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2021 Editorial Advisory Board Forecast 8 **HEALTH FOCUS**

Immune Health: COVID-19 and Beyond 64 INGREDIENTS

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The *year* of Immune Health

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Nutritional Outlook thanks SPINS (Chicago) for sharing market research and insights for this story.

Vitamin C

As the immune-health market soared in 2020, vitamin C demand went into overdrive. "The dramatic rise in vitamin C consumption was due largely to COVID-19," says Tobe Cohen, chief growth officer for Pharmavite. He adds: "Year to date, the vitamin C category has grown almost 70%, and that spike was born out of a reaction to the pandemic."

Sales reports from 2020 reflect this. According to data provided by SPINS (Chicago) on the U.S. mainstream dietary supplement channel, sales of vitamin C (which does not include sales of the popular patented Ester-C brand of vitamin C) grew 61.8% to \$576 million during the 52 weeks ending November 29, 2020. Ester-C sales in the mainstream channel grew 48.9% to \$216 million during that time. Meanwhile, in the U.S. natural supplement channel, sales of vitamin C (not Ester-C) grew 70.7% to \$44 million during that time, while sales of Ester-C grew 41.5% to \$17 million.

Within the U.S. mainstream cold-and-flu category, vitamin C commands nearly twice the level of business (at \$408 million) as other ingredients competing in the category, such as elderberry (\$223 million), echinacea (\$180 million), and zinc (\$32 million), among other popular immune-support ingredients.

Shoppers started reaching for vitamin C at the start of the pandemic. For instance, just during what market researcher IRI (Chicago) dubs as the "peak week" of the pandemic, ending March 15, 2020, when consumers began immediately stocking up on supplies, vitamin C dollar sales grew \$60.4 million, reported Kristin Hornberger, executive, healthcare, for IRI, during an April 2020 webcast hosted by the Council for Responsible Nutrition (CRN; Washington, DC) and Informa. At the time, she reported, "Immunity-focused brands like Emergen-C and Airborne made significant share gains, attracting new buyers and driving stock-up." The Emergen-C brand, she said, saw a 244% dollar sales increase in the six weeks ending April 5, 2020, compared to the same period in 2019.

Any item, in fact, that consumers associated with vitamin C was in high demand. At a September 24 webcast hosted by *Nutritional Outlook*, speaker Joan Driggs, vice president of thought leadership and content for IRI, reported that "anything with vitamin C, including refrigerated juices, the fruit itself—those are also selling at elevated levels."

A lot of new supplement users began taking vitamin C during the pandemic. "In many ways, vitamin C is the gateway into VMS [vitamins, minerals, and supplements] for new consumers, and they tend to focus almost exclusively on the immune-support benefit of vitamin C because they're not as aware of the other areas of health it can support," says Pharmavite's Cohen.

Existing supplement users also upped their vitamin C game. For instance, a COVID-19–focused survey commissioned by CRN from July 31, 2020, to August 4, 2020, on more than 2000 existing U.S. supplement users found that 44% of supplement users had increased their use of vitamin C.

In CRN's annual Consumer Survey on Dietary Supplements, conducted on more than 2000 U.S. adults (both supplement users and non-users) on August 27-31, 2020, data showed that 32% of supplement users take supplements for immune health. Moreover, the survey found that vitamin C is far and away the most popular supplement consumers take for immune support, with 61% of those who use supplements for immune health taking vitamin C. According to CRN's survey, vitamin C usage is high in the U.S., with up to 35% usage, and popular among all age groups: 34% usage by supplement users ages 18-34, 37% usage by ages 35-54, and 34% usage by ages 55+.

Both types of supplement users, new and experienced, are important to the vitamin C market. Pharmavite's Cohen discusses the two types. "The way consumers interact with vitamin C is a good analogy for the two key consumer types that operate in VMS. You have consumers who want a product that does a specific job for them—think Airborne, Emergen-C, or a vitamin C gummy—and you also have well-versed consumers who want to create their own vitamin and supplement regimens. This consumer tends to be more hands-on and understands their individual needs. When it comes to immune support, they may look for a curated solution that goes beyond just vitamin C to include the full

gamut of immune-support nutrients, including vitamins A, E, D, and zinc."

He points out, "There's value in creating different types of products that meet the different needs of consumers wherever they are in their health journey." Luckily, he says, vitamin C is a "versatile" ingredient. It's water-soluble and works well with many delivery

formats, which allows product makers to cater to myriad consumer preferences, whether it be with gummies, powders, or chewables and beyond just pills alone.

As the market dealt with unprecedented demand for vitamin C in 2020, the biggest worry quickly became supply, both in terms of the raw ingredient and finished products to keep retail shelves stocked. For instance, during the April 2020 CRN/Informa web-

cast, speaker Kathryn Peters, executive vice president at SPINS, reported that vitamin C was one of the ingredients showing the greatest rate of out-of-stocks at the beginning of the pandemic.

Now that we're out of 2020, supply is stabilizing. Tony Xue, China team general manager at e-commerce platform ingredientsonline.com, reports that back in 2019, oversupply sent vitamin C prices to historic lows. Then, when the pandemic began in 2020 and demand began to rise, prices started increasing. Now, he says, "from a supply standpoint, the major vitamin C factories have stable output."

Fahad Ali, planner of operations and supply chain for contract manufacturer Lief Labs (Valencia, CA), says as supply stabilized in 2020, prices began leveling out. "Ongoing, [vitamin C's] demand is continually growing at a consistent pace due to the pandemic. On the supply side, there is a visible change in the market as most of the suppliers are fully stocked and prices are going down with the conventional form of vitamin C. In terms of direct-compressible material, there are still price hikes but not as much as seen in the beginning or mid-2020." He also notes that there has been major growth in demand for both synthesized and natural vitamin C ingredients.

Factories are still wary of supply imbalance, Xue says. "Right now, the solution is to increase output; however, the factories have been very cautious to avoid an oversupply issue," he says. He adds: "Occasionally, factories have to stop quoting and hold shipments due to too many inquiries."

