Still Gold
Turmeric continues to surprise in studies showing multifaceted health benefits.

Plus

News
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Science
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These are unprecedented and scary times. The COVID-19 pandemic has changed everything, including the way we work and do business.

For the dietary supplement industry, the rolling economic impact of the pandemic changes by the day. Many supplement companies remain operational, classifying themselves among the food and healthcare sectors considered critical and essential services. Some may have halted production. Major industry events have been cancelled or postponed. It’s hard to imagine that life was “normal” a month or two ago.

These are uncharted waters for the dietary supplement industry. To help companies stay abreast of fast-changing developments, leading industry associations have created COVID-19 online resources with constantly updated information. They include:

- American Herbal Products Association’s COVID-19 page (www.ahpa.org)
- Consumer Healthcare Products Association’s COVID-19 page (www.chpaa.org)
- Natural Products Association’s COVID-19 page (www.npanational.org/covid19-resources)
- United Natural Products Alliance’s COVID-19 supply-chain webinar (www.unpa.com)

Nutritional Outlook will also continue to be here for you as an information resource. Please stay tuned for our ongoing COVID-19 coverage on www.NutritionalOutlook.com, and continue to share your stories with us.

The dietary supplement industry has weathered many battles in the past and will get through this. We’re all in this together. To all of our readers: Stay safe and be well. Like all of you, we’ll be looking forward to brighter days ahead.

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Dietary supplement retail should be deemed essential business amid coronavirus pandemic

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Magnesium’s role in metabolic health

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FDA Scales Back Inspections Due to Coronavirus

The U.S. Food and Drug Administration announced on March 18 that it is “scaling back” on routine domestic inspections of facilities that produce FDA-regulated products, including food and dietary supplements, to protect its staff during the COVID-19 pandemic. The agency already announced earlier this month that it has suspended inspections of foreign facilities through April.

FDA typically conducts risk-analysis inspections at facilities every few years. FDA says it will now only send inspectors out to domestic facilities for “mission critical” purposes, such as “public health emergencies involving FDA-regulated products.” Many FDA staff are already teleworking, excluding those engaged in activities such as lab-related activities or monitoring imported products.

The agency is also evaluating how it can conduct regulatory actions in the meantime. It said: “Importantly, during this interim period we’re evaluating additional ways to conduct our inspectional work that would not jeopardize public safety and protecting both the firms and the FDA staff. This can include, among other things, evaluating records in lieu of conducting an onsite inspection on an interim basis when travel is not permissible, when appropriate.” The agency urged companies to adhere to good manufacturing practices, noting that in the last fiscal year, the violation rate domestically was “only about 5%.”

In a webpage Q&A focusing on food safety in the face of COVID-19, FDA emphasized that “Currently, there is no evidence of food or food packaging being associated with transmission of COVID-19.” As such, the agency said, if a worker at a facility tests positive for COVID-19, “We do not anticipate that food products would need to be recalled or be withdrawn from the market because of COVID-19, as there is currently no evidence to support the transmission of COVID-19 associated with food or food packaging.” The agency also noted that there are no food shortages in the country, despite current low food stock at grocery stores.

FDA, FTC Issue Warning Letters over Coronavirus Fraud

FDA and the FTC have issued warning letters to seven companies for fraudulently selling COVID-19 products. As of March 9, these are the first warning letters to be issued by FDA for unapproved products intended to prevent or treat COVID-19.

“The FDA considers the sale and promotion of fraudulent COVID-19 products to be a threat to the public health. We have an aggressive surveillance program that routinely monitors online sources for health fraud products, especially during a significant public health issue such as this one,” said FDA Commissioner Stephen M. Hahn, MD, in a press release. Hahn urged consumers to seek the advice of healthcare professionals if they are concerned about COVID-19.

“There already is a high level of anxiety over the potential spread of coronavirus,” added FTC Chairman Joe Simons in a press release. “What we don’t need in this situation are companies preying on consumers by promoting products with fraudulent prevention and treatment claims. These warning letters are just the first step. We’re prepared to take enforcement actions against companies that continue to market this type of scam.”

The recipients of the warning letters are Vital Silver, Quinessence Aromatherapy Ltd., Xephyr LLC (doing business as N-Ergetics), GuruNanda LLC, Vivify Holistic Clinic, Herbal Amy LLC, and The Jim Bakker Show. Some products cited in the warning letters are teas, essential oils, tinctures, and colloidal silver. The companies were given 48 hours to respond to the letters, describing the specific steps taken to correct the violations.

FDA and FTC are actively monitoring social media, online marketplaces, and incoming complaints to ensure the companies do not continue to sell fraudulent products under a different name or another website. An FDA cross-agency task force was established specifically to closely monitor for fraudulent products related to COVID-19. The task force has also reached out to major retailers for help in monitoring online marketplaces and has already removed more than three dozen listings of fraudulent COVID-19 products.

On February 11, 2020, dietary supplement industry associations attempted to get ahead of the issue. An industry coalition that included The American Herbal Products Association (AHPA), the Consumer Healthcare Products Association (CHPA), the Council for Responsible Nutrition (CRN), and the United Natural Products Alliance (UNPA) released a joint advisory. In the statement, the coalition of trade organizations advised marketers and retailers to refuse to stock or sell supplements that are presented as treating, curing, or preventing COVID-19, and refrain from promoting any dietary supplement for this purpose. They also advised consumers to avoid supplements that claim to treat, cure, or prevent COVID-19 and report them to FDA.
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Turmeric’s star just keeps shining. Look no further than HerbalGram’s latest Herb Market Report for evidence that, years after turmeric first attracted popular notice, the buzzworthy botanical keeps turning in stellar performances in both mainstream and natural channels.

How stellar? According to the report1, which reflects U.S. sales data for the 52 weeks ending December 30, 2018, turmeric enjoyed the greatest mainstream sales increase among all botanicals monitored, shooting up 30.5% to $93.3 million between 2017 and 2018. At the same time, turmeric raked in $51.2 million in natural-channel sales.

But just as every silver lining has a cloud, turmeric’s golden glow may be sliding into shadow—for the same report noted that for the first time ever, upstart hemp cannabidiol (CBD) usurped turmeric’s long-held top spot in the natural space.

So, is this turmeric’s sign to cede ground to CBD, or is there room enough in the botanical firmament for more than one superstar superfood?

Alexis Manfré, global product manager for proprietary turmeric ingredient TurmiPure Gold, Naturex (Avignon, France), is betting on the latter.

“While turmeric may no longer be in the number-one position, it certainly remains a top seller with continued growth,” he says. “Rather than looking at pure market share, the challenge going forward will be to take turmeric to the next level and meet consumer demand for convenience, clean labels, and efficacy at a low dose.”

Manfré isn’t the only herbal expert still bullish on turmeric—despite its natural-channel dip. "Curcuma longa—the source of turmeric—is one of the most beneficial herbs we have,” says Leisha Jenkins, marketing associate, Verdure Sciences (Noblesville, IN), agrees. "While it’s no surprise that turmeric is now sharing the limelight with other market prospects,” she says, “we’re still optimistic that we’ll continue to see substantial category growth.”

Francesca de Rensis, marketing director, Indena S.p.A. (Milan, Italy), is also optimistic. While acknowledging turmeric’s natural-channel slowdown, she sees its double-digit growth in the mass market as a genuine bright side, “demonstrating that turmeric is being adopted by a broader mainstream audience.”

Down but Hardly Out
Manfré isn’t the only herbal expert still bullish on turmeric—despite its natural-channel dip. "Over the past five years, we’ve seen demand grow massively in the U.S.,” he notes, "and we’re now seeing this same trend in Europe and emerging markets.”

And for good reason.
"Curcuma longa—the source of turmeric—is one of the most beneficial herbs we have,” says Manfré. "And even better, its roots are still too inexpensively priced to be a barrier to use. "

Turmeric’s Trick
The trick, according to Manfré, is to get turmeric into a mainstream product—"something that is different, unique, and can deliver turmeric at a lower dose and still provide the benefits that consumers are seeking.”

As Manfré sees it, the key to turmeric’s continued success lies in its ability to adapt to changing consumer needs and preferences. By offering convenient, clean, and efficacious products at a low dose, turmeric can continue to shine as a health-and-wellness powerhouse,无论是在主流市场还是自然渠道。
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It’s this anti-inflammatory capacity that helps curcumin inhibit the chronic inflammation associated with, for example, arthritis and skin conditions like psoriasis and eczema, adds Gencor’s Hill. “It has a positive track record for boosting immune response and disease prevention,” she continues. “Research shows that it can improve vascular endothelial function, easing blood flow and reducing strain on the heart. Studies show that it may improve metabolic disorders by regulating lipid metabolism and enhancing insulin sensitivity. Curcumin can improve overall brain health in many ways—most notably, by preserving mental acuity as we age. And multiple studies show that it helps cleanse and detox the liver by facilitating the removal of foreign substances from the body.”

In sum, she says, “There’s a mountain of evidence to suggest that curcumin’s therapeutic effects are both powerful and long lasting.”

**Good Sports**

Let’s start with its effects in sports.

“When it comes to exercise, some degree of physiological inflammation post-exertion is essential for the development of muscle mass,” Hill explains. But our modern world and diets already skew us toward inflammation, she continues, which not only impairs general wellness but can trigger the delayed-onset muscle soreness that stalls recovery and dampens performance.

So, it’s encouraging news that a recent exercise-recovery study—currently under peer review—that Hill’s company, Gencor, conducted showed that its branded curcumin product HydroCurc significantly reduces levels of muscle soreness and inflammatory markers following exertion.

“More interestingly,” Hill notes, “the ingredient significantly activated the Akt/ PKB pathway—the downstream region of the mTOR pathway—which signifies potential reduction in muscle catabolism.”

Meanwhile, CurcuWin, OmniActive Health Technologies’ (Morristown, NJ) branded curcumin ingredient, was the subject of a double-blind, randomized, parallel-design, placebo-controlled human clinical trial examining its effects on muscle performance and soreness at doses of 250 mg and 1000 mg administered over eight weeks versus placebo. The results, says Ralf Jäger, MBA, FISSN, cofounder and managing member of Increnovo LLC (Milwaukee) and lead author of the publication, show that consuming the ingredient prior to exercise “can improve training quality and help muscles recover faster.”

This comes atop previous studies showing similar post-exertion benefits for the ingredient, says Brian Appell, marketing manager at OmniActive. To wit, 1000 mg significantly reduced markers of inflammation (interleukin-6) and muscle damage (creatine kinase), showing the potential for facilitated muscle recovery and improved performance. No wonder, Appell says, “We believe curcumin’s role in the sports nutrition market will continue to grow.”

**State of Mind**

Another feather in curcumin’s cap: supporting brain health, which Hill says “is an area of interest for consumers and academia.”

Wacker Chemie’s Mohr points to the research portal NootropiceXperts as crediting curcumin with working at the molecular level to enhance neurogenesis. “It boosts the neurotransmitters serotonin and dopamine,” she says. “And it’s a powerful antioxidant helping to protect the brain from chronic excess inflammation.”

Thanks to an innovation grant from the Australian Federal Government’s Department of Industry, Innovation, and Science, Gencor is currently studying HydroCurc’s ability to cross the blood/brain barrier, Hill notes, and they’re seeing “very pleasing” interim results. “This will validate curcuminoids’ potential for brain health, while also overcoming the challenges of both absorption and uptake, too,” she predicts.

Numerous studies have also associated Verdure’s Longvida curcumin with cognitive improvement, Jenkins says. Within the last year, a follow-up investigation further established Longvida’s effects on cognition and mood in healthy subjects: After participants aged 60 to 80 supplemented with 400 mg of the ingredient daily for four weeks, researchers found significant improvements in measures of memory, attention, fatigue, stress, and mood compared to placebo.
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The study also showed a normalizing of saliva pH levels which is often indicative of a reduction in inflammation.

**Saliva pH - Inflammatory Response**

* Clinical Trial conducted by Morton Scientific Group, Cambridge, Ontario, Canada.
Human trials like these take turmeric and curcumin science in surprising directions—and their number has only increased in concert with the botanical’s popularity.

Notes Jenkins, "It’s really impressive to have healthy subjects exhibit positive cognitive attributes and improved mood, but it’s even more impressive to replicate those results years later in another healthy population.”

The Brain Game
But cognitive health involves more than keeping older people sharp. As Jenkins says, "The field has shifted recently from aiming at symptoms of cognitive decline and aging to helping people of all ages support a healthy brain as well as cognitive function and working memory.”

Which is where sports nutrition comes in. "Mental wellbeing is important for athletes at every experience level," Jenkins notes. "So as the sports-nutrition audience grows and develops, cognitive acuity will be one advantage that all athletes can benefit from.”

Witness the boom in supplements for Esports athletes. Players, Jenkins says, crave mental acuity and focus to carry their play to peak levels on intense schedules. Curcumin meets those needs while also fitting what she calls "the move away from ‘bad’ or unhealthy options toward a focus on health, wellness, and longevity as opposed to quick fixes and the negative side effects of caffeine.” (Turn to page 66 for more on Esports.)

Gut Instincts
And what about the microbiome—can curcumin make a difference there?

"Yes, as Shaheen Majeed, president worldwide, Sabinsa (East Windsor, NJ), explains, "It’s been found that curcuminoids improve the population and type of beneficial commensal intestinal microbiota while inhibiting the growth of pathogenic microbes in the gut lining.”

A double-blind, randomized, placebo-controlled pilot study¹ not only found that the curcuminoids in Sabinsa’s Curcumin C3 Complex ingredient produced a larger, 69% increase in intestinal bacterial populations compared to whole turmeric itself—reinforcing curcuminoids’ role as turmeric’s principal bioactives; it also found that subjects receiving the placebo saw their microbiota species decline 15% from baseline versus the turmeric group.

But those aren’t the only bacterial benefits that curcuminoids confer. In addition to bolstering the population of several beneficial microbiota species, Majeed says, "Curcuminoids are also metabolized to useful products such as the reductive metabolites tetrahydrocurcumin and demethylated curcuminoids.”

Exhibit A: Indena has studied the role of microbiota in the biotransformation of supplementary curcumin. And, as de Rensis says, "In vitro studies, including one published this year", demonstrate that our curcumin formulation with lecithin has an effect on the microbial biotransformation of curcuminoids, with suitable production of active curcuminoid metabolites, where unformulated curcumin has lower levels.”

New Frontiers
Human trials like these take turmeric and curcumin science in surprising directions—and their number has only increased in concert with the botanical’s popularity.

"Research has evolved from examining our curcumin’s role as an antioxidant and anti-inflammatory to investigating, say, its use as an adjunct to chemotherapy,” Majeed says. "This opens new windows for applications in healthcare, leading to yet more new clinical studies with more subjects and longer timelines to learn more about its benefits and safe use.”

This is a promising prospect for the ingredient’s future, Jenkins believes. “Continued research is vital to the category’s success, allowing not only for substantiation of historical applications, but for improved methodology and a more comprehensive understanding of the mechanistic capabilities with proven efficacy and safety,” she says.

Get to Work
But none of what we learn will matter if curcumin can’t get to the tissues that need it. And, says Hill, "One of the biggest challenges with curcumin is its bioavailability.”

The fault lies with turmeric’s lipophilic nature, which limits its absorption in aqueous environments like the stomach. Add to that our bodies’ tendency to eliminate curcumin rapidly, and you wind up in a situation where high doses on the order of 1 to 2 grams per day are needed to reach efficacy levels. “Thus,” says Naturex’s Manfré, “the challenge is to ensure the greatest absorption of all curcuminoids and metabolites at a low and cost-effective dose.”

That’s sent brands to the lab in an effort to crack the bioavailability code. For example, Gencor’s water-dispersible HydroCurc ingredient uses a patented dispersion technology called LipiSperse that it developed with Pharmako Biotechnologies to “increase the dispersion of crystalline lipophilic agents in aqueous environments, allowing for better absorption and use,” Hill says. And because the LipiSperse technology delivers its curcumin payload at a 9-to-1 ratio of actives to excipients, a mere one to two capsules daily provide an efficacious dose.

Manfré notes that a randomized, cross-over-design pharmacokinetic study¹⁰ sponsored by Naturex involving 30 healthy subjects found a 24-fold enhanced level
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of curcuminoid bioavailability for 300 mg of Naturex’s TurmiPure Gold turmeric extract (standardized to curcumin) compared to 1500 mg of turmeric standardized to 95%—even with the addition of pipericine, which Manfré says “is traditionally thought to aid curcuminoid absorption.” In other words, a 300-mg dose of Naturex’s product delivered as many curcuminoids to the blood as 1,922 mg of regular 95%-turmeric, with or without black pepper extract, he says.

