Pack a Product Development Punch With Protein

The protein content of food products has become an important selling point for food manufacturers, says Lu Ann Williams, director of innovation at Innova Market Insights, Duiven, the Netherlands (innovadatabase.com), who presented at the company’s 2015 top 10 trends webinar.

Nutritionists, food companies, and popular diet regimens tout the benefits of regularly consuming protein, including muscle building and satiety. Consumers around the world say that they are eating more protein, with 25% of Americans and 26% of Chinese reporting that they ate more protein in 2014 than they did the previous year, according to research conducted by Mintel, Chicago (mintel.com) (Mintel 2014).

As more consumers add protein to their diets, product developers are working hard to meet this demand, creating protein-fortified products across all categories. In turn, ingredient manufacturers have amped up their own development efforts, releasing a wide array of protein ingredients sourced from plants, meat/seafood, dairy, and even insects to help boost the protein content of food and beverage products. As developers are formulating with a wider variety of protein sources, consumers will continue to see more protein claims and food manufacturers highlighting the specific source of protein on packaging, says Williams. Here is the chance to learn about some of the most popular protein ingredients as well as emerging ones making an impact on today’s protein fortification product development efforts.

Plants Offer Varied Protein Types

Plant proteins are truly coming into their own, with a number of new plant-based protein ingredient developments in the works and food and plant scientists studying different types of plants as potential protein sources. Food manufacturers can choose to use one plant protein ingredient on its own or use an ingredient that combines plant protein and another ingredient like the Profi line of ingredients from Dealers Ingredients, Brampton, Ontario, Canada (dealersingredients.com). The ingredients combine protein from rice, chickpea, lentil, pea, and oat with fiber and provide the functional and health benefits of both protein and fiber to food and beverage applications, according to the company.

Food Technology’s Mary Ellen Kuhn explained in a recent article how sales of meat alternatives have risen in recent years and that scientists are working at the molecular level to develop plant-based protein products that have the taste and mouthfeel of meat (Kuhn 2014). Other factors driving the popularity of plant protein are consumers’ concerns about diabetes, obesity, and high cholesterol, the growth in the number of consumers who follow vegetarian or vegan diets, and

Bars are a popular application for protein fortification. Nuts, plant protein sources, and dairy proteins are increasingly used. © Andy Dean/iStock/Thinkstock
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sustainability issues that are causing certain consumers to rethink consumption of animal products. Even the Dietary Guidelines Advisory Committee has weighed in on the issue of plant proteins, recommending that Americans consume more of these types of proteins (USDA 2015).

Whatever the reason, ingredient manufacturers are hard at work developing plant-based protein ingredients. “Consumers continue to seek out ways to consume protein throughout the day, and are interested in different varieties of proteins besides meat and other traditional sources,” states Nicole Rees, business development manager at Glanbia Nutritional Ingredient Technologies, Fitchburg, Wis. (glanbiana-tritionals.com). The busy, on-the-go lifestyles of many consumers are changing eating habits and the ways food manufacturers approach product development. “For this reason, consumers look at each eating occasion as an opportunity to not only obtain essential macronutrients, but also to consume the variety of whole foods that they know are healthy,” explains Rees. “Glanbia’s protein ingredient innovation capabilities are perfectly aligned to this market trend, so we’ve stepped up our product development to meet the demand.”

From the soybean come a number of protein ingredients and foods, like soy protein isolate to fortify beverages, textured soy protein to create meat substitutes, soy flour for baking, and tofu to use in wraps, smoothies, stir fries, and more.

Glanbia’s plant-based protein options include those in its newly launched HarvestPro line. The protein crisps and protein powders are derived from flax, chia, and other ancient grains to fortify beverages, bars, and baked goods. The HarvestPro Crisps—available in quinoa, chia, and sorghum; chia and amaranth; and organic quinoa and flax versions—have protein levels that range from 50% to 60%. They function best in bars, clusters, and cereal. The protein powder ingredients for use in beverages, bars, and bakery foods include HarvestPro Chia Protein 30, a chia protein concentrate that has 30% protein, and HarvestPro Flax Protein 35, a flax protein concentrate that contains 35% protein.

