2019 Protein Trends & Technologies Seminar

Post-Conference Magazine

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2019 Protein Trends & Technologies Seminar

Welcome to the post-conference coverage of Global Food Forums® Inc.'s 7th annual Protein Trends & Technologies Seminar. This is North America's largest event dedicated to the protein ingredient marketplace and applied technologies for formulated foods using protein-based ingredients. Its Pre-conference: Business Strategies program was held May 21, 2019, in Itasca, Ill., USA. The Technology Program: Formulating with Proteins followed on May 22. Key points summarized from presentations are offered on these pages.

Since Global Food Forums' incorporation in 2012, our product portfolio has grown to include the annual Clean Label Conference and Sweetener Systems Conference. Complimentary copies of presentations from these events since 2013, as well as each year's post-conference magazine, can be accessed at www.globalfoodforums.com.

New developments at our website, globalfoodforums.com, support our mission to provide R&D and other food scientists with practical, non-commercial formulation advice, consumer and product trend information, insights into emerging ingredients, nutritional and regulatory updates, as well as other factors impacting product development in the protein, sweetener and clean label arena.

The 2020 Protein Trends & Technologies Seminar will be held May 19-20, at the Westin Hotel, Itasca, Ill., USA. We hope to see you there!

Warm regards,
Claudia O'Donnell & Peter Havens
Co-owners, Global Food Forums, Inc.

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The annual Protein Trends & Technologies Seminar is North America's largest event dedicated to the protein ingredient marketplace and applied technologies for formulated foods using protein-based ingredients.

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LEADER IN

Whey Protein Production

Agropur Ingredients produces innovative specialty ingredients used for formulating a variety of products from infant formula to cosmetics, medical foods and protein supplements.

Ingredient Types
Specialty Protein Ingredients, Whey Protein Isolates, Whey Protein Hydrolysates, Whey Protein Concentrates

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Technical Program: Formulating with Proteins

Consumer Attitudes & Protein Sources: An Overview

CONSUMERS AROUND THE GLOBE are increasingly interested in eating more protein, and they are obtaining that protein from an evolving variety of sources. Julie Johnson, General Manager of HealthFocus International, presented illuminating results from several recent surveys in her presentation titled "Emerging Global Consumer Views on Protein: Usage Patterns and Preferred Sources." This included a 2018 Healthfocus International study of more than 12,000 primary household shoppers from 22 countries and a 2018 U.S. study with more than 2,000 primary household shoppers. In addition, results from a large 2017 global study of more than 9,000 individuals who reported they were increasing their consumption of plant proteins and/or decreasing their consumption of animal proteins were highlighted.

According to Johnson, today's consumer has health-related priorities beyond just eating well: mental and emotional well-being; maintaining a healthy weight; getting regular exercise; and having an active lifestyle are all important. Most consumers (90% globally) believe they are currently eating a healthy or very healthy diet, but they still see room for improvement. Reducing sugar remains the highest priority among specific dietary changes that global consumers want to make. Close behind, however, nearly a third of global and U.S. consumers report that adding protein is important.

What makes a food or beverage healthier in the mind of consumers? More than three quarters of consumers believe adding more protein to a food or beverage makes it healthier. A similar percentage believe using plant-based protein also makes a food more healthful. These related, but distinct, beliefs are observed in consumers of all ages. However, these views—especially that using plant-based protein improves the healthfulness of a product—are most apparent in younger consumers under the age of 40, said Johnson.

Consumer interest in dietary protein is apparent when looking at the protein content of popular diets, such as the keto diet. While few consumers may actually follow a specific diet, many consumers borrow elements that resonate with them and incorporate them into their eating habits. Johnson noted that the interest in the keto diet has helped create new opportunities for marketing protein-rich foods, some of which have not traditionally been considered healthy due to their fat content.

Protein consumers, particularly in the U.S., ascribe a plethora of health benefits to a high-protein diet. An increasing number of consumers, especially men and younger shoppers, choose foods specifically because they are high in protein. Very few consumers believe they are getting too much protein, and even those that feel they are getting enough may still report trying to increase their protein intake.

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More than three quarters of global and U.S. consumers believe adding more protein to a food or beverage makes it healthier.

When consumers choose protein now, it is not plant OR animal protein; it is usually plant AND animal protein. As Johnson described, it is about adding health and nutrition, not just about adding plants—and both plant and animal sources of protein are considered healthy by consumers.

While consumers are embracing all types of proteins, the source of the protein still matters to many of them. Protein sources considered "good" by consumers include natural sources; complete sources of protein; and those that are free from artificial ingredients.

Perhaps surprisingly, only 25% think plant-sources proteins are automatically "good." Consumers are interested both in traditional sources of protein, such as egg white protein, milk protein and plant proteins, but also in less obvious sources of protein, such as grains. Novel protein sources, which are just starting to make traction in the consumer protein market, include algae and hemp.

Most consumers view proteins of any kind as either good or neutral; only red meat, pork/sausage and insect protein were viewed as "bad" by more than 20% of U.S. consumers. Fish, nuts and lean meats stand out among protein sources as proteins that consumers want to consume more often.

In contrast, although insect proteins are considered sustainable and get a lot of buzz, consumers show little interest in adding them to their diets. This disinterest may change, however, as the sustainability of food is important to consumers and will likely play an increasing role in driving protein demand in the future.

"Emerging Global Consumer Views on Protein: Usage Patterns and Preferred Sources," Julie Johnson, General Manager, HealthFocus International, jjohnson@healthfocus.com

Labeling Regs & Emerging High Protein-Based Foods

EMERGING HIGH PROTEIN-BASED FOODS could trigger implications under existing U.S. Federal Standards of Identity (SOI), explained Jessica O'Connell, Partner with the international law firm, Covington & Burling LLP, in her presentation titled "From Cellular Agriculture to Plant-based Milks: Hot Issues in the Protein Arena." Some already are. O'Connell suggested today's food and beverage consumers' needs and expectations have evolved well beyond the original intents and purposes of SOI.

The original reason the U.S. government established SOIs was in order to protect against adulteration, food fraud and the use of inferior ingredients. Conversely, SOIs also help protect product categories against lower cost, lower quality competition…as in butter vs. margarine, for example.

"Today's deviations from standards are not so much about adulteration and the use of inferior quality ingredients, but more about technological advances made to 'improve' foods," said O'Connell. This begs the question: What constitutes "improvement?"

Since 1939, the U.S. Food & Drug Administration (FDA) has established more than 280 standards, largely for staple foods and beverages, said O'Connell. The U.S. Department of Agriculture (USDA) also has authority to establish standards in consultation with the FDA. Two product segments of particular relevance to the SOI debate are dairy (in particular, plant protein-based products labeled as "milk") and the emerging sector of meat alternatives, including cell-cultured meat proteins.

O'Connell pointed out that violations of existing SOI are hardly unique. For example, she said, "The U.S. Code of Federal Regulations (CFR) defines 'milk' as a 'lacteal secretion, practically free from colostrum, obtained from one or more healthy cows.'"

Sheep and goats need not apply, which may come as news to some cheese manufacturers. Similarly, she continued, the CFR defines "flour" as acquired by "grinding and bolting cleaned wheat, other than durum and red durum wheat." So, oat, potato, barley, rye and other bread flours also need not apply.

An excerpt from the U.S. Code of Federal Regulations (CFR) illustrates the extensive reach of dairy product Standards of Identity (SOI), which may prohibit the use of dairy-like label descriptors for high-protein imitation and other dairy substitutes, such as soy or nut milks.

Bread is also implicated, as "the SOI for bread requires that it be made using 'flour, bromated flour, phosphate flour or a combination of two or more of these;' ergo, only wheat flour." Small wonder, then, that more emerging foods are all but guaranteed to raise concerns about outdated SOIs and the need for potential reform.

The FDA and USDA are both under pressure from a number of sectors to address these questions quickly. In a fairly recent case, the FDA cited the alternative vegan mayonnaise product, Just Mayo, for not containing eggs, as per the SOI for mayonnaise. The FDA allowed a compromise by accepting the addition of qualifying language to the product label.

The National Milk Producers Federation recently petitioned the FDA to enforce existing "imitation" labeling requirements against non-dairy soy and nut milks. The U.S. Cattlemen's Association also petitioned the USDA's Food Safety and Inspection Service (FSIS) to enforce a USDA-derived standard that defines "beef" as product "born from cattle, raised and harvested in the traditional manner." This would pre-emptively target the potential threat posed to cattle producers by beef alternatives, such as plant-based or cell-cultured beef proteins.

A further complication is that individual U.S. states are taking the initiative to regulate these products on their own, which could

Are Federal Standards of Identity Outdated?

Title 21, Food & Drugs, Chapter 1, Dept. of Health & Human Services, Subchapter B, Part 131

Food for Human Consumption—Milk & Cream

Subpart A: General Provisions
131.3 Definitions
131.25 Whipped cream products containing flavoring or sweetening

Subpart B: Requirements for Specific Standardized Milk and Cream
131.110 Milk

131.111 Acidified milk
131.112 Cultured milk
131.115 Concentrated milk
131.120 Sweetened condensed milk
131.125 Nonfat dry milk
131.127 Nonfat dry milk fortified w/vitamins A & D
131.130 Evaporated milk
131.147 Dry whole milk
131.149 Dry cream
131.155 Light cream
131.157 Light whipping cream
131.160 Sour cream
131.162 Acidified sour cream
131.170 Eggnog
131.180 Half-and-half
131.200 Yogurt
131.203 Low-fat yogurt
131.206 Nonfat yogurt

SOURCE: 21 U.S. CFR/2019 PROTEIN TRENDS & TECHNOLOGIES SEMINAR

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throw a monkey wrench into interstate commerce considerations. Within the last two years, the State of Missouri prohibited the misrepresenting of "meat" by any product not directly produced from livestock or poultry.

In 2019, the State of Arkansas passed a law prohibiting the mislabeling of products containing meat and rice, in order to pre-empt imitative or cultured alternatives. O'Connell warned that these actions mark only the first trickles in a pending flood of similar state initiatives, so pressure has ratcheted up on both the FDA and USDA to develop pre-emptive regulatory guidelines for such products.

"One very important aspect, from a legal perspective, is that we need to consider what consumers think about these products," added O'Connell. "Do consumers understand the differences?"

The FDA issued a press release in 2018 declaring their intention to investigate consumers' understandings of the nutritional and other differences between these products—especially in relation to their public health consequences. But, while recognizing that it ultimately should be all about consumers, one should also recognize that nothing moves quickly in Washington, D.C.

"From Cellular Agriculture to Plant-Based Milks: Hot Issues in the Protein Arena," Jessica O'Connell, Partner, Covington & Burling LLP

Specialty Diets for Athlete to Elderly Needs

MARIE SPANO, MSC, RD, CSCS, CSSD, leading Sports Nutrition Expert, began her talk, "Sports Nutrition and Specialty Diets: From Keto to Vegan," by emphasizing that protein isn't only for bodybuilders. It also has a powerful role in weight management; functional living as we age; and disease prevention. Spano is the Sports Dietitian for the Atlanta Braves, Atlanta Hawks and Atlanta Falcons, so she has varied experience with nutrition issues, from top athletes to the general population.

Research shows low protein intake is associated with a reduction in muscle mass and strength throughout the lifecycle. Cortical bone increases up until age 25-30. Women and men lose 35 and 23% of cortical bone with aging, respectively. Protein makes up about 50% of bone volume and 33% of bone mass. Elderly persons who have osteoporotic hip fractures are often undernourished.

