



YES, IT REALLY IS INCREDIBLE

The Indisputably Potent Protein Eggs Supply



American Egg Board

From villain to superhero in one bound? Sounds like a feat only a protein powerhouse could accomplish – and it has. Once scientific evidence dispelled the cholesterol myth, the egg regained its role as a nutrient-rich source of vitamins and minerals, including protein. And as today’s consumers engage in more mindful eating, they’re more deliberate about food choices. They routinely search for health benefits and actively read labels for ingredients of interest. Coincidentally, one nutrient of great interest today is protein. As its popularity soars, so do the foods and ingredients that can supply potent forms of this macronutrient, such as the egg.

Why Bother with Protein?

The Harvard School of Public Health notes that the human body contains 10,000 different proteins that “make you what you are and keep you that way.” Just 20 amino acids comprise these proteins, however nine are deemed “essential” because our bodies cannot manufacture them; we have to get them through eating a proper diet.¹ Animal sources of protein, such as the egg, supply a full complement of these essential amino acid, while other, plant-based sources may lack one or more essential amino acid,² with various sources saying a blend of these plant-based proteins is required in order to obtain a full complement of essential amino acids for human physiological requirements.³

The Institute of Medicine recommends that adults get a minimum of .8 grams of protein



per kilogram of body weight per day.

An easier way to look at it is the recommended daily allowance or RDA. In the U.S., the RDA is 46 grams of protein per day for women (age 19 or older) and 56 grams per day for men.⁴

Proteins are not Created Equal

Protein is a macronutrient, like fats and carbohydrates and provides a source of calories, or energy for the body. Protein is found in every cell in the body. It supplies energy, can boost satiety, help prevent muscle loss in older adults, and can help athletes after a workout, with muscle recovery. Amino acids, commonly referred to as the “building blocks of protein,” perform much of the work credited to protein. The amino acid composition of a protein determines the quality of different types of proteins.

Amino acids are classified as either essential or nonessential. The body cannot produce essential amino acids (EAA), identified as histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine, so they must be obtained through the diet. The protein in eggs is highly digestible and provides much of the essential amino acid supply the body needs.

The various methods used to evaluate a protein include Protein Efficiency Ratio (PER); Biological Value (BV), Net Protein Utilization (NPU) or Protein Digestibility Corrected Amino Acid Score (PDCAAS). Comparatively, the egg is one of the top four most highly ranked proteins when measured in this type of scoring system. A high PDCAAS score, for example, highlights a protein that provides close to 100 percent of essential amino acids, and an egg scores 100 on this scale. And, while all four of the top proteins share similar essential amino acid profiles, the “amino acids obtained from whey and egg protein appear to be better utilized by the body than casein or soy, especially when considering dietary condition.”⁵

Protein in the Polls

When viewed on the ingredient level or as a ‘nutrient of interest,’ protein wrestles with fiber for first place in many surveys and polls. Consumers are very aware of the health benefits associated with protein and are actively seeking it in their food and beverage purchases. This has contributed to the fact that, according to market research firm Innova, Inc., the number of products with a protein label claim doubled between 2013 and 2017. Today, more than 10 percent of all new products being introduced to the market post a protein claim.

Coinciding with this trend, consumers also continue to drive clean label formulating, showing increasing mindfulness in their pursuit of authentic, transparent products that fit within a wellness model. As ‘free-from’ and ‘clean label’ claims proliferate, as many as 70 percent of shoppers in multiple countries, including the U.S.,⁶ say they want to “know and understand the ingredient list” of products they purchase. While numerous protein ingredient options are available, one ingredient choice, the egg, can deliver not just a valuable protein profile, but also additional, multiple functional benefits and clean label opportunities.

Protein Popularity

According to the International Food Information Council (IFIC), U.S. consumers are actively seeking protein in products for a variety of related health benefits. They understand the link between protein consumption and health issues, such as heart health, joints, bones and cognition. The latest IFIC study reveals that among foods or nutrients sought for health issues, protein and vegetables were both perceived as most beneficial and most eagerly sought by the majority of consumers.⁷

Innova data shows the number of new product introductions with a protein claim has risen steadily over the past five years.

On a category by category basis perhaps none has seen such a dramatic rise as the snack category. Data for the first *half* of 2018 for snacks with protein claims doubled compared to all of 2013, an amazing shift over a five-year period.



Even desserts and sweet treats are not immune from this protein trend. A familiar candy from Mars, its Snickers® brand, introduced a protein-based version with the package claiming, 18 grams protein per bar. Another sweet treat, Halo Top ice cream, contains just 280 calories per pint and supplies a “good source” of protein at 20 grams per serving. The IRI New Product PaceSetter Report pegs Halo Top at \$342.2 million for its first year of sales, leading all other 2017 foods and beverages by an impressive margin, considering the fact that 89 percent of the top 200 CPG brand launches of 2017 earned less than \$40 million in year-one sales.

