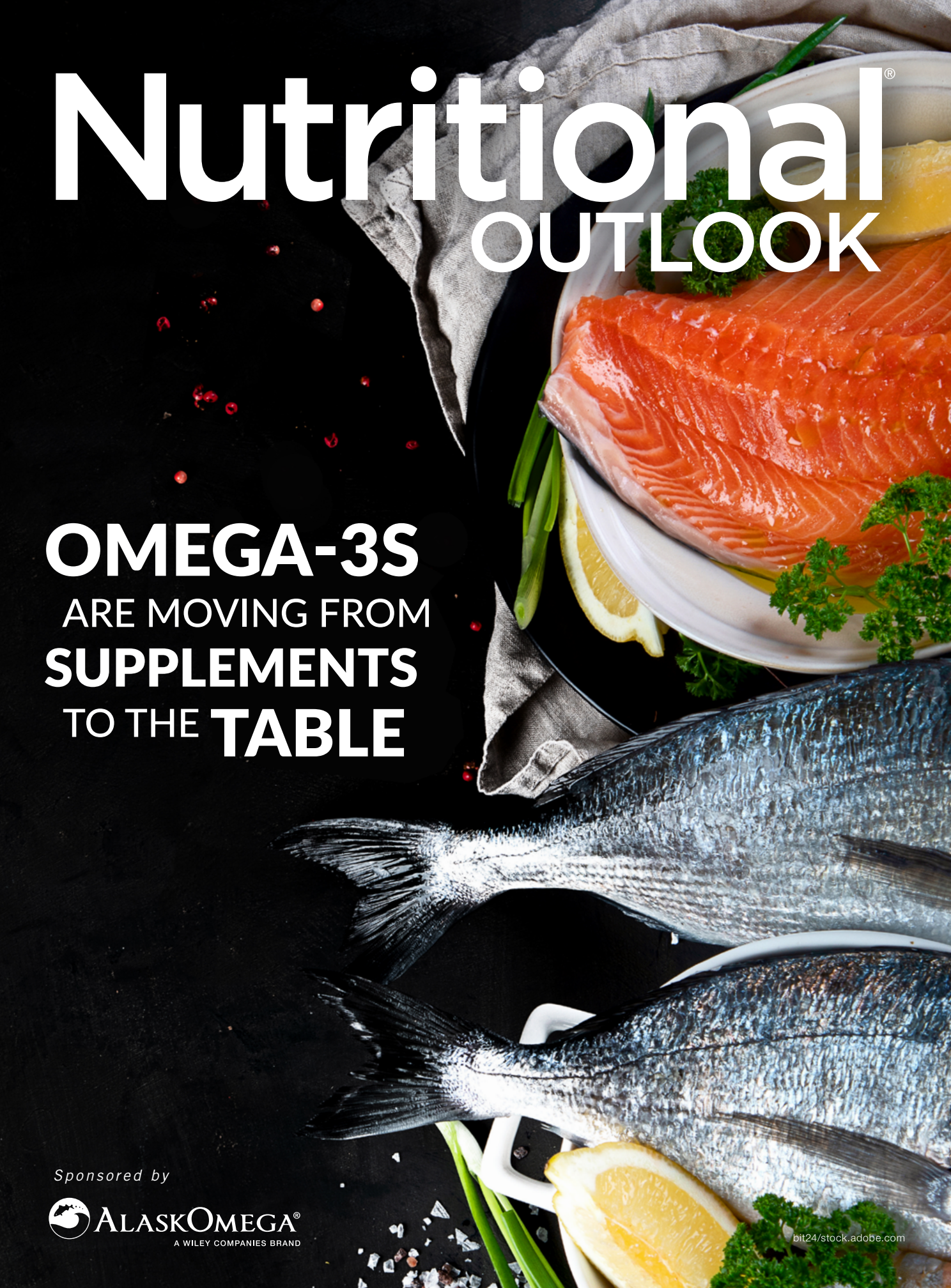
# Nutritional® OUTLOOK



## OMEGA-3S ARE MOVING FROM SUPPLEMENTS TO THE TABLE

*Sponsored by*

AlaskOmega®
A WILEY COMPANIES BRAND

bit24/stock.adobe.com


# The Omega-3s Market

By Alissa Marrapodi

*Mental wellness, sports nutrition, and other functional markets are ready for an omega-3 boost*

A staple in the natural products industry, omega-3 essential fatty acids are best served fresh on a plate or as a dietary supplement, but with new ingredient innovations, market demands, and challenging yet hopeful realizations about misinformation, omega-3s are positioned to further expand into food and beverage applications.

Globally, the omega-3s market size was US$2.49 billion in 2019 with an expected compound annual growth rate (CAGR) of 7.7% from 2020-2027, according to Grand View Research.[1]

More specifically, the global market for eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) omega-3 ingredients in 2018 was 111,210 metric tons in volume and US$1.3 billion in value, the Global Organization for EPA and DHA Omega-3s (GOED) reported.

