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Is Plant Cell Culture Like GMO?

At March’s Natural Products Expo West show, I met with DianaPlantSciences (Portland, OR), a company that specializes in plant cell culture technology. By managing the growth and reproduction of plants, plant tissues, and plant cells, the company says it can build a better ingredient that contains more desired active compounds and less—or none—undesirable compounds. I asked the firm whether plant cell culture is like GMO.

No, says company president Marc Philouze. He describes the process. The company extracts cells from a plant, “selectively eliminates” certain cells with undesirable traits, and then grows the remaining cells and freeze-dries them. The result is an ingredient like Cocovanol, DianaPlantSciences’ first branded ingredient. Cocovanol is a cacao powder (*Theobroma cacao*) with a very high concentration of polyphenols (>20% total polyphenols) and a low level of caffeine and theobromine. ActivBerry is another branded ingredient, set for launch this year. In nature, unripe bilberries contain the highest concentration of proanthocyanins (PACs). As the fruit ripens, those PACs degrade into anthocyanins, which then lend the fruit its purple color. But purple isn’t ideal if you’re creating, say, a skin cream. “So, what we’ve done is repetitively selected our bilberry cells to stop the growing process once they produce PACs so that they don’t convert into anthocyanins,” Philouze explains. “You now have bilberry cells that have about 15–20% polyphenol content, the vast majority of which are PACs and not anthocyanins.”

Other ideas: a ginkgo ingredient with higher levels of ginkgosides or a cinnamon ingredient with a high level of target compounds but without the carcinogenic coumarin.

These are non-GMO methods, Philouze emphasizes. With GMOs, scientists manipulate plant DNA to create traits outside of nature, such as pest-resistance. With plant cell culture, the whole plant cell remains intact. “We’re just taking the cells and selectively removing the ones we don’t want—we’re not making the cells into something else,” he says. “We let the cells produce what they want, and then we decide to keep some and not others. During this time, the cells will evolve slightly, but we’re not transforming them into something else. Everything that’s produced in our cells is also produced in the plant, even if it’s at a different concentration. So it’s not like Frankenstein where suddenly you create scary molecules that exist nowhere in the plant kingdom.”

“Everything that’s in there can be traced back to what the plant produces,” he continues. “You could argue that if you were to take those cells and put them back in nature, they would regrow a plant. For us, we deem it natural.”

Philouze likens plant cell culture to somewhere between a whole-food and a pharmaceutical approach. With whole foods, companies grow, harvest, crush, and dry plants—but the resulting material might not have a lot of an active compound, and thus consumers require a high dose to see benefits. In pharma, companies target a high concentration of just one active—but may also miss out on any other constituents that might work synergistically in the plant to also lend benefits. With plant cell culture technology, “you get the best of both worlds,” Philouze says.

Plant cell culture is not unlike selective breeding. There are critics of animal breeding who believe it unethical to manipulate animals in this way. (Arguably, though, selective breeding can happen on its own, without human intervention, like when plants cross-pollinate in the wild.) While GMO has become a dirty word these days—one need only walk the Expo West show floor to hear all the talk—perhaps plant cell culture is easier to accept. And its benefits are undeniable. It is environmentally friendly and feasible. Companies no longer have to waste a ton of biomass in order to yield a tiny fraction of active compound, or deal with typical agricultural challenges such as rain, drought, pests, and heavy-metal contaminants. Finally, companies have the chance to work with rare species that might otherwise be prohibitive to harness using traditional methods.

Is building a better ingredient worth the added expense? You certainly wouldn’t use plant cell culture technology to create a run-of-the-mill ingredient that you could easily source anywhere else. No, the ingredient would need to be special, Philouze says. He hopes others see the value of the proposition. The company is looking to partner with others that want to harness plant cell culture technology. Now, it’s just a matter of seeing who steps up to the plate.

Jennifer Grebowa
Editor-in-Chief
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FDA Wants to Update the Nutrition Facts Label

FDA is proposing changes to the Nutrition Facts label. Manufacturers would have up to two years to comply with the proposed label once it is finalized. And dietary supplement makers—heads up! Supplements may also see changes down the line, as FDA says it is also looking to update the Supplement Facts label, including altered Daily Values and units of measure.

“The proposed Nutrition Facts changes will affect dietary supplement products as well. The changes to the Daily Values of certain nutrients will apply to products labeled as dietary supplements,” says Justin Prochnow, an attorney and shareholder at Greenberg Traurig LLC (Denver). “The proposed rule modifies the labeling provisions contained in 21 CFR 101.36 regarding dietary supplements, although the changes to Supplement Facts panels will not be as dramatic as those to the Nutrition Facts panels.”

Let’s discuss some of the Nutrition Facts label proposed changes.

- Serving sizes have changed in the past 20 years since FDA first introduced the Nutrition Facts label—that is, Americans are eating more in a single serving. To accurately reflect today’s serving size, FDA proposes changing one serving to represent 400 calories instead of the current 200-calorie serving size. One pint of food will now equal two servings instead of four servings. “By law, the label information on serving sizes must be based on what people actually eat, not on what they ‘should’ be eating,” says FDA.

- Package size matters: Because consumers will typically finish a 12- or a 20-oz beverage in one sitting, FDA suggests that both of these beverage sizes be listed as one serving. The Nutrition Facts label would declare the nutrition info for the entire bottle’s contents and represent one—not multiple—servings. The same goes for food: a packaged food that is likely to be consumed entirely in one sitting would be subject to the same rule. Larger packages whose contents could be consumed in multiple settings may be required to include two nutrition panels—one that reflects what’s consumed if the entire product is eaten in a single sitting, and another that reflects the contents of just a single serving.

- Added sugar: The proposed label now quantifies the amount of added sugar. FDA says this is important in order to encourage Americans to reduce excessive sugar intake.

- Vitamin D and potassium listings are now included on the label. FDA says many Americans are vitamin D and potassium deficient. Listing vitamin A and C content is now voluntary.

- Daily values would also be updated, including for sodium, dietary fiber, and vitamin D. This plays a role in the Percent Daily Values listed on the Nutrition Facts label that help consumers understand what percentage a food’s contents contribute to the daily recommended total for specific nutrients.

- More-prominent calorie listing: Facts such as calories and serving sizes would appear in a larger, bolder font. The Daily Percent Value numbers move to the left-hand side for easier reading.

FDA is accepting public comments for 90 days—a period that kicks off as soon as the proposed rule is published in the Federal Register. Since it was introduced 20 years ago, the Nutrition Facts label has never been updated except to include a “Trans Fat” listing. Foods imported to the U.S. would also be subject to any label changes. Read the full version of this story: NutritionAlOutlook.com/news/fda-wants-update-nutrition-facts-label

One version of the newly proposed Nutrition Facts label.
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Taste-Prediction Model: Maximizing Stevia Levels

Cargill (Minneapolis) has formally launched ViaTech, the now-official name of the company’s stevia taste-prediction model. When substituting stevia for sugar, ViaTech can help figure out which ratio of steviol glycosides enables the greatest calorie cuts while still ensuring the product tastes good.

That’s the catch with most stevia systems, says Scott Fabro, global business development director, Cargill Corn Milling North America. Yes, companies can currently replace 100% of sugar with stevia—but the product will likely taste very bitter and have a heavy licorice aftertaste, both of which are typical when a high amount of stevia is used. With ViaTech, which Fabro describes as “a mathematical formula,” Cargill is drawing on its knowledge of steviol glycosides—there are more than 40 in the stevia leaf—to help each company figure out which glycoside ratio best serves its product, based on the product’s individual pH and sweetness level.

Standard stevia products currently on the market, such as RA98 and Reb A, can typically only achieve “maybe about a 30% calorie reduction at the most,” says Fabro. He says ViaTech can help companies bridge the gap between 30% and even 100% calorie reduction—the highest calorie cuts the company has ever achieved.

Soluble Plant Sterol: Better for Beverages

Plant sterols can lower high cholesterol, as FDA’s approved health claim attests. However, sterols present challenges to heart-healthy food and beverages because they are very insoluble. A new company, HyPhyto Inc. (Frankfort, IL), hopes to change that.

“Because phytosterols are nearly insoluble in water, uses in their crystalline form are very restricted, and the FDA requires a dose nearly twice that required in the form of an ester to make the FDA cholesterol-lowering claim,” the company says.

HyPhyto’s new CardioCare ingredient is a crystalline-form plant sterol that is directly emulsified—so it disperses easily in water. It is suited for functional beverages like juice, flavored water, and smoothies, without altering taste, color, or viscosity and without falling out, streaking, or separating.

CardioCare’s solubility also improves absorption in the skin, which opens up commercial avenues. Cholesterol helps the skin retain moisture. Because plant sterols’ molecular structure is nearly identical to cholesterol’s, sterols, too, can help improve skin moisture.

Most sterol ingredients have larger particle sizes that prevent dermal absorption. CardioCare’s 300-nanometer particle sizes make it completely water-soluble so that the sterols “will easily cross the epidermal layer” in products like skin cream, the company says. There may even be applications in toothpaste, chewing gum, and mouthwash because CardioCare may increase healthy blood circulation in the gums.

L-Citrulline Now GRAS

Kyowa Hakko USA’s (New York City) L-citrulline can now be used in food and beverages, thanks to a self-affirmed GRAS nod.

By increasing nitric oxide production, L-citrulline helps promote vascular dilation and healthy blood circulation. It is converted to L-arginine and nitric oxide in the body. Additionally, L-citrulline helps relieve muscular fatigue by eliminating ammonia.

As a food ingredient, L-citrulline is deemed safe for use at a dose of up to 275 mg/serving and up to a maximum of 2000 mg/day. It can be used in beverages and beverage bases, grain products and pastas, milk products, and more.

Can an Ingredient Mimic the Benefits of Exercise?

Paul Clayton, PhD, chief scientific advisor for ingredients supplier Gencor (Irvine, CA), discussed the company’s new ActivAMP ingredient, introduced at Natural Products Expo West. By activating an enzyme called AMPk (AMP-activated protein kinase), ActivAMP provides many of the same benefits as exercise, including healthy glucose levels, reduced body fat, and a healthy weight.

“Exercise switches on an enzyme called AMPk, which you can think of as a metabolic master switch,” Clayton explains. “When you do physical exercise, whether it’s fight or flight, you’re telling your body, through this enzyme system, don’t store calories; burn them, because we need energy. So when you switch this enzyme on, you stop depositing fat and you start burning it. You start increasing mitochondria activity and muscle performance and you start experiencing more glucose uptake, so you become insulin sensitive once again. You start losing belly fat. And your arteries become more flexible and your blood pressure comes down because your resting glucose is normalizing.”

ActivAMP is extracted from the adaptogenic herb <i>Gynostemma pentaphyllum</i>. Gencor offers the ingredient as a free-flowing powder, including for tablets and capsules. ActivAMP can take advantage of several health claims: 1) Helps reduce body fat, and 2) Helps promote moderate weight loss.

These are backed by clinical research, including a 12-week randomized, double-blind, placebo-controlled study on 80 overweight human subjects that showed benefits for body fat mass, percent body fat, body weight and BMI, and total abdominal fat.

Vidya Herbs Acquires Manko

Vidya Herbs (Bangalore, India) has acquired Manko Natural Flavours and Extracts Pvt. Ltd., an India-based supplier of oleoresins and natural food colors from a wide variety of spices. Vidya says the acquisition expands its own manufacture of spices, essential oils, and oleoresins worldwide, and will also allow the company to focus more on exclusive, high-demand extracts and oils.
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Food-Label Fight

POM Wonderful v. Coca-Cola heads to the Supreme Court.

BY AUGUST T. HORVATH, KELLEY DRYE & WARREN LLP

In April, the Supreme Court will hear arguments in a false-advertising case over food labels. In this case, POM Wonderful sued The Coca-Cola Company over its Minute Maid Pomegranate Blueberry 100% Fruit Juice Blend. POM complained that Coke's product had only a small percentage of pomegranate and blueberry juice, and claimed that the product's name and label trick consumers into thinking the product contains a lot of those juices.

But, as Coke argued in a successful motion to dismiss the case before trial, the Nutrition Labeling and Education Act specifically allows juice blends like this to be named after the juices that provide the product's characterizing flavor, without having to name all the juices in the beverage or list their proportions.

The California federal judge and the Ninth Circuit Court of Appeals both agreed that they shouldn’t second-guess Congress and the FDAs decision that this practice is okay.

Federal Regulations and Safe Harbors

POM's appeal boils down to the position that you can still lodge a legal challenge to anything on a regulated label that isn’t affirmatively mandated. For instance, the food label regulations say that Coke can name the juice blend “Pomegranate Blueberry,” naming two ingredients that provide flavor but that are present only in small quantities. But the regulations don’t say that Coke must name those ingredients.

In POM’s view, the fact that the FDA permits juice makers to give their beverages this type of name doesn’t mean that the practice isn’t deceptive. If POM can produce survey evidence that the label misleads consumers, POM should be able to sue. Similarly, labeling regulations clearly permit Coke to have pictures (“vignettes,” in regulatory jargon) of pomegranates and blueberries on the label, but they don’t require that the pictures be of these particular fruits.

