, success comes from providing an efficacious product,” he says. “If the product works, customers will continue to buy it.”

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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The health-promoting properties of astaxanthin, the red, fat-soluble pigment found in freshwater microalgae *Haematococcus pluvialis*, continue to intrigue health-savvy consumers worldwide. According to a 2015 report from Research and Markets, the global market for synthetic and naturally derived astaxanthin is projected to reach $1.1 billion by 2020. With applications in the antiaging, nutraceutical, cosmetics, and food and beverage sectors, astaxanthin has cast a wide net on the natural ingredient market.

**Astaxanthin’s Biological Potential**

It turns out that the commotion created around astaxanthin is fueled by an increasing number of research studies looking at its *in vitro* and *in vivo* effects. Until now, astaxanthin has been attributed a range of biological activities, including antioxidant, anti-inflammatory, and immunomodulatory effects, as well as anti-diabetic, anticancer, and cardioprotective properties. In fact, it is considered one of the most potent natural antioxidants.

"Natural astaxanthin is 20–90 times stronger than all other antioxidants," says Traci Kantowski, communications director at the Natural Algae Astaxanthin Association (NAXA). "For example, it is 794 times stronger than CoQ10 and 36 times stronger than beta-carotene."

A recent review published in *Food & Function* confirmed the existence of solid *in vitro* and *in vivo* evidence for astaxanthin’s antioxidant effects, but also pointed to a need for additional research on astaxanthin in human subjects with pre-existing atherosclerosis and cardiovascular disease (CVD). With inflammation implicated in the pathogenesis of CVD, the anti-inflammatory action of astaxanthin is a current focus area for both astaxanthin suppliers and consumers.

**Deeper into Science**

The rising consumer demand for astaxanthin-derived products has served as an incentive for astaxanthin suppliers to allocate more time and money to the research aimed at uncovering the potential health benefits, and filling in any existing knowledge gaps, about this promising ingredient.

"There seem to be new scientific studies published every couple of months on the potential health benefits of astaxanthin, adding to an already large base of scientific evidence," says Gerald R. Cysewski, PhD, founder, president, and CEO of Cyanotech (Kailua-Kona, HI). His company sponsored a study at the University of South Florida to..."
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test the bioavailability of six different astaxanthin formulations, including the standard astaxanthin/oil softgels, enteric-coated softgels, water-soluble astaxanthin emulsion, water-dispersible astaxanthin, and liposomal astaxanthin.

“We were expecting to see a two- to three-times-higher bioavailability of astaxanthin in formulations using new technology for water-soluble/dispersible and liposomal astaxanthin; however, the results were not very exciting,” says Cysewski. The study found “relatively little difference in the bioavailability of astaxanthin between the six formulations, as long as astaxanthin is consumed with a meal that contains some fat,” Cysewski further notes that it was reassuring to see that the company’s standard astaxanthin oil softgel is very bioavailable.

AstaReal Inc. (Burlington, NJ), manufacturer of astaxanthin for the dietary supplement, food, and beverage industries, is focusing its research efforts on AstaReal, the company’s premier astaxanthin product. With 133 studies completed thus far, AstaReal is spearheading the research on astaxanthin. “AstaReal astaxanthin has been researched clinically for applications in skin health, vision support, and sports nutrition,” says Joe Kuncenwitch, national sales manager at AstaReal. The latest study, published in the Journal of Clinical Therapeutics & Medicines, found AstaReal astaxanthin to exert beneficial effects against both mental and physical fatigue.

Study subjects in this double-blind, placebo-controlled study consumed AstaReal astaxanthin twice daily for eight weeks (12 mg/day). “Visual Analogue Scale (VAS) analysis showed that AstaReal astaxanthin significantly reduced perceived symptoms of mental and physical fatigue compared to the placebo,” says Kuncenwitch. “These included improvements in cognitive acuity, concentration, motivation, and mood. Irritation and feeling of body heaviness were noticeably reduced,” he explains. In the same study, supplementation with astaxanthin significantly reduced salivary cortisol levels, a biomarker of stress.

AlgaeHealth (Irvine, CA), a division of BGG, is also keeping up with the research trends on astaxanthin. “Our latest research, which will be published in June of this year, shows an excellent cardio-respiratory result in trail runners,” says Bob Capelli, executive vice president, global marketing, at AlgaeHealth. “These were not highly trained athletes, but everyday people working out for a half marathon,” he adds.

According to Shawn Talbott, PhD, of EQQIL, an independent research and development company that conducted and supervised the study on behalf of AlgaeHealth, the significance of this research is “that we found a very novel effect of natural astaxanthin to improve overall cardiovascular function.” He further notes that “the subjects in this study were able to perform the same amount of ‘work’—but at a lower cardiovascular strain after supplementing with astaxanthin.” The study’s abstract will be...
presented at the upcoming 2017 American College of Sports Medicine’s Annual Meeting in Denver.

The Future Looks Bright
With the astaxanthin product market getting more competitive by the day, it’s important to understand which types of astaxanthin formulations can provide a competitive advantage. According to NAXA’s Kantowski, astaxanthin softgels continue to be in high demand.

“We’ve seen an increase in demand for astaxanthin products with higher single dosage levels—i.e., 12-mg single softgels,” she says. Furthermore, she notes that the market is demanding additional third-party verification. Along these lines, NAXA has launched the NAXA Verification Program (NAVP), which ensures that each astaxanthin product submitted for verification is derived exclusively from its natural source, *H. pluvialis*; that it is third-party independently tested; and that it has been grown following good manufacturing practices.

To gain a competitive edge, astaxanthin suppliers are also getting creative with consumer product applications. “For example, AstaReal has developed a method for incorporating astaxanthin oleoresin directly into baked goods,” says Kuncewitch. The company also has in place a spray-drying process that produces water-dispersible astaxanthin powder, P2AF, suitable for instant-beverage applications. According to Kuncewitch, “the powder can be applied directly to liquid and mixed mechanically or can be made into an effervescent tablet and added to the drink.” AstaReal also has a water-soluble product, Clear100, for beverages requiring high clarity.

Consumer education remains the driving force behind the continued interest in astaxanthin products. “Cyanotech is very active with educating our consumers,” says Cysewski. “We conduct demos in retail stores where our products are sold, as well as train store employees on the benefits of astaxanthin.”

AlgaeHealth is also active in consumer education and “works closely with its branded customers to help them educate consumers on the diverse, clinically validated benefits of natural astaxanthin,” says Capelli. The company has a series of white papers which examine these health benefits in detail, as well as “a 500-plus-page abstract list so our customers can quickly and easily review the various health benefits and see the depth and quality of research in each area.”

Cysewski believes that astaxanthin demand will continue to grow in areas where people can feel a real difference from its consumption. “These areas include joint health, faster recovery from strenuous exercise, maintaining good skin health under exposure to UV radiation, and eye health,” he says. Capelli predicts significant growth for astaxanthin in the antiaging industry in the coming years. “As people get older, they become concerned with their eyes and brain, their energy levels and strength diminish, their skin starts to sag, they get aches and pains, and their hearts become weaker,” he says. “Fortunately, in one supplement they can get support for all of these issues and more. It’s really the ultimate antiaging supplement,” he concludes.

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References

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“Since 2004, our sole passion has been the discovery and delivery of the highest quality specialty ingredients to manufacturers in the Health & Wellness industry, that allow for the development of outstandingly efficient products which will make a difference in consumers’ health.”

Patrice Dionne, innoVactiv’s CEO
From anti-wrinkle serums to face washes formulated with added benefits, the skincare market has typically been a topical one. But recent findings from Mintel show that skincare’s getting a shake-up from the nutraceutical and natural products industry.

After years of slow growth, the U.S. facial and skincare industry actually saw a decline in sales in 2015—for the first time in five years, says Mintel. Baby Boomers, arguably the target of most antiaging and skincare products, just aren’t buying: Mintel says consumers over age 55 represented the age group that was least likely to report using skincare products, and one-third of them reported not using anything at all.