The goal, says Xue, will be keeping the scales even. "Most bulk vitamin C is produced in China, and its supply chain is well-established, from the starting material starch to reaction containers, etc. The question remains how to balance output and demand in the long run, how to keep the market at a level with reasonable profit where the factories can grow, and how to make the production more environmentally friendly"—for instance, reducing reliance on coal burning for vitamin C manufacture.

In terms of the size of the global vitamin C market, Ali says the U.S. leads in vitamin C market share, followed by China and then countries such as Japan, Canada, and Europe. As many dietary supplement ingredients did in 2020, vitamin C faced supply chain bottlenecks due to global lockdowns, limited transportation options, increased transportation costs, and other obstacles.

Says Ali, "Yes, there are still a few supply bottlenecks. The one that has most impact is the logistics time and customs clearance. Due to

the shutdowns and limited staff, globally, as a result of the pandemic, there is a huge impact on the transit time of vitamin C. And, because it is used in large quantities, the most economical method of transit is via sea, which is heavily backed up these days."

Xue agrees. "Export to some countries is not as smooth as before due to vessel availability and port functionality," he says.

Up to 90% of the global vitamin C supply still comes from China, Ali points out. He says China made adjustments to try to ease the bottlenecks. "Due to the skyrocketing demand in 2020, the Chinese

25 Bestselling Ingredients (Across All Health Conditions)					
Ingredient Current Dollars Year-Ago Dollars % Change					

Ingredient	Current Dollars	Year-Ago Dollars	% Change
Protein - Animal & Plant Combo	\$1,471,920,849	\$1,423,130,711	3.4%
Probiotic Supplement	\$759,179,571	\$764,096,427	-0.6%
Protein - Animal (Multi)	\$752,511,028	\$784,743,145	-4.1%
Vitamin C (not Ester-C)	\$575,560,199	\$355,660,589	61.8%
Melatonin	\$573,409,150	\$399,410,005	43.6%
Vitamin D	\$544,231,763	\$404,883,161	34.4%
Protein - Animal (General)	\$482,632,315	\$441,082,710	9.4%
Specialty Remedies (Homeopathic)	\$479,708,874	\$477,217,194	0.5%
Multivitamin (Women)	\$473,588,716	\$396,055,811	19.6%
Multivitamin (Adult)	\$385,581,832	\$361,378,819	6.7%
Multivitamin (Children)	\$306,187,219	\$223,126,344	37.2%
Protein - Animal (Whey)	\$269,272,470	\$258,805,431	4.0%
Vitamin B12	\$266,468,865	\$244,569,068	9.0%
Elderberry	\$265,796,969	\$98,863,927	168.9%
Calcium	\$261,634,333	\$256,926,407	1.8%
Multivitamin (Senior)	\$249,598,829	\$229,906,684	8.6%
Psyllium	\$245,935,150	\$200,034,438	22.9%
Fish Oil Concentrate	\$242,494,193	\$285,786,410	-15.1%
Biotin	\$230,956,685	\$211,165,970	9.4%
Multivitamin (Men)	\$229,068,939	\$171,362,052	33.7%
Taurine	\$228,155,491	\$247,186,449	-7.7%
Misc Supplements (Other)	\$219,843,766	\$136,032,015	61.6%
Vitamin C (Ester-C only)	\$216,363,377	\$145,270,333	48.9%
CoQ10	\$209,830,681	\$213,095,864	-1.5%
Caffeine	\$203,258,184	\$186,144,405	9.2%

Data: Dietary supplements (Vitamins & Supplements and Herbs & Homeopathics) Source: SPINS Conventional Channel (powered by IRI)

Time period: 52 weeks ending November 29, 2020

Channel: U.S. conventional multi-outlet comprising grocery, drug, Walmart, mass, dollar, military, and club stores

government was softer with the environmental restrictions, and also other countries have stepped in with production, including India and Indonesia, primarily. European countries have also been producing more vitamin C—specifically the UK. So, these factors have helped to alleviate some of the supply-shortage issues."

Adulteration and false claims are an ongoing concern with such a high-demand ingredient. "There are many adulterated products we have seen during this pandemic, specifically with vitamin C," Ali says.

For instance, in the U.S. last year, ingredient supplier Sabinsa (East Windsor, NJ) began alerting the industry about companies making claims that amla fruit (*Emblica officinalis*) is high in vitamin C when it isn't. Amla ingredients touted as high in vitamin C are likely spiked with vitamin C from other sources, the firm says. Not only that, in December, the company alerted both FDA and the FTC about problems with amla, providing test results showing that vitamin C ingredients are being falsely marketed and sold as coming from amla when actually they come from other plants. Isotope ratio mass

Natural Enhanced Channel (U.S.) 25 Bestselling Ingredients (Across All Health Conditions)			
Ingredient	Current Dollars	Year-Ago Dollars	% Change
Probiotic Supplement	\$126,939,399	\$134,909,671	-5.9%
Protein - Plant (Multi)	\$65,532,276	\$69,350,036	-5.5%
Collagen Products	\$62,382,343	\$62,322,998	0.1%
Fish Oil Concentrate	\$58,068,028	\$61,779,415	-6.0%
Cannabidiol (CBD)	\$57,802,802	\$89,321,383	-35.3%
Elderberry	\$53,249,382	\$31,026,729	71.6%
Vitamin C (not Ester-C)	\$44,441,631	\$26,030,956	70.7%
Multivitamin (Women)	\$41,655,722	\$42,136,202	-1.1%
Turmeric	\$40,939,637	\$47,955,988	-14.6%
Magnesium	\$39,938,823	\$39,836,144	0.3%
Vitamin D	\$39,545,397	\$28,972,878	36.5%
Specialty Remedies (Homeopathic)	\$36,281,721	\$39,887,225	-9.0%
Calcium/Magnesium Combo	\$25,392,808	\$26,187,564	-3.0%
Multivitamin (Men)	\$22,004,474	\$19,979,619	10.1%
Vitamin B Complex	\$20,522,015	\$20,434,467	0.4%
Digestive Enzymes (Other)	\$18,039,402	\$19,611,620	-8.0%
Multivitamin (Children)	\$17,432,931	\$16,994,554	2.6%
Protein - Animal (Whey)	\$17,413,245	\$20,409,286	-14.7%
Grass (Wheat or Barley)	\$17,117,822	\$18,022,263	-5.0%
Zinc	\$17,006,822	\$6,334,626	168.5%
Vitamin C (Ester-C only)	\$16,623,757	\$11,752,191	41.5%
Vitamin B12	\$16,251,078	\$16,286,806	-0.2%
Multivitamin (Adult)	\$16,050,621	\$16,003,051	0.3%
Mushrooms (Other)	\$14,747,375	\$10,096,041	46.1%
Melatonin	\$13,940,686	\$13,129,625	6.2%