Indena enhances the bioavailability of its Meriva-brand ingredient by creating a solid dispersion of its three major curcuminoids in a food-grade lecithin matrix. This “phytosome” delivery system improves the ingredient’s dispersibility and solubility in gastrointestinal fluid, de Rensis says—a necessary condition to optimizing bioabsorption, effectiveness, tolerability over time, and safety.

OmniActive uses its patented UltraSOL technology to increase the relative absorption of its CurcuWin ingredient’s curcuminoids 46-fold over standard curcumin. “For supplements, this translates into efficacy at lower doses,” Appell says. “For food and beverages, it offers a formula-flexible solution.”

Verdure Sciences’ Longvida curcumin survives digestion to enter into circulation thanks to a patented solid lipid curcumin particle (SLCP) technology that Jenkins says “allows delivery of bioefficacious levels of unglucuronidated free curcumin to the brain and bloodstream.”

And finally, Wacker surrounds its Cavacerumin formulation with gamma-cyclodextrin, a ring-shaped sugar molecule that creates a hydrophilic interface between lipophilic curcumin and water—again, easing dispersion and absorption. “A peer-reviewed clinical study11 shows that this successfully enhanced bioavailability by a factor of 40 compared to conventional curcumin extracts,” Mohr notes.

Special Delivery

Mohr adds that Wacker’s ingredient is a free-flowing, water-dispersible powder appropriate for use in supplements like tablets or capsules as well as in functional bars, gummies, beverages, and more.

And this is no small point, she says, “as consumers increasingly look for alternative dosage forms that differ from conventional medicines.”

Sabinna’s Majeed widens turmeric and curcumin’s prospects even further. Noting that turmeric has been used to improve skin health “throughout history,” he points out that cosmetic and even oral-health products that contain curcumin “are finding more acceptance among consumers today.”

Which should go a long way toward keeping turmeric’s star shining. “As studies continue to be published and consumers experience turmeric extract’s benefits, the market will continue to grow,” Majeed says. “And now that the research has extended far beyond inflammation, we expect that market expansion to endure.”

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.

References

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Curcumin is nearly a household name today and is available as both a standalone supplement and an ingredient within supplement blends. Curcumin is a polyphenol derived from turmeric (Curcuma longa): a botanical which, according to the National Institutes of Health's National Center for Biotechnical Information (NCBI), "aids in the management of oxidative and inflammatory conditions, metabolic syndrome, arthritis, anxiety, and hyperlipidemia." It may also offer some defense against muscle inflammation and soreness, and cognitive decline.

Curcumin itself, "combined with enhancing agents" such as piperine, offers multiple health benefits, NCBI asserts. Indeed, turmeric has been used in Ayurvedic medicine in South Asia, especially, for centuries, for such conditions as rheumatism, fatigue, pain, and breathing problems.

In addition to its manufacture and branding for oral supplements, curcumin is produced for the cosmetics industry and as a food additive.

Conventional curcumin is grown in India, Asia, and Central America and is widely available. Organic extractions are available, too: But are they better? And to what extent is curcumin adulteration a problem? Ahead, we examine the challenges of producing organic curcumin and discuss issues curcumin processors and branders face.

The High Cost of Organic
"There's a general movement, with spices as well as natural ingredients, toward organic and non-GMO. Those are powerful movements," says Len Monheit, executive director of the Global Curcumin Association (GCA), which represents seven member companies. "The challenge comes when you're trying to claim 95% curcuminoids on your curcumin supplement label," Monheit explains. "Much of the research done is on curcumin at the 95%-curcuminoids level, and in order to get to that level, you need to do various extraction and concentrating steps. To do that with organics alone is really costly. So most of the products that are labeled 'organic' won't claim 95% curcuminoids," he continues.

Herbal-ingredient supplier and GCA founding member Sabinsa (East Windsor, NJ) points out that quantity is an issue with organics as well. Particularly in India, explains Shaheen Majeed, president worldwide, Sabinsa, significant challenges exist.
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that limit the quantities of organic curcumin available.

“One of these is the proliferation of small farmers—as opposed to huge farms—who make agricultural decisions independently of each other,” Majeed explains. “These individual small farms may not be likely to band together to all follow the same agricultural practices, such as those for certified-organic farming, because of societal barriers. Organic material sourced in this kind of situation is significantly more expensive.” Corporate farming is the alternative, but limited availability of large plots of land in India is a problem, Majeed adds.

GCA’s Monheit continues, “It’s difficult to get an efficacious extraction at a tolerable price point because you need to use organic solvents, too, and those can be expensive as well.” As a result, “organic” on a curcumin label sometimes serves as a “halo, and nothing more,” he says.

Kristen Marshall of GCA member company Verdure Sciences (Noblesville, IN), which produces Longvida Optimized Curcumin, agrees with Monheit’s assessment and adds that an “organic” or “certified organic” claim does not make a product “inherently superior to other options on the shelf.” Organic turmeric extracts can yield high levels of curcuminoids, Marshall says, “but these extracts tend to then be offered at a much higher cost.” She continues, “Just because a product is ‘organic’ doesn’t mean it’s better, and, in fact, there’s a lot of confusion with the term organic and how it is interpreted by media, industry, and consumers.”

“And just because a botanical is conventionally grown doesn’t mean it is or isn’t good quality,” she continues. “There are many farming programs, specifically with turmeric, that are controlled but don’t necessarily fall under the ‘certified organic program’ banner.”

Sabinsa’s Majeed agrees, explaining that the turmeric producers with whom his company works adhere to farming practices that, while not certified organic, are not reliant on chemicals.

“Traditional farming methods used by small farmers in India tend to be those you think of that are more harmonious with the land and have been used for hundreds of years,” Majeed states. “For example, the farmers plant herbs that repel pests alongside the curcumin. The farmers live alongside their fields and are constantly monitoring their condition. The ox and goats on the farm fertilize the fields, rather than commercial fertilizer that may include sewer sludge, as is common in some other countries. And we train the farmers we contract with in good agricultural practices that produce high-quality material without needing added chemicals.”

Verdure’s Marshall posits that a curcumin product claiming a particular level of curcuminoids, such as the 95% figure, is also not necessarily higher quality or more effective—more is not always better, she stresses. “Given bioavailability concerns, several companies have different delivery technologies that offer varying amounts of curcuminoids. Our Longvida product, for example, is standardized to offer approximately 20% curcumin via Solid Lipid Curcumin Particle Technology, which allows our curcumin to survive initial digestion and systemically circulate to deliver free curcumin throughout the body. Therefore, Marshall contends, the claims of “organic,” “95% curcuminoids,” and efficacy are not inherently interrelated, or equivalent to superiority.

She adds that in many cases, additional certifications, which may include organic, are tools suppliers use to help corroborate and relay messages of traceability and transparency to their customers.

Avoiding Adulteration, Synthetics, and Other Problems

Curcumin is wildly popular, “and we know that any popular category is going to be exploited,” GCA’s Monheit says. GCA is aware of adulteration issues and the existence of cheap synthetic curcumin being sold as the real thing, and, as a result, one requirement of GCA membership is for members to send GCA some product for testing in either of the two laboratories it uses. “We at GCA also believe,” Monheit continues, “that every manufacturer should add a specification and actually do testing on their raw materials for the presence of synthetic adulteration. Many do not.”

Steve Geiger, vice president of sales, USA, for GCA member company Vidya Herbs (Fullerton, CA), points to “identifying critical control points” along a vertically integrated supply chain as a method for combatting adulteration. “One of the challenges is to establish, and then maintain, a vertically integrated supply chain. This is done to ensure full traceability and standardization of curcuminoids, and the ability to control quality at every stage.”

“All of our turmeric extracts are C14 carbon tested and TRU-ID/DNA certified,” he adds.

Sabinsa was, as mentioned, a founding member of GCA. It says it alerted industry to the problem of synthetics and adulteration years ago. “We have very close relationships with our farmers and can tell you they are as concerned about the synthetic curcumin on the market masquerading as naturally derived as we are,” Majeed says. “That petroleum-derived material is sold incredibly cheaply, which is why some manufacturers buy it. Serious safety concerns and FDA’s denial that synthetic [ingredients are] allowed aside, these farmers are worried about their livelihoods.”

Since GCA was formed, “we are happy to have an ally in this fight against synthetic adulteration,” Majeed concludes.

Maureen Kingsley is a freelance writer, editor, and proofreader based in Los Angeles. She covers a variety of industries, including medical technology, food-ingredient manufacturing, and cinematography.
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Vitamins

Defending VITAMINS

What’s wrong with the science?

BY JUDY BLATMAN

Let’s face it. Vitamins have generally not fared well in recent years when it comes to high-profile randomized controlled trials (RCTs) or meta-analyses that statistically combine selected data from those studies.

There have been some notable exceptions. For example, the AREDS trials found a specific combination of vitamins reduced the risk of age-related macular degeneration, and the Physicians’ Health Study II suggested a modest benefit that significantly reduced the risk of total cancer in the study population.

There have also been secondary outcomes in clinical trials that have produced positive findings worth exploring further, as is the case in the VITAL trial that suggested reduction in the rate of cancer deaths for the study population taking vitamin D.

But by and large, RCTs hypothesizing that vitamins will prevent chronic disease have been a swing and a miss—something disappointing to everyone from study funders to researchers and from the supplement industry to consumers.

Does this signal the end in the vitamin research wars, with a white flag raised by the supplement industry? Not by a long shot.

Instead, it’s time to refresh the arsenal.

What’s Null Got to Do With It

Consumers are sticking with vitamins. With supplement use at an all-time high according to the 2019 Council for Responsible Nutrition (CRN; Washington, DC) Consumer Survey on Dietary Supplements, vitamins/minerals continue to be the most commonly consumed supplement category, with 76% of Americans taking them annually. The multivitamin (58% percent of Americans take them) and vitamins D, C, B, and E are all firmly planted in the list of most popular supplements in CRN’s survey.

When it comes to the science, preeminent nutrition researcher Jeffrey B. Blumberg, PhD, FASN, FACN, at the Friedman School of Nutrition Science and Policy, Tufts University (Boston, MA), has a lot to say on this topic.

To begin with, Blumberg offers, “No investigator I know wants to come out with a null outcome from their studies. Investigators would like to see something positive.”

It’s understandable that researchers want to swing for the fences, hoping to make their mark with that home-run clinical trial that can elevate their reputation and help secure future grants. But given the multifactorial nature of chronic diseases like cancer and heart disease, why
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would anyone expect that a simple vitamin pill or even a combination of vitamins would, on their own, prevent cancer?

“No one disagrees that nutrient-deficient diets are a risk factor for chronic disease, but they’re just one risk factor,” says Blumberg. “Let’s look at the normative state of Americans today—66% are overweight or obese. Therefore, I could be taking 10 supplements a day, but if I’m also obese with a BMI of 35 and smoke two packs of cigarettes daily, it should come as no surprise that those supplements won’t work to prevent chronic disease.”

“It’s asking way too much of a supplement,” he concludes.

**Does the Past Predict the Future?**

So why conduct these trials? Why spend the money and the time and risk the disappointment?

Blumberg explains that clinical trials build on prior research. He says, “In order to justify doing a clinical trial, you’re saying there is evidence that this intervention could work based on earlier research, from in vitro studies, animal models, observational studies, and maybe some small clinical trials.” In other words, there’s been some hint of benefit that would warrant the use of sponsor funding and all the time and effort involved from a research team to take the next step to the large RCT. “No one does an RCT without evidence that there could be a benefit,” he points out.

However, if the RCT doesn’t confirm that benefit, there shouldn’t be a rush to deny the prior benefits discovered. Says Blumberg, “That’s a pretty big condemnation of all research approaches except for one. Maybe there’s something limited about that ‘gold standard’ of an RCT in that it’s not truly able to measure the benefits that were found in all of the other studies that justified that RCT in the first place.”

**Vitamins Are Not Drugs**

Blumberg continues, “RCTs are a good model to test drugs because they can be done quickly, effectively, and efficiently because if your drug doesn’t work in one or two years, you’re not going to even market it.”

He sees a potential disconnect in the financial viability and long-term researcher commitment that could result in some success for vitamins and chronic disease. He asserts that it takes 20-30 years for cancers and heart disease to develop and that nutrients work best over a lifetime. “To my knowledge, there has never been a 20-year RCT on any dietary supplement. What investigator wants to put in 20 years or more before they get their final results?” he asks.

To compound the issue of studying vitamins and chronic disease prevention and considering how any positive results might be communicated to consumers, there is also the matter of a mandated government disclaimer for product labels using certain categories of claims not pre-approved by FDA. Blumberg gets the irony. If supplement product labels need to state the product is not intended to “diagnose, treat, cure, or prevent any
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Any Questions?

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disease,” Blumberg wants to know “why is all this research focused on disease?”

The Wrong Question
According to Blumberg, “A big part of the problem has been asking the wrong question. It sounds like a reasonable one: how do dietary supplements prevent non-com- municable diseases; which nutrients prevent cancer, heart disease, osteoporosis, COPD, you name it,” he says. But with the critical limitations of using RCTs to test nutrients, it’s probably not the right question, and it’s likely not even what consumers are looking for a vitamin to do.

That doesn’t mean Blumberg suggests eliminating all RCTs for future nutrition research. From his perspective, it’s not appropriate to tell any researcher how or what research he or she should conduct. He does, however, have some forward-thinking research considerations for studying vitamins that link new technology with improving the quality of life—two areas he thinks will make a difference.

Resetting the Bar for Science
One of the areas to consider is how the changing scientific landscape will reset the stage of nutrition and vitamin research. According to Thomas Li, business development manager for IFF Health (New York City), an ingredient supplier and the manufacturer of the Grow Nutrients line of vitamins and minerals, “Science is key for us because it aligns with our message of being premium and high quality; we want to prove our ingredients work. In this age of transparency, having new data is crucial to staying relevant.”

Still, he contends: “While it is true that many well-known ingredients with long histories of traditional use usually have a lot of science behind them, many product claims still rest on outdated science. With the emergence of new technologies and personalized nutrition, the bar for scientific research should be set higher.”

The growing influence of personalized nutrition could change the research in numerous ways. Blumberg is not only energized about what that science means for individuals; he’s energized about how that discipline can translate into clinical research.

Blumberg is so energized, in fact, that he co-authored a paper on personalized nutrition for the American Nutrition Association (ANA; Hinsdale, IL), for which he serves as the Board Chair, published in December 2019 in the Journal of the American College of Nutrition. The paper proposed a definition of personalized nutrition as a “field that leverages human individuality to drive nutrition strategies that prevent, manage, and treat disease and optimize health.”

“If our diets are poor (and they are),” says Blumberg, “will taking vitamins help improve structure or function? I think the evidence is there that it does.”

The Future of Research
In addition to research evolving in these ways, changing attitudes about research could also help improve the way we study these nutrients.

For instance, improving the daily quality of life may or may not lead to a risk reduction for chronic disease, but if improving how we feel improves our health right now, that may be the right outcome.

Says Blumberg, “It’s an outcome we can measure. These kinds of studies are doable because I don’t need to do a 10-year study to see if my immune responses, my cognitive performance, my muscle strength, or my vascular reactivity are improving. I don’t even need 25,000 people to do it right. I’m using the individual as his or her own control, as well as doing a group analysis. I can design a parallel design or a crossover RCT design looking at a physiological response or structure response.”

He points to an observational study which he co-authored that published online in October 2018 in Scientific Reports. In that study, the researchers analyzed data from a personalized nutrition company that provided results from 1032 individuals who had a personalized nutrition analysis and agreed to allow their anonymized data (baseline through follow-up tests after incorporating suggested nutrient interventions) to be analyzed. “What we learned about them en masse is that their numbers changed,” said Blumberg. “We saw vitamin D levels go up, and we saw LDL cholesterol levels and glucose levels go down.”

Using technologies that study the “omics sciences” (nutritional genomics, proteomics, metabolomics, etc.) allows for measuring thousands of metabolites at a time and is “enormously powerful,” he says. “I can look at a nutrient with not just one outcome, but clusters of outcomes.”

He’s realistic that while the possibilities for all these new technologies are endless, the costs may currently be a deterrent. But he’s not personally deterred. “Fifteen years ago, it cost about $1000 to test one genome; now it’s about $100.”

More Sophistication in Science
Blumberg strongly believes that predictive analytics will also play a role. “Now we’re using machine learning and artificial intelligence. I can measure 1000 things in your body through the use of omics to make predictions, but that’s too expensive. Can I actually look at just 10 things and make predictions? Machines can take massive amounts

“No one questions that drug companies should be funding their own clinical trials,” says Tufts University’s Jeffrey Blumberg.
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of data from massive amounts of people and look for patterns. People are building these tools now and trying to understand how only a limited set of biomarkers are needed to tell you something about the state of your health and wellness to make an impactful prediction. This will work for vitamins and other nutrients.”