The good news for nutraceutical and natural topical-product manufacturers and ingredient suppliers is that interest in natural formulations is the one thing Mintel says can rejuvenate this sagging market—and catch the attentions of younger consumers, a much-needed audience. Consumers that the market researcher surveyed agreed that factors like hydration and diet impact skin’s health.
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appearance more than the use of skincare products, which suggests a shift towards a holistic outlook. Specifically, Mintel’s Global Beauty and Personal Care Trend Gastronomia revealed that consumers are most likely to be interested in using skincare products with vitamin C (with 85% of consumers saying so) and probiotics (72%).

This shift toward natural ingredients in the topical market is reflected in increased interest in nutraceuticals formulated with an eye to skin health. If you ask Golan Raz, vice president of health and nutrition at Lycored (Orange, NJ), “ingestible skincare” is a category on the rise thanks to consumers’ interest in holistic health overall. “We see more and more consumers who are willing to adopt nutritional changes and nutritional technologies in order to advance the wellness of their skin,” he says. In fact, data from Euromonitor International show that the market size for vitamins and dietary supplements with beauty positioning grew from $76.8 million in 2015 to $83.9 million in 2016.

Indeed, consumers are starting to view the supplement aisle as important as the beauty aisle when it comes to skincare. “The skin health category should more appropriately be called the skin beauty category,” says Lynda M. Doyle, senior vice president of global marketing at OmniActive Health Technologies (Morristown, NJ). “Because consumers are increasingly looking for products to address multiple concerns—wrinkles, hyperpigmentation, dull skin, and uneven skin tone.”

According to Sebastien Merchet, nutrition business development manager, North America, at Seppic (Fairfield, NJ), the fact is that brands are launching more and more oral and topical natural products in the skin health category thanks to the volume of science available to support their efficacy.

**Topical Strides**

New research on naturally derived topical ingredients is advancing both preventative and antiaging efforts.

**EVENol** is a full spectrum tocotrienol/tocopherol complex from ExcelVite Inc. (Edison, NJ). Extracted from virgin red palm oil, it boasts proven benefits for hair growth and improved skin characteristics when taken orally as a supplement. The newest research, though, supports previous findings that the ingredient also holds promise in topical applications.

A recent study* showed that a facial gel mask infused with EVNol not only hydrated the skin but also enabled transdermal delivery of tocotrienol. Twenty human volunteers were treated with the mask for 30 minutes, with skin hydration levels measured at various intervals up to 180 minutes. What researchers found was that even at the 180-minute mark, the mask was able to yield significant hydration results by maintaining about 50% of the skin’s moisture. Participants treated with a placebo, however, showed a significant moisture loss at just 30 minutes of mask removal.

Moisture retention is also front and center at Improve USA (Anaheim, CA) with the launch of a new topical Aloe vera ingredient called Enderma. “The product was clinically tested, and the positive benefits included enhanced skin elasticity, increased moisturization, and significantly reduced wrinkle appearance,” says the company’s president, Peter Hafermann, “all within seven days of use.”

The pilot study, a single-blind bilateral design published internally in September 2016, showed a 31.49% improvement in skin elasticity after seven days of treatment with the ingredient, as well as a 67.13% improvement in skin moisture. Further, wrinkles decreased in appearance, and 100% of the women included said that post-treatment, their skin felt softer and smoother, and that their face was visibly more radiant.

Targeting wrinkles is paramount at Biova LLC (Johnston, IA) with BiovaDerm, a water-soluble egg membrane ingredient and the subject of a recent clinical study* published in October 2016. “The results were very exciting,” says CEO Pat Schneider. “Sixty-five percent of the women showed a significant reduction in wrinkle depth by up to 60%, after eight weeks of topical use.”

Researchers recruited 20 healthy females between the ages of 45 and 65, with the goal of determining wrinkle-reduction capabilities as well as the mechanisms of action behind the ingredient. Wrinkle depth was tested, as was total antioxidant capacity and collagen production. Indeed, after eight weeks of use, researchers noted not only a significant reduction in wrinkle depth, but also the ingredient’s ability to reduce the formation of reactive oxygen species by inflammatory cells in vitro. Further, the increase in collagen was statistically significant, they reported. The mechanism of this effect, researchers said in their report, may be related to the ingredient’s ability to counteract free radical damage at the cellular level and induce an antioxidant response.

BiovaDerm can be “easily formulated in many delivery systems such as creams, serums, and masks,” says Schneider, but there’s also opportunity to include it in sustained-release technologies that are becoming more popular in topical applications.

Bridging the topical and supplement categories is a unique launch from Blue California (Rancho Santa Margarita, CA) appropriate for both applications, says the company’s executive vice president, Cecilia McCollum. Last summer, Blue California announced commercial production of dihydroquercetin (DHQ), a water-soluble bioflavonoid and a powerful antioxidant, found naturally in fruits and vegetables, with skin-rejuvenating benefits.

According to the company, “Studies have shown that DHQ has the unique ability to not only protect cells, but also to stimulate the production of collagen and elastin in the skin. This property of DHQ means that it can actually lead to renewed elasticity and rejuvenation of the skin.”

DHQ can be used in a variety of applications, from beverages to dietary supplements to cosmetics.

**The market for vitamins and dietary supplements with beauty positioning grew to $83.9 million in 2016.**
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Imagine the Possibilities
THE BEAUTY OF EPIGENETICS

If you ask David Herault, head of global research and development for bioactives at BASF Corp. (Florham Park, NJ), the future of this category will revolve around epigenetics. The company’s Dermagenist marjoram (Origanum majorana) leaf extract was the subject of a recent study, which demonstrated the extract’s ability to rejuvenate cells’ epigenetic patterns and reactive gene expression.

“Our goal is to understand how individual lifestyles influence the conditions and needs of human skin, and to develop ingredients that are capable of reprogramming our skin cells,” he said in a press release. “To achieve this, epigenetics is our strongest ally. It is the key to understanding gene modulation and stimulating the activity of genes that have an influence on the longevity of the skin.”

Nutraceuticals

While some supplement ingredients in the skin health market aim to prevent the effects of aging before they take hold, others seek to undo existing damage. Both approaches are at the center of new research, highlighting a range of benefits from natural ingredients.

Lycored’s proprietary tomato extract was put to the test in a study published in 2016, which sought to determine the extract’s effects, when consumed orally, against ultraviolet UVA, UVB, and UVA1 radiation at a molecular level. The lycopene-rich tomato nutrient complex was found to completely inhibit UVA1 and UVA/B-induced upregulation of select genetic markers. In addition, lutein was effective if taken in the first period of the study, then followed by tomato extract. Ultimately, researchers concluded that both the tomato extract and lutein can protect against solar radiation–induced health damage. This research is important, says Raz, because “it allows us to better understand how to maximize the effect of carotenoid formulations, so that consumers will benefit from available and effective new nutritional technologies.”

Consumers with existing damage, though, tend to turn to supplements that can undo these effects, from uneven skin tone and hyperpigmentation to wrinkles. That’s why much of the newest clinical research is focused on how to turn back the clock on aging.

SkinAx2, an ingredient derived from French grape and melon extracts from Activ’Inside (Libourne, France), was the subject of a recent study, taking into account the color, contrast, and imperfections of skin. The study enrolled 35 women between the ages of 40 and 70, and supplemented them with a daily oral dose of 150 mg of the ingredient for eight weeks. At the end of the trial, skin luminosity increased nearly 26%, and imperfections—dark circles, redness, and spots—were significantly reduced. Subjects were also widely satisfied with the product, to the tune of about 82% of participants reporting improvements on their skin. Further, about 65% said they thought they looked better after the course of supplementation.

Ultimately, researchers said the ingredient improved radiance by reducing coloring, increasing luminosity, reducing imperfections, and improving skin firmness on women with dull complexions.

Antiaging is also center stage at OmniActive’s Health Technologies, where its Lutemax 2020 was the subject of a recent study. Researchers found that taking just 10 mg of the ingredient orally for 12 weeks improved overall skin tone, skin lightening, and elasticity.