Data: Dietary supplements (Vitamins & Supplements and Herbs & Homeopathics) Source: SPINS Natural Enhanced Channel

Time period: 52 weeks ending November 29, 2020

Channel: U.S. natural supermarkets, excluding Whole Foods Market and Trader Joe's

spectrometry (IRMS) is one tool being used to identify extraneously added vitamin C in products and to detect spiking with inexpensive, biosynthetic vitamin C from sources like corn, Sabinsa says.

"When looking at sources for vitamin C, it's important to make sure claims are accurate and supported by current science," says Shaheen Majeed, president worldwide, Sabinsa. "For example, decades ago, amla, also called Indian gooseberry, was thought to be a rich source of vitamin C. Subsequent research has proven that to be inaccurate, yet even today there is product on the market claiming to be high in vitamin C from amla, a scientific impossibility without spiking it with vitamin C from another source."

New product launches will continue to roll out featuring vitamin C. "The global pandemic has spurred further activity in the category," Ali says. He's observed more launches featuring acerola fruit as a good vitamin C source. There is also more demand for liposomal vitamin C formulas. And, he says, don't forget about cosmetics, which continue to tout the skin-health benefits of vitamin C.

Xue adds, "Over the years, different types of vitamin C have been produced, including time-release, varying pH values, oil-soluble, chelate, bonded with minerals, etc."

Will vitamin C still be an ingredient to watch in 2021? Pharmavite's Cohen believes so. Although vitamin C demand will continuing leveling out as it started to last year, chances are it will remain higher than it was before the pandemic, as shoppers have made vitamin C part of their new daily regimen.

"I think one long-term change in consumer behavior that we can expect to see is an increase in taking vitamin C more routinely," Cohen says. "In the past, consumer focus on immunity really centered on the fall and winter months, the traditional time when flu and cold cases are on the rise. The pandemic laid bare the fact that our immune systems are always working to keep us healthy, and we've been retraining ourselves to support our immune system more consistently, not just when a certain time of year rolls around."

He concludes, "[H]abits are hard to break, and consumers have been taking their vitamins—particularly vitamin C—on a daily basis for months now. Once a [COVID-19] vaccine becomes widely available and fears over this health crisis start to diminish, people will more than likely start to loosen the reins on maintaining those daily health regimens—but I don't envision vitamin C consumption going back to pre-pandemic levels."

References

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Melatonin

With the world in utter crisis, it's amazing we got any sleep at all in 2020. "During 2020, people were dealing with a lot—a global pandemic, balancing busy work and family activities, and adjusting to at-home schedules, to name a few," says Harel Shapira, head of marketing for supplements brand Natrol. "With all these factors happening around

us, our consumers can be worried about getting a good night's sleep, which makes falling asleep harder."

Lots of things kept us up. Tobe Cohen, chief growth officer for Pharmavite, adds, "Lockdowns over COVID also created a scenario in which activities outside the home were limited, and electronic devices played a greater role than before. The combination of a stressed-out populace that is adopting bad sleep hygiene habits such as increased screen time amounts to people having a harder time getting to sleep and/or struggling to maintain restful sleep."

Many consumers sought sleep aids to help. In fact, proactive shoppers who had already started stocking up on health aids in the pandemic's early days had also begun stepping up their purchase of sleep aids. This was reported by Kristin Hornberger, executive, healthcare, for IRI Worldwide (Chicago), back in April 2020 during a webcast hosted by the Council for Responsible Nutrition (CRN; Washington, DC) and Informa.

The primary sleep supplement consumers bought was melatonin. And while melatonin sales had been steadily climbing for years before the COVID-19 pandemic¹, consumers doubled-down on melatonin in 2020. According to data provided by SPINS (Chicago) on the U.S. mainstream dietary supplement channel during the 52 weeks ending November 29, 2020, melatonin ingredient sales grew a whopping 43.6% to \$573 million, ranking number five on the list of 25 bestselling mainstream supplement ingredients overall. In the mainstream sleep category, melatonin grew just as impressively, rising 46.9% to \$536 million and significantly outperforming category competitors like valerian, ivy leaf, ashwagandha, 5-HTP, L-theanine, and chamomile, none of whose sales broke the \$20 million mark compared to the hundreds of millions of dollars melatonin commands.

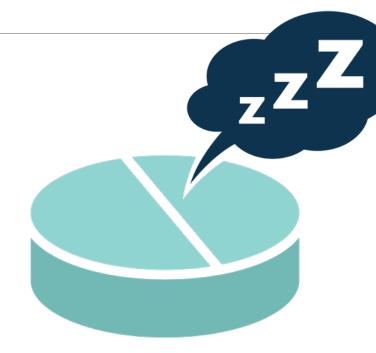
Data from CRN's annual Consumer Survey on Dietary Supplements, which was conducted by Ipsos online on August 27-31, 2020, on more than 2000 U.S. adults (both supplement users and non-users), reveal that 14% of dietary supplement users took supplements for sleep health—and that fully 66% of those used melatonin. Compare that 66% to the 28% using magnesium, 19% using lavender, 19% using valerian, 17% using cannabidiol (CBD), and 10% using *Ginkgo biloba* for sleep purposes.

The main reason for melatonin's leading position in the sleep market hasn't changed: consumers are familiar with melatonin, and they trust its efficacy and safety (as they should).

"A big part of melatonin's continued popularity is awareness and name recognition; people see the word *melatonin* and immediately associate it with sleep," says Christopher Shade, PhD, founder and CEO of supplements brand Quicksilver Scientific. He adds: "Consumers also appreciate that the body naturally produces melatonin in the first place. When they take a melatonin supplement, they can feel confident that they're not putting something synthetic or unnatural into their body."