“Our consumer market research has revealed a very diverse set of desired outcomes that motivate global consumers to get enough EPA and DHA, and overall awareness of omega-3s is high,” said Chris Gearheart, director – member communications & engagement – GOED.

However, as Gearheart points out, despite an overall awareness, consumers aren't familiar with EPA and DHA's key benefits for the heart, brain, eyes, and maternal/prenatal health. "Importantly, very few consumers know EPA and DHA is in every cell of the body, and there is no reliable way to replenish those nutrients other than through direct intake," he said. "With more than 40,000 published papers on EPA and DHA and more than 4,000 human clinical trials, they are among the most important nutrients for public health."

Steve Dillingham, VP of sales at AlaskOmega®, said he sees a continual movement toward higher purity and higher quality omega-3 products. "Consumers are more willing to upgrade to higher concentrations of omega-3 products with EPA-DHA ratios that target specific health applications," he said

But still, there is a lack of demand due to poor education surrounding the benefits of EPA and DHA, according to Gearheart. "Almost all industrialized economies have daily recommended intakes of EPA and DHA, and by most accounts, very few consumers in those countries meet them," he said.

Although the medical community is aware of their countless benefits, there is still a disconnect between the truth about EPA and DHA and what experts recommend. "We've found that not just consumer media outlets but even healthcare practitioners like doctors or dietitians can spread misinformation about omega-3s," Gearheart said. "For example, [they tell patients] that supplements are not worth the money, or that flax, chia, or walnuts (and their ALA omega-3s) are adequate replacements for sources of EPA and DHA. Part of GOED's focus is educating consumers and healthcare practitioners to squash these misconceptions."

***"Consumers are more willing to upgrade to higher concentrations of omega-3 products with EPA-DHA ratios that target specific health applications."***

The essential omega-3 ALA, alpha-lipoic acid, does need to be consumed through diet, but it's only a precursor to EPA and DHA, and it has a very low conversion rate in the body. So, EPA and DHA consumption are still essential and cannot be replaced by consuming foods rich in ALA.

What's ironic about the medical community's misconceptions is the pharmaceutical industry is a large driver of omega-3s. Grand View Research said the industry is being driven by an increase of omega-3 use in the active pharmaceutical ingredient (API) market.

"Pharmaceutical omega-3 revenues are growing extremely fast in the United States with the popularity of Vascepa®, an EPA-only drug for triglyceride-lowering from the pharmaceutical company Amarin," Gearheart said. "Vascepa is on track to gain approval in Canada and China and the European Union, so this will continue to drive growth."

## Research + Market Demand = Opportunity

Among consumers, the most popular products with omega-3s are those that offer heart, brain, and eye-health benefits, according to Innova Market Insights. Omega-3's popularity among heart-conscious consumers should come as no surprise, as its science is rooted in heart health. Interest in omega-3s was piqued more than 40 years ago when researchers discovered that Greenland Eskimos experienced low rates of coronary heart disease despite the fact that they ate high-fat diets.

Omega-3s have been shown to significantly reduce the risk for sudden death caused by cardiac arrhythmias and all-cause mortality in patients with coronary heart disease, to mildly reduce hypertension, reduce hyperlipidemia, and, in higher dosages, reduce elevated triglyceride levels.[2,3] In fact, in June 2019, FDA approved new qualified health claims for EPA and DHA consumption and the risk of hypertension and coronary heart disease.

***Interest in omega-3s was piqued more than 40 years ago when researchers discovered that Greenland Eskimos experienced low rates of coronary heart disease despite the fact that they ate high-fat diets.***

And now, more than 40 years since the Greenland Eskimos epidemiological studies, EPA and DHA have been researched for mental wellness, infant health, sports nutrition, eye health, immune health, oral health, and so much more.

### *Brain*

Science continues to highlight omega-3's ability to help safeguard the brain, as research supports their role in mood and neural function, as well as overall brain health. A study published in the *British Journal of Psychiatry* found among participants with diagnosed depression, EPA-predominant formulations showed clinical benefits compared to the placebo.[4] A separate study found omega-3s and their metabolites function to exert their anti-inflammatory and pro-resolving activities in the brain and regulate microglia phenotype—microglia are specialized innate immune cells of the central nervous system, and they play crucial roles in neural development and function.[5]

And this research is very much in line with consumers' growing interest in mental wellness. According to Innova Market Insights, omega-3 supplements with brain-health claims show the strongest growth, as they experienced a +14.8-percentage point increase in percentage share in 2019 compared to 2015.

Mintel's *Global Food and Drink Trends 2030* report named *Smart Diet*—i.e., technology will enable consumers to construct hyper-individualized approaches to physical and mental health—as a key opportunity for the

global food, drink, and foodservice industries to act upon in the next 10 years. Consumers will use the results of data collection and biological tests to modify their diets and lifestyles to improve their brain health, states of mind, and moods.

"More consumers are considering mental health alongside diet and exercise in their personal health management," Mintel said. "This holistic health-and-wellness approach has inspired them to seek products that can improve mood and boost brain health, as well as those with emerging functional ingredients."