In senior hip fracture patients, protein supplementation (20g) resulted in fewer deaths, shorter hospital stays and attenuation of proximal femur bone loss (Schurch et al. 1998. *Ann Intern Med.* http://bit.ly/2RHSY3z).

Muscle protein synthesis rates are lowest first thing in the morning. So, after an overnight fast, a higher protein breakfast has the added benefit of up-regulating muscle protein synthesis, advised Marie Spano.

Protein is also beneficial for weight management. Protein improves satiety; helps retain muscle mass when dieting; and more calories are burned when digesting protein. Spano described the thermic effect of food (TEF), noting that 1lb of fat burns 2 calories/day at rest, whereas 1lb of muscle burns 6 calories. Further, she said, "TEF of protein and carbs is not significantly different between lean and obese people, but the TEF of fat is significantly lower in obese subjects, suggesting a reduced thermogenic response to fat."

The timing of protein consumption will affect satiety. Under conditions of energy balance, higher protein meals (0.6g of protein/kg/day) made no difference in postprandial or overall fullness. However, during energy restriction, a higher protein breakfast had the greatest effect on meal-related fullness and overall fullness over a 15-hour period (Leidy et al. 2009. *Br J Nutr.* http://bit.ly/2xlVrak).

Spano went on to emphasize, "Because rates of muscle protein synthesis are lowest first thing in the morning, after an overnight fast, a higher protein breakfast has an added benefit of up-regulating muscle protein synthesis" (Layman DK. 2004. *J Am Coll Nutr.* http://bit.ly/2XHIuGw).

Healthy athletes don't need protein powders, as long as they get enough from meals. The peak muscle-building period is likely less than two hours after finishing training for trained individuals (Mori H. 2014. *J Physiol Anthropol.* http://bit.ly/2KKgBI9).

"Consistently eating protein soon after body building has a small-to-moderate effect on muscle growth and may have a positive effect on muscle strength, either due to timing or by contributing to greater total protein intake over the day," she stated.

Moving onto keto diets, Spano explained that, traditionally, these are 80-85% fat and 10-15% protein which, when plant-based, focus on nuts, seeds, avocado and olives. Paleo diets can be high-protein, yet plant-based or vegan, by using nut and seeds. Or they can be keto-friendly when using fish and oils from nuts and fruits.

Spano stressed combining plant proteins to get all EAAs and eating more total protein to make up for low bioavailability, if relying on plant proteins (with the exception of soy, which is a complete protein). "Pulses," she noted, "are hot. And, in their whole state, they offer fiber, vitamins, minerals and plant compounds; they are non-GMO, gluten-free and clean label."

Microalgae are a novel source of protein and a diverse group of species that doesn't require arable land or water to grow. However, "Protein digestibility in the raw, unprocessed state is poor, and they are low in lysine and methionine," said Spano.

Nutrients from dairy foods are difficult to replace, because they provide "shortfall" nutrients—calcium, potassium and vitamin D. Spano stated, "Almond milk is water plus a few almonds, with added vitamins, and the calcium settles to the bottom of the container." Other nutrients of concern include magnesium, phosphorus, riboflavin, and vitamins A and B12.

In the development of products for weight loss, Spano suggested that more protein is better but does tend to reduce the moisture, which can result in a dry product. Also, she said, "Add fiber for satiation, not satiety; use natural sweeteners with no added sugar."

Spano also advised that older consumers should consider easy-to-open, ready-to-eat products that require minimal preparation and that are soft and easy to chew. Consider protein "compliments," as it is hard for many to eat a high-protein meal.

"Sports Nutrition and Specialty Diets: From Keto to Vegan," Marie Spano, Sports Nutrition Expert

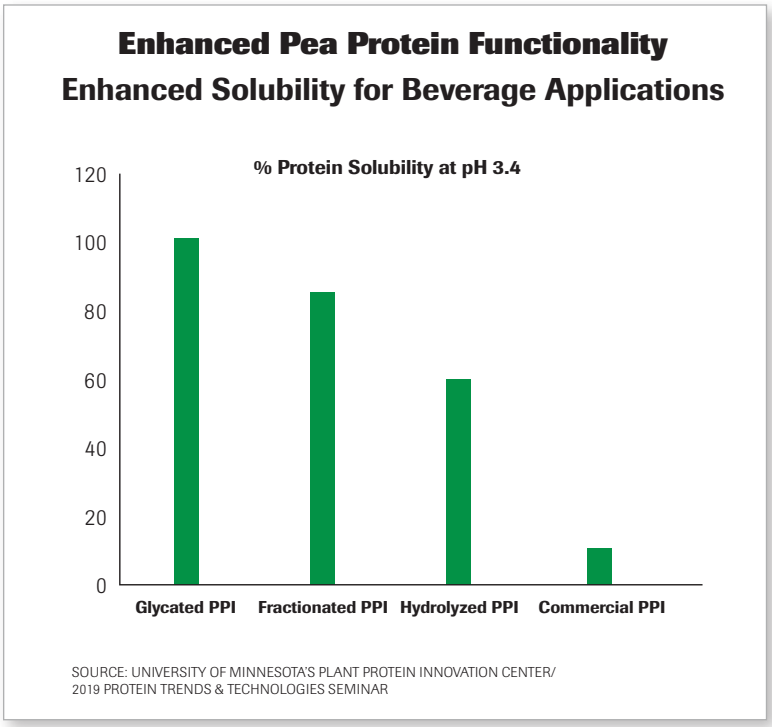
Research into Improving Plant Protein Ingredients

PLANT PROTEINS have come to the fore for a number of reasons. For one, [the raw materials generally] cost less than animal proteins. But they also align well with a number of emergent consumer trends, such as vegetarianism, veganism and sustainability. Thus far, however, proteins' functionality as ingredients has lagged behind that of animal proteins.

Prof. B. Pam Ismail, Associate Professor, Dept. of Food Science and Nutrition, and Director of University of Minnesota's Plant Protein Innovation Center, discussed some intriguing technologies that should expand the use of plant proteins in foods and beverages. She also provided details on two new, interesting protein-rich oilseeds under evaluation for potential commercialization.

"When investigating new and novel proteins, we need to know how to obtain desired protein ingredient functionalities through cost-effective extraction and processing techniques," said Ismail. In addition, she said, "If they don't taste good, consumers won't eat them." Cost-effectiveness, functionality and taste must go hand-in-hand.

The search for new plant protein sources to meet rising global demand led Ismail's researchers to focus on alternate sources to soy, such as peas. She noted that, in 2012, 81% of commercial (plant) protein ingredients were obtained from soy. By 2017, soy protein's market share had dropped to 61.4%, while pea protein's share rose from 7.6 to 21.2% and continues to rise. Yet, pea protein processing technology remains in a relatively early stage, said Ismail.



Through a combination of new process and protein-modification techniques, the solubility of pea protein isolates (PPI) can be enhanced to a level equivalent to that of the highest industry standard: whey protein.

One big quality variable is solubility. Most plant proteins (globulins) exist deeply imbedded within fiber and starch matrices, with water-loving (hydrophilic) amino acids on the surface and water-repelling (hydrophobic) amino acids within the interiors of the protein molecules. The hydrophilic amino acids on the surface are what render proteins soluble. During processing, however, conditions such as temperature, shear or changes in acidity can cause proteins to unfold (i.e., denature) and expose the interior hydrophobic amino acids, causing the proteins to aggregate and precipitate. Therefore, the objective of plant protein extraction and purification is to minimize the denaturation conditions that compromise protein integrity and function. Ismail outlined some of the new technologies being developed at her research center.

The first step is to optimize extraction conditions, said Ismail. She cited three techniques: isoelectric precipitation, salt extraction and ultrafiltration. In addition, Ismail's researchers are investigating new techniques whereby to modify the surface characteristics of extracted proteins in order to enhance stability, such as targeted enzymatic modification (the selective hydrolysis of protein subunits); glycation (conjugation of a reducing carbohydrate with a protein to increase stability); and cold plasma (the application of partially ionized air to oxidize protein surfaces).

Comparing extraction techniques, Ismail averred, "We found that salt and ultrafiltration yielded proteins that were less denatured and more thermally stable than proteins extracted through pH modification."

As Ismail explained: "When considering current commercially available protein choices for beverage applications, whey remains the dominant protein isolate, with close to 100% solubility. Soy protein isolate isn't that great, with slightly less than 20% solubility, but it is still better than pea protein isolate, which exhibits 5-6% solubility. Using salt-based extraction, we were able to increase pea protein solubility six-fold. When combined with targeted enzyme hydrolysis, we approached 90% solubility; with glycation, we achieved 100% solubility." (Similar to whey protein, that is.)

Ismail's group has been applying these protein molecule and process-modification techniques to two promising oil seeds, camelina and pennycress, with encouraging results. "These are winter crops favored for short growing seasons, and both are rich in fat (30-40%) and protein (25-30%)," she said. Modified camelina protein, in particular, shows promise of exhibiting stability in highly acidic beverages, although she admitted some flavor issues remain to be resolved, especially in pennycress protein.

In response to a question from the audience, Ismail added that, while the focus of her team's research has been on increasing protein solubility, the same techniques could also apply to increasing protein hydrophobicity (insolubility), leading to gluten-free protein alternatives for baking, for example.

In a global market where protein demand is likely to remain, in Ismail's words, "steep and long-term," the development and commercialization of new protein sources and modification technologies can only expand product developers' fields of dreams.

"Plant Proteins: Structural and Functional Properties & Use in Food and Beverage Formulations," Prof. B. Pam Ismail, Ph.D., Associate Professor Dept. of Food Science and Nutrition, and Director of University of Minnesota's Plant Protein Innovation Center

Plant vs. Animal Protein Functionality in Model Systems

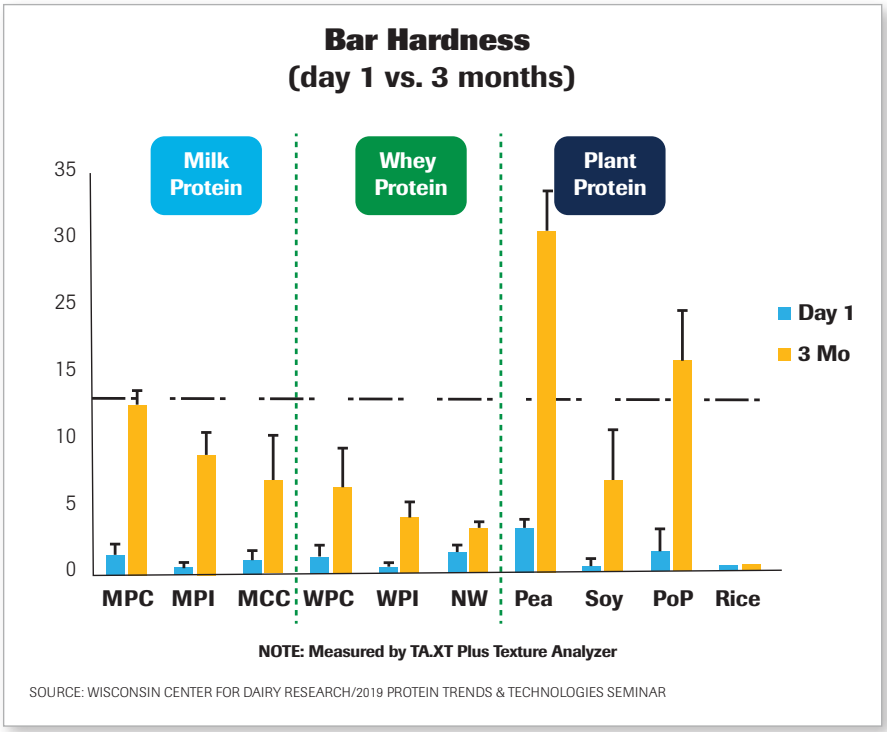
"FUNCTIONAL DIFFERENCES BETWEEN dairy and plant proteins will affect performance in beverage and bar applications," said Hong Jiang, Wisconsin Center for Dairy Research, in her presentation titled "Characterization of Functional and Sensory Properties of Commercial Food Protein Ingredients." Jiang and fellow researchers recently characterized the functional and sensory properties of 30 different, commercially available dairy and plant protein ingredients.