Blumberg says that RCTs will be better designed when we have better biomarkers and as novel statistical analyses to analyze observational data in a manner more like a clinical trial continue to improve.

“Our sophistication in looking at molecular and biochemical outcomes is getting much better in doing assessments and making predictions, but at the same time people doing the biostatistics are developing more sophisticated algorithms and approaches than we used to have before,” he says.

Science Counts

Even as there is hope for future research, there is another dilemma the supplement industry faces: how best to get the research funded.

Nutrition research is not well-funded by the government, and academic institutions aren’t generally ponying up funds. Nor does there appear to be many (or any) Mike Bloomberg-esque scientists able to pull out personal checkbooks to fund their own studies. This is where industry can and should step in.

IFF Health’s Li says the company prides itself “on the clinical science for our branded ingredients to prove and support the claims made in marketing. We have a robust clinical pipeline to keep enhancing this. Not only do we want to make sure our science is updated to be relevant with what the industry is demanding, but also to find new unique features to pass on to our customers. We conduct our own research, but also partner with customers on clinical studies as well as a value added to our services.”

Li further advises “IFF Health is always looking to support our customers in joint studies utilizing their finished products with our ingredients,” as he sees “a big gap in the lack of finished products being used in science.”

Darned If You Do, Darned If You Don’t

Herein lies the quandary: While companies that support nutrition research should be commended, considering the general lack of funding, that research or funding is often discounted by the medical journals and not always welcomed by the consumer press because it comes from the industry.

Taylor C. Wallace, PhD, CFS, FACN, at George Mason University, and editor-in-chief of the Journal of Dietary Supplements, worked in the supplements industry for a short time and now runs Think Healthy Group, a food and science nutrition consulting firm with expertise in developing and executing research to support product claims, policy decision-making, and educational campaigns. Wallace insists that transparency disclosures should be “standard practices” and are used by “most researchers who are honest, credible, and transparent.” He says that “accusing” a scientist of “industry funding or industry bias” implies that the scientist “somehow deviated from standard procedure or either manipulated or fully fabricated data.”

Wallace says he “doesn’t know any credentialed scientist in the field that would even vaguely consider manipulating or fabricating data to suit an industry sponsor,” adding “that act would be career-ending, extremely unethical, and embarrassing.”

Blumberg, who was the director of the Antioxidants Research Laboratory at the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University, has been an academic researcher for 44 years, beginning at Boston’s Northeastern University and joining the Tufts University faculty in 1981. He’s received research grants from the food and dietary supplements industries, served on industry scientific boards, and accepted honorariums to speak at industry conferences. He is also highly regarded in the scientific research community. Yet, he’s felt the discrimination that comes with working with industry and says he’s “not special in that regard.”

“You are tainted if you take money from a company or from a commodity board, even if it’s a non-branded thing—somehow it’s thought you can’t be objective,” says Blumberg. “How can I do the research if I don’t get the money to do it?”

He gets the catch-22 of it all—for himself and for the supplement industry. “You want to blame the supplement companies for not having evidence that their products work, but if they fund the studies to get the evidence, then you can’t believe the evidence because the company funded it.”

“No one questions that drug companies should be funding their own clinical trials. It’s a conundrum that food and vitamin companies are demonized for supporting research that would provide evidence for their products. I don’t know how we ever get over the hump except to change attitudes,” Blumberg says.

Can We Change Attitudes?

Only time will tell. Wallace thinks it’s time for nutrition scientists to break away from using protocols, tools, and research methods that were designed for studies of drugs, noting that drugs and nutrients (or other bioactive constituents in food) are not the same.

Blumberg advises: “What we’re really talking about is promotion of health. There’s a difference between not-sick and sick, and a difference between not-sick and well.”

He explains that while someone may not be sick with a chronic disease, that doesn’t mean they’re well. What he’s interested in—and what he believes consumers are interested in—is the acute effect of vitamins in terms of physiology and structure or function.

“I might not have cancer or heart disease or dementia, but let’s say my immune system is sluggish, my energy levels are low, I don’t sleep well, I’m just not alert as I could be—these are things that are impacted by nutrient intake. These are measurable outcomes, and we know that nutrients have impacts on these outcomes,” says Blumberg.

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Marine Ingredients

Underwater Treasure

Marine ingredients like algae and their derivatives possess potential that has other nutraceuticals green, red, and brown with envy.

BY BECKY WRIGHT

The marine ingredients market is flourishing as consumers look for natural, clean sources of protein and other nutrients that weigh less on their conscience when it comes to environmental concerns.

Increasingly aware and conscious of what supplements they are putting in their bodies, more and more consumers are making choices that support healthier lifestyles and align with their personal values and preferences, according to Juliana Erickson, senior marketing manager, consumer health & nutrition, Lonza (Morristown, NJ). As a result, they are demanding cleaner, more natural, and sustainable products that reflect these aspirational ideals—such as marine ingredients, thanks to their natural, non-GMO, plant-based, and sustainability credentials.

Kim Edwards, MBA, CPMM, global product manager, Kemin (Des Moines, IA), has a similar view. “Marine ingredients, especially algal-based ingredients, are a natural fit for consumers who are increasingly health-minded and focused on protecting the environment. We have seen significantly more interest in higher-protein, plant-based diets on a global basis,” she says.

Algae supplier Vesta Nutra (Indianapolis, IN), sees great potential in marine-derived nutrients and bioactive components, particularly for their medicinal characteristics and added health benefits, such as anticancer and anti-inflammatory activity.

Eyal Shalmon, CEO of Israel-based Yemoja, believes consumers are drawn to algae for their plant-based protein benefits. “Many people are becoming vegetarian and vegan, and protein sourced from marine algae can be a great substitute,” he says, adding that many secondary metabolites found in algae also act as antioxidant agents, which have found a nice home in antiaging cosmetics.

The Promise & Potential of Algae

As part of the "World in 50 Years" project from the publication Quartz, a recent article pondered whether algae could save the planet by changing the way we eat. "If you had to imagine what we will be obsessing over in 50 years, what would top your list? We put versions of that question to dozens of entrepreneurs, scientists, academics, and artists, including Richard Branson, Temple Grandin, Ian Bremmer, Ann Kim, and Bright Simons. From their 550 answers, some clear themes emerged. One such theme: Algae," the article says.

Over thousands of years, algae have adapted and evolved in order to protect and sustain themselves in harsh and variable aquatic conditions. Because of this, Amanda Mackinson, marketing and communications manager, Australia-based Marinova Pty. Ltd., says these extreme marine environments have necessitated the evolution of unique biosynthetic processes that give algae an abundance of nutrients and specialized bioactive compounds.

As far as algae's benefits, Holly Beardon, brand strategist, human and animal wellness division, Acadian Seaplants (Nova Scotia, Canada), says there’s a lot to unpack, but a short list includes thyroid support, cell rejuvenation, anti-inflammatory activity, immune system enhancement, cholesterol reduction, and much more. “Seaweeds are known for multiple bioactives not found in terrestrial..."
ANCIENT WISDOM: PROCESSED TO PERFECTION

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FUCOIDAN FOR THE FUTURE:
ENSURING THE SUSTAINABILITY OF FUCOIDAN

BY DAMIEN STRINGER, PHD; MARINOVA PTY. LTD.

THE UNITED NATIONS DECLARED 2020 the International Year of Plant Health\(^1\). This campaign is dedicated to increasing global awareness of the vital role plants will play in ending hunger, reducing poverty, protecting the environment, and boosting economic development. It also highlights why we need to protect plants at all costs and to ensure their sustainability.

Marine plants are often overlooked when plant health is discussed. They shouldn’t be, however, given that marine plants supply approximately two-thirds of the Earth’s oxygen\(^2\) and are vital providers of both habitat and food for the world’s fish stocks. The importance of protecting marine plants has become increasingly clear.

In the nutrition products market, a recent surge of interest in marine ingredients has led to increased interest in the sustainability of marine sources. Take fucoidan, a relatively new ingredient in western marine ingredients has led to increased interest in the sustainability of marine sources. Take fucoidan, a relatively new ingredient in western nutrition. Some of the world’s leading fucoidan producers are now spearheading environmental and social responsibility efforts.

Research demonstrates that the efficacy of fucoidan is largely determined by the quality of the source seaweed and the extraction process used to isolate it\(^3\). Superior fucoidan extracts are therefore derived from wild-grown species sourced from sites far removed from industrial, human, or agricultural contamination. The seaweed is hand-harvested in an environmentally sustainable manner.

A commitment to sustainability does not end with harvesting techniques. Innovative extraction methods utilizing green chemistry techniques are now being used to bring to market high-purity, certified-organic fucoidan compounds. These compounds maintain their extraordinary range of natural bioactive properties, whilst limiting the environmental footprint of the processing activities themselves. While traditional manufacturing techniques have utilized solvents to precipitate the fucoidan polymer from crude extracts, this can lead to contamination of the polysaccharide by the solvent itself. Compromising the chemical integrity of fucoidan extracts in such a way can lead to significant quality shortfalls and, most importantly, can diminish their bioactivity\(^4\). Instead, contemporary processes are free of harsh organic solvents and produce fucoidan extracts that remain unadulterated in chemical structure and with no undesirable residues. These mild, aqueous processes also ensure the resulting extracts comply with the most rigorous quality standards and regulatory requirements.

Growing Interest

In recent years, fucoidan extracts have attained regulatory approvals in a number of global jurisdictions for use in food and dietary supplements. Fucoidan is now experiencing a surge in interest for inclusion in a range of products. Extensive research and development programs are helping further the understanding of the benefits of this unique marine compound, including how the physical and chemical properties of fucoidan may be best utilized to enhance efficacy.

As fucoidan extracts become better understood and more widely adopted, it is refreshing to see leading fucoidan producers at the forefront of green-chemistry, low-carbon manufacturing. Initiatives that transform both solid and liquid seaweed wastes from fucoidan manufacturing into new, value-added products for the horticultural sector are a great exemplar of these principles. So, too, is the development of sustainable technology and the use of renewable energy to drive these advanced manufacturing processes.

With rising consumer demand for high-purity products that are certified organic and ethically sourced, the efforts of fucoidan producers committed to quality and sustainability should be highlighted. Fucoidan suppliers should be able to provide clear details about their seaweed harvesting methods, source species, extraction techniques, quality control, scientific credibility, and regulatory frameworks. The future of the fucoidan market undoubtedly lies with ingredients that are of superior quality, extracted from sustainable sources with traceable provenance.

Damien Stringer, PhD, is operations manager at Marinova Pty. Ltd. (Cambridge, Tasmania, Australia). As Marinova’s operations manager, Stringer couples his technical expertise with his consultative approach to lead the laboratory, processing, and research teams. Stringer is a former president of the Tasmanian branch of The Royal Australian Chemical Institute and is a graduate of the Tasmanian Leaders Program.

References
**Zhu Ling (in Chinese)** is a appetitive during cancer recovery. Bleeding, better sleep and improved mood, and providing support for reduced anti-cancer agent, reducing tumors have shown its effectiveness as an appetite stimulant and pain reliever. Studies have shown its effectiveness as an anti-cancer agent, reducing tumors and promoting recovery. Active constituents in Zhu Ling have been shown to stimulate nerve growth factor associated with repair and rejuvenation of the brain and nervous system in animal experiments.

**Chaga**

Chaga mushroom (**Inonotus obliquus**) is a hard, deeply cracked, stalkless cork that has the appearance of burnt charcoal with a burnt orange interior, found on the trunks of birch, alder and elm trees. It has a long history of traditional use in Russia and Poland as a tonic, blood purifier and pain reliever. Studies have shown its effectiveness as an anti-cancer agent, reducing tumors and providing support for reduced bleeding, better sleep and improved appetite during cancer recovery.

**Oyster**

Oyster mushroom (**Pleurotus ostreatus**), also known as the “king of mushrooms,” is a very rare, rare, and is a very rare edible polypore mushroom consisting of many small, white, brownish spines that appear at the base of mostly oak. It contains polysaccharides, minerals, and various sterols.

**Cordyceps**

*Cordyceps* (*Cordyceps sinensis*) is a culinary mushroom in Japan, also known as *Himematsutake*, is native to Brazil and popular in Japan. Its fruiting bodies appear as button caps singly or in clusters and has antimicrobial properties, and a hair growth stimulating effect. "Turkey Tail" is a medicinal mushroom that has symbolized great health and longevity throughout thousands of years of Chinese history. It is used in Chinese herbal medicine for supporting a calm state of mind, energy, and supporting normal cell function. Scientific studies show that it helps promote a healthy immune response, normal liver function, and a healthy seasonal histamine response.

**Agaricus**

*Agaricus blaezi murrill* (ABM), also known as *Himematsutake*, is native to Brazil and popular in Japan. Its fruiting bodies appear as button caps singly or in clusters and has antimicrobial properties, and a hair growth stimulating effect.

**Poria**

*Poria cocos* grows underground as a sclerotium, which is a compact mass of hardened mycelium. It helps promote healthy kidney and bladder function, and digestive and stomach health. *Poria cocos* is also known to support calmness and healthy sleep by reducing anxiety, tension, and fatigue. It stimulates healthy brain function, reducing memory loss. As with many other mushrooms, it helps with a healthy immune response, and supports a normal inflammation response with topical use.

**Polyporus umbellatus**

*Polyporus umbellatus* (Zhu Ling in Chinese) is a very rare, rare, and is a very rare edible polypore mushroom consisting of many small, white, brownish spines that appear at the base of mostly oak. It contains polysaccharides, minerals, and various sterols. The mushroom supports normal kidney function, water balance, and healthy bladder function, liver health, and normal cell growth, and an early growth stimulating effect.

**Lion’s Mane**

**Lion’s Mane mushroom** (**Hericium erinaceus**) grows in a single large clump of dangling spines on the side of hardwood trees. Medicinally, it helps support normal cholesterol and lipid levels, cognitive health and mood, and immune health. Human studies show a beneficial effect for cognitive health and mood in aging populations. Active constituents in Lion’s Mane have been shown to stimulate nerve growth factor associated with repair and rejuvenation of the brain and nervous system in animal experiments.

**Maitake**

**Maitake mushroom** (**Grifola frondosa**) is known as the “king of mushrooms” as it grows up to 100lbs in size in large clusters of leafy ruffles, usually at the base of oak trees. Maitake is a culinary mushroom in Japan, but is also used in Traditional Chinese Medicine as a remedy to help support normal intestinal comfort, healthy weight management, normal blood sugar levels, and increased exercise output. Containing beta-glucan polysaccharides, it also offers powerful immune system support.

**Enokitate**

Enokiate or Enoki (**Flammulina velutipes**) is an edible mushroom popular in gourmet Japanese restaurants. It grows at the base of the Chinese Hackberry tree. It is an anti-aging mushroom with blood pressure and cholesterol lowering effects that has also been used effectively for gastrointestinal ulcers. It has significant anti-tumor effects. Enokitate can also be used to support healthy liver function and healthy cognitive function.

**Turkey Tail**

**Turkey Tail mushroom** (**Trametes versicolor**, syn. *Coriolus versicolor*) is a polypore mushroom with flat caps that grow in concentric zones of varying color on decomposing wood. It is rich in polysaccharides and sterols. The active compound PSP supports healthy immune function, and normal cellular health of the prostate, breast, and liver. In addition, PSP supports normal nerve response and comfort. The mushroom stimulates SOD activity and liver detoxification.

**Reishi**

Reishi mushroom (**Ganoderma lucidum**) is a medicinal mushroom that has symbolized great health and longevity throughout thousands of years of Chinese history. It is used in Chinese herbal medicine for supporting a calm state of mind, energy, and supporting normal cell function. Scientific studies show that it helps promote a healthy immune response, normal liver function, and a healthy seasonal histamine response.

**Tremella**

Tremella mushroom Tremella comes from the Latin word for “tremble”, which appropriately captures its gelatinous qualities. There are over 100 species of this “jelly fungus” recognized worldwide. Tremella fuciformis or Snow Fungus, is generally flavorless, but provides support for immunity, cardiovascular health, normal blood sugar, and normal cell growth. Additional research shows that it also helps with cognitive health and managing inflammation.
Mushrooms, fruits and vegetables are ready-made powerhouses of vitality that are important building blocks for a healthy body. Studies show that high consumption of fruits, veggies, and mushrooms can significantly promote heart health, strengthen immune system function, as well as play a prominent role in supporting healthy blood glucose levels. They are also our best source of antioxidants like polyphenols, flavonoids, carotenoids, lignans, and other important anti-aging agents. Potent, nutritious, and functional, Draco Fruit, Vegetable & Mushroom Bioactive Botanical Extracts are effective ingredients for functional food, beverage, dietary supplement, and topical skin care applications.