Last year saw a lot of first-time melatonin users come onboard, says Natrol's Shapira. "This past year, we saw a wave of new melatonin adopters join our longstanding loyal melatonin users," he says.

Supplementing with melatonin is a good idea considering that the body's natural melatonin levels can get suppressed—and melatonin's release delayed—due to common factors like age, artificial lighting, and blue light from digital screens (especially screens looked at near bedtime), Shade points out. "Overall, melatonin really helps consumers



struggling with a variety of sleep barriers to organically realign their circadian rhythms and return to a beneficial sleep cycle," he says.

As Pharmavite's Cohen says, "Quite simply, it works."

There's something else, too. As more consumers pay attention to their health during the COVID-19 pandemic, they are recognizing the link between good sleep and immunity. As Shapira points out, "there's a relationship between sleep quality and a strong immune system, another compelling factor that had many consumers seeking melatonin solutions to help regulate their sleep."

He continues, "We know that sleep enhances immune defense. Studies have shown how people who don't get enough sleep have a higher risk of illness, and not getting enough sleep can also impact the time it takes for the body to recover." Experts, he says, recommend seven to eight hours each night to protect the immune system.

Melatonin the ingredient is going nowhere but up, but how is the product market developing? Formulas are becoming more complex as product makers—and, increasingly, consumers—look beyond the single ingredient alone.

Cohen says, "Melatonin as a single-ingredient supplement currently drives the category, but that speaks to its efficacy and familiarity with consumers who are looking for a specific solution." He calls single-ingredient melatonin an "entry point" for newer supplement users especially. "Melatonin is an entry point into VMS [vitamins, minerals, and supplements], similar to vitamin C in that consumers are seeking out a product to do a very specific job."

As consumers become more educated about sleep health, however, they will begin to expand their horizons, and this will alter the landscape of the melatonin market.

"What's changing with melatonin and the sleep category as a whole is that consumers are starting to better understand that sleep challenges do not stem from one root cause," says Cohen. "That knowledge prompts consumers to do a bit of self-reflection on what may be causing their sleep issues, and they begin to look for solutions that are more nuanced and address their sleep challenges." His prediction? "Melatonin will always be a driver in the sleep category due to its efficacy and the familiarity consumers have with it, but its dominance over the category as a single-ingredient product will lessen as the number of solutions powered by emerging sleep-support ingredients increases."

One need only look at the array of products the companies interviewed here launched last year to see how melatonin supplements are evolving both in terms of complementary ingredients and delivery.

Conventional Multi-Outlet Channel (U.S.) 10 Bestselling Ingredients (By Health Condition)				
Overall Health- Condition Category	Current Dollars	Year-Ago Dollars	% Change	
Cold & Flu	\$1,703,756,797	\$1,206,246,534	41.2%	
Digestive Health	\$878,622,171	\$886,234,417	-0.9%	
Energy Support	\$845,344,117	\$847,979,950	-0.3%	
Heart Health	\$635,960,941	\$619,500,213	2.7%	
Sleep	\$603,693,491	\$419,718,456	43.8%	
Weight Management	\$578,621,173	\$649,250,109	-10.9%	
Bone Health	\$545,478,667	\$464,249,758	17.5%	
Brain Health	\$318,826,040	\$189,078,676	68.6%	
Eye Health	\$316,255,658	\$317,786,375	-0.5%	
Hair, Skin, and Nails	\$286,274,091	\$239,212,554	19.7%	
	Bone Hea	lth		
Ingredient	Current Dollars	Year-Ago Dollars	% Change	
Vitamin D	\$291,760,462	\$220,672,167	32.2%	
Calcium	\$149,747,327	\$152,031,684	-1.5%	
Multivitamin (Women)	\$40,567,353	\$31,351,605	29.4%	
Calcium/Magnesium Combo	\$39,542,494	\$37,411,003	5.7%	
Magnesium	\$18,029,911	\$18,019,978	0.1%	
Multivitamin (Children)	\$1,465,080	\$1,172,500	25.0%	
Vitamin K	\$1,445,501	\$1,265,970	14.2%	
Vitamin A - D - K	\$1,014,859	\$844,675	20.1%	
Cranberry Supplements	\$922,884	\$694,812	32.8%	
Fish Oil Concentrate	\$316,459	\$264,100	19.8%	
	Brain Hea	lth		
Ingredient	Current Dollars	Year-Ago Dollars	% Change	
Misc Supplements (Other)	\$216,225,887	\$132,124,086	63.7%	
Phosphatidylserine	\$54,089,225	\$15,665,297	245.3%	
DMAE	\$10,132,129	\$6,139,085	65.0%	
Ginkgo biloba	\$10,023,940	\$10,431,339	-3.9%	
Caprylic Acid	\$4,851,833	\$2,888,197	68.0%	
Ginseng - All (X Siberian Ginseng)	\$3,102,976	\$2,522,734	23.0%	
L-theanine	\$2,849,241	\$2,863,017	-0.5%	
Васора	\$2,422,117	\$455,901	431.3%	
Protein - Plant (General)	\$1,856,967	\$995,871	86.5%	
Multivitamin (Women)	\$1,807,474	\$861,711	109.8%	

Data: Dietary supplements (Vitamins & Supplements and Herbs & Homeopathics) Source: SPINS Conventional Channel (powered by IRI)

Time period: 52 weeks ending November 29, 2020

Channel: U.S. conventional multi-outlet comprising grocery, drug, Walmart, mass, dollar, military, and club stores. Excludes private-label brands.

Cohen says Pharmavite began broadening its sleep line back in 2019. "We started focusing our efforts on expanding our sleep portfolio by offering solutions that satisfy a more complete range of sleep issues," he says.

For instance, in 2020, Pharmavite's Nature Made brand introduced Sleep & Recover Gummies that blend melatonin with L-theanine and magnesium "to relax the mind and body so that you can fall asleep faster." It also introduced Extra Strength Melatonin (10 mg) in tablet, gummy, and fast-dissolve forms. Finally, it began offering Extended-Release Melatonin, which comes in a specially formulated dual-action tablet to help melatonin release both immediately in the body and gradually throughout the night, raising melatonin levels as quickly as 15 minutes after intake and sustaining it for as long as six hours.