Tate & Lyle, Hoffman Estates, Ill. (tateandlyle.com), derived a protein powder from oat called PrOatein Oat Protein. “It is rich in essential amino acids, highly digestible, and an excellent alternative to dairy, soy, or wheat proteins,” remarks Megan Mullinix, sales manager, oats ingredients, at Tate & Lyle. The company has demonstrated its functionalities in product concepts like Iced Mocha Café Au Lait distributed at the 2014 IFT Annual Meeting and Food Expo and Chocolate Caramel Protein Bar served up at the 2014 SupplySide West event. The powder, which has a mild taste and odor of oat bran, also functions in bread, cereal, meat products, pasta, and meal replacement shakes. “It formulates with ease—it has good wettability and does not stick,” says Mullinix. “It works great in beverages that have some viscosity, because even through it is clear in solution, it does contribute some mouthfeel.”

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Pre-cooked, ready-to-use beans provide product developers with a convenient ingredient to fortify sauces, soup, meat, pet food, bars, pasta, and extruded snack foods with protein. VegeFull Ground Cooked Bean Powders can replace 10%–25% of flour or added fat in baked goods, can be extruded into pasta and snacks, can aid product moisture, and act as a binder and thickener in meat, soups, dips, and sauces.

Other VegeFull versions are Ground Cooked Bean Grits that function like the powder version but provide some added texture and Ground Cooked Bean Pieces that are large enough to provide visual bean identity without the use of the whole bean. Beans, as well as other legumes and pulses, provide nutrient benefits beyond protein—like fiber, iron, and minerals—that make them attractive ingredients to product developers. From whole to powdered form, these ingredients are appealing to consumers, who are increasingly aware of what food manufacturers are putting into packaged food products.

Ingredient suppliers also realize the potential of legumes like pulses and beans in food product development and have expanded ingredient offerings or formed business agreements to provide wider production and distribution capacity of the ingredients. Ingredion Inc., Westchester, Ill. (ingredion.com/us), and AGT Food and Ingredients, Regina, Saskatchewan, Canada (allianceagrain.com), in 2014 formed a partnership in which Ingredion is the distributor of AGT’s pulse flours and protein ingredients in the United States, Canada, China, North Africa, the Middle East, and most of Europe. For Ingredion, this means that vegetable protein ingredients join the company’s line of starches, fibers, flours, and sweeteners to bring enhanced nutrition and improved texture and sweetness profiles to foods and beverages. Marketed under Ingredion’s Homemccraft brand, which also includes functional, gluten-free, and clean label flours, the pulse flours allow for protein fortification as well as offer an alternative to traditional flours and other types of gluten-free flours.

The pulse flours are made from faba bean, chickpea, yellow lentil, and yellow pea and are available in different particle sizes—from coarse to very fine—that contribute in different ways to the finished product’s texture. The company has demonstrated the protein-boosting capabilities of the pulse flours in snacks, bread, cakes, cereal, crackers, and pasta.

Scientists have turned their attention to legumes like the pea as a plant protein source for inclusion in a variety of foods and beverages because of its reported high digestibility and low allergen qualities. Pisane B9 pea protein isolate from A&B Ingredients, Fairfield, N.J. (abingredients.com), made its debut at the 2014 SupplySide West event. The ingredient contains 88%–90% protein, including high levels of branched chain amino acids, according to the company. Currently, Pisane B9 is promoted for protein fortification in protein bars, granola bars, bread products, and extruded crisps that are part of manufacturers’ product lines for sports nutrition, weight management, and senior nutrition.

The Scoular Co., Minneapolis, Minn. (scoularfood.com), has formulated its version of pea protein isolate into Pea Protein Crisps 60%. At recent food industry shows, the company featured the crisps in peanut butter granola bar product concepts where they provided additional protein and added a crunchy texture.

To add the nutritional benefits of protein to low pH and neutral pH beverages, there is Peazz from Burcon NutraScience Corp., Vancouver, British Columbia, Canada (burcon.ca). The company has shown that this isolated pea protein ingredient is 100% soluble at low pH in solutions that are transparent, heat stable, and low in viscosity. Product developers can use Peazz alone or with whey, casein, or soy in product formulations.