Dairy proteins that were tested included milk and whey proteins. Plant proteins included potato, pea, soy and rice protein. All ingredients were >75% protein and were hydrated for one hour at room temperature before testing. Functionality tests were performed at the protein's native pH. Below are key results.

Water-holding capacity is the ability of the protein to trap water within a protein's three-dimensional structure. This property is important for processed meat, soups and sauces, and bakery/pastry. The proteins with the best water-holding capacity were milk, soy and pea.

Viscosity is also a measure of water-holding capacity and demonstrates the flow properties and thickening ability of a protein ingredient. Of the proteins tested, milk and pea protein had the highest viscosity at 10% protein solution.

Heat stability is an important property for beverages. At pH 3, whey proteins had the best heat stability, followed by plant proteins, then milk proteins. Whey protein isolate (WPI) is ideal for clear RTD applications, such as juice, isotonic drinks and protein water. However, not all whey protein ingredients will be clear. Whey protein concentrate (WPC) ingredients contain fat, so they will make beverages cloudy or milky-looking. WPI is the product



After three months of storage, whey protein remained comparatively softer in texture than either milk proteins, pea or potato protein.

suitable for clear drinks. Heat stability at pH 7 is important for UHT beverages and other low-acid foods. At neutral pH, the most stable proteins were milk and whey.

Stability in pH 7 beverage: Ten of the proteins were also tested for stability in UHT beverages based on their heat stability results at pH 7. Formulas were standardized to 5% protein; the pH was adjusted to 7; and formulas were processed in a UHT MicroThermics unit at 140°C for three seconds. At day one, all beverages were stable; however, the rice protein had a sandy texture. The color of the beverages varied by protein source. Bitterness increased after heating. Some of the protein beverages became slightly thicker over two weeks' storage.

Stability in pH 3 beverage: Seven of the proteins were also tested in a high-acid beverage application based on their heat stability results at pH 3. The native whey, WPI and potato protein produced clear beverages. All beverages exhibited some astringency, but the whey protein beverages had a cleaner and more acceptable flavor profile. Three of the four plant beverages separated during storage.

Emulsion activity is important for salad dressing and coffee creamer. Whey, milk, pea and soy protein were better at forming an emulsion than potato and rice protein. Emulsion stability was measured after heating to 80°C for 30 minutes. Milk, soy and pea proteins exhibited good emulsion stability.

Foaming ability is important for mousse, cake and whipped topping. Whey proteins had excellent foaming ability. Whey proteins also had good foam stability as measured after sitting for 30 minutes.

Gelation ability and gel strength are very important for cake, pie filling and processed meat. Heat is required to induce gelation of protein ingredients. Only 12 of the 30 ingredients tested were able to form a gel. All whey ingredients formed a gel.

Sensory properties in 10% hydrated solutions were determined by a trained panel of nine individuals using an established sensory language. Plant proteins had higher intensity of astringent, bitter, sour and beany flavor than dairy proteins. (Research done by Dr. MaryAnne Drake at North Carolina State University.)

Model protein bar. All 30 protein samples were tested in a typical bar formula. The ratio of carbohydrate/protein/fat was 40/30/30. The bars were stored at room temp or in a 45°C incubator for 90 days. Following room temperature storage, all protein bars were darker in color.

On day one, all protein bars appeared soft. After three months of storage, the milk and plant protein bars became significantly harder than the whey protein bars. After 90 days of storage at elevated temperatures, almost all bars reached an unacceptable level of hardness. Some of the whey protein bars remained comparatively softer. Rice protein bars retained softness during storage but tasted grainy and sandy.

All proteins are unique. Dairy proteins offer a comprehensive solution to end-users compared to plant proteins. When selecting a protein ingredient, remember to choose a suitable functional test for the desired end-use application and manufacturing process.

"Characterization of Functional and Sensory Properties of Commercial Food Protein Ingredients," Hong Jiang, MSc, Research Specialist, Center for Dairy Research, University of Wisconsin-Madison

Easy to Long-Range Strategies for Sustainable Protein Foods

THE CHALLENGES OF AND POTENTIAL steps toward achieving and maintaining a sustainable, global protein supply were the focus of a presentation from Clyde Don, Ph.D., a consultant in the food science and green chemical industries, based in the

In developed countries, the protein quality of diets is much improved over those portrayed in van Gogh's masterpiece, *The Potato Eaters*, from the 1880s. However, improvements to the current global protein supply are still needed.

Netherlands, and Managing Director of CDC FoodPhysica Lab.

The diet of the Dutch in the 1880s, as illustrated by van Gogh's masterpiece *The Potato Eaters*, was not ideal, and it was undoubtedly protein deficient. A little over a century later, the food system has dramatically improved; however, improvements to the current global protein supply are still needed.

While global resources exist to feed the world, not all people eat a high-quality diet in terms of protein. Plant-based proteins can help meet global protein needs, and 5% annual growth in the plant protein market has been forecast in the developed countries (such as in North America, Western Europe).

Animal- and plant-based proteins differ in their quality for human nutrition. Protein quality is related to both its digestibility and its amino acid composition. Animal proteins usually have an excellent amino acid composition with respect to human nutrition. In contrast, single protein sources from plants may be low in essential amino acids, such as lysine. Proteins from various plant sources can be blended to achieve a much better amino acid composition and nutritional value, however. For example, a mixture of rice, mung bean, sesame and carrots approximates casein, a relatively high-quality animal protein, in terms of nutritional quality, said Don.

In addition to nutritional quality, the functionality of animal proteins is challenging to replicate with plant proteins. Early attempts to replace meat with plant proteins led to rubbery, dry products with little taste. Clever blending of proteins can provide both better quality protein and better functionality.

Some of the same factors affect both protein quality and protein functionality. Solubility and the ability to form stiff gels are important to protein functionality in foods, and both are influenced by the amino acid composition of the protein. Protein blends can be used to formulate improved meat-like textures, although achieving proper juiciness remains challenging.

The need to obtain sufficient protein will remain a global concern, even while technical challenges are overcome. Don outlined five steps to transition towards a more sustainable global protein supply.

Step 1. Sausage of the future: Incorporating alternative proteins represents an easy and currently available way to move away from the overuse of meat. Sausage is one of the first food products that humans developed. As a mixture of ingredients, sausage can be redesigned by blending different proteins beyond meat (e.g., pulses, cereals/grains, fruits/vegetables, nuts and insects).

Step 2. Animal protein waste recovery: Animal proteins that are currently treated as waste products can be reformulated and utilized as foods. For example, the low solubility of egg yolk powder waste can be greatly improved by enzymatic digestion, allowing it to be used in bakery products or protein beverages. Collagen proteins are another animal protein which may enter the waste stream; however, collagen can be added to sausages, thus increasing product yield, reducing cooking loss and improving texture.

Step 3. New sources of protein: New, sustainable sources of protein are being explored. Insect protein shows promise, but it is not currently eliciting much consumer interest (and may cause reactions in those with shrimp and shellfish allergies). Seaweed is another newer protein source which is produced without using land; however, its water solubility and protein content, both of which are desirable for use in food products, are highly variable. Duckweed, despite poor solubility, has shown promise as an ingredient in certain foods, such as bakery products, suggested Don.

Step 4. Novel proteins from the lab: Generating egg proteins without a chicken (or beef without a cow) by using a bioreactor is in the development stage but has not yet reached the marketplace. At least in the EU and the Netherlands, some regulatory resistance to moving cultured proteins into the food chain exists. [*Editor's Note: For the situation in the U.S., see Jessica O'Connell's presentation "From Cellular Agriculture to Plant-based Milks: Hot*

Issues in the Protein Arena," in this issue on page 10 and online at https://bit.ly/2MCTakQ.]

Step 5. Protein on demand: Modern technology, such as CRISPR-Cas, could be used to change the amino acid composition of proteins "on demand" to provide desired protein functionality and quality. Fermentation technology (and the scaling up of said technology) is already available that could make this goal a reality.

"Creative Reformulation of Protein Foods: Five Steps toward a Sustainable Protein Supply," Clyde Don, Ph.D., Managing Director, CDC FoodPhysica Lab

Protein Quality Measurements, Claims and Values

INITIALLY, PROTEIN ASSESSMENT involves gathering evidence necessary to support protein claims on food labels. In his presentation titled "The Impact of Processing on Protein Quality Measurements: Implications for Protein Content Claims," James D. House, Ph.D., of the University of Manitoba, relayed that two key parameters are: 1) how well does the amino acid composition of the protein source match to human amino acid needs; and 2) how well is the protein digested, and are the amino acids absorbed to support the needs of the consumer.

"Regulatory frameworks for protein content claims in Canada and the U.S. are underpinned by the protein efficiency ratio (PER) and protein digestibility-corrected amino acid score (PDCAAS), respectively," explained House. The digestible indispensable amino acid score (DIAAS) is a novel approach to measuring protein quality. The EU uses an expression of protein content relative to energy content.

The PER method utilizes a rat bioassay that measures weight gain/protein intake over 28 days and adjusted relative to a reference protein (casein). "The advantage," according to House, "is it's simple and provides a summative biological response to protein intake." But using rodents is not reflective of human AA needs, and there are ethical constraints. There is limited data available; 47 entries are in the CFIA PER table and 247,326 foods in USDA Food Composition Databases. "Also, the values are non-additive, so it is limited in its use to predict values for new food products," he explained.

The PDCAAS is determined from the product of the AAS (calculated by dividing the food AA by the AA in the reference pattern) and true fecal protein digestibility (determined by fecal nitrogen output divided by the dietary nitrogen input), with a correction for endogenous losses. Protein content claims for foods are based on the product of the PDCAAS and the protein content of the representative amount customarily consumed (RACC). House stated that "a value of 5-9.9g is a 'good source' of protein; 10g or greater is an 'excellent source.'"

House also explained: "The advantages of the PDCAAS are that it's simple; there are robust AA datasets; and values are additive to permit calculations of PDCAAS values for mixtures of proteins. However, as with the PER, the PDCAAS is determined using a rodent bioassay. Also, fecal protein digestibility is impacted by gut microbiota, and values are truncated at 1.00, so proteins of higher quality are not identified."

The DIAAS has been proposed but has not yet been adopted by any jurisdiction. It has advantages, because it treats AA as individual nutrients; uses ileal (relating to the ileum) digestibility values; and scores are not truncated. But, stated House, "It is a bioassay with its associated ethical constraints; multiple analyses are required for one DIAAS value; and it has an arbitrary cut off of 75% for protein source claims."