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Draco Mushroom Extracts are pure, clean, safe, and natural. They are nutrient dense, whole food extract ingredients. Draco Mushroom Extracts are Full Spectrum extracted in pure, natural water, resulting in a balanced, efficacious extract powder. We start with the entire whole mushroom, sustainably grown and harvested. No excipients nor growing media like grain substrates found in cheaper mycelium versions are used. No chemical solvents are used, which can leave residues, and/or inhibit complete extraction.

In conventional methods used by most processors, organic solvents are used to penetrate cell walls and extract lipid soluble compounds, but this leaves behind valuable water soluble bioactives like polysaccharides. These are left unextracted due to their limited solubility in chemical solvents. Draco’s unique Full Spectrum extraction breaks down the cell walls of mushrooms using our certified organic pure water technology, freeing bioactives, and efficiently extracting a full spectrum of phyto compounds. Our extracts are never subjected to high heat which can damage important compounds. Due to our unique spray-drying process, our mushroom extracts are also carrier-free. We can also process with advanced supercritical CO2 extraction and/or bio-fermentation to produce special extracts with active metabolites and/or high lipid-soluble content, while increasing bioavailability, upon request.

We process our extracts in our own state-of-the-art 120,000 square foot processing facility, which is Certified Organic to both USDA: NOP and European EEC/834 standards. Our facilities are also SQF Certified superseding FSSC22000 under GFSI, US FDA Food GMP 21 CFR117, Dietary Supplement GMP 21 CFR111, ISO 9001:2015 Certified, HACCP Certified, Kosher Certified, and Halal Certified for your additional assurance of quality. As part of our vertically integrated “Seed to Drum” monitoring process, our extracts undergo Rigorous Analytical Testing for constituent assay (HPLC, HPTLC, UV), moisture, bulk density, heavy metals, pesticides, and microbiological plate counts. We lead the botanical extracts industry in purity with plate counts that are frequently several times lower than our competitors and we never irradiate or fumigate either our plants or finished extracts. Extracts also include full traceability from start to finish.
“With the advancement of new technology, complex algal derivatives like fucoidan can now be isolated and extracted,” says Marinova’s Amanda Mackinnon.

Kemin’s BetaVia Complete, a proprietary strain of *Euglena gracilis*, is a naturally sourced, plant-based dietary ingredient that nourishes the immune system while providing health benefits for the respiratory and digestive tracts.

According to Kemin’s Edwards, this nutrient-rich microalgae fermentate contains greater than 50% 1,3-beta-glucans and 20% protein, along with many vitamins, minerals, and other bioactive compounds to support healthy living by priming the immune system, protecting against oxidative stress, supporting respiratory tract health, and contributing to digestive tract health.

Kemin put BetaVia Complete to the test in a recent clinical study published in *Nutrients*. This 90-day supplementation study investigated the effects of BetaVia Complete consumption by healthy, active individuals on symptoms of upper respiratory tract infection. At the study’s end, the researchers found that, compared to those in the placebo group, the group supplemented with BetaVia reported 3.3 fewer self-reported sick days, 70% fewer upper respiratory tract infections, and 80% lower overall severity of upper respiratory tract infection symptoms.

Cognitive health is a growing issue for people of all ages, from children whose brains are still developing, to seniors who may be facing cognitive decline. Phosphatidylserine is a highly researched nootropic, suitable for most ages, across a wide range of applications and is the only ingredient with FDA-approved qualified cognitive health claims.*

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Marine Ingredients

FISH OIL: INGREDIENT INNOVATIONS EXPAND PRODUCT APPLICATIONS

BY SEBASTIAN KRAWIEC, ASSOCIATE EDITOR

Targeting sports nutrition applications, Lonza’s Oceanix marine phytoplankton ingredient supports peak physical performance and facilitates an increased physiological response against oxidative stress to aid recovery. “Supplying high levels of superoxide dismutase (SOD), Oceanix harnesses all the natural goodness of marine phytoplankton (Tetraselmis chuii) in a small, concentrated dose of 25 mg/day, while also offering clean-label, natural, and sustainable credentials for consumers,” Erikson explains.

“In a pilot study involving 32 student athletes, 25 mg of Oceanix marine phytoplankton daily was found to significantly improve multiple biomarkers of exercise performance and recovery compared to baseline and control. These results, which may be attributable to high concentration of SOD, suggest that the Oceanix brand has potential benefits in helping to optimize performance during physical exertion, while also promoting faster recovery,” Erikson adds. This study has not been published.

Algae Health Sciences (Irvine, CA), a division of BGG, recently published a paper[2] that reviewed head-to-head studies comparing astaxanthin from three different sources in animals and in vitro. In each case, the company says, astaxanthin from the algal species Haematococcus pluvialis...
proved significantly more efficacious and biologically active than either synthetic astaxanthin or astaxanthin from yeast called Phaffia.

More specifically, six animal studies tested the different forms for a variety of health benefits and found the algal-based form performed significantly better for a variety of health benefits such as increasing lifespan; treating skin cancer; preventing the formation of gastric ulcers; improving resistance to stress; improving exercise endurance; decreasing reactive oxygen species (ROS); and augmenting enzyme levels. Furthermore, two antioxidant studies found that algal astaxanthin has 14- to 90-times greater antioxidant activity than synthetic astaxanthin.

“In addition to these eight studies demonstrating superior efficacy and activity for algal astaxanthin, it’s important to understand that there are absolutely no human clinical trials we found demonstrating any health benefit or even safety for the alternative astaxanthin forms,” says Shawn Talbott, PhD, President of EQQIL (a clinical research organization), who was an author of the review paper.

Talbott adds that until clinical trials are published on synthetic astaxanthin and astaxanthin from Phaffia yeast showing efficacy and long-term human safety, his conclusion is that consumers should ensure that they’re supplementing with algal-based astaxanthin. ‘Algal astaxanthin has over 100 clinical trials showing efficacy, numerous human safety studies, and twenty years of consumer use in the market,” he says. N

References
Brain health is a diverse and versatile category that supports the needs of consumers across ages.

BY SEBASTIAN KRAWIEC, ASSOCIATE EDITOR

Consumers of all ages have an incentive to buy and use brain health supplements. According to statistics from market research firm IRI, in 2019 sales of specialty supplements targeting brain health grew in sales by 24%, and those targeting sleep and mood grew by 16%. Reasons for purchasing brain health supplements range across age demographics.

For example, older adults might be interested in supporting their memory function and mitochondrial health, while younger folks might be more interested in energy, focus, and stress reduction. In fact, when listing reasons why they take supplements, 22% of respondents cited emotional well-being, and 16% cited maintaining and/or boosting energy levels. Both of these reasons trended significantly higher among millennials. As the industry continues to innovate, there is no shortage of novel ingredients that will help manufacturers meet these consumer needs.

Energy + Focus = Productivity

L-theanine is a popular ingredient often featured in nootropic products to support focus and attention. As an active constituent found in tea, L-theanine is a natural complement to caffeine, which is also present in tea. While caffeine is commonly used as a functional energy ingredient in beverages, recent research shows how combining both caffeine and L-theanine in a functional beverage, for example, could affect the end user.

One study found that subjects taking the combination saw significant improvements in Rapid Visual Information Processing (RVIP) accuracy, reductions in mental fatigue ratings, as well as faster simple reaction time, faster numeric working memory reaction time, and improved sentence verification accuracy.¹

“L-theanine can help counter some of the ‘jitteriness’ that people sometimes experience, especially when consuming larger amounts of caffeine,” explains Katie Ferren of Blue California (Rancho Santa Margarita, CA), which manufactures L-theanine ingredient L-Tea Active. In clinical research, for example, supplementation with L-theanine significantly reduced the effects of caffeine on subjects’ blood pressure.²

Some ingredients act similarly to caffeine, while being stimulant free. For example, a patent-pending proprietary Mangifera indica extract standardized to ≥ 60% mangiferin called Zynamite (distributed by PLT Health Solutions; Morristown, NJ) was found in an animal study to have similar effects on the central nervous system as caffeine.³ Both Zynamite and caffeine act in similar ways on brain electrical activity, increasing long-term potentiation, which is a persistent strengthening of synapses based on recent patterns of activity, and is related to space- and time-dependent memory. Marketed to support mental energy, and endurance during physical fitness, the ingredient’s cognitive and physical benefits can translate into a number of applications, from pre-workout to energy and focus.

Another ingredient marketed for sports and endurance called LJ100 (from HP Ingredients; Bradenton, FL) was recently found to support quality of life, mood, and stress.⁴ In the study, subjects between the ages of 25 and 65 were given a combination of the branded tongkat ali ingredient and multivitamins, or placebo, for 24 weeks. The primary endpoints were quality of life measured with the 12-Item Short Form Health Survey (SF-12) questionnaire and with mood measured by Profiles of Mood States (POMS). The secondary endpoint, stress, was measured by a Multi-Modal Stress Questionnaire (MMSQ). Results showed that those taking the combination exhibited significant improvements in quality of life, mood, and stress. These same subjects reported improvements in vigor, mental acuity and cognition, and emotional well-being.

Stress reduction is an important component of focus. “Healthy stress can help motivate someone,” says Ferren. “When it becomes too overwhelming, the stress can be dysfunctional and paralyzing for the individual, which impacts their ability to focus and pay attention.”

It’s not enough just to promote relaxation. L-theanine, for instance, can promote a calm and relaxed state while also maintaining...
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Older adults might be interested in supporting their memory function and mitochondrial health, while younger folks might be more interested in energy, focus, and stress reduction.

alertness—a unique attribute, says Derek Timm, PhD, RDN, technical sales director, Taiyo International (Minneapolis, MN), which manufactures L-theanine ingredient Suntheanine. “When one is calm and alert, they are better able to focus and complete whatever task is at hand,” he states. “Several alternative relaxation and calming ingredients lead to drowsiness and decreased focus and attention.”

In a study of 34 healthy subjects between the ages of 18 and 40, supplementation with L-theanine in a functional beverage containing Blue California’s L-Tea Active was shown to reduce measures of subjective stress in response to a multitasking cognitive stressor an hour after administration. Analysis of salivary cortisol also showed a significant reduction in salivary cortisol three hours after administration. This same study also used magnetoencephalography (MEG) analysis to measure brain activity. Results showed that subjects supplementing with L-theanine showed evidence of higher alpha wave activity, which is generally linked to a more relaxed mental state. According to the researchers, this activity was particularly apparent in subjects with higher trait anxiety.

A more recently published study conducted on 30 healthy subjects for four weeks found that L-theanine in the form of Suntheanine not only supported stress but also has the potential to support cognitive function. In Schizophrenia (BACS) related to verbal fluency (especially letter fluency) and executive function scores. These scores were found to be most significant compared to placebo in subjects who demonstrated lower baseline functions.

Considering these potential benefits, it’s not surprising that L-theanine is breaking into the mainstream. The fastest-growing use has been in energy drinks to either support focus or antagonize the effect of caffeine, says Timm. “It is especially popular for the next generation of energy drinks that aim to provide focused energy and not just an energy jolt,” he explains. “Another exciting new category, going beyond the standard energy drink, is the concept of beverages for accuracy. This is of strong interest to gamers, students, athletes, and those just looking to be more on their game.”

The gaming category is a major opportunity many industry suppliers are actively seizing. (To read more about this growing market, turn to page 66.) Firms like Kemin (Des Moines, IA) and Nutrition 21 (Purchase, NY), for example, have both made pushes to position their ingredients to the Esports category. Kemin’s Neumentix spearmint extract, for example, has been shown in clinical research to support cognitive and physical performance, even under stress.

One study found that sleep-deprived volunteers from an elite counterterrorism unit showed significant improvements in executive function under stress, compared to placebo. This was assessed by having participants shoot or not shoot a target on the basis of recognition after undergoing cognitive and physical stress. Prior to supplementation, all members of the placebo group engaged the correct target, whereas four out of five volunteers assigned to take the spearmint extract engaged the correct target. However, following supplementation and the high-risk operation, all volunteers who took the spearmint extract engaged the proper target, while only three of five subjects in the placebo group engaged the correct target.

In another study on Neumentix, researchers observed the effects of the spearmint extract by measuring physical performance with a Makoto Arena. This is a 360-degree, multi-planar, game-like environment that closely mimics a sports environment, and it is designed to assess the link between cognitive function and physical performance. Results showed that compared to placebo, subjects taking the extract demonstrated statistically significant improvements in reaction time. These outcomes translate well to virtual reality gaming, which is growing in both consumer and competitive spaces, not to mention traditional athletics, like martial arts, for example.

A proprietary brain-health ingredient from Nutrition 21 called nooLVL (read “new level”) was studied specifically on gamers. In the double-blind, placebo-controlled study, 60 healthy subjects who spent more than five hours a week gaming were given either nooLVL or placebo for seven days. On day one and day seven, before and 15 minutes after dosing, subjects were given cognitive assessments, a mood questionnaire, and then played video games for 60 minutes. Immediately after gaming, these cognitive tests were repeated. Results showed that compared to the placebo group, the supplement group had increased levels of perceived energy, decreased anger, decreased fatigue, and 66% fewer errors in cognitive tests.

Citicoline may also be a valuable addition to a gamer-focused product. For example, a study published in the Journal of Attention Disorders assessed the effects of a proprietary citicoline ingredient (Cognizin, manufactured by Kyowa Hakko; New York City, NY) on attention, psychomotor function, and impulsivity in healthy male adolescents. Reresults showed that subjects taking citicoline...
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exhibited significant improvements in attention, psychomotor speed, and impulsivity, compared to placebo. Considering that gaming is popular among adolescents, this study demonstrates efficacy on an important target audience. While parents may not be keen on products that encourage too much screen time, they might take solace in the benefits such a product might pose for learning and behavior.

**Staying Sharp with Age**

While energy and focus are areas of cognitive health that present newer opportunities for dietary supplements among younger demographics, older adults are an important population because their brain health needs are more urgent. Taking dietary supplements to maintain brain health against age-related decline and to support facets of cognitive health such as memory can have an important impact on a person’s quality of life.

"Baby boomers have become the primary age group for cognitive products," says Lisa Riedell, senior director of marketing, Alfasigma USA Inc. (Covington, LA). “They want to maintain a high quality of life for as long as possible. Maintaining cognitive acuity, including memory and performance, is critical for this age group.”

Kyowa’s Cognizin citicoline has been studied for its effects on memory in aging adults for some time now. A 1996 study, for example, found that supplementation with citicoline improved verbal memory in subjects between the ages of 50 and 85. The randomized, double-blind, placebo-controlled, parallel-group-design clinical study found that compared to placebo, supplementation only improved delayed recall related to logical memory for the subjects with relatively inefficient memories. These subjects were then recruited for a crossover study in which a higher dosage of citicoline was clearly associated with improved immediate and delayed logical memory.12

A more recent animal study on Cognizin found a potential synergistic benefit with omega-3 fatty acid docosahexaenoic acid (DHA), an important active component of fish oil, which many older consumers already take to support cardiovascular health.13 Phospholipids, structural components of cellular membranes, play an important role as precursors to signaling pathways that modulate neuronal membrane function. Phosphatidylcholine is the most abundant cellular phospholipid, and citicoline along with DHA is an essential intermediate in the synthesis of phosphatidylcholine. In the study, mice with brain ischemia were treated with a combination of Cognizin citicoline and DHA, or each alone. Results showed that the combination significantly improved learning and memory ability compared to the ingredients independently.

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of evidence supporting their use in cognitive health formulations. Given their fruit origin, they also have a functional advantage for use in foods and beverages as well as recognition by consumers.

In a study published in *Biological Sciences*, 215 healthy subjects between the ages of 60 and 70 years of age were randomized to receive either 600 mg per day of a polyphenol-rich extract from grape and blueberry (Cerebelle from Diana Food; Hasbrouck Heights, NJ) or placebo for six months. Subjects were given a CANTAB Paired Associates Learning (PAL) test, a visuospatial learning and episodic memory test, as well as a Verbal Recognition Memory (VRM) and Spatial Span (SSP) working memory test, at baseline and 24 weeks.

There were no significant changes in primary outcomes in the placebo and experimental group, but subjects taking the extract did see significant improvements in VRM-free recall compared to baseline and placebo group. Researchers then stratified subjects into four quartiles based on cognitive performance at baseline. Results showed that the quartile with the lowest performance at baseline experienced the most significant improvements in primary and secondary outcomes, compared to placebo.