Don’t expect ingredient suppliers to stop rolling out new ingredients anytime soon. Most recently, InnoVactiv (Rimouski, QC, Canada) introduced to the North American market a new line of nutricosmetic ingredients at this year’s Natural Products Expo West trade show. Called Myoceram, the ingredients are based on plant ceramides. The line stems from the work of a Japanese firm, Nippon Flou Mills Co., whose experience in grain milling extended to research on skin-healthy plant-based ceramides, which are typically derived from rice or wheat.

According to Jocelyn Bérubé, executive and scientific director, health and nutrition, InnoVactiv, in a press release, “Skin is our body’s largest organ. Yet, how nutrition affects our skin is a research field that has been overlooked for many years. When taken orally at a convenient low dosage, Myoceram boosts the expression of enzymes responsible for endogenous ceramide production within the skin itself. These new ceramides can then incorporate lamellar bodies between each cell to strengthen the outermost corneous skin layer, just as they would through our normal skin physiology.”

“Although beauty-from-within supplements are a staple in Asia, this market is still set to boom in North America,” the company added.

Melissa Kvidahl is a freelance journalist and copywriter specializing in the health and wellness industry.

References

Sherry Torkos, Pharmacist

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PET PROJECT

More companies and ingredients are targeting the pet-supplements market.

BY CINDY REED

A recent TechNavio market research report charts out a bright future for dietary supplements in the global pet-health market. The market researcher predicts a compound annual growth rate (CAGR) of 5.26% for the global pet-supplements market moving forward between 2016 and 2020.

One of the contributing factors to this market growth will be the continuing increase in the number of patents in the ingredients marketplace, as manufacturers of pet-health dietary supplements continue to strive to formulate better products. Another significant influencing factor for growth in the global pet dietary supplements market is the onset of a number of age-related health issues in pets of all kinds, which can lead to a number of disorders.

Outlook in the United States

Projections for pet supplements and nutraceuticals in the United States mirror the generally positive outlook for supplements in the human-health market. According to market researcher Packaged Facts, projected retail sales for pet supplements and nutraceutical treats in the U.S. continue to be promising and are expected to grow through 2017, to an estimated $1.6 billion.

"The pet market is split approximately 50% dog and cat, and 50% for horses," says Bill Bookout, founder and CEO of the National Animal Supplement Council (NASC; Valley Center, CA), pointing out that due to a horse’s larger size, a horse will naturally account for a higher percentage of ingredients. NASC is a nonprofit trade association devoted to protecting and enhancing the health of companion animals.

Bookout adds, "Most people think of their pets as their children or their own extended family members. We see the trends for animal supplements following similar trends for human supplements." What’s also promising for this market, he says, is "as consumers become educated on human supplements, that [knowledge] extends naturally to animal supplements as well."

Bookout ticks off a list of ingredients that he says still command a lot of attention in the pet-supplement space. Glucosamine, chondroitin, MSM, boswellia, yucca, and other
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joint-support products are still popular ingredients in the market for supplements and nutraceutical treats for dogs, cats, and horses. Bookout also says that omega fatty acid are popular for seasonal allergies, itchy and flaky skin, unwanted or excessive shedding, and skin and coat health. For healthy horse hooves, omega fatty acids are often combined with biotin. Other ingredients he feels have promise are probiotics (“up-and-coming,” he says) and weight-management ingredients “to help address obesity- and health-related issues for pets.”

Here are some additional ingredients to watch for in the pet supplements and nutrition industry.

### Joint-Health Support

Joint support continues to be a pressing need for our aging animal friends. Luckily, those looking for natural solutions can find some good options in the ingredients space. In 2015, the joint-health category represented a whopping 39% share of the pet-supplements market, according to TechNavio’s market research report, and is forecasted to grow further.

One ingredient option is NEM, a branded natural ingredient obtained from eggshell membrane and supplied by Stratum Nutrition (Carthage, MO). It helps to support joint comfort, flexibility, and a healthy range of motion.

Last fall, Stratum, along with ESM Technologies (Carthage, MO), the supplier and manufacturer behind NEM, announced the results of a first-of-its-kind canine study on the ingredient in dogs experiencing joint discomfort and function. The six-week, double-blind, randomized, placebo-controlled clinical trial was conducted at eight veterinary clinics.

Researchers found that NEM eggshell membrane significantly improved joint function and joint pain compared to placebo at one week (22.5% improvement according to a Canine Brief Pain Inventory (CBPI) questionnaire, and 19.4% CBPI improvement, respectively), but noted that the results “just fell shy of significance” after six weeks of supplementation.

During the study, researchers also tracked serum levels of c-terminal cross-linked telopeptide of type-II collagen (CTX-II), a biomarker for cartilage degradation. CTX-II levels were found to be substantially reduced at the end of the study for dogs taking NEM versus the placebo.

Another ingredient popular in the joint-health space is Regenasure, a branded glucosamine ingredient that is vegetarian-sourced and supplied by Cargill (Minneapolis, MN). It has been shown to support cellular joint health and healthy tissues.

In one study, researchers evaluated whether glucosamine has beneficial effects in cellular and animal models of osteoarthritis, and whether it can activate autophagy in vivo and in vitro. The researchers found that glucosamine may help activate autophagy and support healthy joints in the aging process.

Ingredients like these will continue to find demand in the animal space. Says TechNavio, "The demand for [joint-health] supplements will continue to increase worldwide in the coming years as they help in treating arthritis and crippling effects of osteoarthritis, which are very common in aging dogs....With the growing awareness about joint problems in their pets, several pet owners are increasingly demanding joint-health supplements as a preventative measure, which in turn, will be a major factor contributing to the growth of this market.”

### Weight Management

Interest in weight-management interventions is growing in the pet sector. Reports point to an increase in the number of obese pets along with obesity-related health conditions in pets, including damaged joints and ligaments, and digestive, heart, and other disorders.

“For many of us, pets are like members of our families,” says Mitch Skop, senior director, new product development, Pharmachem Laboratories (Kearny, NJ). “So, it may not come as a surprise that pets often suffer from some of the same maladies as humans, including being overweight and obese. In fact, there is a major trend in the pet food industry for foods that meet some of the same health requirements as the human owner, including that they be organic, non-GMO, low-carb, to name a few.”

One particular branded ingredient, Phase 2 Carb Controller, a white kidney bean (Phaseolus vulgaris) ingredient supplied by Pharmachem, has been clinically shown to promote weight loss and reduce the digestion of starch. It is believed to possess benefits for both human and pet health.

In a 2004, 17-subject study, Phase 2 Carb Controller was shown to help canine subjects lose weight. According to Pharmachem Laboratories, during the eight-week canine trial, 88% of the dogs in the study lost weight after consuming a supplement containing Phase 2 Carb Controller, without any additional changes in diet or exercise. The study also showed that 76% of the dogs that took Phase 2 Carb Controller lost inches around their abdomen, and none of the dogs gained inches in that area.

### Digestive Support

Tracking along with the human gastrointestinal-health (GI) market, the demand for pet supplements for GI health is reported to be increasing, too. Numerous ingredients, including digestive enzymes and probiotics, can lend support in this area. And although animals’ GI tracts contain different types of bacteria compared to those found in humans, unique formulations of prebiotics, probiotics, and digestive enzymes can also help animals maintain the balance of good and bad bacteria levels, and promote healthy digestion in pets just as they do in humans.

In particular, TechNavio’s report notes that, “The demand for probiotics has increased among the dog owners to improve gastrointestinal problems in their pets.”

One company, Hyperbiotics (Henderson, NV), says that it has created a probiotic ingredient composed of six probiotic strains that are found to reside in the animal gut and that helps support and balance dog and cat gut health. The ingredient is called ProPets, and Hyperbiotics produces it using the company’s patented Bio-tract time-released process, which ensures that probiotics bypass the acids in the animal’s stomach and are delivered to the intestinal tract.