Nature Made plans to roll out additional sleep products in 2021, including: 1) Sleep Longer Triple Action time-release tablets, 2) Sleep & Soothe Aches, which marries melatonin and turmeric to ease minor body aches and discomfort, 3) Back to Sleep fast-dissolve tablets, which include melatonin and a proprietary blend of two amino acids to help consumers "relax and fall back to sleep naturally," 4) Sleep & Beauty Gummies, which contain melatonin and ingredients to support hair, skin, and nail health, and 5) Kids First Sleep Gummies with melatonin.

Natrol, meanwhile, launched a melatonin product last summer called Natrol 3 a.m. containing melatonin and L-theanine. "It's the only melatonin supplement made for those middle-of-the-night wakeups," Shapira says, and is designed to "help calm the mind and ease you to sleep with a calming vanilla and lavender flavor." To make the product easier to take in the middle of the night, the company designed it as a fast-dissolve tablet that requires no water to wash down.

Natrol plans to introduce more melatonin products in 2021. Shapira notes melatonin gummies are also becoming increasingly popular for both adults and kids, whose share of the melatonin market continues to grow. For instance, last year Natrol launched Relaxia Night Calm, "a stress- and tension-relieving gummy formulated with a blend of herbals and melatonin to help calm a racing mind and ease you to sleep," Shapira says. Its ingredients include 5-HTP, L-theanine, and lemon balm. "We've also been including B6 in select formulations, as it's known to boost endogenous melatonin production," he says.

Quicksilver Scientific has focused on a liquid liposomal format to deliver its melatonin products. Shade says this technology "makes our melatonin product effective in lower doses and also enables faster and better results than the traditional tablet format," namely because it "bypasses" the digestive system and allows the ingredient to go "straight into the bloodstream" for better uptake. The result is that consumers can start to feel effects from the melatonin in as little as five to 10 minutes, meaning they can take it right before bed, and its benefits are also prolonged in the body thereafter, he says.

The company saw sales of its liposomal melatonin more than double from 2019 to 2020. "We sold 2,305 units in 2019 and 4,828 units in 2020. That is a 109% increase," Shade says, adding, "There was a large uptick in March when we saw a peak in the pandemic, which impacted sales." Moving forward, the company is looking into melatonin gummies, "which would still utilize our liposomal delivery system."

Shortly before the pandemic, Quicksilver Scientific launched its CBD Synergies-SP sleep formula, which includes melatonin, full-spectrum hemp extract, naturally fermented gamma-aminobutyric acid (GABA), and botanicals like skullcap and passion-flower, all again in the liposomal form. This type of product will appeal to the "biohacker [who] recognizes that when melatonin is combined with other ingredients—like CBD or GABA—a full-body effect can be obtained that both calms and helps them ease into sleep," Shade says.

And this is how we'll see the melatonin and sleep market advance to the next level, says Pharmavite's Cohen. "Where the sleep category is modernizing is in continuing to develop formulations that support specific sleep issues. There used to be a simple equation in consumers' minds that melatonin solves insomnia. But, as consumers become more knowledgeable of the important role sleep plays in their overall health and the many issues that can impact quality sleep, they are seeking out solutions more tailored for their specific needs. Expanding our knowledge of sleep issues, finding those combinations of ingredients that can address specific sleep issues, and ensuring they can be found in multiple delivery formats are key to modernizing this category."

Reference

 Grebow J. "Melatonin, King of Sleep Supplements, Eyes New Opportunities, Including Children: 2020 Ingredient Trends to Watch for Foods, Drinks, and Dietary Supplements." Nutritional Outlook. Published online February 6, 2020.

Vitamin D

Over the past decade, consumers and healthcare practitioners have grown more informed about the importance of identifying and preventing vitamin D deficiency. More doctors are testing patients' vitamin D levels, and at-home tests even let consumers do it themselves.

Media coverage of vitamin D research has done a lot to raise the nutrient's profile. "Vitamin D has been the subject of many research studies over the past several years demonstrating a wide range of benefits and is likely the most researched dietary supplement

ingredient," says Luke Huber, ND, MBA, vice president of scientific and regulatory affairs at the Council for Responsible Nutrition (CRN; Washington, DC). "Healthcare practitioners have taken notice, and testing of vitamin D blood levels has become common practice."

Vitamin D is first and foremost known for its role in bone health, aiding calcium absorption

and bone mineralization in everyone, from developing children to menopausal women suffering bone resorption. Aside from bone health, vitamin D's roles in reducing inflammation and supporting cell growth, neuromuscular and immune function, and glucose metabolism continue to be studied. Arielle Levitan, MD, cofounder of personalized-vitamin brand



Vous Vitamin, says vitamin D is being studied in other areas as well, including cancer prevention, heart health, and migraine treatment.

Unfortunately, Americans don't get the amount of vitamin D they need either through sunlight exposure or the diet. The body produces vitamin D endogenously in the skin once sunlight triggers vitamin D synthesis, but most people do not get adequate sun exposure to start with. Doctor and bestselling author Jacob Teitelbaum, MD, points out, "Part of [the problem of suboptimal vitamin D levels] is because of the misguided advice to avoid sunshine, which is what triggers vitamin D production. The proper advice is to 'avoid sunburn not sunshine.'" During the COVID-19 pandemic, people may also be staying indoors more often, exacerbating the problem.

Americans also do not get enough vitamin D from the diet. "We cannot get vitamin D in sufficient amounts from our diet since it is found in very limited amounts in food sources—small amounts in milk, eggs, mushrooms, and more in liver," says Levitan.

The 2020-2025 Dietary Guidelines for Americans state that more than 90% of U.S. men and women over the age of 19 do not get enough vitamin D. "The guidelines recognized that vitamin D is a nutrient of public health concern that is difficult to get solely from food, stating, 'Vitamin D recommendations are harder to achieve through natural sources from diet alone and would require consuming foods and beverages fortified with vitamin D," says Huber.