Manufacturers Expand Plant Protein Options

While brown rice as a whole food may not have as much protein as some other plant-based sources, brown rice...
protein powders can deliver high amounts of protein, up to 24 g per serving in some cases. Manufacturers of these powders also point out that studies have concluded that brown rice protein powder has similar muscle-building capabilities as whey protein. Axiom Foods Inc., Los Angeles, Calif. (axiomfoods.com), uses a proprietary low-temperature, enzymatic extraction process to produce *Oryzatein Brown Rice Protein Powder* that is available in 70% and 80% concentrates and 90% isolates. The rice protein isolate version, which provides 24 g of protein per serving, is marketed under the *Growing Naturals* line of protein powders from Growing Naturals LLC, Culver City, Calif. (growing-naturals.com). Available in original, chocolate, and vanilla flavors, the *Organic Whole Grain Brown Rice Protein Isolate* can be used to add protein to shakes, smoothies, muffins, pudding, waffles, cakes, chocolate candy, pancakes, cookies, bread, falafel, and soup. The company has recipes for these and more on its website.

AIDP, City of Industry, Calif. (aidp.com), offers *Gabiotein*, a sprouted brown rice protein powder for use in beverages, yogurt, bars, cereals, and infant formula. Sprouted grains like rice are said to have increased amounts of many nutrients found in the grains, such as essential amino acids, vitamin C, B vitamins, and folate.

Three versions of *Gabiotein* are available: brown rice protein isolate with a minimum 90% protein, brown rice protein concentrate with a minimum 80% protein, and brown rice protein infant formula. AIDP promotes *Gabiotein*’s smooth texture and the fact that it easily hydrates and stays suspended in liquid, making it suitable for beverage applications. The ingredient has a neutral taste, allowing it to be used in both sweet and savory applications; a neutral color, so it can be used in white and light-colored

![A dark green protein powder derived from the Lemnoidae plant can add protein to smoothies and meal replacement beverages. Photo courtesy of Parabel](image-url)
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Consider Nuts for Protein Enrichment

Nuts are a rich source of protein and can be used in many applications—whole, in pieces, ground, and more.

• The top benefit that consumers say they look for in snack bars is “high in protein,” and almonds were chosen as the most desired ingredient in consumers’ “ideal bar” application, according to Sterling Rice Group’s September 2014 U.S. Bars Exploratory Study as reported by the Almond Board of California, Modesto, Calif. (almonds.com). Whole almonds have 6 g of protein/oz.

• Walnuts have 4 g of protein per oz, which makes them a good choice for enriching dressings and dips. Walnut butter is an alternative to peanut or almond butter for consumers looking for a different flavor and texture. The California Walnut Commission, Folsom, Calif. (walnuts.org), shows how walnuts, when used as an ingredient in breadings and coatings, can add even more protein to applications that are already high in protein, such as fish.

• The Georgia Pecan Commission’s Center for Pecan Innovation, Atlanta, Ga. (ameicansnut.com), promotes pecans as an ingredient that can add protein to meat substitute products; coatings for meat, fish, and poultry; and beverages.

• While the peanut is technically a legume like the bean, pea, lentil, and soybean, it is categorized with other nuts for nutrition research and dietary patterns purposes, according to The Peanut Institute, Albany, Ga. (peanut-institute.org). Compared to other nuts, peanuts contain more leucine, isoleucine, arginine, and glycine. While protein-packed peanut butter is one of the most popular plant protein foods, peanuts can also be used to add protein to soup, breading and coatings, and dips and dressings. In salads, particularly those that contain whole grains, the lysine from peanuts combines with the methionine in whole grains to create a complete protein, according to the organization.

and germ of brown rice, Proryza P-35 contains essential amino acids, including leucine, which research points to as important in muscle recovery after exercise. It is also high in arginine, a rate-limiting amino acid for protein synthesis. The protein powder’s overall protein content is 35%. Finally, scientists are exploring other plants as sources of protein ingredients. Nutegrity, Irvine, Calif. (nutegrity.com), uses alfalfa for AlfaPro alfalfa protein concentrate powder and potato for Solathin potato protein isolate. AlfaPro contains approximately 50% protein and is typically used in green powdered beverages while Solathin, which contains protease inhibitor 2, may help to increase satiety, says Matt Phillips, chief commercial officer at Nutegrity.