Various factors, including plant genetics and growth, as well as processing, affect the quality of plant proteins. (See chart "Factors Influencing Plant Protein Quality.")

Factors Influencing Plant Protein Quality

	Amino Acids	Digestibility/Availability
Plant genetics	✔	✔
Environmental factors	✔	?
Management factors	?	?
Thermal processing	✔	✔
Particle size	X	✔
Blending	✔	✔
Concentration/Isolation	✔	✔
Fermentation	?	?
Germination/Sprouting	?	?
Hydrolysis	?	?

SOURCE: UNIVERSITY OF MANITOBA, 2019 PROTEIN TRENDS & TECHNOLOGIES SEMINAR

Various factors, including plant genetics and growing conditions, as well as processing, affect the nutritional quality of plant proteins.

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House's research has found that digestibility values for fava, pea and lentil protein isolates were greater than concentrates—most likely due to reduced antinutrient factors. Despite having a higher protein content, the final PDCAAS values of the isolates were lower than concentrates for lentil and pea, due to lower AAS. This suggest that the isolation process altered the AA composition.

Extrusion of flours from buckwheat and pinto beans resulted in higher PER, increased digestibility and greater PDCAAS than baked products. A correlation was found between digestibility and PDCAAS values generated from *in vitro* and *in vivo* methods. House suggested that "the use of *in vitro* digestibility analysis could be a potential replacement for current rodent assay for nutrient content claims." (Nosworthy, MG et al. *J. Agri. Food Chem.* 2017/ http://bit.ly/2XrA2eA).

Another study showed that the PDCAAS for processed beans was higher than the DIAAS (61 vs. 45%). Extrusion/cooking of various beans resulted in higher PDCAAS (66% average) and DIAAS values (61% average) than baked (52 and 48%). A significant correlation was found between PDCAAS and *in vitro* PDCAAS (R2 = 0.7497). (Nosworthy, MG et al. *Nutrients*. 2018/ http://bit.ly/2IyzoUw)

"Protein quality plays an important role in communicating protein messages to consumers," concluded House. "But, given the many sources of variability in assessment methods, we need new practical approaches for its determination."

"The Impact of Processing on Protein Quality Measurements: Implications for Protein Content Claims," Dr. James D. House, Dept. of Food and Human Nutritional Sciences, University of Manitoba

Development Considerations for Keto-friendly Foods

DAVID PLANK, A SENIOR RESEARCH FELLOW at the University of Minnesota and Managing Principal of WRSS Food and Nutrition Insights, offered valuable insights into developing keto-friendly food products in his presentation titled "Product Challenges in the Development of Protein and Keto-friendly Food Products."

The origin of the ketogenic diet can be traced back to 500 B.C., when ancient Greeks discovered that epilepsy could be controlled by fasting. In the 1920s, a ketogenic diet which mimicked the physiological state of fasting was developed to treat epilepsy. The current ketogenic diet fervor began in 1994, when a television program featured the successful use of a ketogenic diet to treat epilepsy in the son of a well-known Hollywood producer.

The fat, protein and carbohydrate content of almonds approximates that of a ketogenic diet.

The ketogenic diet reduces the frequency of epileptic seizures, but its use is limited primarily to children—because dietary compliance can be problematic in adults. Ketogenic diets are also effective for weight loss and weight management and may be helpful in other conditions. Variations on the standard ketogenic diet have been developed to improve compliance and for specific populations, such as bodybuilders.

Many individuals initiating a ketogenic diet experience the "keto flu," a constellation of flu-like symptoms, which can include diarrhea and constipation. Other risks associated with ketogenic diets include reduced athletic performance, high cholesterol, ketoacidosis, heart disease and kidney stones.

Plank used a case study to illustrate considerations that might be important when developing a keto-friendly food product. He began with business risks: In addition to compliance problems, the potential for side-effects and the inability to make validated health claims could constitute liabilities. To mitigate these risks, the company focused on developing a "keto-friendly," nutritious product that could stand on its own. They also included wording in the product labeling that recommended consulting a doctor before initiating a ketogenic diet.

For their product platform, the developers wanted their product to be natural; high in fat and protein; low in carbohydrates yet high in fiber; locally sourced; and healthy. Almonds (grown local to the company in California) were chosen for the product's base. The composition of almonds (i.e., 51% fat, 21% protein and 20% carbohydrates) approximates that of a ketogenic diet, and almonds are well liked by consumers.

The protein content of foods is estimated using nitrogen conversion factors (NCFs). An NCF measured in 1898 has been used to assess the protein content of almonds. This factor was based on a single storage protein found in almonds, but other proteins within the nut have higher levels of nitrogen. Following a new analysis, a higher NCF of 6.25 (20% more than the original value) was obtained, which should allow it to be labeled with a higher protein content, increasing the final product's value.

In choosing a sweetener for their product, cane sugar was rejected because of its negative perception by most ketogenic dieters (despite having a "clean label"). The developers eventually chose the sweetener allulose, a monosaccharide isomer of fructose, with 70% of the sweetness of sucrose and only 0.4 calories per gram. According to a new FDA draft guidance on allulose, the sweetener does not need to be counted in total or added sugars on labeling.

The lack of fiber in a ketogenic diet reduces mineral uptake and disturbs the gut microbiome; therefore, the developers wanted to enhance the product's fiber content. Allulose inhibits an enzyme involved in starch metabolism, essentially turning starch into fiber. Almonds themselves are a good source of fiber, but even more fiber was desired.

The company decided to incorporate a viscous fiber into the product to enhance its overall fiber content. Due to current intellectual property considerations, Plank could not reveal its identity but noted that clinical data supports its role in weight management. Together with an existing EFSA-affirmed health claim for the fiber, future marketing claims for the product should be easily justified.

The addition of the viscous fiber to the almond butter product provides other benefits. The fiber gives the product structural stability. Importantly, the addition of the fiber also prevents oil separation in the product without the use of hydrogenated fats or emulsifiers, which consumers perceive negatively. Finally, the addition of the fiber allows intellectual property to be captured for the product formulation, providing a potential advantage in the marketplace.

"Product Challenges in the Development of Protein and Keto-friendly Food Products," David Plank, Ph.D., Senior Research Fellow at the University of Minnesota; Managing Principal of WRSS Food and Nutrition Insights

PHOTO COURTESY ISTOCK/SVETIKD

Most consumers feel it is important to have a healthy balance of plant and animal protein. Some 98% of meat alternative buyers also purchase meat.

Pre-conference Program: Business Strategies

Overview: Where U.S. Consumer Protein Dollars are Spent

MORE THAN HALF OF U.S. CONSUMERS say that they have protein at every meal. That equates to over 300 billion meals with protein per year in the U.S. and Canada. "Of these consumers, 31% say that the source of their protein does matter, and 20% are actively monitoring their protein intake on a daily basis," said Meagan Nelson, MBA, Associate Director, Nielsen, in her presentation titled "Protein Proliferation: Understanding the Consumers' Total Protein Landscape."

The primary sources of proteins for U.S. consumers are meat (in 78% of households); dairy (58%); eggs (61%); fish/seafood (29%); and legumes/nuts/seeds (19%). Consumers are planning to consume more fish, legumes, nuts and seeds, according to Nelson. Interestingly, 14% of U.S. consumers plan to consume more meat, while 22% want to consume less meat. In the U.S., 5% of households have someone on a high-protein diet.

Despite their interest in protein, an amazing number of consumers cannot readily identify protein levels in common foods. Only 22% of consumers correctly identified peanut butter as falling into the category of a low (< 10g per serving) source of protein. And only 12% of consumers correctly identified cottage cheese as a high (>20g per serving) source of protein. At the same time, 55% of consumers correctly stated that beef was a high-protein food.

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51% of consumers say they have protein at every meal

31% agree that the source of protein does matter

20% consistently monitor daily protein intake

SOURCE: NIELSON PANELVIEWS SURVEY, MARCH 2017-CANADA; U.S. HOMESCAN PANEL PROTEIN SURVEY, APRIL 2017/2019 PROTEIN TRENDS & TECHNOLOGIES SEMINAR

Most consumers incorrectly believe that meat is the costliest protein. In actuality, nutrition bars (at 20 cents/gram on average) and jerky (25 cents/gram on average) are among the most expensive sources of protein. The least expensive protein sources are chicken, pork and turkey, at 2 cents per gram.

When consumers have money, they are willing to pay a premium for groceries and, more specifically, for dairy and meat/seafood in the protein space. The deli department is driving the growth of the meat category, as today's consumers find convenience in prepared main courses, salads and appetizers, and lunchmeat and sandwiches. Almost all seafood products are showing growth in both dollars and units. Sushi, which is a unique category, continues to show rapid growth, with $1.3 billion in total annual sales.

Elsewhere in the protein space, in the dairy aisle, milk and yogurt are struggling. However, pockets of growth include specialty cheeses. Overall egg dollar growth has been driven by inflationary pressure, but there is huge growth in cage-free and free-range eggs.

Despite the plant-based movement, the category of legumes/nuts/seeds is not showing significant growth. Some exceptions include pistachios, black beans, sesame seeds, sunflower butter and low-salt products.

Excluding the five primary categories of protein foods, sales of other foods that qualify as a good or excellent source of protein by FDA guidelines account for another $21.6 billion in sales. Grocery and frozen accounted for the most sales in this category. Interesting "up-and-coming" products include grocery broth (bone broth), ice cream and pancake mix.

Roughly 40% of U.S. and Canadian households are trying to increase their consumption of plant foods, and much of this growth is driven by young consumers. Among plant-based foods that are a good or excellent source of protein, there has been significant growth in the frozen prepared foods category.

Protein continues to be top of mind for U.S. and Canadian consumers.

Despite all the buzz about meat alternatives, meat industry total sales were $95 billion dollars, while meat alternatives sales were less than $1 billion. While 21.6% of households purchase meat alternatives, only 27% of meat alternative buyers are purchasing five or more times a year. Sales of plant-based dairy alternatives increased slightly, to total sales of $4 billion.

Consumers are also willing to consider altering their diet for factors outside of health. When consumers were asked what they were willing to do to alter livestock's impact on climate change, while only 16% of consumers said they had any awareness of this issue, 61% were willing to reduce meat consumption, and 43% were willing to replace meat-based protein with plant alternatives. Just 12% of consumers would try cultured meat grown in a lab, and 8% would try insect protein.

Most consumers feel it is important to have a healthy balance of plant and animal protein. Actually, 98% of meat alternative buyers also purchase meat. Only 5% of consumers are vegetarian or vegan.

Protein foods account for nearly $190 billion in sales across the U.S. grocery business, and this is a very competitive space. Growth is happening in very divergent ways. Ultimately, innovation and unique applications of protein will continue to drive growth.

"Protein Proliferation: Understanding the Consumers Total Protein Landscape," Meagan Nelson, MBA, Associate Director, Nielsen
[Editor's Note: All data was derived from Nielsen surveys from the 2017-2019 time period in the U.S. and/or Canada. Certain data was obtained from Nielsen Product Insider, powered by Label Insight.]