Indeed mental wellness is on the minds of consumers, as FMCG Gurus' Personalized Nutrition survey (conducted in Q2 2020) found 24% of consumers believe that in the last two years their health has worsened, and of these consumers, 42% say they suffer from cognitive-health problems.

Yet, although research supports omega-3 supplementation as "a useful strategy for helping to augment dietary intakes and support brain health across the lifespan,"[6] many consumers aren't actively seeking them out.

FMCG Gurus' Omega Fatty Acids survey (conducted in Q3 2019) revealed that while 82% of consumers across the globe say they are aware of omega-3s, only 43% regularly seek out products that contain the ingredient. Of those that do, 43% say they associate the ingredient with helping improve brain function.

***"As society continues to age, and as consumers become more time-scarce and high levels of uncertainty in a pandemic and recessionary environment impact mental wellbeing, more needs to be done by the industry to educate consumers about the link between omega-3s and cognitive health."***

"This shows that over four in 10 consumers who actively seek out the ingredient associate it with improving cognitive health," said Mike Hughes, head of research and insight at FMCG Gurus. "As society continues to age, and as consumers become more time-scarce and high levels of uncertainty in a pandemic and recessionary environment impact mental wellbeing, more needs to be done by the industry to educate consumers about the link between omega-3s and cognitive health. This is especially true given that consumers are taking a proactive approach to researching ingredients."

### *Sports Nutrition*

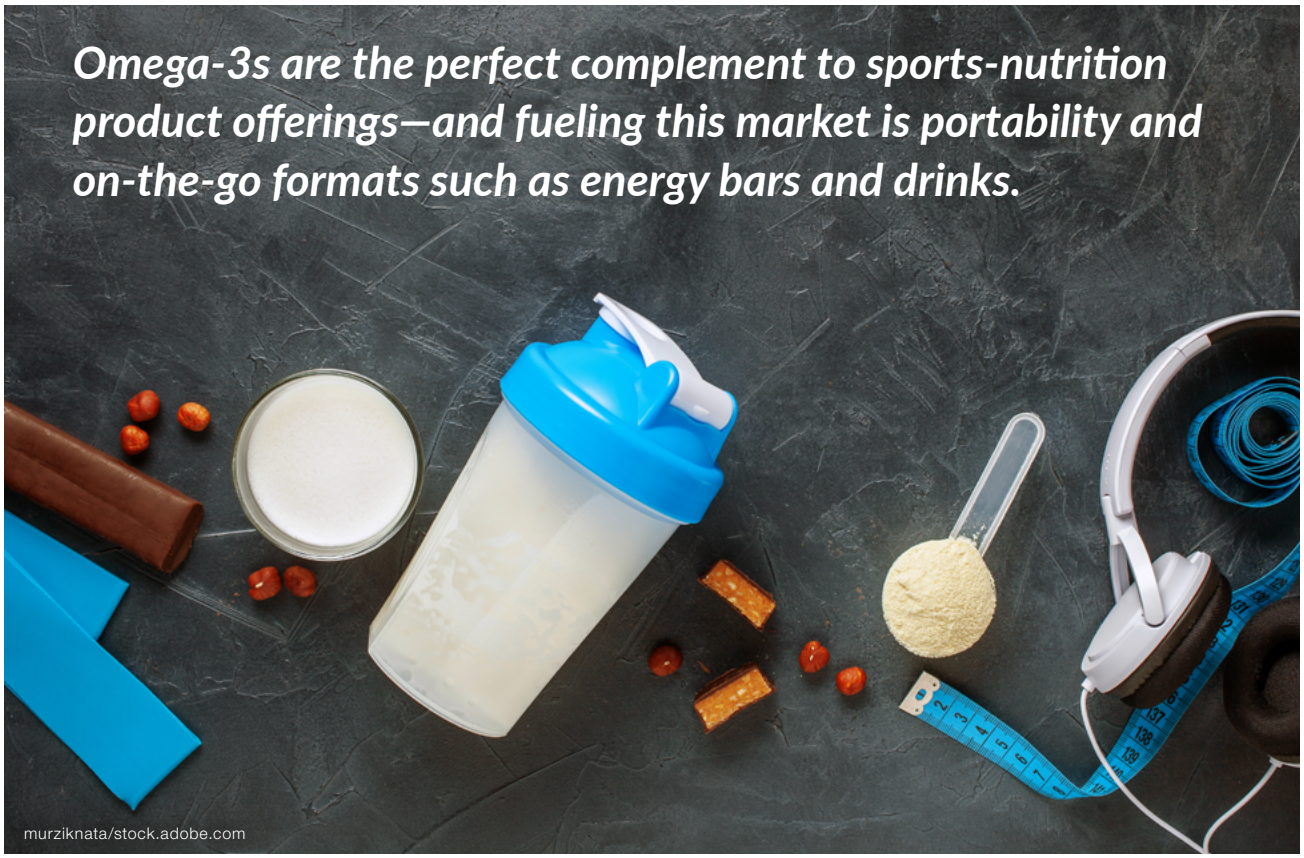
Sports nutrition is another area with burgeoning research and popularity among consumers. Between 2014-2019, the U.S. sports nutrition market grew at a 10.3% CAGR, sitting at $13 billion in 2019, according to Euromonitor International.