Vitamin D supplementation has therefore become essential. The guidelines recommend that people use vitamin D supplements to fill gaps, especially if they also aren't getting exposed to adequate sunlight. What's more, Huber says, for the first time the guidelines took the step of evaluating the vitamin D needs of infants and recommended that breastfed or partially breastfed infants receive 400 IU of supplemental vitamin D daily.

Thankfully, the message is getting through. Vitamin D supplement sales have grown steadily over the years—and last year, against the backdrop of the COVID-19 pandemic, sales simply skyrocketed.

Data from SPINS (Chicago) on the U.S. dietary supplement market during the year ending November 29, 2020, show that vitamin D sales in both the mainstream and natural retail channels grew by pretty similar double-digits across the board. In the overall mainstream channel, vitamin D sales grew 34.4% to \$544 million. Meanwhile, in the natural channel overall, vitamin D sales grew 36.5% to \$40 million. Furthermore, in the mainstream bone health market, vitamin D grew 32.2% to \$292 million; in the natural bone health category, vitamin D grew 43.3% to \$19 million.

Two surveys CRN sponsored in 2020 confirm that more consumers relied on vitamin D last year to shore up their health. The first, a COVID-19–focused survey conducted by Ipsos on July 31, 2020, to August 4, 2020, polled more than 2000 existing U.S. supplement users to determine how their supplement use changed during the pandemic. Fully 37% of supplement users said they had increased their use of vitamin D. Another survey, CRN's annual Consumer Survey on Dietary Supplements, polled more than 2000 U.S. adults on August 27-31, 2020, and found 42% of respondents used vitamin D.

Vitamin D is set for continued growth. Huber points out that vitamin D usage has steadily increased in CRN's survey over the past five

years. "It is likely that vitamin D usage will continue to grow in 2021 and in future years, as this ingredient has increased by 10 percentage points since 2015 (32% in 2015 vs. 42% in 2020)," he says.

Part of what drove the heightened interest in vitamin D in 2020 was research showing that vitamin D status may have an impact on COVID-19 outcomes. "Research is showing that people who are deficient in vitamin D are at increased risk of getting COVID and dying

Conventional Multi-Outlet Channel (U.S.) 10 Bestselling Ingredients (By Health Condition)

Cold & Flu			
Ingredient	Current Dollars	Year-Ago Dollars	% Change
Vitamin C (not Ester-C)	\$408,385,163	\$250,223,975	63.2%
Specialty Remedies (Homeopathic)	\$261,959,567	\$246,598,839	6.2%
Elderberry	\$223,211,352	\$77,263,510	188.9%
Vitamin C (Ester-C only)	\$213,390,716	\$141,746,077	50.5%
Echinacea	\$179,689,318	\$104,425,966	72.1%
Horehound	\$144,481,814	\$152,967,103	-5.5%
Chinese Herbs	\$104,111,190	\$82,070,562	26.9%
Zinc	\$32,333,313	\$14,591,274	121.6%
Ivy Leaf	\$27,137,835	\$34,590,297	-21.5%
Bee Products (not Propolis)	\$16,489,762	\$23,762,103	-30.6%
	Digestive H	ealth	
Ingredient	Current Dollars	Year-Ago Dollars	% Change
Probiotic Supplement	\$552,086,461	\$566,796,526	-2.6%
Fiber (Other)	\$120,259,090	\$124,355,298	-3.3%
Psyllium	\$50,807,745	\$39,109,706	29.9%
Lactase	\$40,792,165	\$40,471,837	0.8%
Ginger	\$32,128,718	\$30,653,800	4.8%
Digestive Enzymes (Other)	\$18,724,170	\$20,410,510	-8.3%
Fennel	\$9,769,752	\$8,652,494	12.9%
Magnesium	\$7,428,623	\$7,389,654	0.5%
Vegetable Supplement Oils (Other)	\$6,584,058	\$5,679,846	15.9%
Charcoal	\$5,378,719	\$6,749,604	-20.3%
	Energy Sup	port	
Ingredient	Current Dollars	Year-Ago Dollars	% Change
Taurine	\$224,811,960	\$243,893,215	-7.8%
Vitamin B12	\$164,940,539	\$147,183,511	12.1%
Caffeine	\$127,688,940	\$118,604,587	7.7%
Vitamin B Complex	\$52,618,622	\$49,846,607	5.6%
Protein - Animal (Multi)	\$52,089,448	\$51,139,208	1.9%
Tyrosine	\$29,860,732	\$35,990,006	-17.0%
Protein - Animal & Plant Combo	\$27,585,758	\$32,072,408	-14.0%
Creatine	\$24,649,297	\$26,622,419	-7.4%
Multivitamin (Women)	\$13,678,535	\$16,253,122	-15.8%
Phenylalanine	\$12,623,989	\$14,350,999	-12.0%

from COVID," explains Penny Kris-Etherton, PhD, science advisory board member for dietary supplements company HumanN.

For instance, Kris-Etherton points to a well-publicized retrospective study² published in September 2020 that found that people deficient in vitamin D might have a higher risk of contracting COVID-19. Researchers looked at data on 489 patients who had had their vitamin D levels tested one year before being tested for COVID-19. The study found that patients who had tested as deficient in vitamin D had a 21.6% chance of getting COVID versus 12.2% for patients who had sufficient vitamin D status. This means suboptimal patients had a 1.77-times higher risk of testing positive for COVID-19. Said the researchers, "randomized trials may be needed to determine whether vitamin D affects COVID-19 risk."

Both Kris-Etherton and Teitelbaum point to another retrospective study³ published in November 2020 that looked at data on 186 patients hospitalized with severe acute respiratory syndrome related to COVID-19. It found that most patients were vitamin D deficient and that deficiency was associated with a 3.7-fold increased risk of death, Teitelbaum says.