Market Size and Applications for Dairy Proteins

THE DAIRY INGREDIENT SECTOR remains a dynamic and crucial source of proteins for foods and beverages. The global market for dairy proteins includes many mature ingredients. "However, it is the newer ingredients, such as native whey, micellar casein and peptides, that are creating added value in the sector," said Tage Affertsholt, MSc, Owner, 3A Business Consulting, in his presentation titled "Global Market for Whey and Other Dairy Proteins."

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Formulating with Proteins Magazine Protein Library

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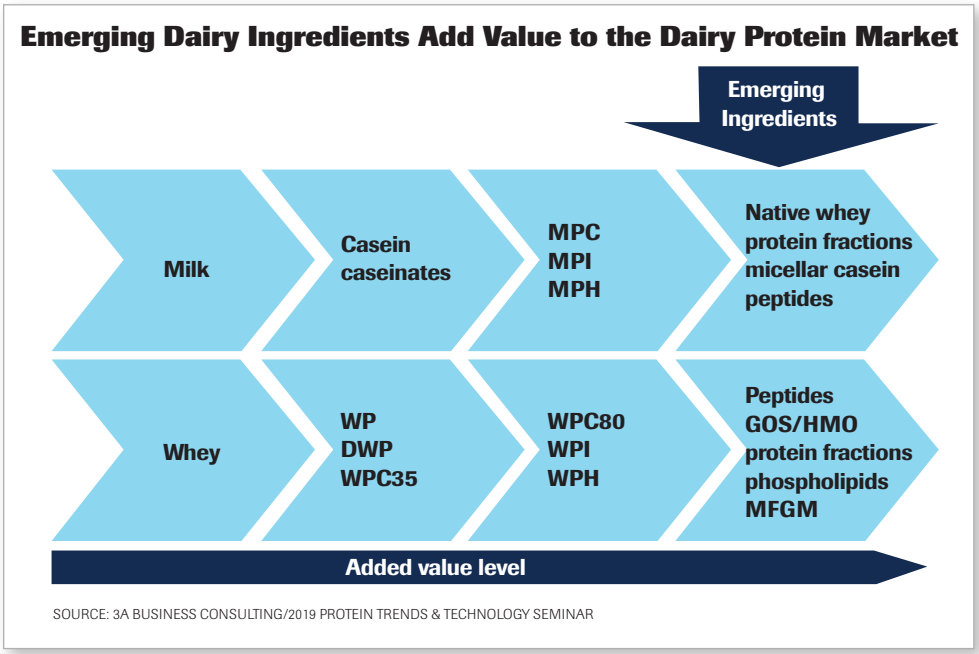


The global market for dairy proteins includes many mature ingredients, but newer ingredients, such as native whey, micellar casein and peptides, are creating added value in the sector.

First, let's look at the whey category. The more concentrated protein products, such as whey protein concentrate 80% (WPC80) and whey protein isolate (WPI), have been driving category growth and value, and this trend is expected to continue through 2022.

The global market value of whey ingredients was approximately 6 billion USD in 2017 and is expected to grow to 7.1 billion by 2022. While the EU is the dominant producer of whey powder and demineralized whey, production of whey protein concentrates in the ranges of 35-89% protein is equally distributed between North American and Europe.

The U.S. dominates production of WPC80 and WPI to fuel its protein-hungry sports nutrition market. Asia relies heavily on exports from North America and Oceania to meet their demand for these ingredients. Demand from the nutrition sector for higher protein ingredients is divided into four major usage categories: obesity; child and infant nutrition; healthy active lifestyles; and aging populations.

The sports nutrition category represents more than 15 billion USD annually and is growing by 10%. One of the biggest companies in sports nutrition is Glanbia, which has acquired many sports nutrition brands.

Milk proteins dominate the 12 billion USD clinical and adult nutrition category, which is also an opportunity area for whey protein hydrolysates.

The infant formula markets in Asia and the EU are major users of 90% demineralized whey powder, while whey powders with lower levels of demineralization are utilized in bakery and confectionery products. Lower protein WPCs are used in sports powders, infant formula and dairy. Key markets for whey hydrolysates include sports nutrition, infant formula and clinical nutrition.

The infant formula industry, valued at over 50 billion USD, continues to be a major market for higher value whey protein ingredients, including those enriched with alpha-lactalbumin or lactoferrin. The Chinese market is driving growth in this category.

Whey proteins are produced by a wide range of suppliers, some with limited portfolios and market scope. In contrast, larger companies have both a wide portfolio and a global scope.

A similar growth story is seen in the milk protein industry. The global market value of milk proteins was approximately 3.5 billion USD in 2018 and is forecast to reach almost 4 billion by 2022. Production of MPC with protein levels above 85% has increased in recent years, as has production of newer ingredients like micellar casein concentrates (MCC), micellar casein isolates (MCI) and native whey.

The EU and Oceania are the major suppliers of casein and caseinates, while North America is both a major producer and supplier of milk protein concentrates (MPC). Asia is a key user of milk proteins, and there is growing demand from developing countries.

Milk proteins are used primarily in infant, clinical and sports nutrition products, but they are also used in processed foods, including dairy and cheese. MCC, MCI and native whey are used almost exclusively in sports nutrition. MPC is seen in a wide range of new product launches, while MPI is used primarily in sports nutrition. Micellar casein in powdered sports nutrition products is touted as being "less processed."

Clinical nutrition is a relatively small (12 billion USD) but growing market for milk proteins in sophisticated markets, such as the U.S., EU and China. Milk proteins are valued for their slower absorption rates.

Other examples of emerging dairy ingredients include casein phosphopeptides and osteopontin. Galctooligosaccharides (GOS), which are derived from lactose, also show growth potential.

A number of dairy ingredient companies are starting to produce organic whey and milk protein ingredients. The forecast is for continued steady and significant growth in the dairy protein industry.

"Global Market for Whey and Other Dairy Proteins," Tage Affertsholt, MSc, Owner, 3A Business Consulting

RDA Determination and Over or Under Consumption of Proteins

COMMON MYTHS REGARDING dietary protein were a key focus of the presentation, titled "New News About Protein: How Much is Too Much…and Not Enough," provided by Steve Hertzler, Ph.D., RD, Sr. Scientist, Clinical Research, Abbott Nutrition.

"Can protein give you energy?" questioned Hertzler. "Yes, theoretically! But this is not preferred and occurs only to a limited extent, as amino acids are not the ideal source to burn for energy." This is because excretion products of protein oxidation, such ammonia and urea, can potentially be toxic to the body.

Hertzler noted that the current Recommended Dietary Allowance for protein is 0.8g protein/kg of body weight per day. "The RDA is the amount sufficient to meet the nutrient requirements of nearly all healthy individuals in a particular life stage and gender group," he noted. RDAs are based on nitrogen balance studies; however, these studies are difficult to perform and interpret correctly.

Indicator Amino Acid Oxidation (IAAO) is a "newer method in which humans are fed different amounts of IAA (typically an isotopically labeled amino acid such as 13C-phenylalanine). The 13C comes out of the body as 13CO2 when the amino acid is oxidized and can be quantified in expired breath samples," stated Hertzler. The IAAO method removes some of the limitations that have been associated with older nitrogen balance studies.

The theoretical basis underpinning the IAAO method is that, at low protein intakes, essential amino acid (EAA) intake is insufficient to support protein synthesis, and IAAO will be high. As protein/EAA intake increases toward requirements, protein synthesis improves, and IAAO falls.

"At breakpoint," Hertzler explained, "IAAO reaches its lowest point, and further increases in protein intake do not alter it. This breakpoint is referred to as the estimated average requirement (EAR). A margin of safety is added (typically 2 standard deviations above the EAR), and that protein intake number becomes the proposed RDA.."

Data from ten IAAO human studies indicate an EAR higher than the present RDA. (See chart "IAAO Studies to Estimate Human Protein Requirement.") "This is important," stressed Hertzler, "because, for non-exercising adults of all ages, the protein RDA (1.15-1.30g/kg/d) is around 50% higher than the present RDA." For athletes, the present RDA is two-three times lower than the proposed RDAs derived from more recent IAAO studies, which range from 1.7-2.6g/kg/d.

Expert groups are recommending increases in protein intake. For example, this would include, for healthy older people or those who are (or at risk of) malnutrition, at least 1.0-1.2g and 1.2-1.5g protein/kg BW/d, respectively. (Deutz NEP et al. *Clin Nutr* 2014. https://bit.ly/2ZU2AuY) Hertzler stressed that nearly all new evidence points to benefits of protein intakes higher than current RDA, yet no specific changes are being implemented to current RDAs.

Data from "National Health and Nutrition Examination Survey" (NHANES) 2011-2014 showed that 31-50% of older populations consume below the protein RDA (which may already be too low), as expressed on an actual BW (not ideal BW) basis. (Krok-Schoen JL et al. *J Nutr Health Aging* 2019/https://bit.ly/2xyzPaQ)

There appears to be a benefit for older people to consume higher protein intakes. Intakes of 1.5 vs. 0.8 g/kg/day protein resulted in muscle mass more than doubling in arms and legs in frail elderly subjects. Indices relating arm and leg muscle mass to BW, BMI and body fat all significantly improved, as did gait speed. (Oikawa SY et al. *Am J Clin Nutr* 2018/https://bit.ly/2XH52Iq)

Data from ten IAAO human studies (shown right) indicate an EAR higher than the present RDA. [*Editor's note: For a list of references noted in this chart, see slide 22 at https://bit.ly/2IZPNS4* .]

IAAO Studies to Estimate Human Protein Requirements

Population (reference no.)	Mean age/ age range (y)	Proposed RDA/population safe intake (g/kg/d)	Current DRI/RDA /AI (g/kg/d)[5]
Children (3)	6-11	1.55	0.95
Young adult males (4)	~27	1.20	0.80
Bodybuilders, male (1)	22.5	2.20	0.80
Endurance athletes, male (6)	28	1.83	0.80
Endurance-trained males, 24h post-exercise (2)	26.6	2.60	0.80
Female athletes, variable intensity exercise (11)	21.2	1.71	0.80
Older males (8)	>65	1.24	0.80
Older females (7)	>65	1.29	0.80
Octogenarian females (10)	82	1.15	0.80
Pregnancy, 11-20wk gestation (9)	24-37	1.66 [upper end, 95% CI from EAR]	1.10
Pregnancy, 31-38wk gestation (9)	24-37	1.77 [upper end, 95% CI from EAR]	1.10

NOTES: CI=CONFIDENCE INTERVAL; DRI=DIETARY REFERENCE INTAKES; RDA=RECOMMENDED DIETARY ALLOWANCE; AI=ADEQUATE INTAKE; EAR=ESTIMATED AVERAGE REQUIREMENT

SOURCE: STEVE HERTZLER, PH.D., RD, SENIOR SCIENTIST, CLINICAL RESEARCH, NUTRITION SCIENCE & INNOVATION, GLOBAL SCIENTIFIC AND MEDICAL AFFAIRS, ABBOTT NUTRITION/2019 PROTEIN TRENDS & TECHNOLOGIES SEMINAR

Hertzler emphasized that it is very difficult to consume "too much protein." High-protein diets within the U.S. Institute of Medicine's Acceptable Macronutrient Distribution Range (AMDR) of 10-35% of energy (and up to two-three times the RDA) pose no direct safety concern. "However, the key proviso is that a person has healthy liver and kidney function to start." (Antonio J et al. *J Nutr Metab* 2016/ https://bit.ly/2xyzPaQ)

High-protein diets are unlikely to have an adverse effect on bone health and may have positive effects. Indirect risks of high-protein diets have less to do with the protein and more to do with other dietary factors that may do harm, such as saturated fat or low fiber.