"The popularity of sports nutrition products has been driven not by consumers who regularly go the gym, but by health-conscious consumers who are taking a proactive approach to health," Hughes said. "These consumers are commonly referred to as active nutrition consumers."

FMCG Gurus' Active Nutrition survey, conducted from July 2019 to September 2019, revealed 47% of active nutrition consumers across the globe regularly conduct research into different types of ingredients. And new research on omega-3s is highlighting how their anti-inflammatory properties, in conjunction with other properties, impact muscle soreness, performance improvement, exercise training, skeletal muscle, and more.

"Recent human studies demonstrate that [omega-3 polyunsaturated fatty acids] can influence not only the exercise and the metabolic response of skeletal muscle, but also the functional response for a period of exercise training," according to a group of Italian researchers. "In addition, their potential anti-inflammatory and antioxidant activity may provide health benefits and performance improvement, especially in those who practice physical activity, due to their increased reactive oxygen production."[7]

Hughes said active nutrition consumers are cognizant of how many essential fatty acids



they consume. Indeed, according to FMCG Gurus' Active Nutrition survey, 45% say they are aware of how much omega-3 is in their daily diet, while slightly less (38%) say they know how much of the ingredient they should be intaking daily.

"While there is still scope to raise awareness of omega-3s among active nutrition consumers, the research implies that health-conscious consumers are being attentive to omega-3s because they are associated with a variety of physical and cognitive health benefits," Hughes said.

Omega-3s are the perfect complement to sports-nutrition product offerings—and fueling this market is portability and on-the-go formats such as energy bars and drinks. In fact, the global protein bar market is experiencing rapid expansion, and it's expected to grow at a CAGR of 6.2% from 2019-2025, according to Grand View Research.

Interestingly, a study conducted in 2018 on 20 professional Rugby Union players investigated the effectiveness of consuming either a protein-based supplement containing 1,546 mg of omega-3s (551 mg of EPA, 551 mg of DHA) or a protein-based placebo twice daily for five weeks.[8] The researchers said, "The moderate beneficial effect of adding fish oil to a protein-based supplement on muscle soreness translated into the better maintenance of explosive power in elite Rugby Union players during pre-season training."

## *Early life nutrition*

Prenatal and infant health are also a popular category. Grand View Research said regulations favoring the usage of omega-3s in infant formulations are contributing to market growth. Much of the research in this category has focused mainly on DHA.

In a randomized, double-blind clinical trial, mothers supplemented 600 mg/d of DHA or a placebo starting at 14.5 weeks of gestation.[9] The authors concluded, "prenatal DHA supplementation substantially reduced early preterm birth." However, a separate study supplemented 900 mg/d of omega-3 long-chain polyunsaturated fatty acids or vegetable-oil capsules starting before 20 weeks of gestation.[10] These researchers concluded, "Supplementation with omega−3 long-chain polyunsaturated fatty acids from early pregnancy until 34 weeks of gestation did not result in a lower incidence of early preterm delivery or a higher incidence of interventions in post-term deliveries than control." Perhaps this contrast highlights DHA's specific role in preterm births. Other research shows prenatal exposure to DHA may contribute to improved sustained attention in preschool children.[11]

Interestingly, research from FMCG Gurus' Early Life Nutrition survey series (Q4 2018 - Q3 2019) found 34% of parents say they are concerned about the cognitive development of their children. As a result of concerns over the cognitive health of their kids, 62% of parents say they have changed their children's diets in response to this, but only 28% said they responded to this by looking to increase their child's intake of omega-3s.

"This reflects an attitude/behavior gap that exists when it comes to omega-3 fatty acids, in the sense that consumers do not actively

seek out the ingredient, even when they associate it with an array of health benefits," Hughes said. "This is something that the industry needs to address, especially as the rate of lifestyle-related health problems among children continues to become more common."

### *Pet food + supplements*

New product opportunities are also going beyond the food and beverage aisles and into the pet-food aisle. Domestically and abroad, pet food is presenting opportunities. "More EPA- and DHA-fortified pet foods and supplements are hitting markets in key Asian and Latin American economies and maintaining their popularity in the two biggest omega-3 pet food markets—the U.S. and Europe," Gearheart said.

On the supplement side, GOED reported U.S. supplement sales in 2019 were $421.4 million at the ingredient level and $11.9 billion at the finished-product level. And what's trending inside of that ocean-sized supplement market is algae. Innova Market Insights said the plant-based trend has permeated the omega-3 industry. Almost one in 10 omega-3 supplements tracked globally in 2019 featured an omega-3 sourced from algae.

"EPA and DHA supplements from microalgae are becoming more popular, and there are more options available than previously, a boon for vegetarians and vegans," Gearheart said.