The company says that the product is formulated with three billion CFU and requires no refrigeration because Hyperbiotics uses its patented LiveBac process, which ensures an eighteen-month shelf life.
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More Research

The hope is that more companies will study the effects of their ingredients in pet populations. Just this April, Lonza (Basel, Switzerland) announced the results of a brand-new study on the companion-animal version of its L-carnitine ingredient, Carniking, in working dogs (Labrador Retrievers). Published in the Journal of Nutritional Science, researchers found that supplementing the dogs with Carniking resulted in positive effects related to activity intensity, body composition, muscle recovery, and oxidative capacity.

“The positive results clearly demonstrated that Carniking L-carnitine helps recovery after exercise in active dogs and has significant effects on muscle mass,” said Dr. Craig Coon, CEO and co-owner for Four Rivers Kennel LLC (Walker, MO), where the study was conducted. “These effects provide the first evidence of Carniking L-carnitine’s specific positive impact on working dogs. This finding is promising as the increase in lean mass, recovery, and activity can provide better quality of life and function for working animals and house pets, for example.”

References


Cindy Reed writes for the nutrition and pet industries from her base in Eastern North Carolina, where she is passionate about healthy living and nutrition.
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The Promise of Cocoa

Even moderate cocoa consumption may benefit heart, brain, and skin health.

BY IRFAN QURESHI

Chocolate has been revered for centuries, with the Mayan and Aztec civilizations considering cocoa beans a gift from the gods. Cocoa, and the end-product chocolate, are rich sources of polyphenolic compounds, with cocoa containing the highest flavanol content of all foods. These compounds include catechin and epicatechin. In addition, cocoa contains the flavonols quercetin and isorhamnetin.

Research suggests that cocoa compounds can contribute to cardiovascular, cognitive, and skin health through multiple mechanisms. For one thing, these cocoa compounds have the ability to cross the blood-brain barrier and support neural transmission and synapse growth. They also support cardiovascular health by enhancing mitochondrial function and antioxidant benefits, improving endothelial function, exerting anti-inflammatory effects, and supporting vasodilation of blood vessels. In addition, they confer anti-inflammatory and antioxidant effects in skin, thereby promoting skin health.

Several recent studies summarized here confirm the health-protective role of cocoa and chocolate consumption. Some studies also point to the fact that these benefits might best be achieved through moderate, but not excessive, intake.

Insulin Resistance

A current area of research interest is how cocoa and chocolate consumption may affect blood sugar metabolism.

A recent study led by Ala’a Alkerwi from the Luxembourg Institute of Health (Strassen, Luxembourg) looked at the link between chocolate consumption and insulin resistance in 1153 adults aged 18-69 residing in Luxembourg. A food frequency questionnaire was used to assess chocolate intake, while blood glucose and insulin levels were assessed to calculate the measure of insulin resistance known as HOMA-IR. In addition, liver function markers, including serum γ-glutamyl-transpeptidase (γ-GT), serum aspartate transaminase (AST), and serum alanine transaminase (ALT), were assessed. In general, the researchers noted that consumers of chocolate were more likely to be younger, physically active, affluent people with higher education levels and fewer chronic health issues compared to those who didn’t consume chocolate.

After excluding those individuals who were on antidiabetic drugs, higher chocolate consumption was associated with lower insulin resistance (calculated as HOMA-IR), lower serum insulin levels, and lower liver enzymes, including γ-GT and ALT, suggesting that chocolate consumption may improve liver enzymes and protect against insulin resistance, a risk factor for cardiometabolic issues.
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A large study conducted by researchers from Harvard Medical School evaluated the association of chocolate consumption and incidence of heart failure.

Heart Failure
The cardiovascular health benefits of cocoa stem from multiple potential mechanisms. A large study conducted by researchers from Harvard Medical School (Boston, MA) evaluated the association of chocolate consumption and the incidence of heart failure. In this prospective cohort study including 31,917 Swedish men aged 45-79, researchers recruited individuals with no history of myocardial infarction, diabetes, or heart failure at baseline and assessed chocolate consumption using food frequency questionnaires. The men were followed between January 1, 1998, and December 31, 2011, and researchers monitored hospitalization for heart failure as well as mortality via records in Swedish registries.

Interestingly, when compared to those with no chocolate intake, individuals consuming moderate levels of chocolate (1-3 servings per month, 1-2 servings per week, and 3-6 servings per week) had progressively decreased risk of heart failure. Notably, however, those consuming more than one serving of chocolate per day were shown to have an increased risk of heart failure in the cohort. While additional research is needed to clarify the findings, the authors suggest that moderate chocolate consumption may be beneficial for heart-failure risk, while higher consumption may in fact increase the risk of heart failure.

Arterial Health
Furthering the potential cardiovascular health benefits of cocoa products, researchers led by Georgina Crichton from the University of South Australia (Adelaide, Australia) evaluated the relationship between dietary chocolate intake and arterial stiffness in men and women with an average age of 61. In the prospective study including 508 individuals regardless of health status, researchers evaluated food frequency questionnaires at baseline to assess frequency of chocolate consumption.

Approximately five years later, researchers assessed pulse-wave-velocity measurements, an indicator of arterial stiffness. Higher pulse wave velocity is associated with greater arterial stiffness, while lower values indicate better arterial flexibility.

Researchers found that dietary chocolate intake was significantly associated with pulse wave velocity; however, the association was non-linear. Pulse wave velocity was highest in those with no or rare dietary consumption of chocolate. Pulse wave velocity was lowest in those consuming moderate amounts of chocolate (an average of once per week). Interestingly, those individuals consuming chocolate more than once per week on average also had higher pulse-wave-velocity values. The findings further support the concept of moderate chocolate intake being heart healthy, while higher intakes are associated with worsening of arterial health parameters.

Skin Aging
Since cocoa is rich in flavanols and other compounds with antioxidant activity, researchers have been investigating the effects of cocoa intake on skin health parameters. In a recent double-blind, placebo-controlled study in Korean women (aged 43-86) with signs of photo-aging, Hyun-Sun Yoon and colleagues from Seoul National University (Seoul, Korea) looked at the effects of daily cocoa supplementation (320 mg total flavanols/day) for 24 weeks on signs of skin aging, including wrinkles, skin moisture, and elasticity. The researchers assessed wrinkles, skin elasticity, and hydration at baseline and at 12 and 24 weeks.

Skin roughness values changed significantly at 24 weeks in the cocoa group versus placebo (decrease of 8.7 versus 1.3 percentage points, respectively). Overall skin elasticity also improved significantly in the cocoa group versus placebo at both 12 and 24 weeks. However, no significant differences were noted in measures of skin hydration. Based on the results, the researchers noted that the cocoa supplement had beneficial effects on facial wrinkles and elasticity and may contribute to the prevention of some signs of photo-aging in women.

Irfan Qureshi is executive director, research and regulatory affairs, for Healthy Directions.

References
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Checking in with CoQ10

From clinical research to pricing and supply, here’s what you need to know about CoQ10 these days.

BY KIMBERLY J. DECKER

What a difference 15 years make. They’re barely a crease on the face of time, but within their span we’ve seen movies go from DVD to the Cloud, telephones from utilities to virtual appendages, and coenzyme Q10 (CoQ10) from “niche” nutrient to veritable household name.

And Scott Steinford, executive director of the CoQ10 Association (Salt Lake City), has been around to witness it all. By the Association’s reckoning, CoQ10 is currently the fourth most consumed specialty supplement in North America, and the expectations, he says, are “for continued growth as education and awareness of its benefits are demonstrated.”

Impressive Growth

Indeed, CoQ10’s compound annual growth rate (CAGR) has held above 20% for more than the past decade and a half. And where the number of brands identified with the compound stood at 18 in 2001, the tally reached a full 123 by 2016. As for the size of the North American market, “skyrocketed” may be too dramatic a term, but there’s no denying that its ascent from an estimated 3.7 million consumers in 2001 to 16.5 million in 2016 is impressive.