This is how POM’s view could translate to other contexts: if the FDA ever defines what “natural” means on food labeling, plaintiffs could pretty much ignore it. The food may qualify as natural by FDA’s definition, but if a substantial number of consumers read the label and think “natural” means something else, the label could be challenged if the product isn’t whatever they think it means. Regulations that permit, but don’t affirmatively require, a food maker to do something would provide no safe harbor against litigation.

Coke’s view of the law is that if FDA regulations expressly authorize a certain labeling practice, even if they don’t mandate it, then it is inconsistent with those regulations for a court to find that the authorized practice is nonetheless misleading and should be stopped. In contrast to POM, Coke argues that approved but non-mandatory labeling practices create safe harbors—that is, if the Congress and the FDA (an enforcement agency, part of the executive branch) specifically allow a practice, they are saying it’s non-misleading. And there is some language suggesting that is true. (However, the FDA’s statement that, “The agency also concludes that it is not necessary to require that each juice in a beverage be named to ensure that the label is not be [sic] misleading” occurred in the discussion of comments upon publication of the regulations rather than in the regulation itself.) Litigation challenging such things as misleading contradicts that finding and therefore should be precluded.
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Pain Scale Reduction Chart Recorded During Trial

* Clinical Trial conducted by Morton Scientific Group, Cambridge, Ontario, Canada
“Could” versus “Does”
According to the parties in POM Wonderful v. Coca-Cola, much also hinges on another issue: whether a claim should be barred only if the government does regulate something, or if it should be barred because the government could—i.e., has authority to—regulate it. Beyond this issue of principle there is a practical issue: the line between “could” and “does” is not as bright as it might sound.

Where the government has issued some regulations concerning a label, has it regulated the whole label, or just the parts of the label specifically discussed in the regulations? And even as to those parts, has it “regulated” every characteristic, or only those mentioned in the regulations? The government may regulate the wording of a common and usual name for a product, but not how prominently that name is displayed. It may regulate the font size of a disclosure, but not its color or exact placement on the label. It may regulate whether images of minor ingredients may be used, but not, to quote one of POM’s trial-level arguments, how “luscious” they appear.

Assuming that the FDA never gets around to regulating the degree of lusciousness of a label vignette, it would seem that plaintiffs always will be able to find something about a label that has not been affirmatively regulated. Proving that the unregulated aspect causes some deception is another matter.

**Implications beyond Competitor Actions**

POM Wonderful v. Coca-Cola is a competitor false-advertising action brought under the federal Lanham Act. Section 43(a) of the Lanham Act gives a federal right of action for false advertising to a company’s competitors and a narrow band of other interested parties. Consumers and other customers generally can’t sue for false advertising under the Lanham Act or any other federal law. So, on its face, this Supreme Court case won’t control consumer class actions brought under state deceptive-practices laws, which typically involve much higher damages claims and have become a significant issue for advertisers.

But it may not be that simple. The defense argument that “the federal government has already regulated my label; you can’t challenge it” exists also in state-law deception cases and is an important defense when a regulated label is challenged. In the state law context, it has a different name and different philosophical roots.

When previous action by the legislative and executive branches of the federal government blocks action by the courts, as in the POM Wonderful case, lawyers say that the litigation is “precluded,” and the basis is mainly one of appropriate policy and judicial efficiency. Judges respect the turf of the legislative and executive branches and have better things to do than re-decide issues that Congress and the enforcement agencies already have decided. So they lay off, in what is largely a judge-made doctrine. On the other hand, when federal law blocks a state-law lawsuit, it is called “preemption” and reflects the supremacy of federal over state law. Under Article 6 of the Constitution, “the Judges in every state shall be bound ... [by] the Laws of the United States,” and they can’t go around deciding that Congress or the FDA got it wrong. That’s non-negotiable. But it still comes back to the question of which parts of a label are federally regulated—meaning that state judges have to back off—and what parts are not?

There’s no particular reason that the analysis of the two doctrines should be the same or lead to the same result. In practice, though, federal and state false-advertising claims often are made together, when a competitor files Lanham Act false-advertising claims with state unfair-and-deceptive-acts-and-practices (UDAP) claims appended under pendent jurisdiction. POM does this in the case now before the Supreme Court. Often, in such cases, the court decides one issue and then follows the same logic in ruling the same way on the other.

If the Supreme Court’s decision provides clear guidance on whether Lanham Act claims should be precluded, it is easy to imagine courts deciding the Lanham Act preclusion issue first, and then following the same logic to the same conclusion about the preemption of pendent state claims. That logic would then become precedential for other suits alleging state UDAP claims alone—namely, consumer class-actions. So whatever the Supreme Court decides in POM Wonderful v. Coca-Cola, it may have an impact on consumer class action cases.

Given this, advertisers will want to watch this case very closely.
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Which Way to GMO Labeling?

Connecticut passed a GMO-labeling law. But we won’t see GMO labeling any time soon.

“I don’t think it is a Pyrrhic victory,” says attorney Justin Prochnow of Greenberg Traurig in Denver, CO. “While the actual implementation may still be a little off in the distance, each time a law gets passed, it helps the cause of the GMO-labeling supporters. Each time one of these state bills passes, they can point to more people supporting the cause. That being said, it seemed like a little bit of a cop-out by Connecticut. Pass something with teeth that will actually go into effect sometime soon if you are going to do it.”

But Michael McGuffin, head of the American Herbal Products Association (Silver Spring, MD), says, “The Connecticut legislation is pragmatic. It acknowledges that interstate commerce impacts regulators, food producers, and consumers.”

“The legislature appears to have acted on the recognition that the state’s population, by itself, is not a sufficiently large critical mass of consumers for food producers to find a separate mandatory labeling law to be economically feasible,” he adds. “In the absence of a reasonably sized market population, consumer choice may be limited by food producers simply choosing to stop doing business in small markets that come to require mandatory labels.”

But Do Consumers Really Want GMO Labeling?

One of the larger questions is whether consumers really want GMO labeling. Results of one survey, part of a recent paper out of New Jersey’s Rutgers University, titled “Public Perceptions of Labeling Genetically Modified Foods” (Hallman WK et al., 2013), may surprise some. The national survey was conducted by GfK Custom Research on 2,442 people between October 23–27, 2013.

When survey respondents were asked, “What information would you like to see on food labels that is not already on there?” most said that no additional information is needed. Only 7% brought up the issue of GMO labeling on its own. A similar percentage, 6%, does want more information about where the food product was grown or processed.

“The answer is that, depending on how the question was asked, I am sure people would say ‘Sure, why not?’” says Prochnow. “But when it comes down to actually doing something about it, they are less driven.”

CA’s Prop 37. Epic Fail?

If there is such purported widespread support for GMO labeling, we asked several experts, why, then, did two of the most notable state efforts either fail (California’s Proposition 37) or not win without restrictive caveats (Connecticut’s current law)?
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“Bad strategy,” notes Turner. “The draft in California was marred in a way that caused the natural health constituency to divide. Outspent. The pro-GMO anti-labeling forces spent 10 times what the pro-GMO labeling forces spent. Too much focus by the pro-GMO labeling team on TV and not enough on social media and grassroots organizing. There were similar problems in Washington State and Connecticut.”

Federal GMO Law?
Will states join Connecticut’s cause, or will they opt to go a different way: the federal route? “Maine seems to want there to be federal GMO labeling, as it is leery of potentially violating the Constitution’s interstate commerce clause,” notes Prochnow.

“Would a federal law avoid a whole patch quilt of states’ laws? Yes. But will the fact that the food industry is now threatening to sue states that pass GMO-labeling laws help the fight or hurt it?”

“At some point, there is going to be regulation, whether it is disclosure, prohibitions against using certain terms, or other provisions,” notes Prochnow. “I just can’t see the FDA and Congress sitting back while various states pass their own laws. Then again, you would think ‘natural’ [defining the term natural] would find its way onto the FDA’s priority list as well, and we are still waiting.”

Do consumers really want GMO labeling? It all depends on how you ask the question, a recent survey implies.

An award-winning health journalist and consultant, James Gormley has 20 years of experience in the natural products industry. He can be reached at jamesgormley01@gmail.com.
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Halal Nutrition Goes Global

Worldwide, halal certification is a mark of quality and access to a growing market.

By Muhammad Munir Chaudry, PhD, the Islamic Food and Nutrition Council of America (IFANCA)

The ingredient industry is no stranger to halal, the Islamic dietary guidelines pertaining to food, pharmaceuticals, and personal care products. When globalization opened up commerce between developed countries and emerging economies in the 1990s, U.S. food companies rapidly embraced halal certification to overcome entry barriers into Muslim majority countries. The strategy paid off: U.S. companies gained access and market share to large, newly thriving economies like Indonesia, Malaysia, and the United Arab Emirates.

Nutritional, dietary, and functional foods, as well as ingredients, are a prominent category in halal-certified products. Among Islamic Food and Nutrition Council of America (IFANCA) certified companies, large nutritional corporations like Sunrider, Nutrilite, Abbott, DSM, Naturex, Kerry Group, Cargill, and Danisco (a Dupont Company) have used halal as an important growth strategy for many years.

Sunrider International was first certified in 1994. By 2009, the company had 415 different halal-certified products for worldwide distribution. In a 2009 interview, Dr. Tei-Fu Chen, chairman of the board and founder of Sunrider International, said that halal certification was important to the company’s customers.1

Similarly, Nutrilite successfully introduced 67 halal-certified products in 11 markets from 2000 to 2010. In a 2010 interview, Nutrilite’s research scientist in technical and regulatory affairs and halal program coordinator Liliana Totoiu said halal certification was a natural process for the company as it listened and worked to fulfill customer needs in halal markets. According to Ms. Totoiu, the success of Nutrilite’s halal product strategy was its commitment to total customer satisfaction. Approximately 240 million people, who translate to about 40% of the entire population of South Asia, with the majority in Malaysia, Indonesia, and Brunei, are halal product consumers,” added Totoiu.2

Another halal success story is with Abbott’s nutritional products. Abbott first procured halal certification in 2003 after a Southeast Asian market request. When Saudi Arabia made halal certification a

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requirement for all edible imports, certification gained even more importance. By 2009, almost all of Abbott's special dietary and nutritional products obtained halal certification. While Abbott initially only certified products for large Muslim regional markets like Southeast Asia, it later decided to obtain global halal certification for all its halal product lines. “Not only did it make good business sense, it was also the right thing to do,” said Donald Sgontz, Abbott’s manager of halal and kosher programs, in an interview given in 2008. Sgontz attributed the decision in favor of social responsibility because Abbott “wants to provide nutritional products to as many people as possible.” That included the 8–9 million American Muslims. In 2011, Abbott received the Company of the Year award from IFANCA for its halal compliance in manufacturing practices, proactive approach in certification, and message positioning in Southeast Asian markets.

Ingredient companies have also done well when they’ve communicated their products’ halal status. Take the example of DSM, a leading nutritional ingredient supplier. DSM began its halal global strategy in 2008, even though its products were halal for many years. According to Stephan Heck, senior director of quality management at DSM Nutritional Products, halal certification “stimulated curiosity from management to the shop floor level, creating a desired outcome in culture, diversity, and inclusion.” As a B2B player, DSM supports its B2C customers with meaningful information about the nutritional value of DSM’s halal products and their corresponding manufacturing and supply process. Heck said the halal certification experience has been positive and that “beyond growth, halal certification is also an acknowledgement of [DSM’s] Quality Policy to be ‘First Choice.’”

**IFANCA auditors are now traveling to China and Peru as much as they travel to companies in the United States and Canada.**

Today, the growth in the halal-certified nutritional product category shows no signs of slowing down. Halal dietary supplements, vitamin pills, and nutritional foods are crossing regional borders; our IFANCA auditors are now traveling to China and Peru as much as they travel to companies in the United States and Canada. In recent years, the number of private and mid-size companies gaining halal compliance has also increased. Chemi Nutra, a privately held pharmaceutical and nutraceutical company best known for its introduction of phosphatidylserine (PS) and alpha-glyceryl phosphorylcholine (A-GPC), received halal certification in 2009. According to Chase Hagerman, Chemi Nutra’s business development and marketing manager, the company decided to get halal certification for its branded ingredient SerinAid PS due to its worldwide appeal and to prevent any limitations to the brand. “In addition to enhancing the marketability of SerinAid PS, non-Muslims appreciate the third-party credibility IFANCA’s halal certification offers,” said Hagerman. He also added, “It’s hard to pinpoint a direct monetary impact halal certification made, but it was certainly worth it as we are regularly asked by contract manufacturers and finished-product marketers for the paperwork.”

Today, nearly every consumable business with an eye on global trade has incorporated halal as part of product formulation. What changed? According to the Pew Research Center’s Forum of Religion and Public Life, Muslims make up 1.6 billion of the world’s population and are one of the fastest-growing consumer demographics. The center projects the global Muslim...
population to grow at twice the rate of the non-Muslim population over the next two decades, estimating that by 2030, Muslims will make up 26% of the global population, at 2.2 billion. Experts also highlight the Muslim market’s “youth bulge” as another driver for halal goods demand. Sixty percent of the Muslim market is under 30 years old, and 87% of Muslims describe the religious aspects of their lifestyle as “very important.” These facts point to an increasing demand for halal-certified nutritional and wellness products as this Muslim population grows and ages.