And while there's room for growth in every geography, Gearheart said omega-3 finished products are growing the fastest in China,

*"More EPA- and DHA-fortified pet foods and supplements are hitting markets in key Asian and Latin American economies and maintaining their popularity in the two biggest omega-3 pet food markets—the U.S. and Europe."*

South Asia, and Southeast Asia. "China accounts for an estimated 21% of global omega-3 consumer packaged goods (CPG) sales," he said. "The expanding middle class there is driving omega-3 consumption via increased demand for DHA in infant formula, EPA and DHA in pet foods, and a stronger interest in supplements."

Two hot categories for omega-3 supplements are immune and oral health. "Omega-3 supplements with oral health claims have been growing with a CAGR (Global, 2015-2019) of +22%," according to Innova Market Insights. "Furthermore, immune-health claims are also becoming prominent within omega-3 supplements, with nearly 50% of all products containing omega-3 ingredients in conjunction with vitamins/minerals."

## The Bottom Line

As research continues to explore EPA and DHA's vital role in human health, the market for omega-3s has a lot of room for growth—consumer education will play a key role in its expansion, as will innovation in product development. Foods, beverages, and

supplements aimed at mental wellness and sports nutrition, as well as infant and eye health, have openings for omega-3 inclusion.

"Omega-3 consumption levels are still very low, and the markets have ample room to grow with the right public understanding of these fats' importance," Gearheart noted.

The opportunities are bottomless.

## References


1. "Omega 3 Market Size, Share & Trends Analysis Report By Type (EPA, DHA, ALA), By Source (Marine Source, Plant Source), By Application, By Region, And Segment Forecasts, 2020 – 2027" Grand View Research. Published April 2020. https://www.grandviewresearch.com/industry-analysis/omega-3-market
2. A P Jain, K K Aggarwal, P-Y Zhang. "Omega-3 Fatty Acids and Cardiovascular Disease" *Eur Rev Med Pharmacol Sci.* 2015;19(3):441-5
3. James Backes, Deborah Anzalone, Daniel Hilleman, et al. "The Clinical Relevance of omega-3 Fatty Acids in the Management of Hypertriglyceridemia" *Lipids Health Dis.* 2016;15(1):118
4. Brian Hallahan, Timothy Ryan, Joseph R Hibbeln, et al. "Efficacy of omega-3 Highly Unsaturated Fatty Acids in the Treatment of Depression" *Br J Psychiatry*. 2016;209(3):192-201
5. Emma Derbyshire. "Brain Health Across the Lifespan: A Systematic Review on the Role of Omega-3 Fatty Acid Supplements" *Nutrients* 2018;10(8):1094
6. Sophie Layé, Agnès Nadjar, Corinne Joffre, et al. "Anti-Inflammatory Effects of Omega-3 Fatty Acids in the Brain: Physiological Mechanisms and Relevance to Pharmacology" *Pharmacol Rev*. 2018;70(1):12-38
7. Maria Alessandra Gammone, Graziano Riccioni, Gaspare Parrinello, et al. "Omega-3 Polyunsaturated Fatty Acids: Benefits and Endpoints in Sport" *Nutrients.* 2019;11(1):46
8. Katherine Elizabeth Black, Oliver C Witard, Dane Baker, et al. "Adding omega-3 Fatty Acids to a Protein-Based Supplement During Pre-Season Training Results in Reduced Muscle Soreness and the Better Maintenance of Explosive Power in Professional Rugby Union Players" *Eur J Sport Sci.* 2018;18(10):1357-1367.
9. John Colombo, D Jill Shaddy, Kathleen Gustafson, et al. "The Kansas University DHA Outcomes Study (KUDOS) Clinical Trial: Long-Term Behavioral Follow-Up of the Effects of Prenatal DHA Supplementation" *Am J Clin Nutr.* 2019;109(5):1380-1392
10. Maria Makrides, Ph.D., Karen Best, Ph.D., Lisa Yelland, Ph.D., et al. "A Randomized Trial of Prenatal n−3 Fatty Acid Supplementation and Preterm Delivery" *N Engl J Med.* 2019;381: 1035-1045
11. Usha Ramakrishnan, Ines Gonzalez-Casanova, Lourdes Schnaas, et al. "Prenatal Supplementation With DHA Improves Attention at 5 Y of Age: A Randomized Controlled Trial" *Am J Clin Nutr.* 2016;104(4):1075-1082


**Alissa Marrapodi** is the custom content writer for *Nutritional Outlook*.


# Formulating with Fatty Acids

By Alissa Marrapodi

*The struggle to move omegas beyond supplements and into foods and beverages*

While the physiological benefits of omega-3s continue to mount, and both the nutritional and medical communities recognize the importance of consuming adequate levels of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), delivering these fatty acids to consumers is still a challenge.

Of course, the easiest way is for consumers to eat fatty cold-water fish—the American Heart Association (AHA) recommends eating fish at least twice a week—but the AHA reports the average U.S. consumer only eats 1.3 servings per week.[1] The second-best way is supplements—they are a well-document means to deliver omega-3s in high doses, albeit they've had their struggles as well.