As it happens, one factor that’s driven those consumers to CoQ10 is another inescapable force of change these past 15 years: the Internet. As Steinford says, “The Internet is affording consumers a lot of opportunity for education.” Recalling his own “discovery” of CoQ10 back in the era of hard-copy journals, he notes that the opportunities for diving into research then were limited to all but those with access to major libraries. But now, he says, the Internet unlocks “in a matter of moments literally thousands of studies that support CoQ10. And that’s driving demand because consumers are generating their own interest and knowledge.”

Knowledge is Power

What knowledge are they generating? For starters, they’re becoming reacquainted with the electron transport chain they first encountered in high school biology, and with CoQ10’s role as a crucial electron carrier in it. In that capacity, CoQ10 helps cells generate ATP (adenosine triphosphate), which, as the body’s fundamental energy-transfer currency, is the stuff of life itself.

No wonder, then, that this ubiquitous compound—not coincidentally known as ubiquinone—resides in nearly every cell of the body, primarily in the mitochondria where electron transport occurs. But CoQ10 does more than carry electrons. As a natural antioxidant, it shields lipids and proteins from oxidation, and as one of the most investigated ingredients in the health space—with 3,000-plus studies referenced on PubMed, Steinford says—CoQ10 is emerging as a compound with the potential to improve everything from heart health and cognitive function to oral health, sports performance, and more.

Research has shown that long-term high doses may slow symptom progressions in early-stage Parkinson’s patients. In patients with heart failure, CoQ10 decreases hospitalizations, reduces labored breathing and edema, and increases overall quality of life, per other studies. Steinford even notes that the Q-SYMBIO Trial found that long-term CoQ10 treatment in patients with chronic heart failure safely attenuated symptoms and reduced major adverse cardiovascular events. “As more clinical studies are completed,” he says,
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CoQ10 production, often within two weeks of statin-therapy onset. That dampening “is a known mechanism of action of statins,” says Steinford.

Another statin side effect—and the top reason patients often abandon therapy—is statin-associated myopathy, manifest largely as muscle cramps and pain. And this is where CoQ10 comes in: Because the enzyme is critical to energy production in energy-hungry muscles, some theorize that statin-associated myopathy may stem to some extent from statin-induced CoQ10 depletion.

While proof of a definitive link between the two remains elusive, Steinford notes that “it’s expected that a study supporting the positive benefits of CoQ10 on statin-induced cardiomyopathy will be released this year.”

“Cardiologists are getting onboard with CoQ10 at a fairly significant rate,” says Scott Steinford.

Sounds grim, right? Not with the help of supplements. According to LabDoor.com, anywhere from 30 to 100 mg of our CoQ10 requirements come courtesy of sources other than our bodies. And while the top supplemental dosage offered 15 years ago was about 30 mg, Steinford says, “now the commonly recommended CoQ10 dosage for the average adult is 100 mg to 200 mg daily, with some brands offering a 600-mg capsule product.”

And if you were thinking of closing the CoQ10 gap via food, you may want to think again depending on your taste for organ meat: You’d need to eat about a kilogram of beef liver—perhaps CoQ10’s premier food source—to attain even 50 mg. And, says Steinford, “Food companies rarely fortify their products due to the high value of an effective therapeutic dose.”

Supply and Demand

Two of the key factors driving CoQ10 demand, Steinford says, are 1) improving margins at retail, and 2) lower ingredient costs. But this wasn’t always the case.

As recently as 2001, the entirety of the CoQ10 raw-material supply was controlled by a consortium of Japanese businesses—a degree of consolidation that never bodes well for pricing. Further, a little over a decade ago, the CoQ10 market underwent a serious supply shortage. The combined effect was that top per-kilogram prices for bulk CoQ10 in 2000 and 2005, respectively, were $2,000 and $5,000 (although typical pricing hovered closer to half those amounts).

Since then, not only has the supply chain opened up—with China now supplying about 90% of the raw material and the United States shoring up the remaining 10%—but current manufacturing capacity has caught up and
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1. Capsugel-commissioned study conducted by Bio-Images Research, Glasgow, Scotland (2014). Copyright © 2017 Capsugel Belgium NV. All rights reserved.
CoQ10 pumped the CoQ10 pipelines with sufficient product to support consistently strong category growth at reasonable ingredient prices. How reasonable? “Per-kilo CoQ10 prices are one-tenth what they were at the beginning of the century,” Steinford says, “and production is up almost twentyfold.”

The flipside of this scenario is that low, low prices don’t encourage suppliers to invest in the scientific research that supports and expands the market for their CoQ10 products. Current low pricing threatens further to pinch quality and supply. The upshot: “The CoQ10 Association encourages manufacturers to maintain their focus on quality, science, and education, and not strictly on pricing,” Steinford cautions.

What You Buy Is What You Get
When Steinford first ventured into the CoQ10 space, most of the world regarded the compound as a pharmaceutical ingredient. Only within the past decade, he says, has it assumed its new identity as a dietary supplement.

Yet, given the differential regulatory regimes governing pharmaceuticals and supplements—and given the lingering specter of adulteration and misidentification that haunts the latter—one can forgive consumers and nutrition brands that raise safety, identity, and purity concerns vis-à-vis CoQ10.

For several reasons, however, CoQ10 confounds those concerns. First, says Steinford, CoQ10 is a single molecule that’s bioidentical to what the body produces itself; as such, a kilogram as-purchased typically assays as 98%–99% active CoQ10. “There’s no room for adulteration,” as Steinford puts it. The same can’t be said for nutritional ingredients that are blends of multiple inputs, each at risk for tampering.

And CoQ10 has its own recognized USP monograph test for assay, which Steinford describes as “very understandable, solid—and strict. It’s easy to tell what you’re getting when you’re testing for CoQ10.”

Potential Energy
Steinford is a CoQ10 evangelist: He truly believes that this compound has the power to better people’s health and quality of life. But he knows that spreading the good news takes work, and that industry will need to expend energy if it wants to see CoQ10 reach its potential.

“The key to the continued success of CoQ10 rests with ingredient manufacturers working together to promote science and education that support the ingredient,” he insists. Suppliers have done yeoman’s work maintaining product quality even as they reduce production costs, but “the level of benefit that this attention to production cost provides will have diminishing returns if the efforts aren’t synergized with more sustainable benefits related to research and consumer education,” he says.

And the thirst for education is out there. The CoQ10 Association’s Research Now survey found that cardiologists, in particular, “are very open to CoQ10 usage,” Steinford says. “But they need to see more proof of efficacy and quality, along with better usage education and guidelines.”

His prescription: Brand owners should encourage their ingredient suppliers to reinvest in education and science, he says. The ubiquity of this enzyme means that “there’s a lot yet to learn about how CoQ10 can help the body. We’ve only touched the surface.”

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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Research on omega-3 polyunsaturated fatty acids (omega-3 LCPUFA) has grown tremendously over the past 10 years, and our knowledge about these LCPUFA—especially, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)—has given way to new understandings of how they can benefit human health.

In this article (the second in a two-part series), I will discuss how our understanding of omega-3 LCPUFA's role in human health has evolved over time.

**New Lipids Containing Omega-3s**

Several new lipids containing omega-3 LCPUFA have received attention in the past decade. Lysophospholipids containing DHA have taken a prominent place in our understanding of how DHA is transported between organs, ever since scientists discovered that the transporter Major Facilitator Superfamily Domain Containing 2A (Mfsd2a) is a selective (sodium-dependent) transporter for DHA into the brain. This discovery was followed by the finding that Mfsd2a also transports DHA as lysophospholipid in the placenta and in the retina, suggesting that carrier-mediated uptake is an important component in the incorporation of DHA in some tissues with high demands for omega-3 LCPUFA.