In order to further visualize the size of this demand, let’s take a quick overview of the numbers surrounding halal pharmaceutical demand, which are based on expenditure data from various national statistical agencies and pharmaceutical industry associations. Thomson Reuters’s 2013 “State of the Global Islamic Economy” report estimates the combined global Muslim spending on pharmaceuticals was $70 billion in 2012, accounting for 6.6% of global pharmaceutical expenditure ($1,094 billion). Thomson Reuters also estimates that by 2018, global Muslim pharmaceutical spending will climb to $97 billion and make up 7% of global expenditure. Comparatively, this means that the global Muslim pharmaceutical market is the third-largest market compared to top national spenders. In 2012, the United States’ pharmaceutical expenditure was $360 billion, Japan’s was $128 billion, and the global Muslim pharmaceutical spending of $70 billion was followed closely by China at US $66 billion. (See figure on page 24.)

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Turkey is in the lead with the greatest number of Muslim pharmaceutical consumers.8

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IN RESPONSE

The individual Muslim pharmaceutical market size ranked by country is also noteworthy. (See table on page 27.) Top countries with Muslim pharmaceutical consumers include Turkey ($10.4 billion), Saudi Arabia ($5.2 billion), Indonesia ($5 billion), Iran ($3.7 billion), the United States ($3.6 billion), and Algeria ($3.1 billion), based on 2012 data. It is interesting to note that Muslim minority countries, such as the United States ($3.6 billion), Russia ($2.6 billion), France ($2.5 billion), Germany ($2.1 billion), and the UK ($1.5 billion), account for a total expenditure of $12.3 billion. The combination of these minority countries is larger than the largest Muslim consumer pharmaceutical market, Turkey. This disproves the idea that halal-certified wellness and nutritional products can only find profits in large Muslim-population markets.

We also believe the demand for halal nutrition and dietary supplements has increased due to growing global consumer awareness and desire for wellness products. Take the example of Indonesia. The largest halal food spending country ($197 billion in 2013), India now ranks third in terms of Muslim pharmaceutical spending. Could it one day become a leader in halal pharmaceutical spending as well? As the fourth most populous country in the world, it is an attractive market for nutritional companies. Despite the low spending on healthcare ($17 per capita on pharmaceuticals), health-consciousness has made vitamin and nutritional supplements more popular and increased total sales by 11% from 2009–2010. According to Global Business Guide, consumers prefer over-the-counter drugs to prescription drugs. This has fueled a 17% growth rate for over-the-counter drugs compared to a 10% growth for prescription drugs. It is also expected that the

Indonesia ranks third in Muslim pharmaceutical spending but is a leader in halal food spending. Are there untapped opportunities?

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demand for nutritional and dietary supplements will increase with the implementation of the National Social Security System in 2015.

Our overview of seasoned and new players in the nutritional industry demonstrates that halal-certified companies have a clear advantage over their non-halal-certified competitors. However, while participating in the halal market requires halal certification, communicating with halal consumers is also important. Given the speed at which information travels through social media and the Internet, it is prudent to show halal consumers in non-Muslim majority markets the halal status of products. A conscious strategy, combined with proactive consumer engagement, will provide the best results.

References

7. Ibid
8. Ibid

Muhammad Munir Chaudry, PhD, is a 30-year veteran of the food industry. He is the president of the Islamic Food and Nutrition Council of America (IFANCA), a leading organization providing halal certification, consulting, and education services to the industry. Chaudry is also a member of the Institute of Food Technologists; an expert consultant to the World Organization for Animal Health; coauthor of Halal Food Production; and a highly sought-after speaker at global halal conferences. Chaudry received his PhD in food chemistry from the University of Illinois, Urbana-Champaign; MS degrees from the American University in Beirut, Lebanon, and Agricultural University in Faisalabad, Pakistan; and a BS degree from the Agricultural University in Faisalabad, Pakistan.
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The time is right to aim brain health food and drinks at the elderly. But marketers don’t seem to think so.

BY INNOVA MARKET INSIGHTS

Among an aging population, and particularly in the United States, demand is growing for dietary supplements that can help consumers maintain their intellectual capacity, memory, and learning ability. But within the cognitive health food and drink sales channel, older consumers are often left aside; instead, brain health food and drinks focus much more on infant health and development.

In terms of dietary supplements, nearly 9% of the launches Innova Market Insights recorded in 2013 carried a brain health positioning, focusing either on mood health or mental acuity. This percentage of brain health launches was up from 7% in 2012 and from less than 6% five years previously.

In food and drinks, a much smaller 0.9% of global introductions recorded by Innova Market Insights in 2013 carried a brain health claim. Within food and drink launches, the main focus remained on baby food, which accounted for three-quarters of introductions using a brain health claim. Soft drinks had the next largest number of brain health launches, representing just over 5% of total launches and slightly ahead of dairy’s 4.5%.

Omega-3 fatty acids, particularly DHA, are now common in baby and infant foods for brain, eye, and nervous system development. DHA is also growing in the mainstream market, but for a whole range of benefits, including heart and eye health, as well as brain health. With ongoing debate about Recommended Daily Intake levels (RDIs) for omega-3s in the United States and permissible claims, product positioning remains difficult, however, and many products may now just tout omega-3 content without mentioning any specific health claims.

Spain has a large and relatively well-developed omega-3 milk market, now accounting for about 6% of total milk sales. But these products tend to address heart health, rather than brain health. The United States is also seeing rising interest in omega-3–fortified milk, although generally without any specific health claims. Innova Market Insights data indicate that 8% of U.S. milk launches in the 12 months ending September 2013 featured omega-3 claims—well ahead of the global 3%.

An ingredient that continues to make its way from Japan into western markets is GABA (gamma-aminobutyric acid). GABA claims to improve mental focus, balance, and clarity, while reducing stress and increasing relaxation. For a number of years in Japan, it’s been included in a range of products, including teas, soft drinks, and dairy products. (In Japan, GABA is also FOSHU approved for blood pressure lowering, so it may target either, or even both, conditions.)

In the United States, GABA inched towards mainstream entry with Jones Soda’s Jones GABA tea-juice blend in the late 2000s, but the product is no longer on the market. More recently, U.S. soft drink launches with GABA included Genesis Today’s Relax Me berry tea. There is also some activity in energy drinks with GABA, such as the ThinQ Mixed Berry Energy Drink, launched in 2012, claiming to “awaken the mind.”

Rice is a GABA target as well. A number of rice products on store shelves promote GABA content, although these products don’t necessarily refer to any specific health benefits. One exception is Truroots Accent Organic Sprouted Rice Trio, launched in 2013, which has a brain health marketing
platform. Its blend of red, brown, and wild rice is described as “waking up enzymes that activate brain boosting.” The packaging for Minsley Sprouted Brown Rice, meanwhile, advertises the product’s high GABA content—although without referring to any specific benefits.

Another ingredient seeing wider use, in soft drinks, is L-theanine. L-theanine is also promoted for mental acuity and relaxation. Yakult was one of the first on the market with its L-theanine relaxation drink in Japan back in the early 2000s. An interesting recent launch in the UK is Brainwave, a drink made with natural ingredients, led by green tea extracts and including L-theanine. The product markets itself as the first of its kind, claiming that regular consumption can help reduce the risk of developing Alzheimer’s disease or dementia later in life.

Faced with rising concerns over dementia, Alzheimer’s disease, and cognitive decline, and a desire for products to help keep grown-ups sharp, the brain health category has potential for strong growth over the next few years. It remains to be seen how much of that brain health market share will go to food and drinks and away from the more dominant supplements sector.

Currently, there are few brain health foods that specifically target older shoppers. Most products, particularly those fortified with omega-3 fatty acids, focus more generally on the health of children and/or families. But older consumers represent a brilliant marketing opportunity, if products are backed by scientific evidence and relevant claims. N

Innova Market Insights is your source for new-product data. The Innova Database (www.innovadatabase.com) is the product of choice for the whole product-development team, offering excellent product pictures, search possibilities, and analysis. See what food manufacturers are doing around the world: track trends, competitors, ingredients, and flavors. In today’s fast-moving environment, this is a resource you cannot afford to be without.
When the United Kingdom’s Food Standards Agency (FSA) announced new import restrictions affecting shellfish-sourced glucosamine earlier this year, makers of joint-health supplements that feature the ingredient girded themselves for a supply-chain hiccup. After all, despite holding its top spot in the joint-support category, glucosamine (often paired with chondroitin, which also fell under FSA’s directive) is facing, if not outright headwinds, then at least stiff competition from up-and-coming alternative ingredients, not to mention the new import rules and hurdles like persistently so-so evidence as to its efficacy.

But looked at in a different light, these clouds could portend silver linings in glucosamine’s future. For if today’s challenges motivate suppliers to step up with new ingredient formats, improved quality standards, and more rigorous demonstrations of the compound’s pharmacology and effectiveness, glucosamine may come out of this current storm under sunnier skies than before.

Opportunity in Disguise

Even FSAs new rules may be an opportunity in disguise. How so? The directive’s stated purpose is to require that imported ingredients of animal origin—like glucosamine, most of which is derived from shrimp shells—come from EU-certified countries with strict quality controls in place. But that’s just their stated purpose; the subtext, some say, is to keep closer watch on one export country in particular: China.

No stranger to periodic accusations of lax quality and safety standards, China remains “the supplier of shellfish-origin glucosamine,” says Larry Kolb, president, TSI USA Inc. (Missoula, MT). Even with India and Vietnam entering the supply chain, Chinese producers still represent approximately 80% of global glucosamine production “based on information we’ve seen,” says Chuck Ray, technical services manager, Cargill Corn Milling North America (Cedar Rapids, IA).

With so much product coming from China, it’s no wonder UK supplement market-ers were wringing their hands over concerns about shipments impounded at ports and production schedules halted in the absence of key ingredients. “UK brand owners and toll manufacturers are very concerned about the potential implications the new regulations may have on their supply chain,” Kolb says.

But much of their hand-wringing may have been overblown, as demonstrated by a container of Chinese-sourced glucosamine powder that cleared UK border inspection without hassle not long after the clampdown went into effect, as reported by Nutraingredients.com. Nevertheless, for manufacturers to take that as a cue to resume business as usual, Kolb cautions, would be to miss the broader lesson the regulations impart.

To wit, “Shellfish-origin glucosamine is open to all the variability associated with supply chains for marine animal-source products,” he says, and that includes any threats that unsafe products pose to a brand’s reputation. The “obvious answer,” according to Kolb, isn’t to hunt for alternative

Import restrictions. Competition from other joint-health ingredients. These are just some of glucosamine’s challenges today.

BY KIMBERLY J. DECKER
shellfish-origin exporters, but to sidestep shellfish altogether and instead "ensure supply by using vegetal glucosamine."

Vegetarian glucosamine—produced via fungal or bacterial fermentation—has been available for years, but its share of the glucosamine market vanishes by comparison to that of shellfish products. Even so, vegetarian glucosamine offers several advantages, only the first of which is exemption from FSAs’s restrictions. Formulating with a vegetarian ingredient also exempts finished products from the need to bear shellfish allergen warnings on pack labels. And the products’ plant-based origins appeal to some consumers—vegetarian and omnivorous—as somehow safer, cleaner, greener, and more trustworthy.

Ray notes that customers find his firm’s domestically produced vegetarian glucosamine “reassuring.” And though he concedes that based on current publicly available information, it appears industry’s production capacity may be insufficient to satisfy total global demand, “vegetarian-source producers continue to explore new technology and efficiencies to meet that demand,” he says.

**Maturing Market**

Interest in vegetarian products has been a shot in the arm for glucosamine, injecting much-needed buzz into this well-established sector. And producers appreciate the fresh attention. As Cal Bewicke, president, Ethical Naturals Inc. (San Anselmo, CA), says, “As a supplier of vegetable-source material, we have seen sales grow steadily.”

But the paradox of being an established ingredient is that, periodic shots in the arm notwithstanding, even stable sales can sometimes feel like the beginning of a slump. So while glucosamine remains “a recognized, mature ingredient,” says Rodney Benjamin, director of research and development and technical support, Bergstrom Nutrition (Vancouver, WA), the competitive nature of the joint-health category forces glucosamine to work harder just to keep pace.

“When you have an ingredient in the marketplace for close to two decades,” that’s par for the course, Kolb says, acknowledging glucosamine’s “flat-to-downward trend.” As for other culprits in its apparent stagnation, fingers point to everything from quality issues like those the FSA directive aims to redress to consumer mistrust of labeling.

On that point, Ray notes that groups like *Consumer Reports* make studies on glucosamine labeling “easily accessible for consumers doing simple Internet research.” Unfortunately, he says, “a minority of products evaluated in these studies is not meeting label-claim amounts for the ingredients of...”
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interest. Although we don’t have any hard data on how this affects consumption, it certainly doesn’t help the ingredient’s reputation, nor that of the joint-health segment or dietary supplements in general.”

When it comes to the quality issue, Tim Hammond, vice president of sales and marketing at Bergstrom, points out, “Any time concerns arise, it has some impact on an ingredient’s ability to gain or even hold market share.” That impact only ampliﬁes as competition from supplement alternatives increases “and the push to differentiate products continues to be a driving force.”

Such competitive forces are acting on glucosamine now more than ever, as new joint-health supplements vie for a slice of glucosamine’s dominance. “There are many ‘me-too’ ingredients and a lot of confusion in the marketplace with the myriad joint-care formulations that tout the same beneﬁts [as glucosamine],” Kolb says. Eggshell membrane, curcumin, ginger, licorice, SAMe (S-adenosyl methionine)—even shark cartilage and krill oil: “All of these take a piece of market share from glucosamine.”

