

Make No *Bones* About It

The market for bone health is strong.

BY JUDY BLATMAN

What is it about bones? The National Institutes of Health tell us that “our bones support us and allow us to move. They protect our brain, heart, and other organs from injury.”

That’s a pretty strong case for keeping our bones healthy.

When it comes to bone health nutrients, calcium is considered the *grand-mère* of ingredients. Known for supporting healthy bones, calcium is one of the few nutritional ingredients granted a fully approved health claim by FDA—in this case for helping reduce the risk of osteoporosis.¹

But to paraphrase Shakespeare, “heavy is the head that wears the crown,” and this appears to be the case for the queen bee of bone health ingredients. As product formulators seek innovative solutions to address

bone health issues and to fill gaps in the bone health marketplace, they are looking beyond calcium alone and at cases in which calcium needs a courtier or maybe a knight in shining armor—ingredients that provide benefits above and beyond what calcium can achieve by itself.

As Jennifer Gu, PhD, vice president, research and development, AIDP Inc. (City of Industry, CA), says so succinctly: “The bone health category has moved beyond calcium.”

While many suppliers would likely agree, that doesn’t mean calcium has abdicated her crown. And Gu does recognize that “...calcium builds bone density and is needed by the body for skeleton building, muscle contraction, nerve signaling, and other metabolic processes.” Companies,

like AIDP, are finding ways to make calcium work more efficiently.

Enter Vitamin K2

Take vitamin K2 for example.

Kate Quackenbush, communications director, NattoPharma (Oslo, Norway), also recognizes the importance of calcium for building strong bones. But, she advises, in order to achieve proper utilization of calcium, it needs to be combined with a vitamin K2 ingredient, such as her company’s MenaQ7 vitamin K2, which “can improve functional equilibrium in the cardiovascular and skeletal systems.”

It’s the interaction between vitamin K2 and calcium, advises Quackenbush, that activates specific proteins—like osteocalcin, a bonding agent that binds calcium to the bone matrix,



“The bone health category has moved beyond calcium,” says AIDP’s Jennifer Gu.

and matrix Gla protein, which impedes calcium from settling inside the arteries and soft tissues where it can do damage.

Gu is in agreement about the important role of vitamin K2, and she adds that despite the benefits of calcium, “excess calcium can accumulate in blood vessels and other soft tissues.” AIDP supplies K2VITAL, which Gu says “directs calcium to the right place, to the bones, supporting bone strength and circulatory health.”

Currently, the vitamin K2 market is a small slice of the overall dietary supplement pie. But Quackenbush believes consumer awareness of K2 is increasing rapidly. Based on her company’s media tracking program, Quackenbush noted a consistent rise in global “vitamin K” media hits between 2015 and 2019, and tracking through July 2020 demonstrated “we are already on point to exceed the 2019 numbers.” Additionally, she adds, “We have seen a significant increase in the number of Google searches for ‘vitamin K2’ worldwide over the last several years, potentially indicating growing consumer awareness.”

Influencers played a key role, according to Quackenbush. NattoPharma initiated a year-long public relations program in the UK to educate consumers about vitamin K2, with a heavy online focus on bloggers and influencers. In the U.S., the company began an outreach program with the dietitian community, resulting in blogs and articles about vitamin K2’s health benefits.

Both Gu and Quackenbush believe there is another reason for vitamin K2 to demonstrate growth: the science. Gu states that “there have been hundreds of clinical trials confirming the effectiveness of K2 for bone and heart health.” NattoPharma also recognizes the importance of science as a means to communicate the health benefits of vitamin K2 with healthcare practitioners and consumers.

But the company has a loftier goal in mind. With no official assigned daily value

(DV) for vitamin K2, Quackenbush says “it’s even harder for consumers to understand how much K2 they need to get daily.”

And although vitamin K has a daily value, it reflects the action of K1 for healthy blood coagulation. “However, in the past 20 years,” says Quackenbush, “researchers have revealed that vitamin K2’s separate and distinct mechanism of action requires its own RDI”—that is, its own recommended dietary intake value advising sufficient daily intake.²

The payoffs of clearly communicating how and why consumers should ensure adequate intake of K2 are vast. As Quackenbush says, “Comprehensive studies show that simply correcting K2 deficiency can deliver unprecedented improvements in bone and heart health.”

Magnesium Makes Its Move

The body needs magnesium. It is key to more than 300 biochemical reactions in the body. Among its many attributes, the mineral regulates blood sugar levels, blood pressure, and muscle and nerve function, to name a few. It’s also needed for healthy bones.