A study of a different polyphenol-rich extract ingredient from grape and blueberry (Memophenol from Activ’Inside; Beychac-et-Caillau, France) published in *Biological Sciences, vol. 77, no. 2* also saw positive results.15 Subjects were given a CANTAB Paired Associates Learning (PAL) test, a visuospatial learning and episodic memory test, as well as a Verbal Recognition Memory (VRM) and Spatial Span (SSP) working memory test, at baseline and 24 weeks.

Results showed that consumption of Memophenol was associated with a 2.5-fold increase in STS variation net scores, compared to placebo. The STS task requires participants to count quickly and accurately backwards in threes from a given random starting number between 800 and 999 presented on a screen. The task aims to evaluate subjects’ working memory and attention levels. A serial seven subtraction task was also performed but showed no significant improvements.

**Healthy Aging**

Healthy aging as a category represents a more holistic approach to combatting age-related decline, within which cognitive health is an important factor. It represents a major opportunity for manufacturers as well. For example, Natural Alternatives International (NAI; Carlsbad, CA) recently introduced a slow-release version of its patented beta-alanine ingredient CarnoSyn, called SR CarnoSyn. The new slow-release version focuses primarily on the healthy aging market rather than the sports nutrition space, a market in which the original CarnoSyn ingredient is already well known.16

**Ingredients touting mitochondrial health benefits are a big part of the healthy aging space.**

The amino acid beta-alanine supports the synthesis of muscle carnosine in the body, which acts as a buffer against lactate acid to delay the onset of muscle fatigue. Carnosine levels decline with age; therefore supplementation reduces the risk of sarcopenia. As an antioxidant, beta-alanine also helps fight glycation. Glycation leads to the accumulation of advanced glycation endpoints, which damage brain cells and function.

Ingredients touting mitochondrial health benefits are a big part of the healthy aging space. “Through the body’s regulation of healthy mitochondria and the removal of dysfunctional mitochondria, brain activities such as memory and learning may be improved,” says Shoji Matsukawa, vice president of Mitsubishi Gas Chemical, manufacturer of BioPQQ, a branded pyrroloquinoline quinone ingredient. “Importantly, the healthiness of mitochondria can affect not only brain functions but so many other functions as well, especially associated with aging, so it is important to have consumers conscious of the importance of mitochondrial health.”

“BioPQQ has been proven to activate mitochondrial biogenesis—a process critical to healthy cell activity in which clusters of mitochondria divide and multiply,” explains Matsukawa. “As we get older, mitochondrial function begins to decline, leading to the deterioration of brain health as well as the heart and other vital organs. But by reenergizing the mitochondria, BioPQQ can fuel cellular activity, providing more efficient energy production.”17

Another ingredient that supports mitochondrial health and, in turn, cognitive health, is MitoCarn from Alfasigma USA Inc. The ingredient is an acetyl-L-carnitine (ALC) form of L-carnitine. “As nerve growth factors in the brain decline, so do acetyl-L-carnitine and acetycholine levels,” explains Alfasigma’s Riedell. “As a result, mitochondria tend to lose their efficiency. This loss of efficiency contributes to common complaints related to aging, including loss of memory, learning, recall, and cognition.”

MitoCarn, says Riedell, penetrates the blood/brain barrier to deliver nutrients directly to the brain. “The molecules may help to increase healthy blood flow and support wide-ranging functions that contribute to healthy cognition, including help with managing oxidative damage, support of mitochondrial function, and maintaining healthy neurotransmitter activity,” she continues. “MitoCarn may also help to minimize cellular waste during the ATP process. Antioxidants are critical in helping to reduce damage caused by free radicals or reactive oxygen species and other toxic residue byproducts.”

**References**


With the population greying—one in every five U.S. residents will be of retirement age by 2030, per the U.S. Census Bureau’s 2017 National Population Projections—it’s no surprise that cognitive-support supplements’ prospects are rising.

Indeed, a 2019 report from Grand View Research foresees a global market for brain-health supplements worth $10.7 billion by 2025—suggesting that many of those future retirees are taking precautions in advance of their big 2030 ageing-up.

But the report also notes that brain-health market drivers extend beyond obvious antiaging concerns to include depression, anxiety, and sleep recovery, among other cognitive issues—which proves that the brain-health category holds promise for more than just the elderly.

But brain-health brands best be careful about which promises they make. Just ask Quincy Bioscience (Madison, WI), which found itself staring down a lawsuit from the Federal Trade Commission (FTC) and New York attorney general accusing it of deceptively claiming that its Prevagen supplement improves memory on the basis of a single study that the plaintiffs said failed to show any statistically significant improvement over placebo.

As the case makes its way through the courts, it should give marketers pause for thought. For while the smart money’s still on brain-health supplements, their potential won’t pan out if brands don’t wise up on what to say, and not to say, when educating consumers about them.

Brain Boom

The Council for Responsible Nutrition’s (CRN; Washington, DC) latest Consumer Survey on Dietary Supplements shows “very steady” support for brain-health formulations, notes Andrea Wong, PhD, the organization’s senior vice president of scientific and regulatory affairs.

From 2015 to 2019, the percentage of supplement users citing brain health as a reason for supplementing stayed roughly static, fluctuating from 15% at the outset to 14% last year. “And while there doesn’t appear to be significant growth in use,” Wong notes, “this is a growing interest area for our members and for companies overall in the dietary supplement space.”

Wong adds that the CRN survey found use of brain-health supplements holding steady across all demographics, as well, and Daniel Fabricant, PhD, CEO and president, Natural Products Association (NPA; Washington, DC), thinks he knows why.

He credits the category’s big-tent appeal. “Are we talking about memory?” he asks. “About focus? Brain health is a different concern for everybody.”

Yes, an aging population’s desire to stay sharp fuels the category. “But the other side of brain health is where you find nootropics and products for gamers who go on gaming binges at their consoles for eight hours straight and need focus,” he adds. When has a heart-health supplement ever enjoyed such broad cachet?

Food for Thought

Regardless of the audience, interest in brain-health formulations is justified. As Wong points out, “Long-term cognitive health is influenced by a combination of diet, lifestyle, genetics, and the environment.” So it’s no surprise that her organization “recognizes considerable evidence showing that proper nutrition through balanced diets or supplements is essential to support brain function.”

Of course, more research is always welcome to “further inform our understanding of nutrition’s role in the prevention of cognitive decline,” Wong goes on. But emerging science continues to demonstrate connections between omega-3 fatty acids, amino acids, probiotics, caffeine, and phospholipids—
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among other supplemental ingredients—and improved brain function, she says.

Fabricant’s background is in botanical ingredients, he says, and “one thing you learn with botanicals is the importance of group 2 metals”—alkali earth metals like zinc and magnesium. “They’re involved in everything that happens neurologically,” he notes.

“You’ve got the whole area of the gut-brain axis,” he continues. “That’s the big story now. Everyone’s looking into how probiotics seem to have an effect on neurological performance.”

Blow to the Head
So the enthusiasm is understandable: There’s much to learn, and much good that might come from it. But that’s where some in industry may have gone too far, Fabricant says.

“You’re often dealing with an older population that doesn’t want its memory to slip,” he says. “But doesn’t necessarily want to go to the doctor about it, either. So they’re looking for a different approach to self-care. And the FTC has long since been smart about that, and it’s focusing as a priority on the claims that some supplement companies are making.”

Wong agrees. “The Federal Trade Commission has been paying close attention to brain-health claims in recent years, so marketers should ensure—as is their responsibility with all claims—that their product claims are supported by sound evidence,” she says.

Consider FTC’s recent action against NeuroPlus’s allegedly deceptive claims that its products could protect the brain against Alzheimer’s disease and dementia, reverse memory loss, and improve memory and cognitive performance, she suggests.

Or the commission’s more recent targeting of Geniux products for their promise to improve short- and long-term memory, increase focus by as much as 300%, increase concentrations, prevent memory loss, boost brain power by as much as 89.2%, effectively double IQ, and improve users’ information-processing speed. Ads apparently billed the company’s “Smart Pill” a “Viagra for the brain” capable of producing “extreme IQ effects,” Wong notes, and also allegedly falsely claimed that the products had been tested in more than 2,000 clinical trials.

Fabricant was actually at FDA during what he calls “blitzes” of combined FDA and FTC effort to uncover bad industry actors. “And knowing that both FDA and FTC are out there and interested should give anyone a moment of pause,” he says.

Getting It Right
Bob Durkin, of counsel, Arnall Golden Gregory LLP (Mount Airy, MD), and former deputy director of the office of dietary supplement programs at FDA, is familiar with the FTC’s recent targeting of combined FDA and FTC, himself, and understands their merit.

“While there are definitely dietary ingredients and supplements that help with cognition,” he allows, “the problem for legitimate players is that they wind up in an environment where the bad players control the message. Even when they put their claims in the right perspective, good players can get drowned out, and it’s really hard to stay afloat in that sea.”

But smart brands can rise above the tide, especially if they follow the right advice.

“Companies should be particularly careful when marketing toward vulnerable populations, like children and the elderly,” Wong agrees.

Indeed, none other than FTC’s Bureau of Consumer Protection director, Andrew Smith, says, “With an aging population, it’s more important than ever that advertisers have solid evidence to back up their claims about memory and cognitive-health benefits.”

But careful consideration of populations should begin before claims are even drafted and inform study design itself. Fabricant warns against conducting brain-health supplement research in diseased subjects, “where you’re no longer dealing with normal aging,” he says. “That goes outside the bounds of what supplements are supposed to do and will attract unwanted attention.”

And when it’s time to draft evidence-based claims, “Focus groups are important, too,” he says. “What do these claims mean to people? That’s another piece that’s going to be critical.”

In all likelihood, most supplement brands serving the brain-health category are already operating by these guidelines. As Wong says, “While some products fall prey to illegal activity, it’s important to remember that these products do not represent the mainstream dietary supplement market, and they should not malign the entire category. Any product claiming to cure, mitigate, treat, or prevent a disease—like Alzheimer’s or dementia—is an illegal product that consumers should avoid.”

And brands should avoid marketing them that way.

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.

References
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Why is telomere length important?
Telomere shortening is correlated with human disease and aging. Short telomeres impair the ability of healthy cells to divide and function properly. Longer telomeres are associated with healthy cell replication and longevity. Telomeres hold remarkable information about the path of our health and may provide the single most important biomarker of aging.

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CONCLUSION: A total of fifty (50) subjects completed all aspects of the study. Group A decreased their TeloYear Age™ on average by 7.43 years. Group B decreased their TeloYear Age™ by 8.52 years.
Each year, scientific breakthroughs bring the world closer to making consumer products more sustainable. In 2018, for instance, Reed College (Portland, OR) biology student Morgan Vague made headlines when she discovered a previously unknown strain of bacteria (*Pseudomonas morganensis*) that consumes plastic. Cutting-edge advancements like these will one day help packaging manufacturers and finished-product brands develop innovative new packaging materials that reduce their environmental impact, increase reusability, and cut down on waste. While those technologies are still on the horizon, what are brands doing today to increase sustainable packaging? We checked in with some brands and manufacturers in the natural products industry.

Maria Emmer-Aanes, senior vice president of marketing for Numi Tea (Oakland, CA), says that Numi has made several recent innovations in its tea-packaging practices. The company launched a plant-based, flexible film tea bag wrapper in January 2020. “This project is the culmination of over 10 years of effort,” Emmer-Aanes says. “The new tea bag overwrap features a non-GMO PLA (polylactic acid) layer made from renewable sugarcane. The new wrapper also uses 100%-FSC-certified paper grown in Scandinavia, which guarantees no eco-toxicity when it breaks down.”

Since its founding in 1999, Numi Tea has used 90%-post-consumer-recycled cardboard in its tea boxes. Furthermore, its tea bags are compostable, and the tags are made from recycled material and printed with soy-based ink. Numi Tea strives to make its products as eco-friendly as possible, Emmer-Aanes says, which extends to its single-use products. “Our Daily Super Shots are currently packaged in glass bottles to minimize plastic waste,” she says. “Glass can be infinitely recycled with no degradation in quality. And although glass is heavier than plastic to ship, Numi offsets shipping impacts of all products through CarbonFund. We are currently researching solutions to further improve the sustainability of our plastic non-recyclable shrink wrap, like compostable PLA or PHA (polyhydroxyalkanoates).”

### The Fine Print

Other significant advancements in sustainability include improving the recyclability of often-overlooked packaging components. Don Earl, president of Overnight Labels (Deer Park, NY), says that sustainability now extends to materials that weren’t previously thought of as recyclable. “In addition to recycled paper stock, over the last few years there have been numerous advancements in plastic resins and extrusions,” Earl says. “These have resulted in both recyclable and compostable options for film packaging. Digital printing has also greatly reduced waste and virtually eliminated setup time and extra materials.”

Earl notes that companies are approaching sustainability in a variety of ways. Packaging design and printing are offering even more ways to improve sustainability, allowing brands to achieve the desired look and functionality. “Some companies are designing their packaging to be smaller and more efficient,” he says. “Some of our customers have come to us because we’re a certified member of the Sustainable Green Printing Partnership. SGP printers are audited and must follow sustainability best practices, including and beyond regulatory compliance.”

Marny Bielefeldt, vice president of marketing for Alpha Packaging (St. Louis), says that it is becoming increasingly common for brands...
to use PET and HDPE packaging made from recycled and plant-based resin. These materials give brands a number of options for safe packaging that aren’t petroleum-based. Additionally, newer, lighter materials are reducing carbon footprints in other ways.

"Some manufacturers are deliberately light-weighting their plastic bottles and jars to remove gram weight," Bielefeldt says. "We have light-weighting projects that have removed anywhere from 9%-23% of a bottle’s total weight. There’s an opportunity for further source-reduction by moving from pressure-sensitive labels to direct screen printing with UV-cured inks."

Bielefeldt says organizations like Oceanworks and OceanCycle are also playing a role in encouraging sustainable packaging development by creating certification processes for post-consumer resins and plastics. The idea is to divert plastic and resins out of the waste process and back into the manufacturing process.

"Plastic that is diverted from winding up in the ocean can be recycled and turned into viable post-consumer resin," Bielefeldt says. "Most plastic that has already made its way to the ocean floor isn’t a good candidate for recycling into food-safe bottles, but now it’s possible to recycle these bottles and turn them into post-consumer resin. Oceanworks and OceanCycle resins also come with FDA letters of non-objection” indicating they are approved for food contact.

**How Well Do Sustainable Materials Perform?**

Environmental concerns are always important, but the primary function of any packaging material is to protect the product inside it. If a material cannot accomplish this purpose, then it is simply not viable as a packaging solution, no matter how environmentally sound.

Rob Beekers, bioindustrial business development director for Cargill (Minneapolis, MN), says there isn’t a one-size-fits-all solution for sustainable packaging in terms
of what will work best. "In one case, glass might be the best approach," Beekers says, "while in others it might be metal or paper. It depends on the physical and barrier packaging requirements for the particular product, as well as the infrastructure in place to deal with the packaging after its primary use."

Beekers says that sustainable packaging materials can perform well provided they can easily be incorporated into the existing recycling infrastructure. Packaging materials that require major changes to a well-established supply chain face untenable adoption challenges, he adds.

For instance, new label and resin materials are making it possible to recycle more of a finished product. While traditional adhesives could render an otherwise recyclable package non-recyclable, Earl says that Overnight Labels’ new water-based label adhesive is fully recyclable and cleanly separates during the recycling process.

Change is incremental, and in this regard, companies and their packaging manufacturers continue making progress in ensuring that each generation of packaging is not only more sustainable than the packaging before but that they improve performance.

Emmer-Aanes says Numi’s new plant-based tea wrappers provide a cleaner tear and therefore offer a better user experience than the original wrappers, with no decrease in either product shelf life or product freshness. Meanwhile, Earl says that sustainable materials are improving in printability, making it possible to maintain the same quality of aesthetic experience that consumers can get from conventional materials.

By all objective measures, sustainable packaging materials are continuing to improve. Earl says that while there is always room to perfect sustainable materials, sustainable packaging options have come a long way in a short time and are starting to close in on conventional packaging regarding functionality and strength.

**The Cost of Sustainability**

Beekers says the cost of packaging isn’t solely determined by the materials that constitute the packaging. Other factors like scalability and end-of-life processing cost also influence how costly or inexpensive sustainable packaging may be. However, Beekers also says that despite the initial cost of making changes to the supply chain, sustainable packaging becomes less expensive at scale and over time.

“When the true cost for treatment of packaging waste at end-of-life is factored in, sustainable packaging might actually be less expensive than incumbent materials,” he says. “We also know that consumers want more sustainable products. When asked in consultations, consumers indicate that they are prepared to pay a small premium for more sustainable goods.”