The Scoular Co., Omaha, Neb. (scoular.com), has derived protein from the sacha inchi plant, a vine that is native to Peru. The five-pointed, star-shaped oilseeds are not only a rich source of omega-3 fatty acids but also of sulfur-containing amino acids, according to the company, which offers a 60% sacha inchi protein powder.

Parabel, Melbourne, Fla. (parabel.com), uses a proprietary cold water extraction process to remove protein from the Lemnoideae, a fast-growing, small, flowering plant high in protein found in still or slow-moving fresh water in many regions around the world. The company also has its own method of growing the plant. “Our growth system is made up by lined raceways so there is no risk of any contamination from the soil, which often happens with crops that are grown in water like rice or algae,” explains Cecilia Wittbjörn, marketing manager at Parabel. Parabel offers Lentein, a green powder that has a protein content of 65%–70%. It can be formulated in chips, crackers, snack mixes, bars, and cereal, and since it is soluble, it can also be used in sports drinks and meal replacement beverages, remarks Wittbjörn. She adds that developers at the company are creating a version with a higher protein content (80%) and a lighter green color “that can be a substitute for any other protein in the market today, like soy or whey.”

Scientists from Solazyme, South San Francisco, Calif. (solazyme.com), and other companies are turning their microscopes to tiny plant-like organisms called microalgae as a protein source. Solazyme produces AlgaVia Whole Algal Protein through a standard industrial fermentation process. After fermentation, the whole microalgae cells are dried and milled to yield a yellow powder that the company has shown can be formulated into sauces, dressings, snacks, ready-to-mix powders, cereal, bread, and beverages, including low-pH beverages. The company highlights qualities of AlgaVia such as its high digestibility and the fact that it contains all essential amino acids. Roquette, Geneva, Ill. (roquette.com), actively promotes Agility HP Whole Algal Protein, showcasing how the protein powder can fortify foods such as the soup product concept the company developed for its presentation about plant-based protein held at the 2014 HiE conference.

Dairy Proteins Offer Multiple Functions

“Consumers increasingly are interested in adding valuable nutrients to their diets, finding natural sources of energy, and reaping the benefits of high-protein diets,” states Terri Rexroat, vice president, U.S. trade services, global marketing, at U.S. Dairy Export Council, Arlington, Va. (usdairy.com). She adds that dairy protein ingredients are quite versatile and offer opportunities for product developers to increase the protein and nutritional value of their products. In general, most dairy protein ingredients have a mild flavor compared with other protein ingredients, and they can function as emulsifiers, flavor enhancers, flavoring agents, formulation aids, humectants, thickeners, and texturizers depending on the food category in which they are used, she says. Whey protein and milk protein concentrate are dairy proteins that serve these functions.

A natural component of milk, whey protein contains branched-chain amino acids, including leucine. Research has shown that whey protein may help to stimulate muscle synthesis, making it an especially attractive protein ingredient to

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...developers of sports beverages. The functional benefits of whey protein are improved texture, emulsification, and stabilization; high solubility across a wide pH range; and a neutral taste that can enhance other flavors, remarks Rexroat. Milk protein concentrates on the lower end of the range of protein content—between 42% and 50%—are used to enhance the protein content of cheese, yogurt, and soup applications, while those with a protein content of 70% or more are used to fortify beverages and protein bars, explains Rexroat. Food formulators use milk protein concentrates in other product applications like desserts, baked goods, low-fat spreads, dairy-based dry mixes, and dairy-based beverages.