This discovery may have implications for the alleged higher efficacy for absorption and transport of omega-3 LCPUFA in the phospholipid form. (A number of studies so far have compared the bioavailability of different chemical forms of EPA and DHA upon oral intake.
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Enzymatically Generated Oxygenated Derivatives
In addition to the growing appreciation for distinct biological activities and roles of various chemical forms of lipids containing omega-3, the last 10 years have seen more understanding about the enzymatically generated oxygenated derivatives of EPA and DHA, as well as docosapentaenoic acid (DPA). Many new studies have been published on the Specialized Proresolving Lipid Mediators (SPMs) that were uncovered from the beginning of the 2000s onwards. SPMs are endogenous derivatives of LC-PUFA (lipid mediators) that activate a range of cellular changes that concertedly drive inflammatory responses towards their resolution. In other words, they are an important part of the body’s physiological mechanism to control the extent and magnitude of inflammation occurring in the body.

In the past decade, several SPMs that are made from omega-3 LC-PUFA have been further characterized in terms of their chemical structure and biological activities, and new members, such as the DPA-derived 13S-series resolvins, and the DHA-derived protectin- and resolvin-sulfdo conjugates, have been described. A newly uncovered DHA-derived metabolite, 19:20-epoxydocosapentaenoic acid, has potent activity in retinal and choroidal angiogenesis. Scientists have been busy elucidating the many biologically active derivatives of omega-3 fatty acids that regulate inflammation and tissue development in the body.

An increasing number of studies has addressed how dietary intake and supplementation with EPA/DHA-containing oils affects the formation and levels of these lipid mediators in the body. Also, the question of how specific nutrients affect the metabolism of EPA and DHA into these lipid mediators, and how omega-3 LC-PUFA metabolism is dysregulated in diverse diseases, is gathering in force. For instance, obesity and aging are now recognized as exerting a negative influence on SPM-mediated healing responses after injury—for example, after myocardial infarction. Lipid mediators derived from omega-3 LC-PUFA are now known not to be confined to the generation in local inflammatory reactions, but have been detected in saliva and in breast milk, suggesting important roles in protecting mucosal tissues and possibly in immunotolerance and gastrointestinal biotic health of infants.

In a rabbit model of periodontitis, the local oral application of resolvin E1 was reported to have systemic anti-inflammatory effects. Further progress has been made in characterizing a more complete scope of immuno-resolvent actions that omega-3
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LCPUFA-derived mediators exert in cells and tissues, in particular their endogenous antiseptic activity through the activation of phagocytosis of microbes.

**Omega-3s and Human Health**

Ten years ago, it was quite clear that the role of omega-3 LCPUFA in the body is far more complex than simply influencing cell membrane properties. It was also known that omega-3 fatty acids played plausible roles in mediating tissue-protective and anti-inflammatory activities. Much more information is now available to support that omega-3 LCPUFA actually modulate disease risk.

Ahead, we also look at what science has revealed about the implications of omega-3 LCPUFA intake on various aspects of human health.

**Immune System**

A shift in the way researchers think about the effects of omega-3 LCPUFA on the immune system has taken place in the last 10 years. Gradually, the poor classification that omega-3 PUFAs are immuno-suppressive is being replaced.

Now, there is an understanding that omega-3 LCPUFA permit the execution of marked multi-cellular immuno-modulatory activities that can be interpreted as being immuno-stimulatory in nature—namely, specific parts of the immune system are triggered to become less active, and other immune cell types are activated to actively promote inflammation resolution.

**Fatty Acid Distinction**

Another notable change is a growing appreciation for the individual activities of distinct fatty acids in general. Even among omega-3 LCPUFA family members, there is recognition of distinct tissue distributions and, in some cases, notable differentiation in biological activities of EPA and DHA.

Furthermore, omega-3s that are not EPA and DHA—for example DPA omega-3 and alpha-linolenic acid (ALA)—are increasingly being studied for their contributions to beneficial effects on health.

With regard to ALA, although it is an essential fatty acid, no unique or distinct biological activity for this fatty acid itself has yet been identified; however, research nevertheless links the dietary intake of ALA to several benefits for health, in particular metabolic health, such as insulin sensitivity and body weight.

Given the variable degrees of metabolic interconversion of the various omega-3 LCPUFA, their individual activities remain challenging to study and elucidate.

**Cardiovascular Disease**

One area that has received much attention is cardiovascular disease, with EPA and DHA having been reported to exert a variety of beneficial effects. Clinically relevant effects have been concluded from both prospective cohort studies as well as randomized, controlled trials. The intake of EPA and DHA at several grams per day lowers blood pressure, a major risk factor for cardiovascular disease.

The omega-3 index is viewed as a marker for coronary heart disease, especially sudden cardiac death, and higher EPA/DHA issue levels may be causally involved in offering protection through their further metabolism into locally acting derivatives that delay the formation of atherosclerosis and stabilize advanced atherosclerotic plaques. The role of omega-3 LCPUFA in the prevention of specific cardiovascular disorders, such as peripheral artery disease, aortic calcification, and aneurysm development, has seen increased research attention.

**Metabolic Syndrome**

Ten years ago, the possibility that EPA and DHA intake was related to the amelioration of various aspects of metabolic syndrome was gaining increased attention. Metabolic syndrome principally encompasses overweight- and obesity-related disorders characterized by high blood pressure, alterations in blood lipids, elevated blood glucose, and a predisposition to a diverse array of disorders such as steatosis of the liver and pancreas, hypothalamic dysregulation, and type 2 diabetes.

That interest has only expanded, and an enormous volume of clinical and preclinical information is now available on the relationship between omega-3 LCPUFA and metabolic inflammatory disorders associated with excessive net energy intake. Studies show a beneficial relationship between EPA/DHA intake and dyslipidemia, oxidation, inflammation, hypertension, glucose intolerance, overweight, and obesity.

**Neurodegenerative & Cognitive**

When it comes to neurodegenerative and cognitive disorders, our understanding of the relevance of omega-3 LCPUFA has improved significantly. Ten years ago, it was reported that a high omega-3 fatty acid intake is inversely proportionate to the prevalence of some affective disorders. Whereas at the time, insufficient clinical evidence was available to prove conclusively that treatment with omega-3 fatty acids has any beneficial effect on affective disorders, it is now becoming clear that stratification of patients by omega-3 index or by the level of oxidative stress can be useful, or is even necessary, to predict who may be responsive to increased omega-3 LCPUFA intake—for example in bipolar disorder, major depression, and cognitive decline preceding Alzheimer’s disease.

In the case of major depression, our understanding that a high-dose intake of EPA, but not DHA, can be helpful in reducing symptoms has refined remarkably. Omega-3 LCPUFA are now considered to protect glutamatergic neurotransmission from damage induced by stress and glucocorticoids.
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Omega-3

Research during the last 10 years has provided many examples whereby EPA and DHA increase the levels of small molecule antioxidants and antioxidant enzymatic defense capacity.

Inflammation
Paradoxically, EPA and DHA appear to exert beneficial activity in low-grade inflammatory disorders in which significantly increased oxidative stress is a characteristic. Based on chemical reasons, one might expect that increased omega-3 LCPUFA tissue levels would aggravate such conditions through their facile participation in free radical propagating reactions leading to lipid peroxidation. Clearly, this does not seem to be the case in the intact biological setting, and the mechanisms involved seem to be the ability of omega-3 LCPUFA to activate cellular and tissue antioxidant defenses.

Research during the last 10 years has provided many examples whereby EPA and DHA increase the levels of small molecule antioxidants and antioxidant enzymatic defense capacity, and decrease pro-oxidant generating activities. Increased turnover of DHA-containing phospholipids, activated through oxidative metabolism and increased neuroprotectin D1 formation, also constitutes a mechanism to maintain the functioning of DHA-rich membranes—for example, in the outer segments of retinal pigment epithelial cells needed for vision.

Nevertheless, the potential for increased oxidation of endogenous membranes enriched with PUFA in the context of low antioxidant levels has also been reported, and understanding the mechanisms involved in the dynamic interplay between oxidation and compensatory protective reactions will remain an interesting field of research. Another interesting line of research addresses the newly gained understanding that omega-3 LCPUFA enhance the detoxification of some environmental contaminants, likely through the promotion of their elimination by the liver.