Yet scientiﬁc evidence supporting their effects “is very limited,” according to Kolb. “While some initial studies show potential beneﬁts, they haven’t yet been tested to the degree that glucosamine has over several decades.” And though the up-and-comers may attract notice, Alice Chin, director of quality control, GWI (Green Wave Ingredients; La Mirada, CA), emphasizes that their market share remains “very small.” As she says, “It’s difﬁcult to replace the ‘golden formula’ of glucosamine, MSM—methylsulfonylmethane—‘chondroitin, and sodium hyaluronate, as it’s so cost-effective, so sophisticated, and works so well.”

Scientiﬁc Support
Or does it? The operating theory is that glucosamine supplementation maintains the structural and functional integrity of the joint, Kolb says, resulting “in signiﬁcantly less knee-joint degeneration, less joint-space narrowing, and signiﬁcant symptom improvement.” We also know that glucosamine, an endogenous aminomonosaccharide, participates in the biosynthesis of glycoproteins and glycosaminoglycans and is itself highly concentrated in cartilage.

But studies examining glucosamine’s ability to improve joint health and/or ameliorate the symptoms of osteoarthritis have been conﬂicting, at best. The National Institutes of Health–sponsored Glucosamine/Chondroitin Arthritis Intervention Trial (GAIT)—the largest randomized, double-blind, placebo-controlled study on the supplement—has yet to conﬁrm whether glucosamine is effective in treating osteoarthritis.

Nevertheless, Kolb maintains, “Numerous studies lasting from a few weeks to three years have reported that oral glucosamine supplementation can signiﬁcantly improve symptoms of pain and joint functionality. Besides bolstering the scientiﬁc evidence for glucosamine’s effectiveness and safety, recent studies have provided new insights on how glucosamine actually works.”

For example, we’re learning that glucosamine inhibits interleukin 1-beta, a cytokine protein whose increased production triggers inﬂammatory reactions and, perhaps, cartilage degradation. By stimulating the production of proteoglycans, key components of the extracellular matrix, glucosamine also helps boost the body’s internal mechanisms of “hydration and swelling pressure to the tissue,” Kolb says, “enabling it to withstand compressional forces.”
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Benjamin notes that MSM—“another mature ingredient”—has also been the focus of research, with several new studies demonstrating its potential, in combination with glucosamine, to reduce joint pain and oxidative damage. One recent study of patients with osteoarthritis of the knee (Usha PR et al.) involved a randomized, double-blind trial comparing MSM, glucosamine, both, or placebo, Benjamin explains. Its conclusion: the combination of MSM and glucosamine reduced pain and swelling and improved joint functionality better than either compound alone. “Additionally,” Benjamin says, “the study reported that the onset of analgesic and anti-inflammatory activity was also more rapid with the combination.”

Then there are studies looking at the combination of glucosamine and chondroitin sulfate, the former’s frequent sidekick in joint-health formulations. Kolb points to the Long-term Evaluation of Glucosamine Sulfate (LEGS) study as showing that 1,500 mg of glucosamine sulfate plus 800 mg of his company’s bovine-source, low-molecular-weight chondroitin sulfate taken daily for two years “provided a meaningful reduction in potential cartilage loss in participants with early symptoms compared to a placebo.” Again, the “team formulation” of glucosamine and chondroitin beat out glucosamine on its own. By contrast, a different study (Gruenwald J et al.) comparing the effects of glucosamine versus a combination of glucosamine and omega-3s from fish oil provided no evidence of improved efficacy over glucosamine alone.

But what, if anything, does the research reveal about glucosamine’s mechanism of action? Ray points to a 2013 study (Lotz et al.) supporting the hypothesis that glucosamine “activates the cellular housekeeping process of autophagy,” he says. Autophagy is a means by which our cells maintain homeostasis, especially in tissues with low turnover, such as cartilage. But like so many other cellular processes, it begins to falter with age, potentially leading to arthritis. This study “provides a possible answer to one of the main gaps in the current research: finding a plausible mechanism of action,” Ray says. He calls it “an important step forward” and adds that the autophagy hypothesis ranked among the International Glucosamine Working Group’s top recommendations for future research.

A surprising link between glucosamine and gut microbiota emerged in a recent study that also confirmed that 12 weeks of glucosamine sulfate supplementation improved osteoarthritis outcome measures (Coulson S et al.). The study found changes in gastrointestinal-tract microbiota profiles, “most notably a reduction in Clostridia sp.,” Kolb says. This suggests that supplementation with glucosamine sulfate might influence the intestinal flora’s metabolic and immunological activities. Indeed, the fact that the decrease in Clostridia was consistent with a decrease in inflammation and an
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improvement of osteoarthritis symptoms hints at a relationship between changes in microbiota and glucosamine activity.

And, finally, Ray cites two recent studies from Japan investigating cartilage biomarkers in athletes (Yoshimura M et al.; Momomura R et al.). In focusing on a healthy population of subjects and measuring biomarkers of collagen turnover, he says, the studies “may be an important step forward in the clinical study of glucosamine on joint health.” What’s more, they offer a strategy for addressing what he says is the second main criticism of glucosamine research: a viable model for performing human studies in a generally healthy population.

And isn’t that the kind of population we all want to be? “Keeping joints healthy before symptoms appear should really be the goal,” Ray says. “Taking joint-health supplements after you have symptoms is analogous to waiting to do something about heart health until after you have chest pain or a heart attack.”

Further, Ray believes that the employment of more precise and quantifiable effectiveness measurements would go far toward increasing not only glucosamine’s but the entire joint-health category’s legitimacy with consumers and clinicians. Currently, subjective questionnaires like the WOMAC (Western Ontario and McMaster) and Lequesne indices let researchers evaluate subjects’ experiences of pain, discomfort, stiffness, functionality, and the like, and X-rays provide data on joint-space narrowing. But Ray thinks we can do better.

“Range of motion and discomfort are important for traditional consumers, as they’re something people can ‘feel.’ But we need to move beyond this,” he says. “What the joint-health science arena needs is a good, practical way of measuring how we keep joints healthy—equivalent to what lowering cholesterol tells us about heart health.” He hopes we’ll soon see more frequent use of biomarkers. “Once scientific consensus on these measures is reached,” he says, “we think we’ll see more definitive studies on the effectiveness various supplements have on joint health.”

And that can only be good for the whole industry. And it proves that rumors of glucosamine’s demise were greatly exaggerated. “The important thing in the joint-health category is that consumers are always looking for something that might help their individual health issue,” Ray says. “We will continue to see different new ingredients touted as joint-health ingredients. Some will gain a measurable audience; most will not. But in the end, glucosamine is still the most widely used, researched, and discussed joint-health ingredient.”

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The Calcium Conundrum

To supplement or not to supplement? Where the science now stands on calcium and cardiovascular risk.

BY IRFAN QURESHI, ND

Calcium is an essential mineral that is a major structural component of bones and teeth. The vast majority of calcium (around 99%) in the body is found in these two tissues. In addition to this important structural role, calcium plays a significant part in blood vessel function, nerve impulse transmission, muscle contraction, and the secretion of hormones.

Dietary intake of calcium is often less than optimal among certain groups in the population. According to the National Institutes of Health (NIH) Office of Dietary Supplements, the groups at greatest risk of calcium inadequacy are males between the ages of 9–13, females between the ages of 9–18, women aged 51–70, and both men and women older than 70. Some estimates suggest that 54% of Americans fail to meet estimated average requirements (EAR) for calcium with diet alone, while 38% fail to meet EARs even when calcium supplement use is taken into consideration.

Still, many take the logical step of using supplements to make up the difference. Current estimates suggest that approximately 43% of the U.S. population use supplements containing calcium to complement the intake of calcium from food. However, recent scientific investigations have raised concerns regarding the safety of calcium supplements, particularly focusing on the impact of calcium from supplements on the risk of heart and vascular disease.

Calcium Supplements and Heart Disease

The evidence that calcium is linked to poor heart and vascular health outcomes includes a randomized controlled trial conducted by Mark Bolland and colleagues from the University of Auckland in New Zealand. The study included 1,471 healthy postmenopausal women with a mean age of 74 who were not taking calcium supplements or other treatments for osteoporosis at the time of enrollment. The women were randomized into two groups: the treatment group (732 women) consumed 1,000 mg of elemental calcium (as calcium citrate) daily in two divided doses, while the second group (739 women) was given an identical placebo. The women were followed up every six months for five years, at which time adverse events were noted. The authors report that the incidence of myocardial infarction was significantly more common in those supplementing with calcium versus those in the placebo group (45 events in 31 women versus 19 events in 14 women, respectively), while a composite endpoint measuring the incidence of myocardial infarction, stroke, or sudden death was also elevated in those supplementing with calcium.

Bolland’s group published a paper in 2011 in which they reanalyzed data from the Women’s Health Initiative Calcium and Vi-
The original trial was a seven-year randomized clinical study of calcium (1 g/day) and vitamin D (400 IU/day) in 36,282 postmenopausal women. The authors of WHI CaD originally reported no adverse effect of calcium and vitamin D supplements on cardiovascular events. However, according to Bolland and colleagues, the fact that a majority of study participants of WHI CaD were consuming personal calcium supplements influenced the conclusions of the study. The purpose of their reanalysis was to analyze data from just those WHI CaD participants who were not taking calcium supplements at baseline. The researchers incorporated this subset of data into a meta-analysis that included eight other trials of calcium supplementation. After analyzing data for 28,072 participants (from the eight trials in addition to the subset from WHI CaD not consuming calcium supplements at baseline), Bolland and colleagues concluded that supplementation of calcium, with or without vitamin D, modestly increases the risk of cardiovascular events, especially myocardial infarction.

Additionally, Qian Xiao and colleagues from the NIH investigated the relationship of dietary and supplemental intake of calcium to mortality from cardiovascular disease by analyzing a subset of data from the NIH-AARP Diet and Health Study. Study participants were AARP members (men and women) between the ages of 50–71. The cohort that was used for the analysis performed in this study consisted of 219,059 men and 169,170 women who were followed for an average of 12 years. Dietary and supplemental calcium intakes were estimated at baseline using a food frequency questionnaire. The authors’ analysis of the data found that men consuming greater than 1,000 mg of calcium per day from supplements had a significantly elevated risk of cardiovascular disease and heart disease mortality compared to men who were non-users of calcium supplements. However, no such associations were noted for women. Furthermore, dietary intake of calcium was not associated with an increase in cardiovascular disease mortality.

However, not all studies on calcium supplementation point to an increased risk of heart and vascular conditions. Joshua Lewis and colleagues from the University of Western Australia conducted an analysis of data from a five-year randomized clinical trial and a 4.5-year follow-up study (the Calcium Intake Fracture Outcome Study) examining the efficacy of calcium in preventing fractures. The analysis looked at 1,460 women over the age of 70 with no current use of medications for osteoporosis and no present illness likely to limit involvement in the five-year study. They were asked to consume 600 mg of calcium carbonate tablets twice per day (1,200 mg total) or an identical placebo.
results of the analysis, which was designed specifically to investigate the association of calcium supplementation and the risk of atherosclerosis and vascular disease, found that women receiving calcium supplements over the five-year study period or during the 4.5-year follow-up did not have a higher risk of death or first-time hospitalization from atherosclerotic vascular disease (including myocardial infarction); in fact, further analysis by the authors showed a protective effect of calcium supplements in those with preexisting atherosclerotic cardiovascular disease.

Moreover, in response to the findings by Mark Bolland’s group, Ross Prentice and others who were investigators on the original WHI CaD trial conducted a further analysis of the data from that trial and a subsequent observational study. When this group looked at the women in the trial not taking personal calcium or vitamin D supplements at baseline, they found no apparent effects associated with calcium or vitamin D supplementation on the risk of myocardial infarction, coronary heart disease, total heart disease prevalence, stroke, or total mortality. In addition to the 36,282 women initially included in the WHI CaD trial, the companion WHI prospective observational study included almost 94,000 postmenopausal women aged 50–79. Data from these combined studies thus was used to generate a broad view of trends associated with calcium and vitamin D supplementation. After analyzing the data, the authors concluded that there was no significant elevation of risk of myocardial infarction in either study. In addition, when 754 women enrolled in the WHI CaD study underwent cardiac CT scans for coronary artery calcium scores at the end of the study, no correlation between calcium scores and supplementation was observed, further supporting the lack of adverse heart or vascular effects.

A comprehensive review of trials reporting on the link between calcium supplementation and cardiovascular disease risk was undertaken by a group of academics and researchers led by Robert Heaney of the Osteoporosis Research Center at Creighton University. Among the contributors to this review were Douglas MacKay of the Council for Responsible Nutrition association (CRN; Washington, DC) and Taylor Wallace, also at CRN at the time. The authors reviewed 16 studies involving more than 358,000 individuals and concluded that there was no indication of a connection between calcium intake and atherosclerotic heart disease or stroke. While a few of the studies included showed a weak positive association with heart disease endpoints, a similar number of trials showed associations in the opposite direction. Taking the overall data into account, the authors suggested that the evidence for adverse cardiovascular effects from calcium supplementation is lacking and does not warrant a change in current Institute of Medicine (IOM) recommendations for calcium.
The IOM currently designates a 2500 mg/day tolerable upper intake level of calcium for adults 19–50 years of age and 2000 mg/day for adults aged 50 and older.