Eye Health			
Ingredient	Current Dollars	Year-Ago Dollars	% Change
Eye Health Formulas	\$108,242,495	\$107,700,903	0.5%
Lutein	\$98,914,839	\$96,323,263	2.7%
Multivitamin (Adult)	\$72,091,605	\$75,130,902	-4.0%
Specialty Remedies (Homeopathic)	\$30,665,318	\$32,281,122	-5.0%
Combination Oils (Supplements)	\$3,716,805	\$4,047,509	-8.2%
Vitamin A	\$1,261,870	\$854,170	47.7%
Hyaluronic Acid (HA)	\$588,959	\$588,772	0.0%
Bilberry	\$373,887	\$452,291	-17.3%
Multivitamin (Children)	\$150,272	\$0	-
Fish Oil Concentrate	\$73,343	\$77,749	-5.7%

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Hair, Skin, and Nails				
Ingredient	Current Dollars	Year-Ago Dollars	% Change	
Biotin	\$145,996,210	\$127,567,854	14.4%	
Collagen Products	\$65,822,169	\$45,983,972	43.1%	
Alpha-Lipoic Acid	\$14,316,539	\$14,873,663	-3.7%	
Specialty Remedies (Homeopathic)	\$11,247,870	\$11,210,214	0.3%	
Borage Oil	\$7,492,299	\$5,525,663	35.6%	
Multivitamin (Adult)	\$6,715,571	\$5,439,121	23.5%	
Shark Cartilage	\$5,625,094	\$3,752,740	49.9%	
Zinc	\$3,675,592	\$3,203,605	14.7%	
MSM	\$2,717,411	\$2,279,439	19.2%	
Vitamin A	\$2,475,112	\$2,046,198	21.0%	

Data: Dietary supplements (Vitamins & Supplements and Herbs & Homeopathics) Source: SPINS Conventional Channel (powered by IRI) Time period: 52 weeks ending November 29, 2020

Channel: U.S. conventional multi-outlet comprising grocery, drug, Walmart, mass, dollar, military, and club stores. Excludes private-label brands.



Teitelbaum highlights another observational study⁴ published in November 2020 that found that the fatality rate for patients deficient in vitamin D was higher (at 21%) compared to those with adequate vitamin D status (at 3%). The study looked at data on 154 patients, including those severely ill with COVID-19 who required ICU admission. The study also looked at data from asymptomatic carriers. Researchers found that while 97% of severely ill ICU COVID-19 patients were vitamin D deficient, only 33% of asymptomatic patients were vitamin D deficient—meaning vitamin D deficiency may be more heavily associated with severe COVID-19 cases. These findings led the researchers to state, "This all translates into increased mortality in vitamin D-deficient patients. As per the flexible approach in the current COVID-19 pandemic, authors recommend mass administration of vitamin D supplements to population at risk for COVID-19."

Of the studies being done on vitamin D and COVID-19, Teitelbaum says, "The science is very credible."

Furthermore, he points out: "They are convincing enough that Richard H. Carmona, MD, MPH, the 17th surgeon general of the U.S. and distinguished professor of public health, has noted, 'It is our responsibility as physicians not to wait for perfect evidence when making life-and-death decisions. Given the safety profile of vitamin D, the 40% prevalence of vitamin D deficiency in the U.S.⁵, and the fact that this season will likely be the deadliest phase of the pandemic to date, we need to act now. Identifying and eradicating vitamin D deficiency with early and aggressive supplementation in COVID-19 has the potential to save thousands of lives and should be one of our highest public health priorities." This statement was published in an op-ed⁶ written by Carmona and co-authors on January 5, 2021.

Nicole M. Avena, PhD, assistant professor of neuroscience at Mount Sinai School of Medicine and visiting professor of health psychology at Princeton University, agrees the studies done on vitamin D and COVID-19 seem credible. But, she rightly points out, "These studies are new since COVID-19 is so new and will need several more years of trials and evidence to become truly robust—but so far, the results of the studies conducted already have been consistent."

10 Bestselling Ingredients (By Health Condition)				
Heart Health				
Ingredient	Current Dollars	Year-Ago Dollars	% Change	
Psyllium	\$180,060,541	\$146,538,772	22.9%	
Fish Oil Concentrate	\$141,170,301	\$157,144,334	-10.2%	
CoQ10	\$137,980,285	\$136,807,845	0.9%	
Krill Oil	\$30,299,028	\$38,097,649	-20.5%	
Vitamin E (not Ester-E)	\$26,366,075	\$23,906,494	10.3%	
Garlic	\$18,057,638	\$15,562,587	16.0%	
CoQ10 (Ubiquinol)	\$14,616,144	\$13,498,777	8.3%	
DHA Products	\$10,901,634	\$7,820,261	39.4%	
Red Yeast Rice	\$9,228,372	\$8,871,365	4.0%	
Flax Seed and/or Oil	\$8,389,948	\$8,348,835	0.5%	
	Sleep			
Ingredient	Current Dollars	Year-Ago Dollars	% Change	
Melatonin	\$535,681,394	\$364,704,434	46.9%	
Specialty Remedies (Homeopathic)	\$16,629,104	\$15,550,133	6.9%	
Valerian	\$11,512,469	\$13,148,567	-12.4%	
Ivy Leaf	\$5,609,893	\$8,264,545	-32.1%	
Ashwagandha	\$4,526,236	\$110,522	3995.3%	
5-HTP	\$2,436,312	\$2,364,632	3.0%	
L-theanine	\$2,414,954	\$32,210	7397.5%	
Chamomile	\$2,191,354	\$1,345,711	62.8%	

Conventional Multi-Outlet Channel (U.S.)

DHEA	\$1,359,310	\$847,643	60.4%		
	Weight Management				
Ingredient	Current Dollars	Year-Ago Dollars	% Change		
Protein - Animal (Multi)	\$120,581,966	\$136,400,798	-11.6%		
Protein - Animal (General)	\$116,918,083	\$121,487,597	-3.8%		
Protein - Animal & Plant Combo	\$63,055,057	\$76,567,367	-17.6%		
Caffeine	\$56,523,328	\$58,333,799	-3.1%		
Protein - Animal (Casein)	\$28,853,003	\$32,564,537	-11.4%		
Green Teas & Supplements	\$18,113,029	\$19,992,461	-9.4%		
Glucomannan	\$17,083,110	\$20,462,863	-16.5%		
Protein - Animal (Whey & Casein)	\$16,898,957	\$22,064,580	-23.4%		
MCT (Medium-Chain Triglycerides)	\$15,607,384	\$12,246,611	27.4%		
Cider Vinegar Supplements	\$15,183,514	\$17,273,385	-12.1%		

\$1,649,639

\$406,424

305.9%

Data: Dietary supplements (Vitamins & Supplements and Herbs & Homeopathics)
Source: SPINS Conventional Channel (powered by IRI)
Time period: 52 weeks ending November 29, 2020

Channel: U.S. conventional multi-outlet comprising grocery, drug, Walmart, mass, dollar, military, and club stores. Excludes private-label brands.