**Environmental concerns are always important, but the primary function of any packaging material is to protect the product inside it. If a material cannot accomplish this purpose, then it is simply not viable.**

Emmer-Aanes points to the results of a 2019 research report by consumer intelligence provider Toluna (Paris, France). The report, a survey of 1,000 American consumers, found that 37% of consumers were willing to pay up to 5% more money for an environmentally friendly product. The survey also found that over one third of consumers are already changing their buying habits and seeking out brands that operate in an environmentally sustainable manner. Perhaps most importantly, the report noted that consumers hold a belief that corporations are morally obligated to pull their weight in the fight against climate change.

"[Sustainability] does cost slightly more," Emmer-Aanes says, "but when others jump in, it brings the cost down. Consumers are willing to pay more for products that are good for the earth. Investing in innovation and supporting a market for plant-based packaging materials brings us one step closer to eliminating the natural product industry’s dependence on fossil fuels."

**Sustainability in 2020 and Beyond**

Sustainable packaging is growing in popularity and advancing in sophistication, with new developments making eco-friendly packaging options less expensive and more effective. Beekers says that the next evolution of sustainable packaging will result in increased recyclability, more use of natural materials like paper and cardboard, and materials with a smaller environmental footprint.

“The major trends in packaging materials are a shift toward mono-materials and materials that can biodegrade at their end of life,” he says. “But the most significant advancement is that all companies now realize sustainable packaging will become a qualifier to be in business rather than a differentiator.”

The future of sustainability is one that will encompass product, packaging, process, peripherals—and partnerships. In 2007, Numi CEO Ahmed Rahim co-founded OSC2 with vice president of sales and marketing Lara Dickinson. OSC2 then created the Packaging Collaborative, a group of over 40 brands, printers, manufacturers, extruders, and end-of-life recovery businesses that are collaborating on the development of sustainable packaging materials.

The time could not be more right. Given the growing consumer demand for companies to operate sustainably, brands that invest in sustainable, biodegradable, and eco-friendly packaging will likely reap the benefits of increased brand loyalty and positive press.

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What’s in Your Sustainability Toolkit?

Key considerations for brands and OEMs implementing eco-friendly packaging solutions

BY JORGE IZQUIERDO, VICE PRESIDENT, MARKET DEVELOPMENT, PMMI, THE ASSOCIATION OF PACKAGING AND PROCESSING TECHNOLOGIES

The move toward sustainable practices, products, and materials is no longer on the horizon but ever-present. This is especially true as more consumers factor brands’ social responsibility initiatives in purchase decisions. In fact, global demand for sustainable packaging is expected to reach approximately $400 million by 2024, with a compound annual growth rate (CAGR) slightly above 7%. As such, brands have begun to integrate environmentally sound practices, while other companies are leading the pack. Regardless of where companies currently stand on the sustainability spectrum, there is always room for growth—and certainly the demand to support it.

As consumer awareness of sustainable brand practices grows, there are some considerations that companies must make to catch up or stay ahead of the curve.

Educate Your Audience

Generally speaking, consumers are increasingly motivated to be more environmentally conscious. While consumers generally gravitate toward sustainable packaging options, they may not fully understand the impact they have on the sustainability supply chain and how to properly recycle or compost products after use. As such, brands should ensure that their audiences understand the role they play so that they may better integrate sustainable practices in their daily regimen.

Brands that are making strides to be more environmentally conscious resonate more with consumers and influence purchase decisions. As such, it is in brands’ favor to communicate their efforts regarding more sustainable practices.

Consider Materials from All Angles

While the adoption of sustainable materials is better for the environment, the use of certain substrates, like those that are biodegradable, can tack on additional costs compared to traditional non-sustainable materials. Biodegradable packaging is qualified by the material’s ability to completely break down and decompose into natural elements within a short time after disposal, typically within a year or less. The materials used can consist of paper and cardboard, cornstarch, recycled polythene, or plastarch material (PSM). Moreover, brands are often met with challenges in sourcing sustainable materials to create quality packaging. As more consumers demand sustainable packaging and more manufacturers implement eco-conscious solutions, the supply of sustainable materials dwindles. This can affect the price of the overall product, which can
consequently turn consumers away. However, consumers are more likely to pay more for a product knowing that it has sustainable qualities.5

Certain packaging options preserve foods with minimal or no preservatives. Companies need to ensure that as natural and organic foods continue to grow in popularity, the packaging also has sustainability-enhancing attributes like recyclability or biodegradability. These qualities, as well as reusability, resonate with audiences. Flexible packaging is an example of a format that has numerous sustainable benefits for manufacturers while offering consumers convenience for on-the-go consumption, and reusability attributes to address food spoilage concerns.

Seek Innovative Materials and Solutions

When designing sustainable packaging, manufacturers should take note of the materials being used to ensure the quality aligns with the product and brand promise. Consideration of materials can enable a product to feel more premium than others. For example, packaging consisting of paper or cardboard can incorporate different forms of lamination and varnishes to give a more premium aesthetic and feel.

Manufacturers have also begun to design reusable containers to extend beyond a single use. Brands such as PepsiCo, Nestlé, and Unilever have emerged with stainless steel and glass containers, double-walled steel containers, as well as aluminum containers for refillable products like orange juice, oatmeal flakes, ice cream, deodorant sticks, and refillable toothpaste tablets.

In addition, efforts in sustainability can extend beyond packaging. For example, efficient use of ingredients; processing techniques that safely preserve food; and operations that reduce energy consumption, waste, and reduce emissions all contribute to enhancing a brand’s sustainability. For example, as consumers continue to gravitate toward products with fewer preservatives, high-pressure processing (HPP) can address shorter life-span needs to compensate for a lack of chemical preservatives. HPP is a processing technique used to package organic and natural foods susceptible to spoilage with the application of purified cold water at incredibly high pressures. This technique enables brands to not only streamline production efficiency but also meet sustainability targets by utilizing renewable energy and recycled resources like water and electricity.6

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The dietary supplement industry has seen tremendous growth over the past 25 years. The global market is anticipated to reach $216 billion by 2026.¹ This growth is fueled by the fact that over 70% of Americans take dietary supplements.² However, it is not always clear consumers can trust that what’s on their supplement label is what’s in the bottle.

The Dietary Supplement Health and Education Act of 1994 (DSHEA) provides a framework for the U.S. Food and Drug Administration (FDA) to regulate supplements differently than prescription or over-the-counter medicines. The law puts the responsibility on supplement manufacturers to evaluate the safety and labeling of their products before marketing.³ Thus, it is up to manufacturers to be quality leaders and build trust in their product among consumers.

USP’s market analysis indicates that companies with less than 0.1% market share combine to make up 54% of the global dietary supplement market. We applaud manufacturers who act proactively and responsibly to ensure products are safe and of high quality, but with the many very small manufacturers that make up the dietary supplements market, we cannot assume this level of quality is universal.

Public standards help build consistency and trust needed in dietary supplements. For 200 years, USP has advocated to ensure the quality of medicines, dietary supplements, and foods. USP also participates in the Dietary Supplements Quality Collaborative, whose work aims to improve the quality and safety of products marketed as dietary supplements. In 2006, we launched the Dietary Supplement Verification Program, a third-party service providing manufacturers a way to confirm quality attributes such as positive identity, potency, and purity. Those whose products pass rigorous testing may display the USP Verified Mark.

Yet, we know only 3 out of 10 of the largest dietary supplement manufacturers who make up nearly half of the global market use a USP public standard or participate in the USP verification program.

Now is the time for all of us to work to ensure the public’s trust in the quality of dietary supplements. FDA has indicated its desire to modernize regulation and oversight of dietary supplements.⁴ Companies who lead with their commitment to quality are poised to help shape the conversation for what good looks like for the industry, while building consumer trust in the quality of dietary supplements.

Source: USP data on file (March 2020)

By Ronald T. Piervincenzi, PhD, Chief Executive Officer, USP

Ronald T. Piervincenzi, PhD, has served as Chief Executive Officer of the United States Pharmacopeia since February 2014. Dr. Piervincenzi provides strategic leadership to USP’s global staff of over 1,400 across sites in Rockville, MD/USA, Brazil, China, Ghana, and India.

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Esports supplements are the name of the game.
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Over the past decade, sports nutrition has entered the mainstream as active nutrition has become a dominant lifestyle. Consumers are gravitating toward functional ingredients like protein that have both performance and dietary benefits. With new casual users and infrequent exercisers using sports nutrition products, whey powders now appear in mass channels like supermarkets, and protein bars have become a staple of convenience stores. The result has been, until recently, a booming sports nutrition marketplace, with global growth of 207% from 2010 to 2018, according to Euromonitor International.

Part of what has driven sports nutrition growth is marketers’ ability to expand to serve a broader set of lifestyles while still responding to the narrower needs of core users. Market expansion has also positioned the industry much closer to mass-market food and beverage. Protein launches have popped up all over the grocery aisle, for instance. Mainstream consumers have gravitated toward products marketed around functional, healthier snacking, using these products after a workout rather than buying specialty products marketed only around sports functionalities. Though the protein halo is still well in effect, consumers are now tempted by a raft of new consumable products.

Some Slowdown in U.S.?
We have seen recent dips in the U.S. sports nutrition market. U.S. sales of sports nutrition slowed to 3% in 2019, according to Euromonitor International, with all product types dipping below their average growth in 2010-2018.

Sports nutrition products closest to mainstream appeal, like protein/energy bars, saw the starrkest slowdown in the U.S. last year, slipping to just 1.5% year-on-year growth. Here, we believe oversaturation and lack of differentiation stifled interest. This caused global growth to slip as well; global sports nutrition sales fell to 5%, the lowest aggregate growth since 2009.

Looking Forward
Despite this slowdown, the industry has several budding innovations that could stimulate growth over the next few years. Together, these innovations will likely add value and tell a distinct story from food-based nutritional.

Protein sourcing presents a significant opportunity and has already led to the emergence of plant-based protein powders as a driver of new business. This should improve as enhanced methods for ingredient testing and verification come to market and as transparency becomes table stakes. Such techniques hold the promise of increasing trust and returning more premium price points to the industry, as consumers pay for the assurance that they are using the cleanest and highest-quality protein ingredients.

Pre-workouts are also expanding through ready-to-drink offerings, taking an interest in energy drinks and reorienting promotional messaging toward performance and sport. Emergent brands like Bang and Monster’s Reign Total Body Fuel, for example, contain amino acids and are marketed to workout enthusiasts, potentially extending usage for on-the-go athletes.

Additionally, sports brands are experimenting with added blends of supplements to extend positioning from solely performance to other adjacent needs.
Performance involves much more than muscle building, and consumers are eager for products that combine a number of benefits in one package.

For instance, newer blends might include collagen for bone and joint health, adaptogens or CBD for mood and energy, nootropics for focus, or probiotics for recovery or anti-inflammation. These formulations underscore that performance involves much more than muscle building and that consumers are eager for products that combine a number of benefits in one package.

Outside the Core
While a move toward higher-value offerings will likely spark renewed interest in the U.S., the industry would also be wise to further push outside this core market. According to Euromonitor International, the U.S. is expected to drop from 62% of the global market for sports nutrition in 2018 to 57% by 2024, as an emergent and active global middle class focuses more on fitness.

Sports nutrition is still quite limited in many countries where gym culture and working out are not as longstanding as they are in the U.S. As a result, there are considerable opportunities to extend marketing and collaborations in regions like Latin America or Eastern Europe, which have high growth and an evolving culture around sports nutrition.

Matthew Oster is the Head of Consumer Health at Euromonitor International, overseeing the industry’s research and analysis and leading a team of experts in 100 markets worldwide. As Head of Consumer Health, Matthew provides insight into the consumer trends, key markets, competitive landscape, and growth opportunities in the global consumer health space to help organizations make strategic business decisions. Prior to this role, Matthew was the Head of Institutional Channels, where he analyzed the changing global healthcare landscape and its effects on the B2B marketplace for goods and services. Matthew has worked in market research since 2011 and holds a master’s degree from the Johns Hopkins School of Advanced International Studies.
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Active nutrition is a term increasingly used in the consumer products nutrition market. But who is the active nutrition consumer—and how does this customer differ from the traditional sports nutrition customer?

Simply put, active nutrition and sports nutrition consumers are often interested in similar products, but the active nutrition customer represents significantly broader interests. While the sports nutrition market caters to customers actively involved in sporting activity—or at least those aspiring to a sporting activity—active nutrition is characterized by consumers who seek products with a health halo and who make products typically associated with athleticism part of their day-to-day routine, with the goal of benefiting their long-term health.

For product makers, consumer research suggests that active nutrition marketing gives companies a wider market audience for their products by being able to focus on those who are not necessarily intending to get more active but who are purchasing products for more general health benefits.

Health Concerns of the Active Nutrition Customer
What health benefits are active nutrition customers seeking? Consumer research from FMCG Gurus’ new report, “Global Active Nutrition: How to Get It Right in 2020” (published in January 2020, with 26,000 respondents), sheds light on this.

Goals: According to the report, 55% of consumers surveyed say they are unsatisfied with their digestive health, and 51% say they are concerned about their heart health. In general, 40% say that even though they are not suffering from any negative health symptoms, they want to take a more proactive approach to maintaining their health.

Effort: 47% of consumers say they have tried to exercise more in the last two years, while 39% have improved their diets and 20% have taken nutritional supplements. Those who have undertaken a diet-based route to improvement are working on reducing their sugar intake (51%), followed by increasing their protein intake (45%). Other popular tactics include adopting a reduced-meat or flexitarian diet (39%), or cutting sugar entirely (39%). Consumers seeking products they perceive as healthy say they look for products high in probiotics (40%) and prebiotics (45%).

Product Targeting
These types of consumer insights are valuable for companies trying to determine how to target these new market trends. With a variety of new snack or supplement options available for the active nutrition customer, ranging from everyday high-protein coffee to energy gels, these consumers have a greater variety of options to choose from than ever before, and it is easy to see from the consumer research which products they are moving towards and which they are moving away from.

FMCG Gurus’ “Global Active Nutrition Survey” (published in 2019, with 26,000 respondents) showed that the product that active nutrition customers increasingly sought in the past 12 months is protein snack bars, with 16% growth over the time period. Other categories also showing strong growth are sports powders and protein...
powders to add to shakes or beverages, and protein-fortified foods like cereal, porridge, or crisps, all showing a 14% increase.

Other categories, however, showed slower growth, with sports and protein gels both growing at a lower 5%, while energy gel showed an overall decrease of 1%. The consumer insights into gels indicate that gels are a significantly less popular way to consume active nutrition products these days. This coincides with data suggesting that energy-focused foods—specifically bars, gels, and powders—are also not something active nutrition consumers are particularly likely to seek out.

**Protein for Everyone**

The most popular snack options for active nutrition customers are those that contain high levels of protein, FMCG Gurus research shows. Of those surveyed, 45% of consumers have increased their overall intake of protein, and more than half of consumers surveyed say they have directly switched from snacking on high-sugar products like chocolate and confectionery to snacking on high-protein products.

Unlike traditional sports nutrition motivations, only a relatively small percentage of active nutrition consumers are looking to build muscle (16% of those surveyed), while a significantly higher number are interested in more general health benefits. To this end, the appeal of protein has broadened significantly among active nutrition customers: 48% look for high-protein options for general health and wellness purposes; 47% look for high-protein products to boost their energy levels or improve their heart health; and 44% seek high-protein products to boost their immunity.

**What to Avoid**

Finally, it is important to note that a mainstay of consumer concerns is the fear of side effects related to certain products. In our survey, 20% of respondents said they are or would be prevented from buying healthy/high-protein snacks due to a fear of side effects. Based on previous experience, 29% of respondents said they believe such products will cause dehydration, 28% said they are worried about resulting gas or constipation from consuming the products, and 26% said they fear negative effects such as bad breath or bloating. Companies looking to capitalize on these market trends will need to not only take steps to reduce consumer concerns about these issues, but also to reassure consumers on the fence.

Data for this article is based on FMCG Gurus’ “Global Active Nutrition: How to Get It Right in 2020” report (published in January 2020) and its “Global Active Nutrition Survey” (published in 2019).

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Esports

Leveling UP

Esports supplements are the name of the game.

BY KIMBERLY J. DECKER

Is playing video games a childish waste of time? Despite what your mother may have told you, no.

With universities offering athletic scholarships to top-ranked gamers, and with payouts at big-name gaming competitions heading north of seven figures, Esports has reached the rank of serious business—both for competitors and for the companies that cater to them.

In fact, notes Rob Brewster, president, Ingredients by Nature (Montclair, CA), “Now that 73% of Americans over age two play video games every week, video gaming is the leading form of entertainment in the U.S.”

So as the spotlight focuses on these 21st-century athletes, Esports enthusiasts are focusing on nutrition as an avenue to improved performance. The upshot: “There’s a lot of spending power within the gaming community that the natural-products industry can take advantage of,” says Brewster.