"My main concern is with protein crowding out other healthy foods," stated Hertzler. Many high-protein foods are low in carbohydrate and fiber, yet many healthy high-carbohydrate foods are low in protein.

He noted, "Plant-based proteins, as part of your overall protein mix, are a great way to get protein, as well as a lot of other beneficial nutrients."

Hertzler concluded that current research suggests protein recommendations, such as the RDA, may be too low to promote optimal health and function, especially as people get older. Proper distribution of protein intake may be helpful as well.

"New News About Protein: How Much is Too Much…and Not Enough," Steve Hertzler, Ph.D., RD, Senior Scientist, Clinical Research, Nutrition Science & Innovation, Global Scientific and Medical Affairs, Abbott Nutrition

Consumer Sales Data on Plant and Animal Proteins

HIGH-PROTEIN DIETS mean different things to different people. So stated Kasey Farrell, Data Product Manager, Product Intelligence Team SPINS, while setting the stage for her talk "The Age of Protein: Emerging Opportunity for Plant-Based Alternatives."

Historically, vegan products have been favored for animal welfare and environmental concerns but are often associated with poor taste qualities. The term "plant-based" is more about good health and flexible, customized approaches to eating.

Sales of plant-based meat alternatives are growing with plant-based burgers seeing the most accelerated growth. Sugar-free, low-carb, gluten-free and keto-friendly products using plant-based protein sources are trending.

The meat substitute market is expected to grow 74% to $2.5 billion globally by 2023, according to Euromonitor.

Farrell noted data from a 2018 International Food Information Council Foundation report that shows over 70% of people view protein from plant sources as healthy, whereas less than 40% view animal protein as healthy. In the retail sector, animal-based proteins—with the exception of egg and collagen—declined. Meanwhile, plant protein sales are still increasing, with pea protein showing the greatest growth.

Farrell presented data showing that plant-based alternatives to burgers and other meats, protein supplements and milks all saw impressive growth in the past year. Milks have the highest dollar sales, but burgers have seen the greatest percent growth.

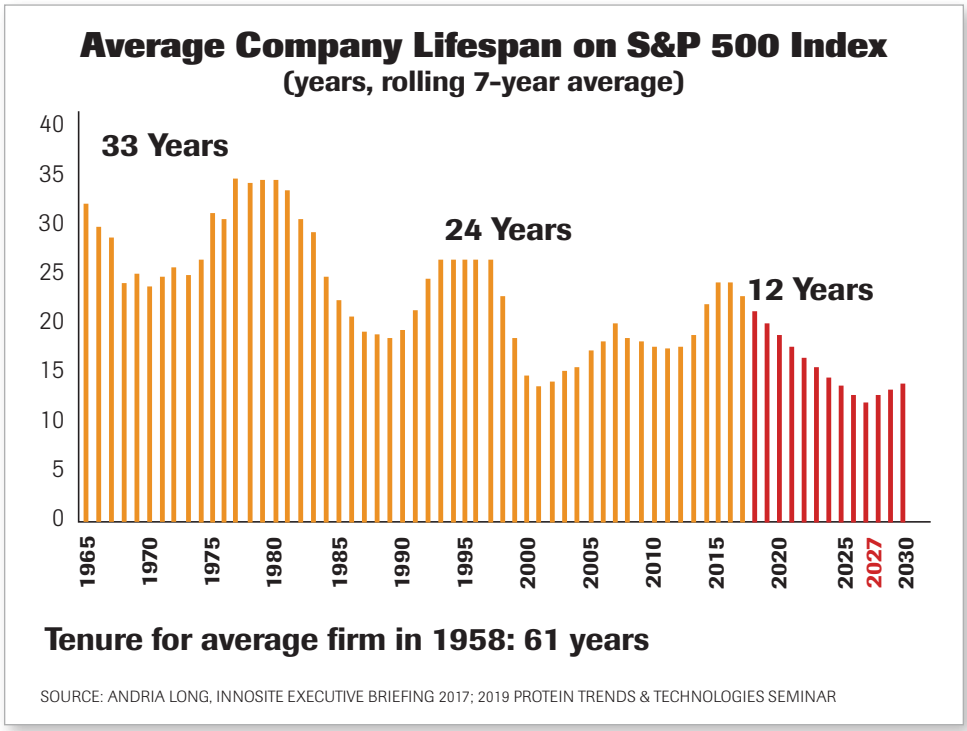
"Euromonitor International data noted that the meat substitute market was valued $1.44 billion and, by 2023, is expected to grow 74% to $2.5 billion," Farrell stated.

Taste is still the primary determinant for consumers, and restaurants and chefs are formulating new recipes and menu items to broaden plant-based options. Farrell provided examples including Burger King's "Impossible Whopper," Carl's Jr's "Beyond Famous Star burger" and Silver Diner's "Just Egg Benedict." Additionally, Dunkin Donuts has announced the introduction of plant-based breakfast meats.

Farrell noted that, according to the Food and Agriculture Organization (FAO), environmental sustainability may be another driving force behind plant-based eating, with livestock farming leading to soil erosion, deforestation and destruction of natural habitats. Furthermore, FAO reports that 1-2,000 liters of water are needed to produce 1kg of wheat, whereas 13-15,000 liters is required to produce 1kg of grain-fed beef. The livestock sector contributes about 9% CO2, 65% nitrous oxide and 37% methane.

Traditionally, vegans and vegetarians are known to avoid meat for animal welfare concerns. According to GlobalData, the number of people in the U.S. who followed a vegan diet grew 600% between 2014-2017.

Small food and beverage companies have proliferated as entrepreneurship has become easier, and barriers to entry have been lowered. However, average company lifespans have decreased. In 1958, those on the S&P 500 Index averaged 61 years. This fell to an average of 33 years, then 24 years, in the face of factors such as an increasingly fast-changing consumer environment. At the current churn rate, company lifespans are predicted to decrease to 12 years. By 2027, 50% of the S&P 500 companies will be replaced.



Non-GMO (or not genetically modified) is another claim or certification consumers may be looking for in their products. Many consumers shun GMO ingredients or products, believing these have not been studied enough to understand safety and long-term effects. Farrell explained that the USDA will require bioengineered foods to be labeled by 2022, with the exception of ingredients with undetectable levels of the ingredient, such as high-fructose corn syrup. Consumer demand for Non-GMO Project Verified items grew exponentially since 2011, across all retail channels.

Brands and manufacturers across all categories are looking for new and innovative ways to increase their products' protein content. Products featuring pea protein grew more than other plant-based protein sources in the natural segment in 2018. Plant-based options are expanding into new product categories and traditionally meat-based areas, like jerky and meat snacks.

Farrell concluded by stating that protein sources are being combined to provide complete nutritional profiles as well as texture and taste properties. New categories of products are getting an added boost of protein, including items that inherently contain protein, like nut butters. Indulgent treats are following suit and appealing to the protein-conscience consumer.

"The Age of Protein: Emerging Opportunity for Plant-Based Alternatives," Kasey Farrell, Data Product Manager, Product Intelligence Team SPINS

Changes in Food Development, Marketing and Distribution to Consumers

"CHANGE HAS NEVER HAPPENED THIS FAST, and it will never be this slow again."

Andria Long, Growth Advisor, drew upon her years of innovation experience working with consumer packaged goods (CPG) companies to lay out thought-provoking challenge scenarios for the future food and beverage industries.

Long continued, "Consumers remain at the center of everything." Pointing to the success of Apple, Inc., she said that innovation is "all about solving consumers need in new ways; they may not know what they need, but when you speak with them, they can clearly tell you what makes them dissatisfied." So, where to start?

"Convenience is still king!" she continued. "We are spoiled. We don't even like to cut or peel stuff anymore. It may cost more, but we prefer 'grab and go.' And nobody likes to clean utensils…we now want our portion-controlled meals and side dishes purchased and cooked in the same package," she said.

Then came the gradual retreat of grocery shopping in the onslaught of on-line economy, for which delivery times have gotten shorter and shorter. "I remember when it used to take one to two days to get a home delivery. Now, I can receive my orders within one-to-two-hour time frames," said Long. This has also shifted expectations, as "food on demand" rests only a smart phone away from the consumer's couch.

Fast, home-based delivery services still have growing pains. Long elaborated, "I once ordered a meal kit and was shocked to find that the instructions were overwhelming. Not only that, but they expected me to cut and peel the ingredients. Come on…we don't do these things anymore…the service failed to reflect my inability to cook!"

Long views Amazon.com as the great game-changer behind this trend: "Amazon trained us to expect not to have to wait for our electronic orders." Beyond grocery, the U.S. has experienced a proliferation of ready-to-eat home delivery services in urban areas (e.g., GrubHub), she noted.

Small companies are proliferating in this environment. "The market research company, IRI, just published its top-100 company list of pacesetters and, for the first time, small companies represented more than 50% of that list." But average company lifespans are also declining. Part of this "surge and churn" environment is attributable to lowered barriers to market entry.

At one level, just about anyone can now gain entry into the food industry through sub-contracted services and relationships. Traditional barriers to entry, such as access to manufacturing and distribution systems, are disappearing. For many large CPG companies, said Long, "retailers have now become competitors," with their private label acting more like brands.

Entrepreneurship has become easier, as expertise is now readily available through innovation incubators, contracted expertise or on-line services. Capital is also more available. "I've been shocked by how many entrepreneurs in the Chicago-area start-up community openly say they didn't know anything about CPG, or food or beverages before they founded their successful companies," observed Long.

Branding is also being redefined; brands today are less associated with product attributes and more with emotional needs, Long averred. Many consumers attach their loyalty to companies that align with their own values. "We used to define 'transparency' by healthy ingredient lists, clean labels, transparent packaging and such," she said. But now, consumers want more emotional connections to their food, starting with knowing where it was grown and how it was raised. "How many people would have anticipated that an outdoor apparel manufacturer such as Patagonia would ever enter the food and beverage industry based on shared customer values?"

Fast-changing technology combined with rising consumer expectations have pushed the envelope of consumer expectations to new heights and shattered barriers to entry to the food and beverage sector. But, consumer expectations are fickle and can quickly change direction. "While the market used to be defined by 'big fish, small fish,' it is now defined by 'fast fish, slow fish,'" she concluded. Be it in a big pond or small, failure to change can prove fatal.

"Impact of Disruption on the Future of Food," Andria Long, Growth Advisor, www.andrialong.com

Panel:

Business Insights from Entrepreneurial Companies

IN THE WORDS OF ONE INDUSTRY WAG, "If you need to attend a class on innovation, you're no innovator." If you agree, not so fast! A panel entitled "Managing Innovation: From Entrepreneurial Startups to Going Mainstream" offered attendees of the 2019 Protein Trends & Technologies Seminar a practical "how to" guide for innovators. It exposed pitfalls and proffered practical solutions to the challenges that plague those struggling at the leading edges of food and beverage development.

Kara Nielsen, Vice President of Trends and Marketing at Emeryville, California-based CCD Innovation, a consulting agency focused on food and beverage innovation, moderated the panel. Her panel participants included five highly credentialed industry innovators, representing five very different entrepreneurial skill sets.