Given the state of current data, the link between calcium supplementation and increased risk of heart and vascular conditions seems speculative at best. As the majority of currently available data show, calcium supplementation is likely safe. However, the findings showing positive associations for adverse heart health effects cannot be totally discounted without additional studies. While the associations are weak, some practical steps may be advisable to ensure that the calcium needs of individuals are being met in a way that mitigates any potential risk of heart health concerns.

Meeting Daily Calcium Needs
As calcium is a critical nutrient for bones and plays significant roles in other areas, ensuring adequate intake is paramount. A finding that doesn’t currently seem to be in conflict is that the intake of calcium from foods is a healthy practice and doesn’t carry any increased risk of adverse heart and vascular conditions. Efforts should be made to increase the intake of calcium-rich foods as a part of the diet.

If calcium requirements aren’t being met through the diet, supplementation is advisable. Calcium supplements should be taken with food and perhaps in smaller divided doses throughout the day. While trying to explain the adverse findings in certain studies of supplemental calcium, Ian Reid and Mark Bolland speculate that bolus doses of calcium...

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are unnatural and acutely raise blood levels of calcium to levels that are potentially harmful. When calcium is taken in food form, the amount of calcium present may be less than amounts commonly present in supplements, while other nutrients and compounds that antagonize calcium absorption are concurrently present in those foods, mitigating the elevation in blood calcium levels. It’s likely that taking calcium in divided doses and ensuring that supplements are taken with food may alleviate this concern.

Calcium’s Helpers

Nutrients required by the body are often co-dependent on other nutrients to support physiological function. Ensuring that overall nutritional intake is adequate goes a long way towards facilitating optimal health. Indeed, the body’s ability to efficiently use calcium is dependent on the supply of several critical cofactors. Three important helpers of calcium that are often inadequate in large percentages of the population are vitamin D, vitamin K2, and magnesium.

The prevalence of vitamin D deficiency in elderly individuals in the U.S., Canadian, and European populations has been estimated by various sources at between 20%–100%. Vitamin D interacts with calcium to facilitate its absorption from the intestinal tract. The active form of vitamin D also supports calcium balance in bone tissue, while it facilitates calcium reabsorption from the kidneys.

While vitamin K intake is often adequate in humans, 90% of vitamin K in the western diet is in the form of vitamin K1. This form plays a functional role in the liver in supporting healthy clotting; however, the menaquinone form of vitamin K (vitamin K2) plays significant roles in the blood stream by activating two important calcium transport proteins—namely matrix Gla protein and osteocalcin—which enhance the efficient utilization of calcium and facilitate the transport of excess calcium to bone tissue. Inactive (or unphosphorylated) forms of these transport proteins have been associated with arterial calcification. A striking indication that suggests the widespread nature of a lack of vitamin K2 in the western diet comes from research showing that up to 50% of osteocalcin in the serum of normal individuals is present in its inactive form.

Magnesium intake has long been thought to be inadequate in the U.S. population. Estimates show that nearly half of individuals consume less than the daily requirement of magnesium from foods. Magnesium deficiency has been associated with heart and vascular diseases, diabetes, and osteoporosis. Like calcium, magnesium is an essential structural component of bone tissue. Magnesium also balances calcium levels in the blood and is important for the metabolism and utilization of vitamin D.

Taking calcium in divided doses and ensuring that supplements are taken with food may alleviate concern.

Ensuring the adequate intake of these three important cofactors along with calcium can go a long way towards mitigating the possibility of any adverse effects associated with imbalanced nutrient intake. The presence of an optimal supply of these helpers facilitates efficient utilization of calcium from supplements and dietary sources, while also potentially reducing overall calcium requirements.

Further research is needed to continue to explore the benefits and potential adverse effects of calcium supplements. The state of research today seems to favor the safety of supplementation with calcium, though concerns will remain given the divergent opinions of scientists. As studies continue to tease out the risks versus benefits, prudent measures include increasing the intake of calcium-rich foods, using calcium supplements smartly to support dietary intake levels, and addressing deficiencies in other nutrients that improve optimal calcium utilization. This can ensure calcium needs are met in the safest way possible.

References

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Promoting health by optimizing immune function is more complicated than just providing the body the nutrition it needs to function well. As immunologists continue to unravel the intricacies of the human immune system, the complexities continue to broaden. Estimates suggest that upwards of 70% of the human immune system resides in the gastrointestinal tract, pointing to the significance of healthy gut function in promoting immunity.

Moreover, our gastrointestinal tract is home to trillions of microorganisms, some beneficial and others harmful. A key to health is keeping these residents happy, healthy, and in balance. Thus, optimizing immune health requires an understanding of the interplay between the body’s largest immune organ (the gastrointestinal tract) and its population of microbes, in addition to ensuring that the body and the beneficial organisms are getting the nutrition needed to thrive.

It is in this light that the science of immunology is leading towards therapies that act on the primary factors involved in this dynamic interplay to attain health. This is why probiotics, prebiotics, and direct immune activators are at the forefront of this movement. Probiotics are healthy bacteria that colonize the intestinal tract to maintain its delicate microbial balance. Prebiotics are substances that support the growth of healthy bacteria preferentially to crowd out the less healthy flora and promote digestive health by enhancing the production of beneficial short-chain fatty acids. And compounds that directly activate or modulate immune processes support health by optimizing multiple aspects of immune function.

Nutritional compounds can uniquely and holistically influence multiple factors of immune health. Several nutritional therapies have the ability to “communicate” with the immune system in both direct and indirect ways, meaning that they interact directly with immune structures while also impacting gut flora immune interactions via prebiotic activity. Three such compounds in particular are larch arabinogalactan (ResistAid), an ingredient from Lonza Ltd. (Switzerland), a dried yeast fermentate complex (EpiCor) from Embria Health Sciences (Ankeny, IA), and yeast-derived beta-glucan (Wellmune) from Biothera (Eagan, MN).

ResistAid

ResistAid is a water-soluble extract from larch trees containing the soluble fiber arabinogalactan and flavonoids with antioxidant activity. Clinical studies on ResistAid have shown its ability to support various facets of immune function. Studies have also investigated the prebiotic benefits of arabinogalactan. Using the SHIME (Simulator of the Human Intestinal Microbial Ecosystem) model—a dynamic in vitro model used to simulate the major compartments of the human digestive tract—researchers evaluated the effect of arabinogalactan (5 g/day for three weeks) on the composition and activity of the microbial environment. Arabinogalactan caused a beneficial increase in short-chain fatty acid production with a concomitant decrease in ammonium production, indicating its prebiotic potential. Arabinogalactan further promoted increases in healthy bacteria and decreases in pathogenic Clostridium perfringens.

Arabinogalactan, of course, also shows direct immune-supportive benefits. Linde Riede and colleagues in Berlin recently conducted a study assessing the ability of arabinogalactan (ResistAid) to prevent the common cold and reduce cold symptoms. This placebo-controlled clinical trial included 199 healthy adults with recurring upper respiratory tract infections (self-reported occurrence of three infections in the six months prior to enrollment). Participants were assigned to consume 4.5 g of arabinogalactan daily or a placebo for 12 weeks. Three assessments were performed during the study: at baseline, after 6 weeks, and at the end of 12 weeks. In addition, if a participant contracted a cold during the study, a visit occurred at the beginning and on the fifth day of each episode. Participants documented their symptoms for a 14-day period. In the 187 individuals included for analysis (12 were excluded due to significant deviations from protocol), the results indicated that significantly fewer participants in the arabinogalactan group contracted the cold compared to placebo (60% versus 74%). In addition, the percentage of symptom-free days in the treatment group was significantly higher than placebo.

Jay Udani of Medicus Research in Northridge, CA, assessed the immune-modulating activity of larch arabinogalactan (ResistAid) in healthy adults aged 18–61 years. This double-blind, placebo-controlled study in 75...
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individuals assessed the ability of two doses of larch arabinogalactan (1.5 g or 4.5 g/day) or placebo taken for 60 days to influence the immune response to a standardized antigenic challenge. On day 30 of the study, subjects were administered the influenza and tetanus vaccines. The serum response to the antigens was then measured on days 45 and 60 and compared to baseline antibody measurements. While neither treatment group demonstrated any significant elevations in antibodies to the flu vaccine compared to placebo, the participants in the group receiving 1.5 g of the arabinogalactan preparation saw a significant rise in tetanus antibodies versus placebo. No significant difference was noted in the higher-dose group, indicating that a low dose of larch arabinogalactan can augment the immune response to bacterial antigens.

EpiCor
EpiCor is a complex fermentation product from baker’s yeast containing antioxidants, protein, beta-glucans, fiber, polyphenols, vitamins, amino acids, and other metabolites. Several studies attest to EpiCor’s ability to modulate immune function. In a recent investigation led by Sam Possemiers from Ghent University in Belgium, EpiCor was studied using the SHIME model (described earlier) and found to have a prebiotic-like effect on gastrointestinal flora. Changes observed included alterations in general flora profile, reduction of pathogenic strains, and increased levels of healthy Lactobacilli and Bifidobacteria. Researchers observed an increase in butyrate production and a significant decrease in pro-inflammatory cytokines.

Clinical studies support EpiCor’s ability to promote a healthy immune response in humans. Mark Moyad, the director of preventive and complementary medicine at the University of Michigan Medical Center, led a study investigating the effects of EpiCor on allergies and allergic rhinitis. This 12-week, placebo-controlled trial included 96 healthy subjects with a documented history of seasonal allergies and allergic rhinitis. The subjects received 500 mg of EpiCor daily or a placebo. Participants were examined at baseline and then followed up at 6 and 12 weeks. EpiCor administration significantly reduced the severity of allergic rhinitis symptoms, specifically nasal congestion and runny nose. The EpiCor group experienced 12.5 fewer days of nasal congestion compared to the placebo group and had significantly elevated salivary IgA levels (an antibody associated with enhanced mucosal immunity).

An additional 12-week study also led by Mark Moyad looked at the impact of EpiCor on cold and flu symptoms in 116 individuals.
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with no recent history of receiving the seasonal influenza vaccine.\(^7\) Study participants were between the ages of 18 and 76 in good general health. The study was conducted during prime cold and flu season (January through March). Individuals were examined at baseline and then again at 6 and 12 weeks, and were asked to record cold or flu-like symptoms in a standardized diary.

Gitte Jensen’s group at NIS Labs in Klamath Falls, OR, assessed the acute and rapid immune-modulating effects in a clinical trial with a crossover design.\(^8\) This double-blind, placebo-controlled pilot study consisted of 12 healthy subjects aged 18–54. EpiCor (500 mg) or placebo was administered on an acute basis, and measurements in the 12 subjects were taken at least two weeks apart (the washout period). At each of the two sessions, serum assessments were conducted before, and at 1 and 2 hours after, administration of the treatment for cytokines, immune cell subsets, activation status of circulating natural killer (NK) and T cells, and antioxidant protection capacity. Compared with placebo, the investigators found rapid changes in serum antioxidant status, cytokine levels, and immune surveillance capacity after the single dose of EpiCor. Moreover, the changes observed in specific lymphocyte subsets indicated a modulatory effect of EpiCor on circulating T and NK cells. The findings of this study highlight the rapid onset of EpiCor’s benefits.

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of beta-glucan from various sources, and suggest that these compounds could be unique contributors to gut health in addition to their immune-health benefits.

Yeast beta-glucans have a long history of research for immune support dating back several decades. A few recent studies highlighted here attest to their powerful immune-enhancement potential. Two recent studies in particular led by Shawn Talbott of GLH Nutrition in Draper, UT, assessed the immune-enhancing effects of Wellmune. In the first study, 77 healthy women with an average age of 38 and moderate levels of psychological stress were administered the beta-glucan supplement (250 mg daily) or a placebo for 12 weeks to reduce the incidence of cold and flu symptoms. The participants consuming Wellmune had fewer upper respiratory symptoms compared to placebo. Additionally, individuals in the Wellmune group reported better overall mood and superior mental and physical energy levels. The results indicated that daily use of the supplement supported immune health in the face of daily stressors.

The second study looked at the impact of Wellmune in ragweed allergy sufferers. This randomized placebo-controlled study included 48 participants with a mean age of 36. Serum IgE concentrations (an antibody associated with allergies), allergy symptoms, quality of life measures, mood, and physical function were assessed at baseline and again after four weeks of daily administration of Wellmune (250 mg) or placebo. When compared to placebo, Wellmune reduced total allergy symptoms and symptom severity, including nasal symptoms, eye symptoms, and non-nasal symptoms, but had no effect on serum IgE concentrations. Additionally, participants in the treatment group reported increased physical health, energy, and emotional well-being compared to participants in the placebo group.

A recent study evaluated the ability of yeast beta-glucan to support mucosal immunity and prevent upper respiratory infections after strenuous exercise. Strenuous activities are known to suppress mucosal immunity for up to 24 hours, during which the body is more vulnerable to developing upper respiratory infections. Led by Brian McFarlin from the University of North Texas, this two-part study looked at whether yeast beta-glucan (Wellmune) could positively impact immune function in individuals undergoing intense exercise.