Arla Foods Ingredients, Basking Ridge, N.J. (arlafoodsingredients.com), promoted two of its popular whey protein ingredients that are suited for sports nutrition products at the 2014 SupplySide Boost the protein content of soup applications with milk protein concentrate. © Joe Gough/IStock/Thinkstock
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West event. The first, Lacprodan HYDRO.365, is a whey protein hydrolysate for use in beverages and bars geared toward active people, particularly elite athletes. The company has conducted a clinical study on the ingredient to show it helps to speed muscle recovery after a workout, says Cheryl Reid, account manager, health & performance, at Arla Foods Ingredients. “If you’re active, you should be consuming some sort of whey protein just for muscle retention and for muscle recovery, but if you’re an elite athlete you have significant muscle degradation from the workout.” It is this significant degradation of muscles that the ingredient will help rebuild, she says. From a functionality standpoint, the ingredient is soluble, UHT stable, pH neutral, and has a low bitterness profile, according to the company.

The other ingredient that Arla showcased was Lacprodan DI-7017, a whey protein concentrate with the main functional benefit of being UHT stable. “One of the production challenges that many food processors have is how to get whey protein into a UHT product because whey protein tends to gel at those temperatures,” explains Reid. Manufacturers can use as much as 8% of the ingredient in a beverage product, she adds. The company promotes that the ingredient helps to build muscle and increase satiety, has a quicker digestion time than casein, and is rich in essential and branched-chain amino acids.

Beverages and bars are two product categories where protein fortification is quite active, but snack foods offer opportunities for protein enhancement, too. During the 2014 SupplySide West event, Agropur Ingredients, La Crosse, Wis. (agropur.com), offered samples of Cheddar & Firecracker Flavored Popcorn made with whey protein isolate. A serving of popcorn (3 cups popped) provided 8 g of protein.

Going back to beverages for a moment, Ingredia Inc.,

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**FUTURE FOOD 2050**

Protein Technologies for the Future

One of the goals that researchers and scientists have with feeding the world’s growing population is developing protein sources from more sustainable methods. The Institute of Food Technologists’ FutureFood 2050 website recently examined some of these technologies to bring more alternative sources of protein to people around the world while at the same time making sure that the processes do not put too much strain on the environment. FutureFood 2050’s interview series on alternative proteins details such advancements as an *in vitro* burger made from laboratory-grown meat, protein derived from sweet blue lupine seeds as an alternative to soy protein, plant proteins that can mimic the structure of meat, industrial-scale insect farms, and insect protein as a sustainable protein for famine relief.

Learn from the people who are heading these efforts at futurefood2050/interviews/alternative-proteins/.
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Wapakoneta, Ohio (ingredia.com), at the SupplySide West event promoted its Prodiet Fluid milk protein isolate for high-protein ready-to-drink beverages. The ingredient is said to reduce the beverage’s viscosity by up to 88%, have no off-flavor, and offer stability at high temperatures, especially UHT process, according to the company. Representatives from Ingredia also explained how Prodiet Fluid can be formulated into beverages that target different consumer needs like weight loss, muscle building, post-exercise recovery, and satiety.

Other ingredient manufacturers that offer wide portfolios of dairy protein ingredients include Hilmar Ingredients, Hilmar, Calif. (hilmaringredients.com), which provides whey protein concentrate, whey protein isolate, and whey protein hydrolysate, and Grande Custom Ingredients Group, Lomira, Wis. (grande-cig.com), a manufacturer of proprietary whey protein ingredients and inclusions like whey protein crisps. Hilmar Whey Protein Concentrate ingredients are around 80% protein and include specialty proteins that are lactose-free, high-gelling, or alpha-lactalbumin-enriched. At more than 90% protein, Hilmar Whey Protein Isolate ingredients have several levels of hydrolysis—from moderate to extensive—available for flavor enhancement, texture improvement, or increase in nutritional value. Hilmar Whey Protein Hydrolysate ingredients have around 80% protein and are enzymatically broken into smaller peptides, making them useful in clear beverages, dry mixes, and low-pH formulations. The Grande Bravo whey proteins come in a range of viscosities upon hydration and viscosities upon heating that can help improve the texture of creamy applications like sauces, soups, and dressings as well as add stability and improved mouthfeel to meat, bakery, and frozen dessert applications. For beverages, especially clear beverages, Grande manufactures Grande Ultra whey protein isolate by removing the fat and lactose from milk and white Italian cheese through a proprietary process and concentrating the protein for a neutral taste and clarity over a wide pH range. Grande WPCrisp whey protein crisps are an extruded ingredient that can be coated, seasoned, or mixed with other ingredients for use as toppings or as inclusions in bars, cereals, and snack mixes.