The smart brands already are. “Slowly but surely,” he says, “companies are developing nutrition products targeted at and marketed to gamers—and gamers are buying.”

Serious Play

Esports’ meteoric rise has raised some eyebrows, including those of Maxine Weber, director of marketing, health and wellness, Ashland Inc. (Wilmington, DE). “Admittedly,” she says, “for many of us over age 30, it’s hard to imagine the popularity of Esports. However, the audience is growing.”

Estimates put the number of gamers worldwide at 2.5 billion, generating an output in 2019 of $120.1 billion for an industry on pace to hit a value of $300 billion by 2025. “The U.S. market alone generated $35.4 billion last year,” Brewster notes.

And while it’s easy to think of video games as a ‘man’s world,’” he continues, according to the Entertainment Software Association, “women actually make up about 46% of U.S. gamers.” Further, although 40% of gamers are between age 18 and 35, almost as many—39%—are older, “meaning that Gen Xers and baby boomers are getting in on the fun, too,” says Brewster.

At a Kemin-sponsored SupplySide West event last year, Diane Ray, vice president of strategic innovation at consumer intelligence firm Natural Marketing Institute (NMI), noted that gamers are also “typically health strivers,” and “are somewhat price
sensitive and are most responsive to products backed by strong education.”

But per her own online research into the community, Leisha Jenkins, marketing associate, Verdure Sciences (Noblesville, IN), observes that many professional gamers seem to retire in their mid-twenties, blaming the early exits, in part, on health concerns like joint pain, eye fatigue, and mental fatigue.

“The pressure of live gameplay and team dynamics might also cause emotional stress for players,” Jenkins adds. “And with prizes earning players thousands—sometimes hundreds of thousands—of dollars per game, players can experience high levels of stress due to the viewership and money on the line.”

Occupational Hazards
So being a competitive gamer is no day at the arcade. The demands on these athletes are many.

“First and foremost,” Brewster says, “video gaming requires mental prowess. But staring at screens for hours may cause mental fatigue, debilitating the ability to focus and slowing processing speeds. This is a big deal when each gameplay session is full of constant split-second decisions and the difference between winning and losing can be a matter of seconds.”

What’s more, with primary and working memory prized in puzzle games and those trafficking heavily in tactics and strategy, “if short-term memory is impaired from fatigue, oxidative stress, or any other reason, so, too, is a gamer’s ability to compete,” Brewster adds.

Gaming’s occupational hazards are hardly all in one’s head, either. “Physical challenges can affect cognitive ability,” Brewster continues, with spikes in blood sugar crashing energy levels and cognitive focus alike. “And visual damage, which may come from excessive exposure to blue light, not only affects vision generally but decreases the ability to visually process at optimal speeds.”

As in any other sport, inflammation is a common threat, with repetitive use of the mouse, keyboard, and controller putting finger and wrist joints at risk and “making it hard to act quickly and effectively,” Brewster concludes. And even ears aren’t entirely safe, with blaring headphones doing a number on gamers’ hearing.

Top of Their Games
No wonder gamers are growing as keen as traditional athletes on nutritional support. But the needs of a Counter-Strike competitor aren’t necessarily the same as those of a triathlete or bodybuilder.

“Gaming and traditional sports are both mental and physical,” says Ceci Snyder, MS, RD, global vision product manager, Kemin (Des Moines), “but the tilt in gaming is definitely toward the mental edge. Thus, they need more than just energy.”
Elyse Lovett, senior marketing manager, Kyowa Hakko USA (New York City), agrees. "Like other athletes, Esports players are looking for that edge in performance," she says. "But Esports players are asking questions like, 'How can I up my game, be more focused, and get the energy I need to play for six or 12 hours straight?'"

The answer involves qualities like endurance, quick reaction time, and rapid problem-solving abilities, notes Weber. "And after play, gamers may need recovery support, just like traditional athletes—for intensive use of muscles and joints, as well as for unique challenges such as eye strain and exposure to blue light."

Adds Brewster, "Gamers are looking to avoid fatigue, distraction, and jitters. Jitters may cause dysfunction of motor skills at critical moments while fatigue may slow response time and decrease focus. Of course, the detriments of being distracted while playing a game with many moving parts and active opponents is a very clear 'game over.'"

Indeed, notes Samantha Ford, MS, director of business development, AIDP (City of Industry, CA), like everyone in our fast-paced world, gamers are looking for both an edge and a sense of calm. "Ironically, though, these two are interconnected," she says. "When brain neurons are healthy and functioning properly, one has a better ability to focus and less cognitive stress."

Natural Opportunity
There was a time when gamers would have sought proper neuronal functioning in vehicles like sugary, over-caffeinated energy drinks or snacks packed with empty calories from starch and fat. Or at least that was the assumption.

But, says Brewster, "Today's gamer isn't always the stereotypical couch potato often depicted as overweight, surrounded by junk food, and rarely sleeping. More are taking the time to eat well-rounded meals and get some exercise and a good night's rest, knowing that these decisions will ultimately affect their performance."

Adds Jenkins, "Health trends in general lean toward more comprehensive approaches to wellbeing, and it appears the Esports industry is aligning with that trend. Gamers are more aware of how they treat their bodies, and many teams now employ professionals to help balance play-intensive lifestyles with specifically designed sleep, nutrition, and physical-activity programs."

This poses a "unique opportunity for supplement makers," concludes Kim Edwards, MBA, CPMM, global product manager at Kemin. "Whether gamers are competing in a professional event or playing for the love of the sport, they're looking for a competitive edge, and for gamers who take supplements, 80% take them at least five days per week."

The Gamers' Garden
Research into compounds that provide the cognitive boosts gamers value—a.k.a. nootropics—has blossomed about as dramatically as Esports themselves, and it’s uncovering impressive results for herbal and botanical ingredients.

Notes Verdure Sciences’ Jenkins, "Bacopa monnieri has long demonstrated mood and emotional-wellbeing benefits," apparently via antioxidant support, acetylcholine mediation, and serotonin modulation. "Serotonin is known to help regulate mood naturally, and when serotonin levels are normal, people feel calmer, happier, more focused, and less anxious."

Clinical studies show that Verdure Sciences’ proprietary B. monnieri extract, Bacognize, delivers those benefits plus cognitive acuity, focus minus stimulant side effects, improved working memory, and less mental fatigue and distractibility.

Adding that B. monnieri has "an age-old reputation in Ayurvedic medicine for being effective in memory and cognition," AIDP’s Ford notes that her company's full-spectrum extract is standardized for phytochemical composition and delivers nine different bioactives. Called BacoMind, it’s "been shown to improve memory acquisition and retention, as well as verbal memory," she says.

Jenkins mentions curcumin as an ingredient that helps "meet the emotional and mental challenges of high-level play." Studies link curcumin with significantly lower fatigue, tension, anger, and confusion, she notes, which, along with the botanical’s anti-inflammatory properties, “are significant for the comprehensive wellness that gamers might find appealing in a natural alternative.”

Research into adaptogens may also benefit gamers, as a randomized, double-blind, placebo-controlled trial involving the adaptogenic herb tulsi (Ocimum tenuiflorum) suggests. In the study, Ford says, AIDP's standardized herbal composition—OciBest—appeared to support stress management, producing significant reductions in forgetfulness, frequent feelings of exhaustion, and sleep problems," she says.

Notes Kemin’s Snyder, spearmint (Mentha spicata L.) extract “supports physical and cognitive performance related to multitasking, as well as focus and choice reaction performance.”

A randomized clinical trial involving Kemin’s Neumontix spearmint extract found that young, healthy, active male and female subjects receiving 900 mg of the extract daily performed significantly better on a focus task compared to the placebo group. "In fact," adds Brenda Fonseca, MA, senior global technical service manager at Kemin, "individuals taking Neumontix showed an 11% increase in sustained attention from baseline."
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Brewster of Ingredients by Nature mentions that sage (Salvia officinalis) “has been used for hundreds of years in health applications, and has recently been growing in popularity for its cognitive-health applications. The compounds in sage help provide better mental clarity and cognitive energy, and support improved memory.”

Citrus flavonoids like hesperidin and eriocitrin also seem to improve energy, focus, and cognitive-processing speed, he says. Powerful antioxidants, they help manage oxidative stress and depress free-radical levels in the brain, helping neurons “communicate optimally for a more competitive edge.” Additionally, eriocitrin and other lemon flavonoids seem to significantly help manage blood glucose levels. “Keeping blood sugar in balance ensures that gamers avoid sugar crashes while maintaining optimal attention, focus, and energy,” Brewster says.

**Special Delivery**

How brands deliver these ingredients is as important as the formulations themselves, and, as Lovett observes, “Gamers will want high-quality ingredients that get them to their peak, but they’ll also want unique delivery forms—maybe a snackable gummy or small shot.”

Brewster wagers that pills, powders, beverages, bars—even meal replacements—will also “take the lead,” with the common denominator among them their convenience.

And while “the days of Red Bull aren’t quite over,” he continues, “gamers are realizing that sugar-filled drinks don’t provide the longer-term edge they want. As such, they’re turning to sugar-free alternatives for energy, including energy drinks that provide other vitamins and minerals.” Even caffeine is falling in favor of what he calls “natural nootropics” that supply energy and cognitive sharpness without caffeine’s drawbacks.

Adds Weber, “Technologies for controlled, extended, or sustained nutrient release during or after play could be extremely beneficial to gamer athletes.” Her company, Ashland, recently introduced a powdered beverage base, n-dur XR, that can release its payload over as many as six hours. “This could be very exciting in a sustained-energy drink, a post-play relaxation beverage, or even a joint-recovery beverage,” she says.

Lovett will be paying attention. “I think it’s interesting watching the Esports category evolve—not just with new technology, but into the wellness space, too,” she says. “Not only does gaming attract traditional gamers and Esports players; it’s also watched by millions all over the world, which is an important marketing outlet for finished products or new technology.”

View story references at www.nutritionaloutlook.com/sports-energy/esports-enthusiasts-target-dietary-supplements-their-game

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**Ahead of the Game**

“One trend we’re seeing is that gamers are taking pre-workout supplements before a game for a boost of energy and focus,” notes Aimee Masterson, marketing director, Nutrition 21 (Morristown, NJ).

A recent double-blind, placebo-controlled study involving her company’s nooLVL—an inositol-enhanced arginine silicate—found that in a population of avid gamers (all subjects played video games at least five hours per week for at least six months prior to the study) found that the supplement significantly improved visual attention, motor speed, and reaction time after 60 minutes of play relative to baseline, while also yielding 66% fewer errors compared to placebo.

“Another unique advantage for gamers is that the bonded arginine silicate in nooLVL—a non-stimulant—safely increased perceived energy in gamers without negatively affecting their heart rate or blood pressure after a single dose and within 15 minutes of ingestion,” Masterson adds. Given the study’s success, she says, the company plans to fund further study on the ingredient and its benefit to gamers.

Finally, Kyowa Hakko’s Lovett calls attention to clinical evidence showing that her company’s Cognizin brand of citicoline supports focus, attention, mental energy, and memory. A 2015 study published in the *Journal of Attention Disorders* found that of 75 healthy male adolescents receiving a placebo, 250 mg of the compound, or 500 mg daily for 28 days, the two treatment groups showed statistically significant increases in motor speed and improved attention compared to the placebo, she says.

**Seeing the Light**

Given gamers’ exposure to damaging blue light, another key focus for Esports formulations is vision support. And here, all eyes are on lutein.

Snyder credits Kemin’s branded lutein ingredient FloraGLO for improving visual processing speeds, promoting sharper vision, and absorbing excess blue light from digital devices.

Studies show that when healthy individuals supplement with 10 mg of the ingredient, their ability to recover from glare and see contrasts, as well as the rapidity with which they recover from bright light, improves—“demonstrating an overall improvement in visual performance,” Fonseca adds.

The LAMA (Lutein, Vision, and Mental Acuity) study series involving OmniActive Health Technologies’ (Morristown, NJ) own Lutemax 2020 marigold extract has contributed more data on the important role of lutein in these areas. One of the studies in this series found that OmniActive’s Lutemax 2020 supplement significantly increased photo stress recovery and disability glare performance.

Ashland’s Weber suggests that gamers may want to consider eye-health options that include lutein as well as bilberries. Her company’s Bil-Max bilberry extract and GPM lutein “would be excellent ingredients to incorporate into an eye-health supplement or ingestible,” she says.

And don’t forget the skin! Neil Astles, global marketing manager for Vincience Biofunctionals at Ashland, notes that his company markets non-ingestible, topical personal-care ingredients that “energize the skin,” he says: Suprastim biofunctional, which helps repair signs of skin fatigue; Blumilight biofunctional, which protects skin from blue light’s effects; and Chronogen YST biofunctional, to stimulate skin lacking sleep and sun exposure.

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**Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.**
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The sports drinks category continues to grow and evolve, with brands investing in the research and development of healthier products with functional ingredients. Data from Mordor Intelligence indicates that the global sports drink market will grow at a 4.5% CAGR through 2024. While North America will be the largest market for sports drinks during the forecast period, Asia Pacific is expected to be the fastest-growing market. Here are some of the latest trends driving growth and innovation in the sports drinks market.

**Esports Drinks Go Smart**

Jim Tonkin, founder and president of Healthy Brand Builders (Scottsdale, AZ), says Esports drinks are now adopting smarter ingredients with functional properties. Says Tonkin: “The gamer space is a burgeoning part of the young adult market, especially Millennials and Generation Z in the 15-to-30 age range. A big part of that space is brain-health ingredients. These ingredients, whether pharmacological or supplement, are finding their way into ingredient profiles for sports drinks.”

Several brands are creating cognitive performance drinks for Esports, with companies like Engage (Utrecht, The Netherlands) and Nau Drinks (Gothenburg, Sweden) producing functional beverages aimed at professional gamers. Nau’s first product, called Sense, incorporates brain-boosting ingredients like lemon balm, sage, and L-theanine. Engage has taken a similar approach, using naturally sourced ingredients like Ginkgo biloba and maca root.

Market researchers expect the gaming market to keep growing. The professional competitive video gaming industry generates over USD $1 billion in annual global revenue, and Esports now has a larger global audience than football and rugby combined. Professional gamers are often looking for every edge they can get, given the amount of tournament money at stake. For instance, in 2019, professional StarCraft player Park Ryung-woo won USD $210,000 for finishing in first place at the StarCraft II World Championship Series. As Esports’ growing popularity attracts more sponsors and bigger prize pots, demand for Esports drinks will increase.

** Powders, Fortified Rehydration on the Rise**

Tonkin says that one of the emerging niche markets in sports drinks is fortified rehydration. These beverages, Tonkin says, are
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commonly found in gyms and other fitness facilities, and are marketed as post-workout recovery drinks. Tonkin cites the example of the branded Resqwater drink by Intelligent Beverages (Scottsdale, AZ).

“Resqwater is made with L-theanine and other bioactives that are good for brain health,” Tonkin says. “It’s considered a sports-oriented rehydration drink, and I think a lot of people are also using it as a hangover remedy. It’s very common for these brands to position clean, electrolyte-fortified waters as rehydration sports drinks.”

Rehydration beverages are even coming in the form of powders, Tonkin notes, with powdered products like Liquid I.V. (El Segundo, CA) and SOS Hydration (San Francisco, CA) hitting store shelves. These electrolyte mixes are just one example of a growing trend toward a preference for powdered products.

“Sports nutrition is no longer just RTD,” Tonkin says. “People are using the sports nutrition overhang to put powders in stick packs and tubs. There are even better-for-you energy products being put in powders. There’s a lot of activity around powders right now.”

Hybrid Beverages Gain Shelf Space

Rather than use multiple beverages for different functions, consumers are showing a strong preference for so-called “superdrinks”—all-in-one products with multiple functional claims. Holly McHugh, marketing associate for Imbibe (Niles, IL), says that brands are creating a wide array of superdrinks for various applications.

“Some of the especially prevalent beverages are energy drinks enhanced with creatine, BCAA, or electrolytes,” McHugh says. “Brands are also innovating by combining protein with ingredients like veggie blends, coconut water, and caffeine.”

McHugh says these beverages are commonly coming in the form of ready-to-drink shots, particularly those that contain amino acids, caffeine, or B vitamins. Typically, she says, ingredients tend to orient around functional claims related to power and performance, recovery, or focus. “Nootropics are trending, as are creatine and free-form amino acids,” she says. “MCT oil is another emerging ingredient popular with active consumers, especially those on the keto diet.”

Brands Target Women and Millennials

Sports drink brands are continuing to release products specifically aimed at women and Millennials, two of the fastest-growing sports product markets. Maxine Weber, global director of marketing for health and wellness at Ashland (Wilmington, DE), says the rising influence of these two markets is going to dictate marketing and formulation trends.