The first study included 182 men and women post-marathon and investigated beta-glucan’s (250 mg/day) ability compared to placebo to prevent upper respiratory infection symptoms for 28 days. The results of the study indicated that those supplementing with beta-glucan had a 37% reduction in the number of days with upper respiratory symptoms compared to placebo. In the second study including 60 men and women, yeast beta-glucan (250 mg/day) or placebo was administered for 10 days prior to undergoing a 50-minute-long strenuous cycling task. At two hours post-exercise, salivary IgA levels were increased by 32% compared to placebo, indicating the ability of the supplement to enhance mucosal immunity after vigorous exercise.

Enhancing immune vigilance requires addressing the multiple factors that influence immune health. These include the structural integrity of the gut barrier, direct support of immune processes, and supporting a healthy balance of microbial flora. Using nutritional compounds that influence these three major areas can holistically help ensure the immune system functions at peak levels.

References


Irfan Qureshi, ND, is chief regulatory officer for Vitamin Research Products LLC. His current focus includes oversight of product development, regulatory affairs, quality control, and quality assurance.
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Collagen, not unlike Cheap Trick, is big in Japan. Sure, it has a loyal following here in the United States, where it appears in joint-health supplements and cosmeceuticals—topical products—that promote skin, nail, and hair health. But in terms of sheer gusto for this structural protein—which accounts for at least a quarter of the body’s total protein content—American consumers can’t hold a candle to their Japanese counterparts, who until recently comprised 90% of the world collagen market, according to Lauren S. Clardy, principal, NutriMarketing (Santa Rosa, CA).

So what do Japanese consumers “get” about collagen that we don’t? In a phrase, its nutricosmetic value. For while American shoppers have been slow to embrace nutricosmetics—skincare supplements that deliver their nutrients internally, rather than topically, to generate “beauty from within”—their peers in Japan have driven the category’s growth from the start, gobbling up roughly $777 million of the beauty-boosting tablets, capsules, foods, and beverages in 2010 alone, according to research firm Euromonitor International (London).

It’s safe to say that many of those nutricosmetics were vehicles for collagen. “Oral ingestion represents more than 95% of the Japanese collagen market, with millions of people in Japan taking collagen daily,” Clardy says. If American consumers want to reap collagen’s beauty benefits themselves, they’d be wise to follow suit. For the more we learn about collagen’s relationship to healthy, young-looking skin, the clearer it becomes that this protein works its magic better from the inside out than the outside in.

Science Sets the Stage

Americans’ tepid response to nutricosmetics has frustrated industry insiders and observers for years. After all, we’re a nation of supplement users; and with some 70 million baby boomers staring retirement in the face, domestic demand for antiaging products, including collagen-containing nutricosmetics, could top $114 billion by 2015, per Global Industry Analysts (San Jose, CA) research.

But among the explanations posited for our moribund nutricosmetics market, perhaps the toughest to refute is consumer skepticism about the products’ efficacy. And that’s why emerging science on collagen pharmacokinetics bodes so well not just for supplement manufacturers hoping to put collagen’s skin-supporting promise into practice, but for a public keen to turn back time’s hands, as well.

“Over the decades, collagen science has advanced considerably,” says Jessica Mulligan, vice president, sales and marketing, NeoCell (Irvine, CA). While convincing research was “scarce at the outset,” she says, “dozens of more recent clinical studies have confirmed collagen’s effectiveness as an oral supplement for skin benefits.”

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and in Europe, where nutricosmetics also enjoy broader acceptance than in the United States. But universities and laboratories on our shores are now helping advance the science behind collagen’s beauty potential. “Several aspects of its antiaging skin benefits are being investigated using sophisticated testing machinery that measures skin qualities such as suppleness, wrinkle reduction, hydration, elasticity, and more,” Mulligan says.

Building Blocks
To make sense of the results, a quick refresher on this hardworking protein is in order. To start, collagen is a fundamental component of artery walls, cartilage, and the corneas of our eyes. “It’s in the myofibrils of skeletal and cardiac muscle, and in the extracellular connective tissues,” says Nena Dockery, technical support manager, Stratum Nutrition (St. Charles, MO). “It’s the main component of scar tissue.”

Most relevant to the nutricosmetic discussion, collagen constitutes 80% of the skin’s dermal layer, where its presence is so central that Jason Kwon, technical sales, Vesta Pharmaceuticals (Indianapolis), calls it, “essentially, the foundation of skin.” To the extent that healthy skin is smooth and wrinkle free, he says, we can largely credit “the rigid structural support that collagen and connective tissue networks provide.”

That support is a consequence of the very amino acid-rich composition of collagen itself, wherein hydroxylated proline residues form the basis of the protein’s fibrous structure. Fibroblast cells in our bodies produce these fibers by “spinning” the collagen proteins into strands that exhibit formidable tensile strength. “The collagen fibers then intertwine into a triple helical subunit,” Kwon says, “which then crosslinks further to provide a rigid, complex network on which the cells of the skin can grow.”

By age 45, collagen levels may have dropped by as much as 30%.

Downward Spiral
Fibroblasts spin out dozens of types of collagen, with types I and III predominant in skin. And while the spinning process proceeds smoothly for decades, the machinery starts to slow by a rate of about 1.5% annually after age 25, says Kathy Lund, vice president, business development and marketing, AIDP (City of Industry, CA). By age 45, collagen levels may have dropped by as much as 30%. “This leads to increased skin dryness, wrinkles, and a lackluster appearance,” Lund notes.

Not only does collagen production decline with age; its breakdown amps up, as catabolic enzymes attack the protein’s fibrillar network. And while a certain degree of crosslinking is necessary to knit collagen units together, that crosslinking accelerates in older
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The trick to doing so, Mulligan says, “is to increase the body’s natural collagen production back to its youthful level so that it can rebuild and strengthen the skin.” And that calls for oral supplementation. “Only when taken orally does a special set of amino acids—the building blocks of collagen proteins—signal the body to increase collagen production,” she says.

Topical application can’t effect the same changes, as collagen is too large a molecule to penetrate the skin. “This means that topical collagen doesn’t stimulate collagen production on a cellular level the way collagen supplementation will,” Mulligan continues. And though topical collagen may produce local results at the skin’s epidermal layer, those results are superficial and temporary. “Topical collagen’s benefits are lost each night when the cosmeceutical is washed off,” she points out.

Of course, experts aren’t recommending that consumers compost their collagen creams and serums en masse. As Clardy points out, the collagen question need not boil down to “a battle” between nutricosmetics and cosmeceuticals. “Both have benefits, and work in conjunction,” she asserts. “That being said, most clinical data support the benefits of oral ingestion.”

The Breakdown
But even orally ingested collagen can produce uneven results if it’s not the right collagen for the job. And as research reveals more about the protein’s mechanism of action in skin and its cells, both collagen suppliers and supplement manufacturers are learning which collagen forms and types make for the most effective nutricosmetic ingredients.

Perhaps the top priority is bioavailability. As Dockery explains, “Supplemental forms of collagen, either taken orally or applied to the skin, must cross barriers” before making themselves available to the tissues. The most imposing barrier orally ingested collagen confronts is the human gut, where digestive enzymes begin breaking down the collagen molecules into smaller peptides and amino acids for absorption through the intestinal wall. “The body must then reassemble these building blocks into proteins—both collagen and others—that our bodies need,” Dockery says.

But if the collagen arrives at the gut in a form too big for our digestive machinery to manage, it’s “not completely absorbed through the intestinal wall and can’t be re-assembled or used by the body as collagen,” she continues. Thus, by partially hydrolyzing the collagen first—cutting it into smaller, lower-molecular-weight chunks—we “ensure the ready absorption of its components into circulation.”

For maximum bioavailability in nutricosmetics, Ahmad Alkayali, CEO, president, Certified Nutraceuticals (Murrieta, CA), recommends formulating with type I and III collagen peptides hydrolyzed to a molecular weight below 5,000 Daltons; by contrast, the type II collagen produced by chondrocytes and commonly used in joint-health formulations usually appears in such products at molecular weights exceeding 20,000 Daltons. Further, Alkayali says, hydrolysis should target liberation of peptide chains “rich in the key amino acids hydroxyproline and disulfide linkages,” Kwon says. “Age and increased exposure to sun and free radicals cause harmful oxidative stress to these chemical bonds, compromising the integrity of the collagen.” Environmental factors like smoking, pollution, and day-to-day anxiety amplify the effect, leaving skin wrinkled, coarse, and older looking. “Thus,” Kwon says, “it’s essential to replenish the right building blocks to aid in rebuilding collagen with the proper chemical bonds.”

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and proline,” as these best stimulate fibroblast cells to produce more collagen.

**Playing to Type**

Though it’s true that “all collagen types do not have the same ‘blueprints,’” as Alkayali says, and that “each type has its own amino acid structure that the body recognizes for specific structural rebuilding,” Joosang Park, vice president of scientific affairs, BioCell Technology (Newport Beach, CA), cautions supplement makers against focusing too heavily on collagen type when selecting ingredients for nutricosmetic formulations.

Namely, Park believes that the association of collagen types I and III chiefly with skin, hair, and nails, and the primary association of type II with joint health, creates “a great degree of misunderstanding about the types of collagen found in collagen supplements.” What really matters to the consumer, he says, “is not the collagen type, but its bioavailability and efficacy.”

For example, his company’s BioCell Collagen is a matrix of hydrolyzed type II collagen—normally thought of as the “joint collagen”—and glycosaminoglycans (GAGs) sourced from chicken sternum cartilage. Yet, he says, “multiple human studies showed that its ingestion improved not only joint health, but also reduced various signs of skin aging through the support of collagen and GAGs, which may help regenerate the extracellular matrix.”

**Collagen Sidekicks**

One of the most important GAGs for skin health is hyaluronic acid (HA), which, as part of skin’s extracellular scaffold, “serves as a core protein in which glycosaminoglycans link,” Kwon says. Acting much like a lubricant, HA “helps retain water within the skin; thus, it’s essential to giving skin its supple, youthful appearance.”

Yet as with collagen, HA levels decrease with age, “deflating” skin and allowing wrinkles and roughness to emerge. That’s why collagen suppliers frequently pair collagen peptides with HA in nutricosmetics both to goose collagen production and hydrate skin tissues at once.

And HA isn’t the only sidekick capable of increasing collagen’s effectiveness. The glycoprotein fibrillin—like collagen, a product of fibroblast cells—settles into the extracellular matrix to provide a framework for the deposition of elastin, another protein that gives skin elasticity.

Some nutricosmetics deliver these proteins along with collagen; others are designed to help the body better generate them on its own. That’s the case, according to Oliver Wolf, head of advertising/print media/exhibitions for global marketing and communication, Gelita (Sergeant Bluff, IA), with his company’s Verisol Bioactive Collagen Peptides. A recent double-blind, placebo-controlled trial showed that Verisol, when taken orally, not only reduced wrinkles, but increased synthesis of type I collagen, elastin, and fibrillin.1

Female subjects aged 45–65 received either 2.5 g of the collagen ingredient daily or a placebo for eight weeks, and had their skin wrinkles measured before treatment, at four and eight weeks into the protocol, and, finally, at four weeks after treatment ceased. Results showed that reductions in eye-wrinkle volume among the treatment group were statistically significant at four weeks and grew more pronounced at eight, attaining a maximum reduction volume of 50%. Further, Wolf says, “Pro-collagen type I content was increased by 65%, elastin by 18%, and fibrillin by 6% after eight weeks of Bioactive Collagen Peptide treatment.”

Other nutrients to consider adding to nutricosmetic formulations include antioxidants “to prevent free radicals from attacking the body’s healthy collagen,” Mulligan says. Furthermore, supporting nutrients like silica, biotin, and vitamin C can increase the efficiency of the body’s internal collagen-production mechanism. NeoCell’s Beauty Infusion includes vitamin C, alpha lipoic acid (ALA), and biotin to “work synergistically” with the base formula.

**From the Source**

Some consumers are also concerned about where the collagen comes from. Two of the most common industrial sources are bovine and porcine tissues, the latter of which is neither kosher nor halal, while the former, despite industry safeguards, can bear the perceived risk of potential contamination with bovine spongiform encephalopathy (BSE).

Marine-source collagen, extracted from fish skins and scales, appears to be a palatable alternative that also produces noticeable beauty-boosting results. AIDP’s Lund notes that participants in a double-blind, placebo-controlled study (not yet published) using her company’s Natricol fish collagen enjoyed significantly better skin hydration after 6 and 12 weeks, as well as significantly improved skin elasticity measures at an experimental dose of 10 g. Lund says that the collagen’s “higher ratio of peptides” permits better digestibility compared to porcine and bovine sources, “allowing the body to circulate amino acids necessary for collagen fibril synthesis.”

Clardy is also a fan of marine-source collagen, noting that research supports the claim that type I peptides extracted from fish are smaller, more readily shuttled into circulation, and thus more bioavailable. “Marine-collagen peptides are also characterized by their specific amino-acid composition,” she goes on, with a high concentration of glycine, proline, and hydroxyproline to stimulate collagen synthesis. She adds that the number of hydroxyproline-containing peptides in TruMarine Collagen, an ingredient from supplier Nippi Collagen NA (Burnaby, BC, Canada), is “significantly higher than in any other collagen form, and is detectable in blood after ingestion.”