“Magnesium is an important mineral to support bone health as it helps to increase bone mineral density, which plays a vital role in reducing the risk of bone fractures and osteoporosis,” according to Tom Druke, marketing director, Balchem Human Nutrition and Pharma (New Hampton, NY). “It also influences the activities of osteoblasts and osteoclasts and helps the body to regulate bone homeostasis.” The two osteos—blasts and clasts—are cells with key roles to play in bone health. The former helps build bones and control calcium and mineral deposits while the latter participates in resorption of bones.

In citing magnesium’s dramatic growth over the last few years, Druke references a *Nutrition Business Journal* report³ that showed magnesium sales grew by 10.2% in 2018, and he notes SPINS reported 11% growth in 2019. This growth, says Druke, is further supported by

data from the Council for Responsible Nutrition’s (CRN; Washington, DC) annual consumer survey⁴ that ranked magnesium among the top 10 dietary supplements consumed in 2019.

That’s good news, considering that so many of us need more magnesium. According to the Office of Dietary Supplements, an analysis from the National Health and Nutrition Examination Survey (NHANES) from 2013-2016 found that slightly less than half (48%) of Americans of all ages ingest less magnesium from food and beverages than recommended, particularly adult men over 71 years old and adolescent boys and girls.⁵

Balchem’s Albion Minerals line of ingredients includes a variety of branded magnesium options, all of them chelated for easy absorption.

Jost Chemical Co. (St. Louis, MO) also supplies a variety of magnesium ingredients, including several that combine calcium and magnesium citrate. This ensures what Joseph R. Hardimon, manager, research and development at Jost Chemical, advises is “a need to have products that contain the correct ratio of calcium to magnesium of 2:1.”

“Consumers are recognizing the multifaceted benefits of magnesium for health, and it can be included in functional foods and supplements, making the ingredient highly available to be formulated to meet consumer demands,” says Druke.

The Case for Collagen and Collagen Peptides

If celebrity magazines and social media sites are to be believed, celebrities are wild for collagen. With stars like Jennifer Aniston, Kate Hudson, and Kelly Ripa, with their dewy skin and youthful façades, thought to be fans of the growing-in-popularity protein, celebrity endorsement could attract an army of followers down the collagen path.

Collagen is known to boost elasticity in the skin, but what does it do for the bones?

As it turns out, quite a bit. Collagen is the most abundant protein found in the body, and it offers support and elasticity to connective tissues, including the bones.

AIDP's Gu thinks of it this way: "Calcium builds bone density, and collagen builds the framework for calcium to attach. Collagen plays an essential role in improving bone flexibility." Without adequate collagen, she says, even the strongest bones can crack or break.

Add to that the fact that, as Gu advises, "Although the body produces collagen naturally, its production diminishes as we age." That's where adding collagen to a supplement regimen or to food can help.

And that's where science comes in.

According to Lisette van Lith, global director, health and nutrition, Rousselot (West Allis, WI), "When it comes to application preferences, taste, texture, and look and feel can make or break the success of a product or brand. Science-backed benefits, however, play a critical role, too, as consumers look for proven solutions that can be easily integrated into their busy lifestyles."

Van Lith shares that multiple *in vitro* and *in vivo* studies⁶⁻¹⁰ suggest that collagen peptides exert bioactivity that helps bones stay strong and healthy. Further, research conducted with Peptan, Rousselot's branded collagen peptide ingredient, has also shown that collagen peptides can stimulate the endogenous production of bone tissue by triggering osteoblast function (bone-formation cells) and increasing bone size and density.

AIDP supplies KoACT, a patented collagen and calcium chelate. Gu says her company is also supportive of science. "Having well-recognized research with supportive claims provides a high level of assurance to our customers and consumers in the product integrity. The supplement industry needs to assure consumers of safety and efficacy of the ingredients," she states.

A KoACT 12-month study was published in the *Journal of Medicinal Food* in 2015¹¹, and Gu advises that the study conducted in postmenopausal women indicated the ingredient improved bone mineral density versus the control group.

According to these two ingredient suppliers with skin in the collagen game, except for a momentary COVID-19-related setback, the future for collagen and collagen peptides is rosy.

Gu reports that "prior to the COVID-19 outbreak, collagen was one of the hottest ingredients as new applications were being studied and introduced. A large trend has been the emergence of bone broths and functional foods with added collagen."

During the pandemic, Gu says that "while consumers shifted focus to immunity, some of these products lost the fanfare." But she reports "we are now seeing customers returning to collagen as consumers continue to take control of their overall health."

Van Lith has encouraging statistics that indicate collagen will be on the rise for at least the foreseeable future. As for the COVID-19

crisis, she says, "Months of downtime, during which many consumers were required to stay indoors and move less, have led to a rise in mobility concerns, for example. And as the world shifts in and out of lockdowns, we expect demand for solutions that allow consumers of all ages to maintain their bone health and mobility to rise."