Oxidation
Ten years ago, we knew that polyunsaturated fatty acids were sensitive to oxidation by molecular oxygen. Marked appreciation has now evolved for the chemopreventive effects of omega-3 LCPUFA, which are likely mediated through reactive oxidation products activating antioxidant defenses.

Cells can sense reactive products of EPA- and DHA-containing lipids through specific molecular sensor proteins, such as Keap1/Nrf2. The formation of non-enzymatic oxidation products from EPA and DHA, such as isoprostanes and neuroprostanes, can activate tissue-protective effects and mediate anti-arrhythmic and analgesic effects. Fascinatingly, these activities are not shared with those of the analogous autoxidation products from AA, suggesting that the body actively monitors non-enzymatic oxidation of omega-3 LCPUFA.

I regret that it has been impossible to highlight a more complete spectrum of scientific discoveries and advancements of the past 10 years. References that support the mentioned scientific developments can be obtained from the author via e-mail at gerard@goedomega3.com. More information on the role of polyunsaturated fatty acids in health can be found at Fats of Life (www.fatsofife.com).

particularly in the hippocampus, an activity which may counteract the development of stress-related disorders such as depression or anxiety.

Significant progress in halting the progression of cognitive decline prior to Alzheimer’s disease has been demonstrated in elderly people with daily intake of EPA/DHA in combination with B-vitamins. Most likely this goes back to the restoration of a molecular defect in the liver, in which the hepatic biosynthesis of DHA-lysophosphatidylcholine, involved in the transport of DHA to the brain, is significantly reduced. High intake and blood levels of both B-vitamins and DHA are able to reduce cognitive decline >80% over a three-year controlled intervention period.

Cancer
Clinical evidence has now also started to appear supporting results from basic research indicating that the immune-modified state of certain cancers is amenable to interference by omega-3 LCPUFA, making cancer more susceptible to treatment. In the treatment of cancer, omega-3 LCPUFA have been found efficacious in sensitizing cancerous cells to anti-cancer agents, in triggering apoptosis selectively in cancerous cells, and decreasing their glycolytic metabolism.

Both preventive as well as adjunct roles of omega-3s in cancer targeting are emerging—for example, in colorectal and breast cancer. Interesting applications have been developed, such as the capacity of DHA-loaded LDL nanoparticles to kill malignant hepatocytes.
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Green Tea

Yay or nay: What does the latest research say about green tea for weight management?

By Irfan Qureshi

Green tea (Camellia sinensis) is a healthy beverage traditionally consumed in Asian cultures. Green tea leaves are a rich source of polyphenols and other compounds with beneficial antioxidant properties. Recently, green tea has gained notoriety as a weight-loss aid, with some studies indicating that certain green tea components may have thermogenic benefits. The theory is that these thermogenic effects—including increasing fat oxidation and overall energy expenditure—could help reduce body fat and body weight.

The mechanism behind green tea’s thermogenic effects remains unclear, however. For one thing, green tea contains the compound epigallocatechin gallate (EGCG), which may account for several of the plant’s thermogenic effects; however, green tea also contains caffeine, itself a well-known thermogenic, and it is unclear whether any potential weight-loss benefits associated with green tea are due to the tea’s catechin profile, its caffeine content, or a combination of factors. Ahead, we look at what some of the most recent studies reveal about green tea for weight management.

Fat Absorption and Body Composition

Previous clinical studies on the effect of green tea supplements on fat absorption and body composition have shown mixed results. In a recent 12-week clinical trial, Pilou Janssens and colleagues from Maastricht University (Maastricht, The Netherlands) investigated the effects of green tea supplementation on fat absorption and resting energy expenditure.1

In the randomized, placebo-controlled trial, 60 men and women aged 18–50 supplemented with nine capsules of green tea extract, or placebo, daily in divided doses. The extract provided more than 560 mg of EGCG and between 280 mg and 450 mg of caffeine per day. At the end of the study, there was no difference between green tea and the placebo on fecal energy content, fecal fat content, resting energy expenditure, or body weight or body fat, ultimately indicating that the green tea supplement had no significant effect on body composition.

Fat Mass and Bone Mineral Density

In postmenopausal women, green tea supplementation has been associated with a decrease in fat mass as well as benefits to bone mineral density. It is not known, however, whether these effects are a result of green tea’s catechins or caffeine. To determine whether green tea does indeed benefit fat mass or bone mineral density, Allison Dostal and colleagues from the University of Minnesota (St. Paul, MN) conducted a sub-study in 121 overweight/obese postmenopausal women. During the study, subjects were administered a decaffeinated green tea extract providing 843 mg of EGCG, or a placebo, daily for 12 months. (This study was a sub-study of the larger Minnesota Green Tea Trial, which included 937 women.2)

At the end of the randomized, double-blind, placebo-controlled trial, the researchers found no changes in the green tea subjects’ body mass index, total fat mass, percent body fat, or bone mineral density when compared to placebo, nor did they see changes in circulating hormones. There were, however, small improvements in tissue and gynoid fat percentage (fat distributed around the hips, breast, and thighs) in those with higher body mass index.

Weight Maintenance following Weight Loss

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for weight loss, Joanna Bajerska and colleagues in Poland conducted a randomized trial in 55 obese men and women with metabolic syndrome. Following an eight-week weight-loss phase that involved a reduced-calorie diet and during which individuals lost an average of 7.3 kg of body weight, the subjects were randomized to two groups. One group—the treatment group—consumed rye bread containing green tea (specifically 123–158 mg of caffeine and 188–242 mg of EGCG daily) for 12 weeks. The second group was a control group who consumed non-supplemented rye bread for 12 weeks.

At the end of the study, the green tea did not provide any measurable benefits for weight maintenance versus placebo, nor did it impact HDL, triglyceride, or glucose concentrations. Green tea intake was associated with better maintenance of blood pressure levels, but overall, no significant effects were seen for weight management.

Energy Expenditure
In a recent study, Spanish researchers assessed the effects of green tea EGCG on energy expenditure, body composition, and cardiometabolic risk factors in obese women. In the randomized, double-blind, placebo-controlled study led by Juan Mielgo-Ayuso and colleagues, 83 obese pre-menopausal women consumed either 300 mg of EGCG or a placebo daily for 12 weeks. Metabolic and adiposity parameters were measured before and after the 12-week intervention period.

At the end of the study, the researchers found no significant changes in body weight, energy expenditure, fat metabolism, fat mass, insulin resistance, or total and LDL cholesterol levels as a result of EGCG intake compared to the placebo group. EGCG was determined to be not effective for improving energy expenditure, body fat, or weight in these women. The investigators also assessed liver function biomarkers to examine the safety of this amount of EGCG and found no adverse changes after 12 weeks.

Jury Still Out?
Recent clinical investigations have shown a lack of effect of green tea on conditions associated with energy expenditure and weight loss. In addition to lingering questions about

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precisely how green tea benefits weight, recent scientific reviews have pointed to potential adverse effects associated with the use of green tea preparations—specifically, green tea supplements. A systematic review led by Gabriella Mazzanti from Sapienza University of Rome (Italy) examined reports of liver toxicity associated with the use of green tea supplements. Mazzanti’s team concluded that, while the risk of liver side effects is low, a certain risk does exist and seems to be higher with combination products and possibly with increasing doses. Furthermore, while caffeine is probably safe in amounts commonly consumed on a daily basis in most healthy individuals, there have been recent concerns raised about its safety in higher doses and in certain populations.

While it’s likely that certain optimized green tea preparations may perform better than others, little is confirmed regarding an effective and safe dose of green tea for weight loss. Given the inconsistent trial results as well as potential safety concerns with increasing doses of catechins and caffeine, it may be wise to take a cautious approach when it comes to supplementation.

References
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**Velositol May Boost Whey Protein’s Effect on Muscle Protein Synthesis**


Velositol, a supplement formula from Nutrition 21 (Purchase, NY) that combines amylopectin and chromium, may double the muscle protein synthesis (MPS) rate when taken with whey protein, compared to whey-protein supplementation alone, according to a new study published in the *Journal of the International Society of Sports Nutrition*. Researchers found that the combination of Velositol and whey protein increased MPS by a significant 48% over baseline, while whey protein alone increased MPS by just 24%.