And don’t forget eggshell membrane. “Eggshell membrane provides a more desirable source for many because of its pure derivation from eggs and its content of...
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other supporting ingredients, such as additional glycosaminoglycans, and both elastin and keratin, which are also components of healthy connective tissues,” Dockery says. Eggshell membrane also delivers a different mix of collagen types, including types V and X, in addition to the type I necessary for skin development and maintenance.

**Closing the Deal**

Eggshell membrane is “also a sustainable ingredient that’s safe and minimally processed,” Dockery adds, which should appeal to America’s reluctant nutricosmetic consumers. But to truly close the deal, supplement manufacturers must provide not only safety, sustainability, and scientifically backed efficacy, but novelty in product delivery and format to attract consumers’ notice.

“We feel that incorporating collagen into functional delivery systems like drink mixes and chews is a natural progression for the nutrient,” Mulligan says. As an example, she points to her company’s Beauty Infusion drink mixes. “We’ve created the first delicious line of flavored drink mixes that infuse collagen and other beauty-stimulating nutrients into an easy-to-consume drink mix that can be added to liquids like juice or water.”

Clardy notes that portability and convenience score points, too. “Products consumers can carry or that are easily incorporated into meals and beverages” will expand the market, she believes. “Collagen-loaded stick packs; powder-, liquid-, or jelly-based shots; gummies and chews; and other alternative delivery formulations will continue to grow in popularity.” A particularly novel alternative is the sipping straw that Nippi developed in partnership with Unistraw (Singapore). Using the latter’s Unistraw delivery system, the Inner Beauty Sip Straws are filled with TruMarine collagen beadlets that dissolve as the consumer sips a beverage through them. The product attracted enough buzz to become a finalist for the SupplySide Editor’s Choice Awards in the nutricosmetics category at last year’s SupplySide West show.

That kind of buzz may pique consumers’ curiosity and draw them closer to nutricosmetics after all. As Clardy says, “The good news is that the U.S. nutricosmetics market offers tremendous expansion potential. New and creative product launches are continuing to grab consumers’ attention, while specific demands will help shape and define this category in the future.”

**References**


Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.
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Because arguments can be made for just about every fruit being a “superfruit,” there is no need to speak ill of some fruits for being nutritionally inferior to others. It is, more importantly, worthwhile to explore each fruit’s unique contribution to human health.

Researchers and suppliers continue to unearth interesting details about these seedy, juice-filled wonders, from exotic fruits to domestic ones. Here are a few of the more peculiar findings of late.

**Black Chokeberry**

Of all the delicious berries that spot the United States and Canada, black chokeberry is likely not the first that comes to mind. But this blueberry-sized fruit does grow here, and it has a deeper connection to the land than one might think.

In the latest edition of the American Botanical Council’s (ABC) *HerbalGram*, Gayle Engels and Josef Brickmann author an entertaining, although members-only black chokeberry review, which details the cultural and agricultural history of black chokeberry, along with insights on its potential human health benefits. (A yearly membership to ABC is really worth it for gems like this.) As Engels and Brickmann explain, black chokeberry, also known as aronia, is predominantly harvested in Poland. Surprisingly, though, this perennial shrub has a checkered past with early North American inhabitants: According to an ethnobotanical account from 1933, the Forest Potawatomi tribe reported that “they eat the berries from this plant, but they are entirely too bitter to suit the white man.” Among North American settlers, both the berries and the bark were used as an astringent.

Whether because of changing local palates or some other factor, North American consumption of this berry is not what it once was. But black chokeberry is still native to North America. It only reached Poland as recently as the 1980s, presumably by way of both North American and Russian cultivars. Engels and Brickmann say that today’s U.S. black chokeberry production is “but a fraction of total world output, albeit an increasing one.” They site records from the USDA National Organic Program that show there were as many as 40 domestic and certified organic producers of black chokeberry or aronia listed in 2012.

Throughout the world, black chokeberry is consumed in products such as preserves, cereal bars, juices, gummies, and liqueurs. FDA even allows manufacturers to use this darkly colored fruit as a safe and acceptable coloring agent.

Given the success so many other berries enjoy in U.S. and Canadian markets, black chokeberry shouldn’t have a problem scaling up production and consumer interest as an alternative berry. Engel and Brickmann also note that cross-breeding has yielded some sweeter-tasting cultivars over the years.

**Pomegranate**

Because of its high price and short harvest season, pomegranate is occasionally adulterated at the supply level. Actually, it’s often adulterated at the supply level. According to domestic supplier POM Wonderful (Los Angeles), pomegranate juice imports were so often adulterated last year that FDA placed an “Import Alert” on several suppliers.

In order to help concerned juice manufacturers, Spanish researchers are analyzing the nutrient changes that occur when pure pomegranate juice is mixed with common...
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pomegranate juice adulterants, namely peach juice and grape juice.

Peach juice and grape juice are relatively cheap ingredients in Spain and presumably other countries, but researchers at the Miguel Hernandez University of Elche say these juices are used to adulterate pomegranate for different reasons. Peach juice can make pomegranate juice taste sweeter and less astringent, and grape juice can mimic pomegranate juice’s deep red color.

Hoping to improve everyone’s ability to detect potential adulteration, the researchers analyzed pomegranate juice from two popular cultivars—a 4:1 ratio of “Mollar de Elche” and “Wonderful”—and compared the resulting nutrient levels to those of the same pomegranate juice mixed with peach juice or grape juice. By quantifying a broad range of minerals, organic acids, sugars, and other compounds that were present, the researchers settled on a few observations that could, in many cases, signal potential adulteration.

Even though pomegranate and grape share similar sugar profiles (mainly fructose and glucose) peach juice has a completely different sugar makeup, with sucrose as the predominant sugar. Substantial presence of sucrose could be a sign of adulteration with peach juice or even sugar cane. As for detecting grape juice presence, look for significant increases in the amino acid proline.

POM Wonderful, which creates pomegranate products from the Wonderful cultivar used in the study, is pleased to see this kind of research taking place in support of an honest marketplace. For further details, read “What Is in Adulterated Pomegranate Juice?” at Nutritional Outlook online.

Blackberry

Blackberry juice is a delicious juice. But could it be that probiotics like this juice as much as our taste buds do?

Researchers at the University of Maryland seem to think so. In a series of tests on blackberry juice and milk, they found that adding 10% blackberry juice to milk containing probiotics actually promotes the growth of some of these friendly bacteria. The effect was apparent without milk, too, but manufacturers may be most interested in the milk results, because dairy products are already popular vehicles for probiotic delivery.

When Lactobacillus species (L. rhamnosus, L. casei, and L. plantarum) were grown on cell plates, the addition of 10% blackberry juice improved plate counts for all three species,
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especially *L. rhamnosus*. Why this happened is still a mystery, but the researchers presume that blackberry juice could be utilized as sugars by *Lactobacillus* species in milk and other slightly acidic environments.

The bacterial benefit, however, did not end with probiotics. When blackberry juice was added to cell plates containing foodborne pathogens (*E. coli, L. monocytogenes*, and *S. typhimurium*), growth of these harmful bacteria decreased. The effect may be especially related to blackberry’s high content of ellagitannins, compounds which have shown antimicrobial potential in other berry studies.

Further hypothesizing, the researchers said, “The possible reason for this inhibition could be the partial hydrophobicity of phenolics, anthocyanins, and proanthocyanidins, which allows them to bind to the outer membrane of the bacteria, causing changes in fluidity.”

This latest study on blackberry juice and bacteria was performed with highbush blackberry (*Rubus fruticosus*). Before Sagu’s team came along, the most recent declaration for optimal juice production was a hot water extraction at 95°C (203°F) for 120 minutes. Since then, researchers have found that as temperature increases on banana juice, so does the loss of nutrients. Hoping to find sufficient (yet less intensive) extraction conditions, Sagu and his team treated banana pieces to hot water extraction at a range of temperatures (35–95°C) and times (30–120 min). His team found optimum conditions for hot water extraction of banana juice to be just 33°C for 108 minutes with an enzyme concentration of 0.03% v/w.

Sagu and his colleagues say there is good reason for companies to manufacture banana juice, because the juice would be naturally high in potassium and would repurpose the “considerable amount of this fruit [that] is wasted due to inadequate processing and preservation techniques.” Presumably, multiple species of banana are suitable for making banana juice, but the bananas used in this study were ripe *Musa acuminate*, also known as Dwarf Cavendish bananas, with green skin. In the United States alone, an estimated 4.35 million tons of bananas were imported in 2012. Just think how much juice that could have made.

**Banana**

So many fruits are enjoyed as juices, but rarely bananas. The pectin content of these fruits makes extraction of their juices especially difficult. Yet, even with this challenge, efforts to extract banana juice have not let up, and researchers from Cameroon and India now claim they know the optimal conditions for banana juice extraction.

Banana juice has been a scientific endeavor for years. Previous studies were based mainly on drying bananas—but also on puréeing them—and researchers had success when using hot water extraction, commercial enzymes (to clarify the juice), and a fine mesh to separate the liquid from the pulp. Still, Sorel Tchewonpi Sagu from the University of Ngaoundere in Cameroon, and three colleagues, are concerned that the heating requirements established in previous studies are unnecessarily intense.

**Acai Berry**

While analyzing the mineral content of acai pulp, Brazilian researchers discovered that acai is extremely rich in manganese.

In the study on freeze-dried acai pulp from various harvests in São Paulo, researchers recorded desirable levels of calcium, iron, and zinc. But a mere 300 ml of acai was enough, they say, to put an adult at least six-fold above the reference daily intake for manganese. Some Brazilians likely consume this much acai on a daily basis, but acai suppliers say that acai purée is hardly available in such quantities to the average consumer outside of Brazil.

Manganese is still useful for purposes including but not limited to skin health and blood sugar control, but the researchers say excess manganese may have adverse effects on the brain, “leading to a set of symptoms similar to Parkinson’s disease (manganism).” Manganese can also deplete iron, because the two elements compete for the same carriers in the body. Despite the scares, the researchers admit the jury is still out on whether high manganese intake is a legitimate health concern for those who do consume lots of acai purée daily.

“Our research group is now working on understanding the chemical forms of manganese in acai berry, bioavailability of its compounds, and its interaction with other minerals such as iron,” the researchers said. Shortly after their first publication in the *Journal of Toxicology and Environmental Health*, the same authors published a study in which they analyzed the effect of acai’s anthocyanins on manganese. They found that these antioxidant-like compounds, which also give acai its deep purple pigment, actually protected nerve cells against manganese neurotoxicity.

Acai experts around the world also note that numerous studies performed on acai over the years have yielded zero reports of toxicity after acai consumption.

**Maqui Berry**

While fruits are generally high in sugar, some contain compounds that actually help modulate blood glucose in the human body.

The effect may be most pronounced with delphinidins. These polyphenol compounds provide blue-to-purple pigments for plants, but they are increasingly regarded for this other, less visible benefit. And their highest concentration from known fruit sources is in maqui berry. So far, at least one maqui berry supplier has taken serious interest in maqui’s delphinidins. That company is Maqui New Life (Santiago, Chile), developer of a maqui berry extract standardized for 28% delphinidins (Delphinol).

Preliminary research shows that this high amount of delphinidins can almost abolish the spike in blood sugar that follows consumption of food—an effect that would still occur with plain maqui juice, but to a lesser extent. More recent science has unveiled the mechanism of action behind this effect: inhibition of a blood glucose transporter called SGLT-1, and stimulation of the secretion of incretins, which are hormones that encourage production of insulin.

Human trials continue on maqui and blood sugar, and the ingredient may have a special place in beverages and other applications where maqui’s color is desired.
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**Probiotics: Part of a Healthy Breakfast**
A good day starts with good digestion. Post’s new Great Grains Digestive Blend cereals tout Ganeden Biotech’s (Cleveland) Ganeden BC30 Bacillus coagulans probiotic strain, as well as whole grains and natural fiber. The cereal comes in two flavors, Berry Medley and Vanilla Graham.

**Natural Food Dye for the Home Cook**
For decades, it was almost a given that retail food dyes were sourced from artificial colors such as Red 40. But natural color exploration has come a long way ever since, and today's home bakers don’t have to be stuck in the past. That’s why industrial color specialist ColorMaker (Anaheim, CA) is introducing Color Garden—a 100% plant-based food colors retail product. Color Garden dyes are available in four basic colors sourced from an interesting variety of plant ingredients. Natural red is composed of beet juice and purple carrot juice. Yellow is sourced from turmeric. Blue is sourced from red cabbage juice. And orange is made possible with annatto, caramel color, and beet juice.

**Here’s to Healthy Skin, Nails, and Hair**
Beauty now comes in a caffeine-free, non-carbonated drink. In addition to antioxidant, vitamin, and mineral support—plus its proprietary, physician-formulated “Vemma blend”—Vemma Renew contains 20 mg of plant-sourced silica to help maintain healthy skin, nails, and hair and supports collagen production. It comes in at only 45 cal and just 5 g of all-natural sweeteners.

**Vitamin C Gummies**
Nordic Naturals’s latest launch is great for kids and the young at heart: vitamin C gummies that provide 250 mg of vitamin C in each dose. The 100% vegetarian, tangerine-flavored gummies are pectin-based and free of gelatin, artificial colors and flavors, preservatives, and allergens.
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Moringa May Be an Attractive Soap Ingredient

Because moringa (Moringa oleifera) is a known water purifier, a team of researchers is exploring the plant’s antibacterial benefits for another human use: they think moringa may be a soap alternative.