Kara Nielsen, Vice President, Trends & Marketing, CCD Innovation

The panelists were:

Didier Toubia, CEO of Aleph Farms: This is an Israeli start-up company seeking to revolutionize the animal protein industry by artificially growing animal muscle tissues using a technology Toubia equated to producing "hydroponic meat." He stated that his company was still four years short of entering the market.

Anthony Brahimsha, Founder and CEO of PROMMUS Brands, LLC, harkened to his Syrian roots in describing his company's origins. He was first exposed to the idea of "food as medicine" as a volunteer within Syrian refugee camps. "That experience allowed me to think differently about the foods that we consume here," said Brahimsha. Chicago-based PROMMUS Brands, LLC introduced a line of high pressure-processed (HPP) hummus products enriched with protein isolates in 2018. These products, assured Brahimsha, were designed to "blow out the competition" on the nutritional label alone.

Umaima Merchant is the Director of Innovation and Growth at Premier Nutrition, a leading consumer brand company whose brands include Power Bar, SupremeProtein and JointJuice. Premier Nutrition is an affiliate of St. Louis, Missouri-based Post Holdings, a large CPG holding company. Merchant presented a largely CPG-based perspective on the challenges of innovation, leavened by her past experiences working with companies like Deloitte and Clif Bar.

Scott Mandell, Founder and former Chief Executive Officer, Enjoy Life Foods

Scott Mandell, Founder and former Chief Executive Officer of Chicago-based Enjoy Life Foods, drew upon Enjoy Life's success in pioneering the market for gluten- and allergen-free foods. He subsequently transferred his entrepreneurial expertise to Chicago-based Cannibistry Labs, a developer of cannabis-based food and beverage products serving a plethora of start-ups in this still nascent market.

Mark Haas, Founder and CEO of The Helmsman Group, has been helping natural and organic companies grow for more than 20 years. With a background leading high-growth brands as well as founding his own contract manufacturing plant, Mark provides experienced insight and strategies to growing food and beverage companies.

When To Innovate…Or Not

Kara Nielsen jump-started the discussion by asking whether innovation was always necessary? Marc Haas noted that innovation came in many forms.

"Innovation," said Haas, "is simply the application of something novel; it can be a new technology; new ingredients; or new ways of communicating a consumer 'need-state.'" Or it can consist of a marketing campaign.

Didier Toubia, CEO, Aleph Farms

The type and degree of innovation undertaken depends largely on a company's particular circumstances, offered Aleph's Didier Toubia. "There are two ways to look at innovation; large companies are customer-driven, while start-ups are more vision-driven. Customer-driven innovation is much less risky, because one can afford the consumer research needed to mitigate risk." Start-ups depend on yet-unproven visions of future opportunities.

This concept brought up another important role for innovation: to attract needed visionaries, risk-takers and capital. "We need continued innovation, in order to keep attracting the right kind of people to participate in our efforts, " explained Toubia.

Fast-growth companies such as Premier Nutrition must often choose between allocating resources between higher risk technology innovation and market expansion of existing products into new categories.

Umaima Merchant, Director of Innovation and Growth, Premier Nutrition

An interesting question posed by Premier Nutrition's Merchant discussed the role of innovation when a company's brand is already growing quickly. Does a company apply its resources to pursuing riskier innovations or toward growing its winning brand? "It is a challenge for me to justify allocating resources to the innovation of new products in a fast-growth environment," Merchant explained. For Premier Nutrition, new growth has come from market expansion into new consumer sectors. She concluded: "Because of the space we compete in, innovation is an option—but not a requirement."

Carving Out Safe Spaces

One thing is clear, however: The high risk and limited resources that define small-company innovation leave little room for error. Thus, entrepreneurs and innovators need to articulate clearly defined business goals in their quest to meet clearly perceived market needs.

For Aleph Farms, it was the recognition that most people who like to eat meat want to continue eating meat, not substitutes thereof. "Our goal is to provide real meat without any of the downsides," said Toubia. Among the downsides he cited were sustainability, land-use practices, production timelines, widespread antibiotics misuse and animal welfare considerations.

Mandell explained, "At the time of Enjoy Life's founding, nobody owned the allergen-free space that we set out to fill. We set out to build a true moat around our brand identity that would protect our runway to revolutionary innovation." From day one, he continued,

High-Protein Product Innovation through Market Expansion

Category Beginning	**Serious athletes**	Products to give them a winning edge Performance-driven group Prioritize functional benefits
Expansion into Actives	**Actives**	Products support an active lifestyle Healthy products that taste good and provide energy Fit into their busy, "on-the-go" lifestyle
Expansion into Lifestyle Users	**Lifestyle users**	Products seen as a shortcut to health Weight management aid or seen as a shortcut to health
Expansion into Everyday Use	**Everyday users**	Products as part of an everyday routine (breakfast, snack)

SOURCE: PREMIER NUTRITION/2019 PROTEIN TRENDS & TECHNOLOGIES SEMINAR

Technology and the Nutrition Label

PROMMUS (Traditional Variety)	
Fat content	2.5g
Calories	50Kcal
Sodium	35mg
Protein	4g
Saturated fat	0g

SOURCE: PROMMUS BRANDS, LLC/2019 PROTEIN TRENDS & TECHNOLOGIES SEMINAR

A combination of protein isolate ingredient- and high-pressure processing (HPP) technologies was used to develop a hummus designed to let a traditional product "blow out the competition," on the basis of taste and its nutrition label.

Enjoy Life invested in its own manufacturing facility, in order to maintain total control over production quality and thereby "keep our promise to create products free of all allergens."

Mandell's transition as a market service provider with Cannibistry Labs required a different business model altogether. Cannabis is not approved in the U.S. at the Federal level, so development has had to occur on a state-by-state basis and, for now, is not subject to Federal interstate commerce opportunities. The problem, noted Mandell, is that "while many start-up companies are securing cannabis licenses, they don't know how to develop and commercialize food and beverage products. Our professionals create best-in-class products; develop brands around those products; and then license them to companies within the states where such products are legal." An unstated advantage of this model is that it helps keep legal liabilities at arm's length in confusing Federal and State regulatory climates.

Merchant observed that one successful model driving food and beverage innovation is to draw from global influences. Citing Brahimsha's success in developing a market for traditional but nutritionally boosted hummus products, she noted that many new market ideas have come to the U.S. from other cultures and countries. "Greek yogurt wasn't a big deal in the U.S. until the early-2000s, when it was introduced and built into a billion-dollar business by the Kurdish-immigrant Chobani family. The U.S. food and beverage industry boasts many similar success stories of immigrant origin."

Toubia summed it up: "What is important in innovation is to make sure that innovation brings real value to its customers. It's not just about our vision as entrepreneurs because, for the customer, it really is 'all about me.' Sometimes we forget that."

Anthony Brahimsha, Founder and CEO of PROMMUS Brands, LLC

Interdependency

Can innovation start-ups go it alone? Every situation is different, and many considerations come into play, such as the availability of capital, technical and management resources, and infrastructure.

Toubia views his company's venture as part of an "ecosystem" of alliances with other companies. "It would be very difficult for start-ups, if we didn't have alliances with other companies to help us build market strategies and to optimize our products and technologies." Other artificially grown animal protein companies also operate in alliances with large CPG companies.

Brahimsha noted that his current business partner, Mike McCloskey, disrupted the dairy category when he and his spouse, Susan, introduced ultra-filtered, low-lactose, protein- and calcium-concentrated milk to the market in a joint venture between his company, Chicago-based Fairlife, LLC, and The Coca-Cola Company. Fairlife provided the innovation and technology, while large CPG-company Coca Cola provided the distribution.

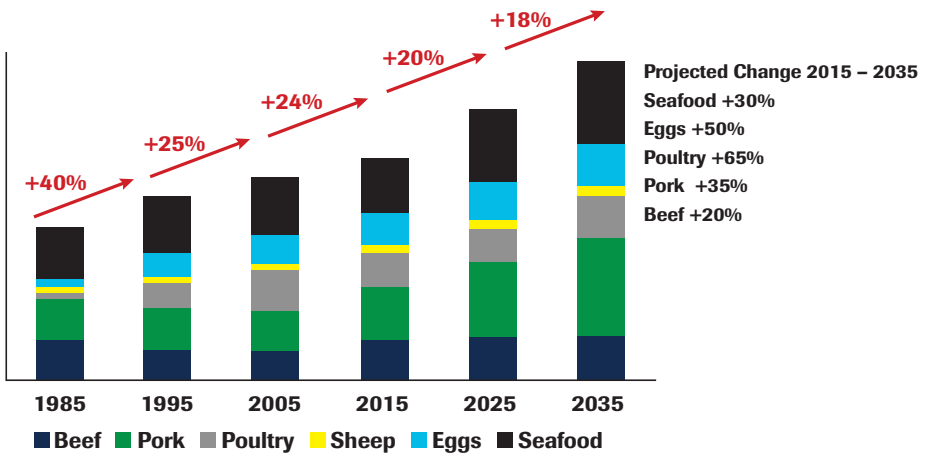
"What about working with business and innovation incubators," prompted moderator Nielsen. "Are they a fad or are they here to stay?"

Mark Haas, Founder and CEO of The Helmsman Group

Haas maintained: "They are here to stay." The terms of such relationships could be tough on small entrepreneurs, he allowed, but "from a big company perspective, it allows them to place a lot of inexpensive bets and retain some control over those companies."

Mandell demurred, saying, "While I agree that the terms may look good from the venture capital side, they are not always so from the founders' perspectives." He cited sub-optimum mentorship support and significant equity grabs exchanged for relatively small investments made by corporate patrons.

Brahimsha suggested that a more important consideration than the capital investments themselves were the values represented by a CPG patron. "While cognizant of the capital contributed by your



SOURCE: ALEPH FARMS/2019 PROTEIN TRENDS & TECHNOLOGIES SEMINAR

As global incomes improve, increased demands for animal proteins may outstrip traditional production capacities, spurring the development of technology-based alternatives such as the "hydroponic" production of beef, poultry and seafood proteins.

venture partner, one must also consider the importance of ensuring that your brand values and principles mutually align."

Innovation Cultures

Then, there are business cultural considerations. Can high-risk, unstructured innovation cultures survive or coexist with highly structured CPG environments? What is innovation culture, and what are its key attributes?

"Innovation culture demands a number of things," said Mandell. "A big part of that is finding the right people and giving them the right resources to succeed." Enjoy Life, he continued, scanned the industry to find people with the right mindsets. And then, he emphasized, "we gave them the right to fail;" this is a quality that may not be as tolerated inside highly political CPG corporate cultures.

"You can't expect 100% success 100% of the time…that would be insane," agreed Haas.

Merchant recalled her time working at Clif Bar. The company was run by the founders' shared vision for their company. "They went where their passions took them." They were OK with failure. They were also highly successful. A "scary statistic," noted Merchant, is that "about 80-85% of new products in CPG markets fail in their second year after launch."

Given the large up-front investments necessary to launch new products, large CPG companies accountable to investors are seldom in a position to assume large innovation risks. Consequently, large CPG companies tend to groom risk-averse cultures, while start-up companies attract more innovative and risk-friendly employees.

So, adjustments must be made. Mandell explained that, following his company's acquisition by Mondelēz, a company not renowned for high-risk innovation, its parent ran Enjoy Life as a quasi-independent unit—in order to protect its innovation culture. Properly siloed, it seems that competing corporate cultures can coexist.

Building an Authentic, Compelling Narrative

Given that innovation cultures must by tolerant of failure, are there any upsides to failure?