Dr. Andrew Bell, vice president of product and process development at Wiley Companies, explained one formulation hurdle with omega-3 supplements is oxidation. Wiley's omega-3s are in a concentrated form, which means they are more prone to oxidation than products that use lower amounts of EPA and DHA. The key, according to Bell, is processing. "We make sure to process our oils using an inert gas atmosphere to remove oxygen and

protect them from heat and light," Bell said. "Since our omega-3 is in a liquid product, it can get degraded, but adequate packaging, such as soft-gels and bottles, help to protect it from oxygen and light."

But liquid oils don't mix well with water-based systems. And in food matrixes, the oil is difficult to formulate with if it's not suitably protected from exposure to oxygen or high heat, Bell explained. As with supplements, oxidation is also an issue in foods and beverages, but fortifying a snack bar or a salad dressing, for example, with fish oil is a bit trickier, and historically, it has been very challenging.

The thing is, the market for omega-3 finished products is huge. In fact, in 2019, the global finished-products market for EPA and DHA was valued at US$44.2 billion, according to the Global Organization for EPA and DHA Omega-3s (GOED). And this includes supplements, fortified foods and beverages, infant formula, pharmaceuticals, pet foods, and clinical nutrition/medical foods.

However, sales for foods and beverages offering EPA and DHA have been relatively flat, according to Chris Gearheart, director – member communications & engagement – GOED. Why? because of "poor flavor profiles and high prices-per-dose, making customer loyalty difficult," he said, "But we still see some potential for that space in the future."



*"One major hurdle that omega-3s face is often linked to the palatability. Developments in deodorization technologies have helped reduce the impact that taste has on consumers' purchasing decision."*

Taste is one of many issues fish oil struggles with. There are six major formulation hurdles omega-3s face: sustainability, quality (which is dependent on the season and location, ocean pollution, etc.), taste, odor, stability, and the purity process.[2]

According to Canadian researchers, "A major difficulty in fortifying foods with fish oil containing EPA and DHA is that these polyunsaturated fatty acids are unstable. They readily oxidize in the presence of light and oxygen with the formation of a variety of degradation products. Some of these degradation products are aldehydes that have an unpleasant smell and taste, leading to off-flavors in food products fortified with fish oil."[3]

Innova Market Insights said, "One major hurdle that omega-3s face is often linked to the palatability. Developments in deodorization technologies have helped reduce the impact that taste has on consumers' purchasing decision. And when it comes to algal omega-3, the main hurdle faced is in terms of economic sustainability and costs involved in production."

Because omega-3s are polyunsaturated, Kantha Shelke, Ph.D., CFS, food scientist and principal of Corvus Blue LLC, said they are highly susceptible to lipid oxidation, which usually means undesirable fishy and rancid off-flavors. "These off-flavors can deter consumers from accepting omega-3-enriched foods," she explained. "When developing omega-3-enriched foods, especially with multiphase food systems, a number of factors can affect lipid oxidation, including oil quality, delivery systems for omega-3 fatty acids, i.e., whether the oil is encapsulated or not, processing conditions for the production of the food products, and the composition of the food matrix."

A study published in the *Journal of Functional Foods* points out a common formulation issue with spray-dry emulsions. Although the bioavailability of microencapsulated fish oil using spray-dried emulsions is high, "spray-dried emulsions tend to have high surface oils levels, low oil content, and poor stability, making their use limited commercially."[4]

Further, Shelke said that formulation challenges vary depending on the type of omega-3-enriched food, i.e., dairy such as yogurt, mayonnaise, dressing, energy bars, and fish patés. "Challenges are greater for some product types than for other product types," she said. "For example, fish oil-enriched milk is much more susceptible to lipid oxidation than yogurt. The composition of the food matrix affects omega-3 oxidation significantly. In yogurt, the peptides formed during milk fermentation act as efficient antioxidants."

So, while research is uncovering omega-3s' many health benefits, the food and beverage industry is still searching for new ways to deliver these fatty acids tastefully and efficaciously.

## References


1. https://www.heart.org/en/news/2018/05/25/eating-fish-twice-a-week-reduces-heart-stroke-risk#:~:text=To%20get%20the%20full%20benefits,servings%20a%20week%20in%201999.
2. Xiao-Jun Ji, Lu-Jing Ren, and He Huang. "Omega-3 Biotechnology: A Green and Sustainable Process for Omega-3 Fatty Acids Production" *Front Bioeng Biotechnol.* 2015;3:158.
3. Colin J. Barrow, Coleen Nolan, Bruce J. Holub. "Bioequivalence of encapsulated and microencapsulated fish-oil supplementation" *J Funct Foods.* 2009;1(1):38-43
4. Ibid. Colin J. Barrow, Coleen Nolan, Bruce J. Holub. "Bioequivalence of encapsulated and microencapsulated fish-oil supplementation" *J Funct Foods.* 2009;1(1):38-43


**Alissa Marrapodi** is the custom content writer for *Nutritional Outlook*.


# *Inventing Fish Oil Delivery Solutions*

By Alissa Marrapodi

*How industry is engineering delivery systems for EPA- and DHA-fortified foods and beverages*

Fortifying foods and beverages with eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) can increase omega-3s reach into new consumer demographics and market categories, and new ingredient solutions are opening the door to this.