Relying on research from several sources, van Lith claims the world market for collagen peptides is expected to reach \$1.7 billion by 2026 at a CAGR of 10%¹², with dietary supplements that support bone health being one of the strongest categories¹³.

She further advises that at a regional level, both the European and U.S. collagen markets are showing strong growth potential between 2020 and 2025 at a CAGR of 5.29%¹⁴ and 5.03%¹⁵, respectively.

Prevention and the Path Forward

Probiotics are known for their ability to impact gut health. But in recent years, the scientific research community has shown increased interest—and some success—in assessing the role of probiotics in bone health. They began by seeking to understand how probiotics regulate the gut-bone axis.

One article¹⁶ explains that the gastrointestinal system is important to bone health because it regulates the absorption of minerals, including calcium and magnesium. The article also refers to the long history of use of probiotics specifically to address longevity and health, dating back to ancient Ayurvedic texts (400 and 200 BCE).

Now, research in humans is emerging on probiotics and osteoporosis, an aging condition that is a major health concern impacting mainly women, but also men.

Titti Martinsson Niskanen, PhD, director, R&D and clinical operations, Probi AB (Lund, Sweden), shared the results from a study funded by her company, published in *The Lancet Rheumatology*.¹⁷

The randomized, double-blind, placebo-controlled, multicenter trial randomly assigned 249 healthy postmenopausal women to receive the probiotic product or placebo. The primary endpoint was the percent change from baseline in bone mineral density at the lumbar spine at 12 months between the two groups.



The conclusion was encouraging: “Probiotic treatment using a mix of three *Lactobacillus* strains protects against lumbar spine bone loss in healthy postmenopausal women,” the researchers wrote.

According to Martinsson Niskanen, this is the only clinical trial so far with Probi Osteo, the company’s newest bone health concept, based on the combination of *Lactobacillus plantarum* HEAL9, *Lactobacillus plantarum* HEAL19, and *Lactobacillus paracasei* 8700:2. But still, it’s a good start.

She explains that her company’s interest in funding the clinical trial was piqued by experimental studies in rodents that suggested that manipulation of the composition of the gut microbiota might alter bone homeostasis.

She adds, “Clinical studies are expensive, and few research groups are equipped to finance trials on specific probiotics. It is the responsibility of the players in the market that want to be serious and protect the interest of the consumer at the end to finance this type of research.”

Martinsson Niskanen views osteoporosis as a major health concern, and since the bone-loss process increasing the risk for osteoporosis starts around the age of 30-40, a preventive solution that can be used safely for a long period is warranted. She reminds us that “probiotics are safe and associated with few side effects.”

Tocotrienols: A Natural Solution?

Jia Zhang Lee, executive director, Davos Life Science (Singapore), has safety in mind, too, when he talks about the category of tocotrienols and the future of his company’s tocotrienols ingredient, DavosLife E3.

In layman’s terms, tocotrienols and their siblings, tocopherols, are part of the vitamin E family. The Office of Dietary Supplements explains that naturally occurring vitamin E exists in eight chemical forms (alpha-, beta-, gamma-, and delta-tocotrienol; and alpha-, beta-, gamma-, and delta-tocopherol) that have varying levels of biological activity. Vegetable oils are a good source of tocotrienols, especially palm oil and rice bran oil.

When it comes to trends in the bone health category for supplements and functional food, Lee sees movement toward “taking preventative measures with a focus on naturally sourced ingredients. People are realizing that health is something to be preserved rather

than fixed,” he says. “They are looking for ways to maintain health and wellness as they age.”

Drugs that treat osteoporosis mainly focus on preventing further bone loss, and they “come with many side effects such as muscle cramps, stomach distress, and headaches,” Lee suggests. Further, he believes science is pointing toward tocotrienols as a safe and efficacious option for bone health via its antioxidative, anti-inflammatory, and mevalonate-suppressing activities.

More research, especially clinical trials, needs to be done. But Lee is good with that. He says his company is embarking in the near future on conducting clinical trials to further establish tocotrienols’ efficacy in promoting bone formation. “It is very important to establish efficacy, and clinical trials are the gold standard for claims substantiation in the industry. There are also research gaps that need to be filled, especially in further illustrating the mechanism of action [of tocotrienols].”

As the science moves to the next phase, and if it continues to show promise, Lee envisions the possibility that “tocotrienols supplementation can be used as a long-term inexpensive measure to reduce the degree of risk and delay the onset of osteoporosis.”

Don’t Forget the Vitamin D

Finally, like calcium, vitamin D has become a staple for bone health, in part because our bodies need it to effectively absorb calcium, and in part, because a lack of it can result in skeletal issues and weak bones. **■**

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