Nielsen raised the need for start-up brands to create compelling "innovation stories." She stated: "Millennials and other consumers like brands about which they can get excited and champion."

Virtually all start-ups are the outcome of trials, tribulations and failure, agreed Haas. He observed, "Consumers are more attached to brands that reflect a creation story to which they can emotionally connect."

One need only look back at the compelling "struggle and success" narratives of successful U.S. food and beverage industry icons, ranging from Colonel Sanders' Kentucky Fried Chicken to Steve Demos' White Wave Foods (now part of Danone North America), to recognize the truth in these words.

Brahimsha added that, to be effective, a narrative must be absolutely authentic. "Consumers can see right through a product narrative that was developed in a board room, vs. one developed in someone's garage," he said.

Merchant added, "While an innovation story is very important for consumers, it is also important for internal customers." It motivates their efforts to know that they are part of a bigger story.

"Authenticity is huge," agreed Mandell. One way that Enjoy Life built authenticity with its customers was by constantly interacting with them through social media. "We even asked them whether they would like to participate in our innovation process by letting them evaluate our new innovation products through SurveyMonkey." For example, "Our number-one selling product, Mini Chips, was the result of moms calling us to ask that, given that kids could eat our allergen-free chocolate chips in chocolate chip cookies, could we just bag the chips separately? Well that was pretty easy!"

So, asked an audience participant, given all the information discussed, "Should innovation focus on following consumers' stated needs, or should it focus on leading consumers toward specific, not-as-yet identified opportunities?"

Merchant replied: "You do both!" Meeting identified consumer needs or leading them to discover unmet needs are the two great pillars of successful innovation. "But leading lets you venture into the unknown."

The "Managing Innovation: From Entrepreneurial Startups to Going Mainstream" panel at 2019 Protein Trends & Technologies Business Strategies program

Once again, the staff at Global Food Forums thanks everyone involved with our 2019 seminar—from attendees to speakers, sponsors and exhibitors—for their assistance in making this year's event a success. We are deep in the planning stages for our 8th annual event, the 2020 Protein Trends & Technologies Seminar. See https://globalfoodforums.com/2020-protein-seminar for details. We'd love to see you there!

Speakers at Global Food Forums' 2020 Events

Confirmed as of Summer 2019

PROTEIN TRENDS & TECHNOLOGIES SEMINAR - MAY 19-20

☞ **The Rise & Rise of Proteins: Global Consumer & Innovation Trends**

— Tom Vierhile, VP Strategic Insights, North American, Innova Market Insight

☞ **Protein Recommendations: RDAs to the Real World!**

— Robert Wildman, Ph.D., Chief Science Officer—Post Active Nutrition Brands

☞ **An Update on Developments in Plant-based Textured Meat Alternatives**

— Mian N. Riaz, Ph.D., Director, Food Protein R&D Center,Texas A&M University

Sweetener Systems Conference - March 24

- **Elizabeth Sloan, Ph.D., Sloan Trends — Factors Influencing Consumer Sweetener Preferences**
- **Alex Woo, Ph.D., W2O Food Innovation — Clean Label Sweetness Modulators**
- **MaryAnne Drake, Ph.D., North Carolina State University — Reduced Sugar Dairy Foods**
- **Melanie Goulson, MSc, Merlin Development — Properties of New Sugar Reducers**

Clean Label Conference - March 25-26

- **Lynn Dornblaser, Mintel — Shifting Perceptions of Clean Label & Innovation**
- **Philippe Rousset, Ph.D., Nestlé Product Technology Center Beverage — An Industry Perspective on Clean Labels**
- **David Plank, Ph.D., WRSS Food & Nutrition Insights & U. of Minnesota — Fiber, Cleaner Formulations & Labels**
- **Webb Girard, MSc, CuliNex — Rethinking Formulation Approaches for Cleaner Labels**
- **Lin Carson, Ph.D., BAKERpedia — Innovative Clean Label Ingredient Replacement Technologies for Baked Goods**
- **Nesha Zalesny, MBA — IMR International- Hydrocolloids: Clean Label Tools**

2019 Protein Trends & Technology Magazine Advertiser Profiles

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AIDP, Inc. is a leader in developing and sourcing innovative ingredients for the health and functional food & beverage industries. For 20+ years, AIDP has developed an expertise in providing premium, research-based ingredients that meet consumer demand for wellness and healthy aging, as well as solving manufacturers' formulation challenges. AIDP's ingredient portfolio features unique branded ingredients for cognitive, digestive, bone, joint and skin health, plus over 200 commodity ingredients and a complete line of plant-based proteins. www.aidp.com/index.php

Family owned since 1938, **Erie** specializes in dairy protein ingredients and is a leading manufacturer and supplier of calcium, sodium and potassium caseinates, milk protein concentrate and milk protein isolate. It also offers specialty pre-mixes and custom formulations. Erie's latest innovation, PRO-CRISPS® packs 90% AS-IS protein content into a milk protein crisp that is gluten-free, non-GMO, all-natural, low-carb and endlessly customizable. PRO-CRISPS won Food Ingredients Europe's 2017 "Growth Categories Innovation Award." www.eriefoods.com/

Givaudan is the global leader in the creation of flavors, tastes and kitchen ingredients. In close collaboration with food & beverage partners, it develops tastes that delight consumers the world over. Strategically focused on health and wellbeing, Givaudan is investing in advanced solutions for flavorful plant-based foods, high-protein products and next-generation protein sources. With a relentless drive to innovate, Givaudan is at the forefront of creating flavors that "engage your senses." www.givaudan.com/flavours/health-and-well-being/protein

ICL Food Specialties is a global leader in providing ingredient systems that deliver texture and stability to food & beverage products. Its application experts partner with customers to create innovations that satisfy ever-changing market and consumer trends. ICL Food Specialties is investing in leading technologies and application capabilities to deliver new functional ingredients that inspire product development. Whether you specialize in bakery, dairy, meat or beverage products, it has a product solution for your needs. www.iclfood.com/

Idaho Milk Products constantly produces the highest quality milk proteins that, when tested by third-party trained panels, consistently out-perform competitors' products in delivering superior solubility, texture, hydration, consistency & flavor. Our proteins even won the national "Best of Class" award. Our vertical integration provides full lot traceability from the dairy to you. Innovative IdaPlus, an enhanced 85% milk protein concentrate, is ideal for clean label, high-protein RTDs, yogurt, flavored milks and ice cream.

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2019 Protein Trends & Technology Magazine Advertiser Profiles

Industry-leading performance nutrition manufacturer **Milk Specialties** creates high-quality dairy protein ingredients designed to optimize the health & nutrition of people around the world. Our ingredients are the product of continuous exploration & innovation; we partner with our customers from concept through finalization to achieve desired results. Our market-leading whey and milk protein products include many functional variations and are available in organic, grass-fed, rBST/rBGH-free and non-GMO. www.milkspecialties.com

Osage provides industry and product expertise & experience to create comprehensive ingredient solutions to simplify the product development process. Osage Food Products supplies a range of dairy proteins, plant-based protein and other food ingredients. Osage Flavors creates flavors and masking agents to build custom flavor profiles to fit your protein applications. OFP Ingredients utilizes multiple agglomeration lines to create protein powders that are highly dispersible and soluble in liquids. **Sabinsa** is a highly regarded, responsible and sustainable manufacturer and global supplier of high-quality ingredients for functional foods, beverages and nutraceuticals. Its founding mission, stated 30+ years ago, was to utilize modern scientific methods to build upon traditional Ayurvedic knowledge to improve human health. The initiative has produced over 140 products, including 100 standardized botanical extracts, and Promond™, an all-natural, versatile almond protein powder with a complete amino acid profile and winning taste.

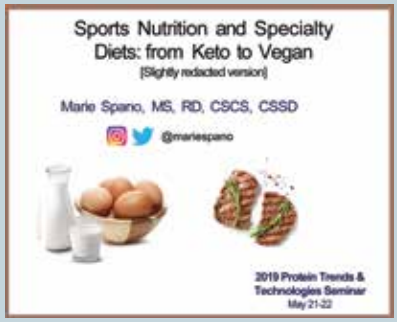
Vitalus is a global brand providing specialized dairy ingredients for the active lifestyle, healthy aging, infant/growing up and industrial segments. We provide milk protein concentrate/isolates and VITAGOS™ for large multinationals around the world. www.vitalus.com

Additional Resources

Innovative New Protein Products on Display

Attendees of the 2019 Protein Trends & Technologies Seminar's Technical Program were able to try over 20 products at the Innovation Protein Products Sampling Station. The items exemplified trends in protein-enhanced foods and/or plant-based alternatives. Examples included Herbalife High Protein Iced Coffee with whey protein concentrate (15g protein, 30%DV); Wild Friend's Collagen Almond Butter (8g protein); Pure Hemp CBD Premium Protein Organic Whey Isolate with whey protein concentrate and 300mg Cannabidiol (24g protein); Stryve Beef Biltong Mini Sticks(15g protein, 30%DV); Sophie's Kitchen Vegan Smoked Salmon with pea protein (0g protein); and Love Good Fats™ Plant-Based Snack Bar with protein sources such as almond butter and brown rice (6g protein, 12%DV).

To see photos, ingredient lists and nutritional information of these products, visit https://bit.ly/2Z7aBkb.



Couldn't Attend the Event?

Nothing can match the experience of attending the 2019 Protein Trends & Technologies Seminar in person. From tasting products at the Innovative Protein Sampling Station; to face-to-face conversations and networking with vendors and others in the industry; to the ability to hear all presentations in detail, nothing is as beneficial—or enjoyable—as "being there."

However, if you couldn't make it, a reminder: PDFs of most all presentations are available for viewing at https://www.globalfoodforums.com/store/protein-seminars/.

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AIDP's

PLANT BASED PROTEIN INGREDIENTS

AIDP has an extensive portfolio of plant-based proteins plus egg white protein. Over 20 variations of products are offered to meet the need for good taste and texture, low heavy metals and price considerations. The plant proteins are ideal for today's food market and healthy consumer. Plant proteins address the continually rising costs of other protein sources, a growing vegan market, and growing awareness of whey, soy protein, and other foods that lead to allergies and sensitivities. AIDP protein products are available in organic and non-organic varieties.

RisaPRO™ Peasipro™ Advantein™

Hemprotein Sachi Inchi Wheatein

Pumpkin PROTEIN Mung Bean Protein CRANdOr™

Protein	Description
RisaPro	Brown rice protein - smooth taste and texture with similar muscle building capabilities to whey protein
Peasipro	High quality pea protein - neutral taste, smooth texture and good source of lysine
Advantein	Proprietary blend of pea and rice protein - sweet, creamy taste with PDCAAS of 1
Pumpkin Protein	Produced through a proprietary, cold pressed process - lightly sweet, nutty flavor and perfect for powder and food bar formulations
Hemprotein	Highly sustainable, clean source of protein from hemp seeds
Sachi Inchi	Plant protein with a long history of traditional use - PDCAAS 1 and great for drinks, cereals, and food bars
CRANd'Or	Produced using cold-pressed process with no excipients, flow agents, solvents or chemicals
Mung Bean Protein	High quality, >80% Protein - good source of fiber, antioxidants, and easy to digest with anti-inflammatory properties
Wheatein	Gluten-free, wheat-based protein - neutral flavor, lightly sweet and great for food and supplement

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