Scour the Internet and you'll see offerings for liquid oils, swirls, smoothies, and more that can be taken by the teaspoon, mixed into a beverage, or even topped on a dessert. According to Innova Market Research, liquid omega-3 supplements are on the rise, with their growth mainly driven by the United States.

"Omega-3 are primarily delivered through soft-gels and liquid pourables, with some use as liquid emulsions that are incorporated into food products such as milk," said Dr. Andrew Bell, vice president of product and process development at Wiley Companies. "These provide a high dosage of EPA and DHA per serving."

Inside the EPA- and DHA-fortified food and beverage space, where sales are fairly flat, according to Chris Gearheart, director – member communications & engagement – GOED (the Global Organization for EPA and DHA Omega-3s), there is potential for future growth.

"New micro-encapsulation methods are improving customers' sensory experience, and a more competitive market for algal omega-3 ingredients could bring costs low enough to encourage experimentation by brands," he said.

In fact, a 2018 study said, "Several technologies such as microencapsulation can prevent omega-3 fatty acids from oxidation and development of fishy flavors, increase food shelf-life, and improve the fortification of foods with these fatty acids."[1]

However, the study also noted that although encapsulating omega-3 fatty acids decreases the amount of loss during storage time, due to changes in texture and color in products like bread, "low-cost methods should be developed and there should be more efforts to maximize the stability of omega-3 fatty acids for extensive use in the food industry."

Canadian researchers said to overcome issues with taste, odor, and oxidative stability, "there are several methods of microencapsulating fish oil, including producing spray-dried emulsions or spray-dried complex coacervates."[2] However, these emulsions and coacervates only work if they're bioavailable. As such, this same study investigated the nutritional quality of DHA and EPA delivered in microencapsulated fish oil powder produced by complex coacervation. The study confirmed that it is bioavailable and bioequivalent to dietary supplementation with soft-gel capsules.

Omega-3 powders open up opportunities for formulators to incorporate high levels of omega-3s into a variety of food and beverage applications such as sports nutrition powders, energy bars, baked goods, vitamin supplement blends, dairy products, and more. AlaskOmega® developed a concentrate omega-3 powder sourced from wild Alaskan pollock and certified sustainable and traceable by the Marine Stewardship Council (MSC). It delivers more than 200 mg/g of EPA and DHA without a fishy taste or smell. Plus, it's below the industry's total oxidation (TOTOX) measurement of fish oil rancidity. GOED set a limit of 26, but the oil used to make this powder has a TOTOX limit of 5.

***"Omega-3 powders open up opportunities for formulators to incorporate high levels of omega-3s into a variety of food and beverage applications."***

Kantha Shelke, Ph.D., CFS, food scientist and principal of Corvus Blue LLC, weighed the pros and cons of neat oils, microencapsulated fish oil, and a fish oil-in-water emulsion. "Neat oils produce a better final quality because they are not as prone to rancidity as fish oil-in-water emulsions, whereas in other food systems like yogurt, the microencapsulated or emulsified fish oil may work better," she said. "Neat oils are also

less expensive than microencapsulated oils or emulsions. Encapsulated omega-3s are more stable as an ingredient but also require overage to compensate for the encapsulant."

Another solution to low water-solubility, oxidative stability, and reduced sensory properties is nanoemulsions. "Nanoemulsions offer a promising way to incorporate omega-3 fatty acids into liquid food systems like beverages, dressing, sauces, and dips. [They] are colloidal dispersions that contain small oil droplets that may be able to overcome many of the challenges of fortifying foods and beverages with omega-3 fatty acids. The composition and fabrication of nanoemulsions can be optimized to increase the chemical and physical stability of oil droplets, as well as to increase the bioavailability of omega-3 fatty acids."[3]

Additionally, nano-liposomes, made from natural lipids, are considered to be an effective technology for encapsulation of bioactive compounds such as DHA and EPA, as well as enhancing their stability and bioavailability.[4]

Interestingly, the Iranian researcher, Zahra Hadian, said, "Compared to microencapsulation, nano-sized delivery systems provide more surface, increased solubility, improved bio-availability, and improvement of controlled release, as well as active targeting."[5]

Powder concentrates, as well as nanoemulsions and other delivery systems, are widening the scope of omega-3s from beyond the supplement aisle and into on-the-go snacks, baked goods, dairy products, dressings and sauces, and more.