The fact that the pandemic has gotten even more healthcare practitioners now paying attention to vitamin D is good news for the supplements industry, Avena acknowledges. "Considering the compelling evidence that has surfaced so far associating vitamin D deficiency with more severe COVID-19 cases, it is likely that practitioners will continue to recommend vitamin D to support immunity against COVID-19 and in general," she says.

Kris-Etherton agrees. "I think that more practitioners will be assessing the vitamin D status of their patients now and intervene when necessary."

And Levitan says, "I believe the pandemic has been enlightening to many health professionals regarding the essential role vitamin D can play in overall health. I suspect it will continue to be an important focus in preventive medicine going forward."

Even setting aside COVID-19 concerns, vitamin D is such an important nutrient that supplementation should always be a priority. "Vitamin D is crucial for many functions in the body and should be consumed for good health for the entirety of one's life," Avena says. Vitamin D deficiency continues to be a problem for a wide portion of the population, including Hispanics, blacks, seniors, and obese individuals. (Levitan points out: "Interestingly, the highest-risk groups for COVID infection have significant overlap with people known to be vitamin D deficient—obese, dark-skinned, diabetic.")

But all this attention on vitamin D could be a double-edged sword, says Teitelbaum. It's important to set the right expectations for patients about what vitamin D supplementation can do, especially in cases of illness; if not, there could be backlash. For instance, he says, "It is important to understand that low vitamin D blood levels may not reflect vitamin D deficiency. Vitamin D is what is called an 'acute phase reactant.' That means that the blood levels change during inflammatory and other conditions, which may be what is driving the vitamin D deficiency in these illnesses."

Basically, he says, this means that in people with certain conditions, even if vitamin D deficiency is detected in a blood test, supplementing with vitamin D may not necessarily result in an expected benefit. "We do need to be careful to note that association does not confirm causation," he says. "The low vitamin D being associated with an illness does not mean that supplementing will decrease the illness risk. Having this understanding as we move forward is important to temper expectations. Otherwise, negative results will be used to slam the natural supplement industry."

It's also important for consumers to understand that vitamin D supplementation needs depend on the individual. Levitan says that while most people need to supplement with vitamin D, "they do not all need the same amounts. Needs vary based on the individual. Who you are, where you live, your diet, lifestyle, and health concerns all factor into your individual vitamin needs. Thus, taking a personalized multivitamin is a great way to get exactly what you need."

The research on COVID-19 and vitamin D will continue to fuel interest in this ingredient in the near term and will further the motivation to supplement with this critical nutrient. And while no supplement can treat or prevent a disease, "I think that the ongoing research on vitamin D and COVID will continue to promote interest in understanding the health benefits—and benefits on immune

Vitamin C

(not Ester-C)

health—of vitamin D," says Kris-Etherton. She adds: "We know that a good vitamin D status is beneficial for developing a healthy immune system."

And, as vitamin D has shown over the past decade, the ingredient's staying power is strong—COVID or no COVID. Says Huber: "CRN anticipates sustained interest in vitamin D in 2021 and beyond due to continuing research demonstrating the important role the ingredient plays in supporting various health outcomes. A current search of clinicaltrials.gov using the search terms *COVID-19* and *vitamin D* currently provides a list of 67 studies globally, illustrating the significant research interest in this nutrient. Vitamin D continues to be studied in many other areas as well, with over 3,200 studies appearing on a search of vitamin D in the clinical research database. As these studies publish, vitamin D will continue to garner more attention."

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Elderberry

One of the biggest ingredient superstars coming out of the COVID-19 pandemic is elderberry, as consumers shopped for immune-support products wherever and whenever they could. According to SPINS (Chicago) data on the 52 weeks ending November 29, 2020, elderberry experienced a whopping 168.9% sales increase to reach \$265.8 million in the U.S. mainstream supplements channel, and a 71.6% sales increase to reach \$53 million in the U.S. natural supplements channel. These gains are impressive, even considering that elderberry has been on an upward trajectory for years. For instance, back in 2019, elderberry saw sales gains of 116% and 32.6% in the mainstream and natural supplement channels, respectively, based on SPINS data covering the 52 weeks ending October 6, 2019.

While skyrocketing demand in 2020 was excellent news for elderberry suppliers and finished-product manufacturers, meeting that demand was challenging. The nature of the global pandemic made business operations exceptionally difficult, straining the supply for raw materials.

"Whenever you experience such a significant increase in demand of two to four times, chances are high there is going to be a strain to keep up with the immediate surge coupled with ongoing

requirements," explains Leslie Gallo, president of elderberry supplier Artemis International (Ft. Wayne, IN). "Production was just one challenge, combined with substantial freight issues—flights delayed or cancelled, vessels overbooked, split shipments. It was stressful for suppliers and customers as well as for co-packers with tight production schedules."

Despite these obstacles, suppliers and product manufacturers have adapted and are making it work to meet demand. For better or worse, as the pandemic drags on into 2021, it's likely that both the challenges and the opportunities for elderberry will persist.

"The ongoing fear of the pandemic and a slower-than-hoped-for rollout of the [COVID-19] vaccine is continuing to affect the way consumers are thinking about their immune systems—what best to do/take to support their bodies to tackle COVID," says Gallo. "Additionally, we are seeing a significant shift in inquiries from the functional food and beverage markets for our elderberry, blackcurrant, aronia, and cranberry [from] people seeking immune benefits in their everyday eating and drinking habits without needing to rely on daily supplements."

The main draw for elderberry products is that they offer immune support from a natural source that also tastes good, which makes proactive immune support easier. This was true before the pandemic and will likely remain true long-term, says Nishant Shukla, director of marketing for Nature's Way. "Even before the