Take a New Look at Animal Protein Ingredients

While much of the protein fortification of late is focusing on plant and dairy sources, product developers are reexamining what animal protein ingredients like powders derived from meat and seafood offer. ARC Concentrated Chicken Protein Powder from International Dehydrated Foods (IDF), Springfield, Mo. (idf.com), is a complete protein made from chicken
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breast meat. The company offers ARC 70, which contains 70% protein, and ARC 90, which contains 90% protein. It has plans to launch ARC 85, with 85% protein, in mid-2015.

The powders are said to have neutral flavor and color and bring protein enhancement to sauces, soups, beverages, protein mixes, savory snacks, and even foods like pasta. “We’ve used ARC 70 to develop a pasta, which is a great delivery system for protein in family-friendly meals,” states Stephanie Lynch, vice president of technology, sales, and marketing at IDF. “Another application we’ve developed is a savory recovery soup, which is a desirable alternative to sweet recovery drinks for those seeking flavor variety in their recovery meals. We’ve also created extruded snacks, to which ARC 70 contributes both protein and a savory umami flavor, allowing for a lesser amount of sodium than many other savory snacks in that category. The baking segment has obvious growth potential, so bringing protein to breads has been an exciting application we’ve had success with.”

IDF positions the allergen-free protein powders as alternatives to the soy and whey. Other reported qualities of the chicken protein powder are that it is highly digestible, lower sodium, and shelf stable.

In addition to using chicken meat to produce spray-dried high-protein powders, Proliant Meat Ingredients, Ankeny, Iowa (proliantmeatingredients.com), manufactures these types of powders from other meat sources like beef, pork, and turkey. Diana Naturals, Valley Cottage, N.Y. (diana-food.com), also offers a selection of powders based on chicken and cod that can be used to fortify products with protein and allow food manufacturers to make a protein claim on the package. Under its Diana Baby ingredient range, the company features the protein in egg whites helps to create a stable foam on top of coffee beverages and craft cocktails. Photo courtesy of American Egg Board

The protein in egg whites helps to create a stable foam on top of coffee beverages and craft cocktails. Photo courtesy of American Egg Board
dehydrated meat (chicken, turkey, duck, beef, veal, and lamb) and fish (salmon and cod) powders to add protein and flavor impact to dry and wet baby food applications.

One animal protein source noted for both its functionalities as an ingredient and its nutrient content is the egg. Eggs are considered a high-quality protein (100 g of liquid whole egg has 12.5 g of protein) that can contribute to satiety, and egg protein contributes to texture and structure, aerates, and creates foams, according to the American Egg Board, Park Ridge, Ill. (aeb.org). As Elisa Maloberti, director of egg product marketing at the organization, puts it, eggs are multifunctional and adaptable in a variety of products. The American Egg Board works with a chef and a culinary team to develop egg-based product concepts that go beyond typical uses for eggs. Some recently developed ones highlight the functionalities of egg protein. The Tom & Gianduja, a contemporary take on the Tom & Jerry cocktail, combines hazelnut milk and egg yolks with Nutella and spirits all topped with a frothy egg white foam. The Kale Pesto Hand Pie is filled with scrambled eggs, slow-roasted cherry tomatoes, kale pesto, and potatoes. The application is a convenient way for consumers to get a protein boost on the go. The protein in egg whites helps create a light and airy mousse when combined with nonfat Greek yogurt in Mango Raspberry & Greek Yogurt Mousse Parfait. The mousse is layered with a mango and raspberry compote and topped with chia seed and coconut granola clusters, perfect for dessert or breakfast. FT

Next month’s Ingredients section will examine the functionalities of lipid ingredients, particularly fats and oils.

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REFERENCES