## References


1. Ehsan Feizollahi, Zahra Hadian, Zohreh Honarvar. "Food fortification with omega-3 fatty acids; microencapsulation as an addition method" *Cur Nutr Food Sci.* 2018;14(2):90-103
2. Colin J. Barrow, Coleen Nolan, Bruce J. Holub. "Bioequivalence of encapsulated and microencapsulated fish-oil supplementation" *J Funct Foods.* 2009;1(1):38-43
3. Rebecca Walker, Eric A Decker, David Julian McClements "Development of Food-Grade Nanoemulsions and Emulsions for Delivery of omega-3 Fatty Acids: Opportunities and Obstacles in the Food Industry" *Food Fuct.* 2015;6(1):42-55
4. Zahra Hadian. "A Review of Nanoliposomal Delivery System for Stabilization of Bioactive Omega-3 Fatty Acids" *Electron Physician.* 2016;8(1):1776–1785
5. Ibid. Zahra Hadian. "A Review of Nanoliposomal Delivery System for Stabilization of Bioactive Omega-3 Fatty Acids" *Electron Physician.* 2016;8(1):1776–1785 ■


**Alissa Marrapodi** is the custom content writer for *Nutritional Outlook*.


# Innovation Turned Ingredient

## *How AlaskOmega® is changing the omega-3s industry*

In 2020, AlaskOmega®, produced by Wiley Companies, offers many omega concentrates, including its new omega-3 powder form for use in foods, beverages, and dietary supplements. *Nutritional Outlook* sat down with AlaskOmega's vice president of sales, Steve Dillingham, to discuss how AlaskOmega was developed, its products' unique features, how a powder can re-shape omega-3s' use in food and beverage products, and more.

### How was AlaskOmega developed?

**Dillingham:** The opportunity for AlaskOmega was born out of a desire to fully utilize the Alaska pollock fish for a higher value. The Alaska pollock fishery is the largest fishery in the world for human consumption and is a common staple in a wide variety of products—from fast-food fish sandwiches in the United States to surimi products in Japan. Wiley Companies, together with our fishing partners, felt there was an opportunity to bring higher value to the fish oil extracted during processing, which is normally used in animal feed or biofuels. Although Alaska pollock, a white fish, contains about half the omega-3 content of an anchovy, which is the most common source of omega-3s used in dietary supplements, we believed we could extract, purify, and concentrate

omega-3s from Alaska pollock oil and create a premium quality omega-3 concentrate, which could become a preferred alternative to anchovy oil for omega-3 supplementation in humans. We've come a long way toward this goal.

## What makes AlaskOmega standout against other omega-3 suppliers?

**Dillingham:** AlaskOmega sources its crude oil exclusively from Marine Stewardship Council (MSC)-certified wild Alaska pollock. The Alaska pollock fishery has been sustainably managed by the U.S. government for more than 40 years and has been certified by MSC since April 2005, which is considered by many as the gold standard for sustainability. In addition, we are 100% U.S.-sourced with a direct and transparent supply chain from the fish caught in Alaska's Bering Sea to our ISO 9001:2015 registered and GMP-certified facility located in Ohio.

Wiley Companies also added a new omega ingredient to the AlaskOmega line: omega-7, which is made as a 50% and 70% omega-7 concentrate derived from Alaska pollock. The key health applications for omega-7 include heart health, insulin sensitivity, skin health, and anti-aging, as well as hydration of mucosal membranes.

## What unique features, such as freshness and taste, do AlaskOmega's ingredients offer?

**Dillingham:** Palatability of a fish oil is directly related to the level of oxidation. The more a fish oil is oxidized, the more likely it is to have off-notes responsible for a fishy

The opportunity for AlaskOmega was born out of a desire to fully utilize the Alaska pollock fish for a higher value.


AlaskOmega

taste and smell. The industry uses total oxidation (TOTOX) as a general measure of fish oil rancidity.

AlaskOmega omega-3 concentrates now lead the concentrate market in freshness with a maximum TOTOX limit of 5, more than a five-fold reduction from the limit of 26 set by the Global Organization for EPA and DHA Omega-3s (GOED). Typical AlaskOmega TOTOX values range between 0 and 3. Fresher oil translates into a more optimal sensory profile, better product stability, and a longer shelf life.

To assure AlaskOmega oils have optimal taste and smell, we analyze the sensory profile of our triglyceride oils through a certified, in-house organoleptic panel. We are committed to the most stringent organoleptic standards.

## What applications do your products work well in?

**Dillingham:** Triglyceride oils are preferred for use in liquid pourable omega-3 products due to their increased stability and sensory characteristics. However, they can be more difficult to formulate directly into drinks and functional food products due to exposure to air, causing off-flavors from oxidation and the potential of oil leaching out of the formulations, and oil/water interactions. Soft-gel applications can accommodate either ethyl ester or triglyceride, as the oils are better protected within the soft-gel.

*"To assure AlaskOmega oils have optimal taste and smell, we analyze the sensory profile of our triglyceride oils through a certified, in-house organoleptic panel. We are committed to the most stringent organoleptic standards."*

## How does your Omega-3 Powder expand product offerings?

**Dillingham:** AlaskOmega Omega-3 Powder is our first powder, an MSC-certified, Halal-certified omega-3 concentrate powder for use in food, beverage, and dietary supplement formulations. It offers a minimum of 200 mg/g of EPA + DHA content without a fishy taste or smell, based on the superior freshness and purity of AlaskOmega omega-3 concentrates.

Our omega-3 powder allows formulators to incorporate high levels of omega-3s into a variety of applications and formulations that would not typically be amenable to utilizing liquid ingredients, such as meal-replacement and sports-drink powders, energy bars, baked goods, vitamin blends, and dairy products, to name a few. ■