“The number of women involved in sports has increased significantly in the last few years,” Weber says, “and I would anticipate that we’ll continue to see products that target women. Millennials will also be a target for sports drinks. Millennials are eco-conscious variety seekers, so look for new flavors, added sensory experiences, and more products with natural claims.”

Weber says that a growing challenge for sports drink brands to navigate is the emergence of the “everyday athlete.” The consumer base for sports products is expanding, which will require brands to change how they communicate. “Brand owners will have to talk about their products in a way that clearly communicates their relevance to this broader base of consumers,” Weber notes. “This might mean providing additional explanations of the benefits of certain ingredients, or using entirely different language to appeal to consumers’ needs.”

Clean Labels, Natural Ingredient Claims

Natural ingredients and clean-label formulations are still at the top of sports consumers’ minds. While these terms don’t have a universally accepted or standardized meaning, McHugh says they are quickly becoming some of the most popular marketing claims in sports drinks.

“Many brands are formulating or reformulating to meet clean-label standards of ‘natural,’ which can differ depending on the brand and the consumer,” McHugh explains. “Last year at Expo West, many brands were referring to their products as ‘clean protein,’ ‘clean performance,’ or ‘clean energy’.”

Furthermore, the push toward low-sugar drinks has continued. While sucralose is a common ingredient in sports nutrition products, McHugh says that brands are now making the switch toward natural sweeteners like monk fruit. “Linger and bitterness can pose challenges with these sweeteners,” McHugh says. “But advances in stevia technology and flavor development make it possible to have a great-tasting, low-calorie product.”

Niche Producers Challenge Big Brands’ Market Space

The market outlook for sports drinks appears strong, especially for smaller companies that offer niche products with “better for you” functional claims. The sports beverages space is becoming highly competitive, with plenty of opportunities for smart brands. Citing the example of Bodyarmor (Queens, NY), Tonkin says that the biggest challenges going forward will be for established brands.

“Established brands will have to defend their market share,” Tonkin says. “A lot of new products are going after their consumer. Bodyarmor is probably the fastest-growing brand in the space, and they’re the biggest player in terms of functional ingredients. If you look at their ingredient list, you can tell that they’re throwing the kitchen sink at their competitors.”

As sports drinks usage grows, sophisticated consumers will demand better functionality and healthier ingredients from brands. The greatest opportunity will be for companies that can create the most functional benefit while maintaining the cleanest label.

Mike Straus is a freelance writer living in Kelowna, Canada. He has written for publications including Canadian Chiropractor, Grow Opportunity, and Massage Therapy Canada.

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In the Field

In 2019, global public health organization NSF International (Ann Arbor, MI) collaborated with women coaches organization WeCOACH to survey a select group of WeCOACH members on how dietary supplements are seen and understood by both coaches and student-athletes. While some results were not surprising (social media looms large), many respondents had strong responses regarding challenges, concerns, and “red flags” when it comes to dietary supplement use.

Survey participants included athletic directors, head coaches, assistant coaches, and strength coaches from colleges, universities, and academies across the United States, from a broad spectrum of sports, including:

- Cross Country/Track & Field
- Golf
- Gymnastics
- Lacrosse
- Rowing
- Soccer
- Softball
- Swim & Dive
- Tennis

The survey probed the following topics related to how student-athletes choose and use a dietary supplement: the role of the coach when it comes to dietary supplement education, concerns about worrisome supplement ingredients, the role of the National Collegiate Athletic Association (NCAA), and the challenges faced when trying to add supplement education to students’ already-packed schedules.

Here are some of the takeaways on how student-athletes and coaches approach the topic of dietary supplementation.

Bringing in the Experts

Respondents repeatedly stressed the importance of bringing dietary experts, such as the team’s registered dietitian (RD) or athletic trainer, into any conversation about supplements as soon as possible.

“I think it’s important for coaches to be knowledgeable about supplements, especially supplements that pertain to their sport,” said Ashley Bastron, Women’s Assistant Cross Country/Track & Field Coach at Wake Forest University. “For example, it’s good for cross country coaches to understand the impact that iron supplements can play. However, it’s important for coaches not to play nutritionist. Don’t try and be a doctor.”

Indiana University Associate Softball Coach Kendall Fearn agreed, recommending “clean and consistent communication and referral to an athletic trainer or dietician who will take a look at the ingredients” in a supplement under consideration.

When asked about bringing up supplement safety with student-athletes, Georgetown University Women’s Assistant Soccer Coach Lyndse Hokanson also emphasized the importance of input from a nutritionist expert. “If I were to be approached about supplements by one of our student-athletes, it would be a conversation that would loop in our athletic trainer, our strength and conditioning coach, and obviously our head coach,” said Hokanson.

Education about dietary supplements happens both in group settings and one-on-one conversations, but the coach’s reliance on the expertise of dietary specialists, like an RD, is paramount in either setting. George Washington University Rowing Head Coach Marci Robles makes the position clear: “We always encourage student-athletes to seek advice and guidance from our athletic trainer before taking anything.”

Red Flags and Worrisome Ingredients

Registered dietitians with expertise in understanding supplements are important for more than just the student-athlete’s athletic success; they also contribute to the student-athlete’s overall health and well-being. These dietitians can also guide
student-athletes when it comes to questionable supplement ingredients.

Lewis & Clark College Head Strength Coach Angela Dendas-Pleasant reminds student-athletes that “supplements are more than just protein powder,” and cautions students “to read through the ingredients and if they don’t know the ingredients, then don’t take it.”

Athletes need to be vigilant about what they put into their body to not only protect their health but to also avoid testing positive for banned substances during a drug test. Samantha Eustace, Lacrosse Head Coach at Mercer University, warns against “ingredients ending in -ol, -diol, or -stene, or ones that contain a lot of numbers.” These ingredients, along with those ending in -heptane, -hexane, -amine, or -arane, may indicate that a stimulant or steroid is present in the product.

Kelsey Hinton, Gymnastics Head Coach at William & Mary College, reminds her athletes about a simple but deceptive ingredient, sugar, noting that “all smoothies are not good smoothies.” Various products make claims of ingredients being all-natural or ‘healthy’ but commonly contain lots of sugar. Whether a product is sourced from natural ingredients or otherwise, 40 grams of sugar is still 40 grams of sugar.

The Role of the NCAA
When asked what student-athletes should consider when shopping for supplements, the coaches highlighted the student-athlete’s personal responsibility when it comes to avoiding substances banned by the National Collegiate Athletic Association (NCAA) or the World Anti-Doping Agency (WADA). “The most important job we have as coaches is to ensure that athletes are making choices that are NCAA compliant and that are beneficial to them in the short- and long-term,” said Hokanson.

But ultimately, the responsibility for supplement use falls to the student-athlete. Per the NCAA website, “In addition to performance-enhancing drugs, alcohol, and other recreational drugs, dietary supplements can be dangerous to a student-athlete’s health and may contain NCAA-banned drugs. Supplements are not required to be tested for purity, effectiveness, or safety before going to market. Also, their labels may not accurately reflect what’s in the bottle. Many student-athletes have lost eligibility for using a supplement they thought was safe, only to test positive because the supplement was contaminated with a banned steroid or stimulant.”

“We are not against supplements,” said Caroline Powers, Women’s Golf Assistant Head Coach at Michigan State University. “But we want them to be safe and legal within the NCAA. Making products that align with that is more important than anything else.”

The Female Difference
When asked about particular concerns for female athletes when it comes to dietary supplements, multiple respondents cited concerns about supplements designed and marketed to help athletes “get huge.” While these marketing tactics are generally targeted to males, they still also reach female athletes, and the concern is that products in this category are commonly found to be adulterated or even found to contain steroids and other prohibited substances. Sometimes these substances are not listed on the label.

Other female-centric concerns around supplement products related to issues of body image; coaches expressed concern that female athletes may substitute supplements for a healthy meal plan or may be motivated to use supplements to improve physical appearance rather than to improve overall health or athletic performance.

Information Overload
When asked about the biggest challenge in teaching athletes about dietary supplements, the issue of information overload cropped up repeatedly. “The biggest issue athletes face is the amount of information out there,” said Bastron. “It’s too much, and it’s too easy to get mixed messaging. It’s hard to know what and who to listen to, especially since so many supplements are not monitored.”

It’s unsurprising that coaches are also concerned about peer pressure and the role of social media. “Obviously, word of mouth and social media are some of the strongest influences on our athletes,” said Fearn.

And just because a supplement is getting a lot of attention or usage, it doesn’t guarantee that the supplement is safe. “Our athletes may have friends in non-NCAA sports who just use supplements at the gym,” said Alice McCall, Assistant Men’s and Women’s Swim & Dive Coach at Florida Atlantic University. “They see the supplements that are working, but they may not be NCAA/WADA compliant.”

Powers takes it one step further, by stressing that athletes should only utilize certified products and not rely on word of mouth or the assurances of a retail clerk when it comes to purchasing products, including those labeled as organic or “FDA approved.” The FDA does not approve supplements, nor does the NCAA. Athletes should avoid products making these claims as they are commonly found to either be adulterated or contain harmful and/or banned ingredients.

Making Time for Supplement Education
As might be expected of coaches in an academic setting, the overall focus when asked about how to improve conditions was often the most obvious one: increase education. Coaches stressed the importance of educating student-athletes about reading and understanding product labels and looking for products that have been certified by an independent organization. According to Fearn, “The biggest challenge in teaching athletes about supplements is providing the educational structure needed to best inform them of the safety and compliance of supplements.”

“It means we have to make the time to educate them. We focus a lot on areas of health and well-being, but we haven’t addressed supplements,” said Robles. “I think just as we’re charged with creating an environment of compliance, we’re also charged with creating an environment in which we promote healthy habits as it relates to nutrition, fuel, and supplements.”

Dana Leenheer is the Technical Scheme Manager for Dietary Supplements at NSF International, focused on the NSF Certified for Sport certification. Prior to NSF International, Leenheer acted as a Therapeutic Use Exemption and Drug Reference Program Lead for the U.S. Anti-Doping Agency.

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Substance Watch
Sports adulteration concerns, from Esports to CBD.

BY SEBASTIAN KRAWIEC, ASSOCIATE EDITOR

Adulteration is a real risk with sports nutrition, weight management, and even energy/focus supplements and functional foods. The most common adulterants in these products include stimulants and steroids, which pose health risks and are among the many substances on the World Anti-Doping Agency’s (WADA) list of athletically banned substances.

Even familiar and reliable ingredients can be at risk of adulteration. For example, in 2018 the U.S. FDA had to take steps to protect consumers from pure or highly concentrated caffeine by making it unlawful to sell directly to consumers in bulk quantities. It’s dangerous for consumers to have pure caffeine in bulk because they are not generally equipped to properly measure the safe amount for consumption. Sports certifier NSF International (Ann Arbor, MI), for its part, sets limits on the amount of caffeine allowed in its NSF Certified for Sport products to 150 mg per serving and 300 mg of caffeine per day.

“New, potentially harmful ingredients in these categories are being employed all the time,” explains John Travis, senior research scientist, NSF International. “In recent weeks, we’ve been hearing about the increased presence of N,N-dimethylphenylethylamine (N,N-DEPEA), a substituted phenethylamine sometimes used as a flavoring agent, being used as a pre-workout and/or bodybuilding supplement ingredient.”

This ingredient was found to be the culprit when a number of professional athletes failed drug testing following supplementation with a pre-workout supplement. N,N-DEPEA, which was listed on the product’s label, is a structural isomer of the methamphetamine analog Nalpha-diethyl-phenylethylamine (Nα-DEPEA), which researchers tested for and found in the product.

“WADA considers it a prohibited substance, listing phenethylamine and its derivatives, which include N,N-DEPEA, under the stimulants category,” says Travis.

The Vulnerable
Many pre-workout products claim to support focus and concentration during a workout. Such claims translate to other supplement categories such as cognitive health, and have recently made their way to energy products targeting gamers. That leaves room for concern, says Travis. “There is enormous potential for adulteration of energy and focus products marketed towards Esports competitors. The same stimulants found adulterating pre-workout and weight-loss products could find their way into the energy/focus products. These substances are part of our routine screening, so Esports organizations and competitors can benefit from recommending and using NSF Certified for Sport products.”

According to an article recently published in The Washington Post, abuse of the prescription drug Adderall is very common in the Esports space. A number of professional gamers admitted to using Adderall as a performance-enhancing drug. So far, only one league actively tests competitors for banned substances. In professional sports, WADA and the U.S. Anti-Doping Agency already list Adderall as a banned substance. Should other Esports leagues decide to ban the use of Adderall among their athletes, this could cause athletes to turn to other banned substances in dietary supplements, making energy/focus products more vulnerable to adulteration.

Another trending new space open to a great deal of unknowns is hemp cannabidiol (CBD). While becoming popular for fitness recovery and stress reduction, CBD and its toxicology are not yet well studied, says Travis. “If a manufacturer is making a CBD isolate, there could be a concern in that one way of isolating CBD involves a reaction with 3,5-dintrobenzoxy chloride that can leave residual 3,5-dinitrobenzoic acid, which could be a toxicological concern,” explains Travis. “Basically, you are creating a reaction that causes the CBD to precipitate, and then you cleave that precipitated product, and the residual chemical after that hydrolysis may be an issue if no one is monitoring it, or there’s a lack of toxicological awareness of it.”

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No Dairy? No Problem.

Innovation has made plant-based yogurt a viable and delicious option.

BY SEBASTIAN KRAWIEC, ASSOCIATE EDITOR

One of the quintessential foods that comes from dairy is yogurt. Consumers enjoy yogurt as a healthy snack that can also support their digestive health through probiotic content. With the growing demand for plant-based alternatives to popular dairy and meat-based products, ingredient suppliers and product manufacturers have been working hard to create great-tasting plant-based yogurt products that compete with the real thing.

Consumers want the option. According to recent consumer research from ingredient supplier Cargill (Minneapolis, MN), based on the responses of 840 U.S. respondents, about 50% of shoppers consume both dairy and dairy alternatives, with about 12% being true dairy avoiders. Among shoppers, 49% cite great taste as an important attribute influencing the purchase of plant-based yogurts, meaning that many are not willing to sacrifice flavor for the perceived health benefits of plant-based foods.

Yogurts in particular can be difficult for plant-based products manufacturers to replicate. “Dairy proteins provide so much functionality, and they have a very clean flavor profile,” explains Christine Addington, Cargill’s senior dairy technical service specialist. “Further complicating formulation, plant proteins are less soluble than dairy proteins, which can result in a gritty mouthfeel.”

Many manufacturers use plant-based fats to replicate the creamy mouthfeel, for example, adding high amounts of coconut oil, cocoa butter, or palm kern oil, says Addington. However, in order to keep the fat content low, hydrocolloids and starches also create acceptable mouthfeel. “Hydrocolloids and starches are also extremely helpful in preventing syneresis,” she explains. “We’ve also found fibers, like chicory root fiber, can help with texture and mouthfeel.”

Syneresis is the expulsion of liquid from a gel. This can occur in dairy yogurt when whey collects on the surface of yogurt, but is less desirable in plant-based applications, particularly when it occurs over the product’s shelf life. “Because plant-based proteins function differently than dairy proteins, syneresis is a much greater concern,” says Addington. “Starches help absorb the excess water that seeps out over shelf life, while also contributing to the creamy mouthfeel consumers expect.”

In a prototype, explains Addington, Cargill was able to create a plant-based yogurt starting with coconut cream, then used Puris-brand pea protein, a SimPure functional native starch blend, and pectin to control syneresis and create the rich, creamy texture.

Some textures, however, are more difficult to replicate than others. A good example is the popular Greek yogurt, whose texture Addington explains is a result of the way milk is cultured.

“Traditionally, Greek dairy yogurt is made with milk that has been cultured to form curds, then strained or separated,” she explains. “The culturing coagulates the dairy proteins, which are strained to concentrate solids in the yogurt’s white mass. The result is a very thick, velvety texture.” Creating curds is not really an option for plant-based applications; therefore, manufacturers will increase the fat content to replicate the texture and mouthfeel of Greek yogurt.

Sugar content is another important attribute to consider. According to Cargill’s recent report on plant-based yogurts, 9.2 grams is the preferred threshold for sugar content in yogurt. Using alternative sweeteners such as stevia and erythritol can offer significant sugar reductions. In a prototype, Cargill was able to create a yogurt with 70% less sugar using its ViaTech stevia leaf extract and Zerose erythritol.

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<th>Product Type</th>
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<td>14 BILLION / YEAR Solid Dosage: Tablets • Capsules</td>
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