Native to South Asia and parts of Africa, the moringa tree is used for most of its parts, including the seeds, flowers, fruit peels, and unripe pods. But the leaves in particular appear to have antibacterial activity against human pathogens. Anecdotal evidence suggests that moringa may be a useful hand-washing product, but in vivo science was never available to support the notion.

In what is likely the first human trial on moringa as a hand-washing product, researchers at the London School of Hygiene and Tropical Medicine assigned 15 volunteers to wash their hands with liquid soap and another control. Historically, results of these studies have centered on inulin and FOS for blood sugar and cholesterol; a 2012 European Journal of Nutrition, published online January 8, 2014.

Like other tuberous roots, yacon is rich in inulin and fructooligosaccharides (FOS). Both of these fibrous compounds have multiple manufacturing uses and potential health benefits, but a curious collection of studies has centered on inulin and FOS for blood sugar control. Historically, results of these studies have been mixed. A new study on yacon, however, just had some fruitful results.

For nine weeks, Brazilian researchers fed 70 elderly women freeze-dried yacon powder or control (maltodextrin) daily. The yacon powder—roughly a tablespoon each day—contained 7.4 g of FOS.

Compared to control, those who consumed yacon powder saw a mean decrease in blood sugar, but no decrease in cholesterol. Yacon intake was well tolerated and without bloating, intestinal discomfort, or a certain other side effect associated with fiber.

The researchers speculate that yacon provided this effect because yacon is a prebiotic

Can Yacon Lower Blood Sugar?

More of the active component of the plant at the moment of hand cleansing. The researchers presume that moringa’s effect is due to the plant’s natural content of tannins, phenols, alkaloids, and also saponins, which are known for their detergent and surfactant properties.

Thanks to this study, moringa may be an attractive ingredient for plant-based soap products, but, more importantly, it might serve as a soap alternative in developing countries where consumers can’t afford soap (but can grow moringa trees). The researchers behind the study are especially curious as to whether fresh leaves would be a more effective hand cleanser than manufactured leaf powder.

Is This the Oral Health Study That Aloe Vera Needed?

Forget the sunburn-soothing properties of Aloe vera for a moment, because the number of aloe studies on oral health is growing. And the latest human clinical on aloe mouthwash is the biggest yet.

To backtrack, the brief history of aloe studies on oral care relate to gingivitis and plaque reduction. Previous trials on aloe toothpaste and aloe mouth rinse have brought success, but their positive outcomes are perhaps questioned because of small sample sizes.

At Teerthankar Mahaveer University in India, though, a team of researchers managed to recruit 345 students for a 30-day study comparing the effects of aloe mouthwash, chlorhexidine, and placebo. Chlorhexidine is a highly effective oral solution for plaque and gingivitis reduction, but it’s available by prescription only, and prolonged use can result in side effects. Anyway, the researchers assigned 115 students to rinse with one of the three mouthwashes, twice daily.

At both 15 and 30 days, researchers saw no difference in effectiveness between aloe and chlorhexidine, and both treatments performed better than placebo. That should be welcome news to anyone willing to buy a plant-based–alternative mouthwash.

Researchers believe aloe’s oral benefits relate to the plant’s anti-inflammatory and wound-healing properties, and a 2012 in vitro study managed to even pinpoint some of the oral microbes that aloe works against.
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What’s the buzz around natural honey powder?

By Joe Raimondo, Artiste

What could be more delicious than the pure, golden sweetness of honey? There is growing buzz surrounding the popularity of honey as it makes unexpected appearances in an array of foods and beverages. From teas to beer, whisky and bourbon, energy drinks, soda, and juices, innovative companies are increasingly finding ways to incorporate honey’s natural sweetness into their products—and consumers are happily responding.

Honey itself is hardly a new discovery. It has been prized since the days of ancient cultures. A rock painting in eastern Spain, estimated to date back to 6000 BC, shows a prehistoric figure gathering honey. Found in tombs of early Egyptians, honey was reportedly used medicinally and for its flavor.

Today, honey, the nectar of flowers, also delights the palate in the form of versatile honey powder. Honey powder provides extended product shelf life and opens a wide window of new honey applications. Further sweetening the pot, honey packs health benefits, demonstrating that civilizations thousands of years ago were indeed on to something.

Sourcing

In the United States alone, more than 300 sources of nectar are used for honey production—including both wild and managed sources—but clover is the predominant source. Honey powder can be processed from any of these nectar sources, and numerous others globally. For example, commercially available honey powder processed in Indonesia is made from honey derived from the nectar of wild Ceiba pentandra and Hevea brasiliensis plants.

Honey powder has such an iconic look. Doesn’t it?

Natural honey can be honed, through a technique of spray drying, into a fine white or pale yellow powder, with texture similar to that of corn flour. In this form, bakers can blend honey with fructose and maltodextrin to create a free-flowing consistency for flavoring breads and baked goods. Honey powder helps to maintain product moistness and improve product stability. An added bonus is that honey is sweeter (and less caloric) than sugar, so smaller quantities of honey are needed to produce a pleasing flavor. In powder form, honey offers easier handling and reduced storage space.

Replacing a product’s sugar with honey may boost its antioxidant effects.

Baking Benefits

A 2010 study, published in Food Research International, compared the effects of honey powder and sugar on dough rheology and bread quality. Results showed that as the amount of honey powder increased, so did stability and retention of moisture in bread crumbs, which slowed staling, extended shelf life, and decreased bread development time. The fructose in honey powder allowed more moisture absorption than did the sugar, and it promoted softening of the bread dough. This, along with honey powder’s significant effect on yeast activity and production of gas during fermentation, contributed to bread loaves with increased volume.

Honey powder even improved the color development of crumbs.

Replacing a product’s sugar with honey may boost its antioxidant effects.

In another, somewhat recent study, published in the International Journal of Food Properties, researchers analyzed the processing techniques used to make dried and intermediate-moisture honey products. Replacing a product’s sugar with honey may boost its antioxidant effects.

The highest scores for sensory evaluation occurred with 10% honey powder—the same level at which resistance to extension (dough strength) increased. Honey breads had low hardness and gummy properties, and they exhibited heightened cohesiveness and springiness.

In another, somewhat recent study, published in the International Journal of Food Properties, researchers analyzed the processing techniques used to make dried and intermediate-moisture honey products. Replacing a product’s sugar with honey may boost its antioxidant effects.

A significant problem associated with drying high-sugar honey products is stickiness, they noted. Dried honey powder, however, can alleviate this problem and thus...
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provide good commercial potential in the bakery and confectionery industries. Using dried honey would also eliminate the need for high temperature and flavor-disruptive cooking that is required to remove water when making certain types of candy.

The researchers added that, with honey-fruit spreads, replacing part of sugar with honey improved product taste and nutrition.

Health Benefits
In addition to its recognition for flavor, honey possesses important nutritional and health benefits. Honey contains phenolic acids and flavonoids, proteins, enzymes, amino acids, vitamins, minerals, and other components that contribute to its benefit as an antioxidant and prebiotic. Honey is also an antibacterial agent that can be useful in relieving wounds, burns, and skin irritations, while also creating a moist environment to promote improved healing and reduced scarring.

A 2010 study in the *Mediterranean Journal of Nutrition and Metabolism* outlined numerous references to the health benefits of honey and suggested that replacing some food sugars with honey can boost antioxidant effects, potentially even preventing the spread of metastatic cancer cells. The components in honey also deliver antiviral, antiparasitic, anti-inflammatory, and immunosuppressive properties, as well as control bacterial growth. Honey can also be effective in alleviating gastric pain and peptic ulcers and reducing the duration of diarrhea.

Cardiovascular benefits were seen in a human study in which honey reduced total cholesterol, LDL cholesterol, and triglycerides, and slightly raised HDL cholesterol. Nitric oxides found in honey may also have a protective function in cardiovascular diseases.

Honey powder is an important staple for the baking and confectionery industries. Honey’s natural, flavorful, and nutritional qualities are attractive to consumers. The applications and possibilities for honey powder in foods and beverages are wide open. And where the delectable taste of honey emerges, customers will follow.

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Joe Raimondo is principal and president of Artiste, a global flavor, fragrance, and specialty ingredient company. Through its network of partnerships, Artiste offers citrus, mint, extracts, and natural aroma chemicals.
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Rochem International celebrates its 20th anniversary this year. The company announced plans to move its headquarters from Ronkonkoma, NY, to a much larger, 60,000-sq-ft facility in Haupauge, NY, by the middle of this year. It recently celebrated its 20th anniversary at an event held in New York.

Sabinsa Australia (Woolloomooloo) welcomed Jon Tilyard as general manager and Alison Dear as technical advisor, a newly created position.

Albion (Clearfield, UT) welcomed Bo Lönnertal to its newly formed scientific advisory board. Lönnertal has been a professor at the University of California, Davis, specializing in pediatric nutrition, for the past 33 years.

Silliker Inc. (Chicago) announced several personnel changes. Kurt Westmoreland was promoted to vice president, sales and marketing; Neda Veseghi is now regional director of sales, West; John Iams is now regional director of sales, East; and Jeff Lucas has rejoined the company as a technical consultant.

InterHealth Nutraceuticals (Benicia, CA) named Jessica Hoel western regional sales manager. It also promoted Jay Martin to senior vice president, global sales and marketing, and Rob Worsena to vice president of sales, North America.

Nutraceuticals International Group (Bloomingdale, NJ) hired Jaime Esquilin as sales representative for California.

B&D Nutritional Ingredients (Vista, CA) announced Scott D. Murray as its new northeast regional sales manager.

Austin Soejoto is now the sales representative for California, Nevada, Arizona, and New Mexico for enzymes supplier American Laboratories Inc. (Omaha, NE). Rod Schake, who previously held the position, was promoted to senior vice president.

QualiTech (Chaska, MN) hired Joy Foster as director of purchasing and Laura Sheeran as East Coast sales manager, food division.

Herbal extracts supplier Gencor moved its offices from Anaheim, CA, to Irvine, CA.

Hilmar Cheese Company, Inc., (Hilmar, CA) plans to build a milk powder processing facility in Turlock, CA. The Turlock facility will produce a variety of milk powders, which have become an important source of dairy for developing nations—in part because milk powder is easy to transport and store.

The United Natural Products Alliance (Salt Lake City) welcomed new members: packaging solutions provider Nosco Inc. (Gurnee, IL), contract manufacturer The Rhema Group (Coquitlam, British Columbia), supplement manufacturer Ortho Molecular Products (Woodstock, IL), and consulting firm CRB (Kansas City, MO).
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Despite its South American origins, quinoa is now eaten by many consumers around the world. The so-called “ancient grain” (technically it is not a grain, but a seed from a broadleaf plant) is most often consumed as whole, cooked seeds. But because this format can be quite limiting, manufacturers are inquiring about new ways to formulate products with this fiber-rich ingredient.

In response to quinoa’s new demand, ingredient suppliers are giving quinoa a makeover. They’re making the ingredient more compatible with today’s food products and, at times, more entertaining. So get ready for the incredible new life of quinoa in foods and beverages.

**Quinoa Flour**

In some cases, the label appeal alone of “quinoa flour” may be enough to warrant adding milled quinoa to baked goods. But bakers should remember: quinoa is gluten-free.*

Baking ingredient experts like Bay State Milling (Quincy, MA) are quick to point out this important detail, warning that the absence of gluten means quinoa flour won’t help baked goods rise. For functionality in quinoa-containing baked goods, consider adding starches, or other grains with gluten.

Ancient grain blends are an increasingly popular option. To balance their label appeal with functionality, many of these mixes contain at least one glutenous grain. Bay State’s own blend features amaranth, millet, quinoa, and gluten-containing barley, rye, and spelt.

**Smooth Quinoa**

Even with its appeal, quinoa is, at the end of the day, still a fiber. And fiber can impart a gritty texture. Fortunately, there are ways to soften quinoa’s texture if it is a problem.

**Quinoa for Babies**

Having quinoa available in liquid-friendly formats creates even more opportunities, even including purées for babies.

Because quinoa is a complete protein, it is well suited for baby and infant health foods. Realizing this potential, Factoria Quinoa (Bogotá, Colombia) markets instant quinoa powder, which has applications for both young consumers and older ones. This quinoa powder is pre-gelatinized, too, and Factoria Quinoa says this makes for a more digestible quinoa.

**Puffed Quinoa**

Forgetting sophisticated quinoa powders for a moment, there is still a visual appeal of whole, cooked quinoa seeds. For manufacturers eager to show off quinoa, Glanbia Nutritional now supplies puffed quinoa.

These quinoa puffs are made not from standard quinoa but from a considerably smaller, yet nutritionally equivalent, quinoa species called kaniwa. Also known as “baby quinoa,” the little puffs can add chewy texture to cereal clusters, nutrition bars, and other grain-based products. But imagine these little guys floating in beverages. For consumers who really want to see their fiber, quinoa puffs are a fun option.

*Although quinoa is technically gluten-free, some researchers have shown concern for “gluten-like peptides” in quinoa. To learn more, read “Can Celiacs Eat Quinoa?” at Nutritional Outlook online.
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