“This study shows Velositol has the ability to unlock the potential of protein, promote lean body composition, and enhance muscle building,” said Joe Weiss, president of Nutrition 21, in a press release. “This study confirmed our theories, and exceeded our expectations for Velositol.”

The randomized, double-blind, single-dose, active-controlled crossover study included 10 healthy men and women aged 22–34. Participants were either given 2 g of Velositol with 6 g of whey protein or 6 g of whey protein alone, followed by an exercise session involving eight complete sets of bilateral isotonic leg extensions with a load equivalent to 80% of their estimated one-repetition maximum. Muscle biopsies were taken before and after supplementation and the exercise bout.

In addition to finding the significant improvement in MPS in the Velositol-plus-whey-protein group, researchers also observed a non-significant increase in insulin “to help initiate muscle growth,” according to Nutrition 21. But blood glucose levels of participants remained in a healthy range.

Tim N. Ziegenfuss, PhD, lead author of the study, explained that the small number of subjects is common for a study like this, as muscle biopsies are invasive and must be tightly controlled. “The study results are impressive,” Ziegenfuss added. “Until this study was done, one of the only ways known to improve the anabolic response to resistance training was to consume more protein, which is not always practical. If future studies confirm our results, Velositol could be a huge benefit not only to people in their 20s and 30s, but especially those in their 40s and 50s and older, whose muscles become more resistant to the anabolic effects of protein.”

Nutrition 21 adds that in the wake of these promising study results, it intends to fund more studies investigating further additional benefits of Velositol, including its effects in combination with different types of protein.

**Milk Thistle Extract Helps Inhibit Inflammation in Immune Cells?**


Silymarin, an herbal extract made from the seeds of the milk thistle plant (*Silybum marianum*), may help suppress inflammation in a diverse range of immune cells, including in cells obtained from HIV-positive subjects, according to a new study. Euromed (Barcelona, Spain) recently shared results of the study, published in *PloS One*, which investigated the anti-inflammatory action of cells treated with Euromed’s milk thistle extract.

In the *in vitro* study, conducted by researchers at the University of Washington and supported by a grant from the National Center for Complementary and Integrative Health, researchers exposed silymarin to immune cells from chronically infected, HIV-positive subjects, as well as HIV-negative subjects.

Researchers found that treatment with the milk thistle extract suppressed the expression of activation and exhaustion markers of CD4+ and CD8+ T cells from HIV-positive subjects. Those same silymarin-treated cells also showed a trend toward modifying CD4+ T cell memory subsets. Additionally, in cells from HIV-negative subjects, the silymarin treatment showed a trend toward “suppressing pro-inflammatory cytokines from non-activated and pathogen-associated molecular pattern (PAMP)-activated primary human monocytes, and non-activated, cytokine- and T cell receptor (TCR)-activated mucosal-associated invariant T (MAIT) cells,” researchers reported.

Taken together, the results suggest that the milk thistle extract successfully elicited anti-inflammatory and immunoregulatory activity across a broad range of human immune cells. It was also noteworthy that beneficial effects were observed in cells from subjects in both diseased and non-diseased states, as both HIV-positive and HIV-negative subjects were included.

“In this study, we show that [silymarin] significantly reduces expression of various markers of T cell activation and exhaustion (e.g., CD38, HLA-DR, CTLA4, and PD1), as well as pro-inflammatory cytokines (e.g., IL-6 and IL-18) in PBMCs from chronically infected HIV-positive subjects,” researchers explain. They concluded that, based on the findings, silymarin from milk thistle “appears to modulate multiple metabolic pathways that converge on suppressing inflammation in diverse immune cell types, independent of the inflammatory insult or stimulus.”

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Protein Flavors

Which flavors work best for dairy protein versus plant protein?

BY JENNIFER GREBOW, EDITOR-IN-CHIEF

Consumers everywhere are quickly embracing protein drinks (powders and RTDs) as one of the surest investments in good health—and yet, a trip down the products’ retail aisle might have one thinking that he or she had wandered into the desserts section. Just consider some of the product flavors: Glazed Donut, Cookies ‘n Cream, S’mores, Birthday Cake.

Is this a case of consumers wanting what they can’t have? In a way. “Consumers of high-protein beverages tend to be more health-conscious. Their diets tend to be more restrictive,” points out Bob Verdi, PhD, health and wellness business director for flavor supplier Virginia Dare (Brooklyn, NY). A dessert-flavored protein powder or drink can give these customers the illusion of “guilt-free indulgence” and allow them to “cheat” on their diets, without cheating on health, he says.

It’s no surprise that some of the most successful flavors currently in the protein aisle are those sweet and sinful. Taking a deeper dive, there are slight differences in terms of which of those flavors pair better with dairy (whey) protein versus plant protein.

Whey versus Plant

Plant-protein powders and RTDs are much newer to the market than whey-protein powders and RTDs. While whey proteins have had time to branch out beyond flavor basics like chocolate and vanilla, plant proteins are still staying true to these classic flavors, says Megan Trent, marketing representative for flavor firm Gold Coast Ingredients (Commerce, CA).

“The whey-protein industry strives for what is new, creative, and will stand out in the market,” she says. Whey-protein customers are especially interested in sophisticated sweets like Salted Caramel, Red Velvet, Peaches ‘n Cream, Sugar Cookie, Cinnamon Bun, Orange Creamsicle, Chocolate Éclair, Bear Claw, and Baklava—all flavors mentioned by flavor firms.

By contrast, says Trent, “Currently, plant-based protein is a trend itself. Consumers seeking plant-based protein beverages tend to first examine the ingredients (vegan, raw, allergen-free) and secondly select their flavor preferences based on availability.” For plant-protein beverages, popular flavors are still traditional vanilla, chocolate, banana, and strawberry, she says. Trent and others also mention chai, coffee, and mocha as emerging flavors for plant proteins.

While flavor houses all say that they can achieve pleasing-tasting whey- or plant-protein products, plant proteins are still said to be slightly more difficult to flavor, for several reasons. For one, plant proteins like pea, chickpea, soy, hemp, rice, and spirulina are known to have earther, bitter notes, says Trent. Other plant-protein challenges can include palatability, says Jim Yang, director of R&D beverage systems and flavors for supplier Kerry (Beloit, WI), or even a grainy or “chunky” mouthfeel, says Virginia Dare’s Verdi. And, says Trent, other ingredients in a powder or RTD—amino acids, caffeine, stevia—can also contribute unwanted tastes.

Companies have ways of sidestepping these challenges. First, of course, is to find the right flavor to complement the protein. “For dairy protein, traditional sweet brown flavors work better, while heavier flavors such as chocolate, mocha, and coffee help cover off-notes in plant proteins better,” says Yang. Will McCormack, PhD, business development manager, nutrition, for Synergy Flavors (Wauconda, IL), says that sweet brown flavors also work for plant proteins, “whereas fruiter flavors can prove more difficult to pair.” McCormack also points out that flavors within dairy proteins can also differ—for instance, between grass-fed and stall-fed dairy protein. Milky, creamy notes like strawberry milkshake or vanilla ice cream work better for grass-fed, he says, while a “burnt” flavor like coffee would work better for a stall-fed dairy protein.

In addition to finding the right flavor pairing, companies often use masking or sweetness enhancers to fine-tune flavor. And finding the right blends of plant proteins to begin with is crucial. Kerry, for instance, recently launched ProDiem, a flavor-optimized plant-protein product that finds the best balance of different protein types, including pea, rice, and oat protein.

Looking Forward

Plant-protein profiles will only continue to improve, says McCormack. “Pea protein five years ago tasted much worse than it does now, but those learnings will continue and will then need to extend to rice, hemp, and algae, etc.”

Looking forward, no matter which side of the aisle you stand on—plant or dairy—indulgence is still the name of the game. Thanks to the options on the market today, protein customers can have their cake (good health) and eat it (indulgent flavors), too.
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