The fact that these products speak to the consumers’ sweet tooth is not surprising given the trend of healthier-for-you indulgences. Again, within the IRI Pacesetter report, desserts accounted for 23 percent of new food launches by consumption group as a percent of food pacesetter dollars, with breakfast solutions just behind at 19 percent.⁸

The report further states, “Protein continues to be a driving force in food innovation.” Thirty-six of the 76 Pacesetter food brands touted protein attributes, with most of the products contained within either the dinner or breakfast sectors.

Plant Forward Plus Eggs

Eggs aren’t confined to breakfast or dinner or excluded from any except the most rigid dietary plans. This is illustrated by eggs’ role in plant-forward or flexitarian dining. Flexitarians are on the rise, according to new information from Datassential.⁹ The shift in eating patterns involves more plant-forward meals with a reduction, not elimination, of red meat. The very word ‘flexitarian’ stems from the concept of remaining flexible yet conscious of and deliberate when it comes to food choices. The flexitarian consumer wants to meet daily protein requirements and is very interested in healthful eating. This is where the egg can play an important role.

The benefits of including eggs within a flexitarian diet or combining eggs with plant-based proteins are many. In any instance, for example, the egg portion of the meal will contribute the full complement of essential amino acids required by the body while plant-based sources of protein can act as a supplement.

☞ Adding eggs to a plant-forward dish can actually increase vitamin absorption. ☞

One study in particular found that adding whole eggs to a colorful salad increased the amount of vitamin E the body absorbs from the vegetables. This adds to the body of research showing that eggs help with vitamin absorption when paired with a salad or vegetables.¹⁰

Another study conducted in 2015 found that adding eggs to a salad increased the absorption of the vegetables’ carotenoids. The absorption of carotenoids, including alpha-carotene, beta-carotene, lutein, zeaxanthin and lycopene was three- to eight-fold higher when the salad included three eggs compared to no eggs.¹¹

The flexitarian diner should not be confused with a strict vegan consumer, which in the U.S. equals less than two percent of the overall population.¹² In addition, flexitarians, like any other consumer group, are ultimately guided by taste and flavor.

Dispelling Myths

One myth is that vegetarians eschew eggs as part of their dietary plan. This myth is dispelled as most vegetarians, including semi-vegetarian, pescetarian and lacto-ovo vegetarians eat eggs and other animal products. Other myths, more seriously affecting the egg’s image, have been dispelled within recent years, including the belief about eggs and cholesterol. While egg yolks are a natural source of dietary cholesterol, the totality of scientific research has shown no or little effect between dietary cholesterol and cardiac outcomes. Because of this, government and health organizations have revised their dietary cholesterol recommendations. The 2015-2020 Dietary Guidelines for Americans place no daily limit on dietary cholesterol intake.

Although the body of evidence continues to mount in favor of eggs and their effect on overall health, two recent studies are worth mentioning. They show that eating an egg per day may help reduce the risk of stroke by 26 percent and eating up to 12 eggs per week does not negatively impact cholesterol for

people with pre-diabetes or type-2 diabetes.

The first study, published in the journal *Heart*,¹³ examined data supplied by half a million adults in China, and found that when comparing those who ate eggs with those who did not, the daily egg consumption could help reduce the risk of cardiovascular disease.

The second study, conducted by scientists at the University of Sydney in Australia and published in *The American Journal of Clinical Nutrition*, found that in people who ate up to 12 eggs per week, there was no increase in cardiovascular risk factors for people with pre-diabetes or type-2 diabetes.¹⁴

Satiety and Weight Management

While on the subject of dietary patterns and food consumption, over consumption should not be ignored. Obesity is a multi-factorial and complex health issue. Current guidance for weight management encourages physical activity along with consuming an overall healthy eating pattern which includes whole grains, fruits, vegetables, lean proteins, low-fat and fat-free dairy products.



Protein + Satiety

The recommendation for lean proteins is important, because multiple studies provide evidence to link protein to satiety. Several clinical trials have specifically assessed the effects of high-quality protein from eggs on satiety and weight loss. Some examples include:¹⁵

- In a study in overweight adults, calorie-restricted diets that included either eggs or a bagel for breakfast were compared; the people who consumed eggs for breakfast lowered their body mass index by 61 percent, lost 65 percent more weight, and reported feeling more energetic than those who ate a bagel for breakfast.
- Men who consumed an egg breakfast versus a bagel breakfast showed that appetite hormones were suppressed following eggs at breakfast, as was energy intake over the course of the day.
- A study of overweight premenopausal women that evaluated satiety responses to eating a turkey sausage and egg breakfast sandwich versus a low-protein pancake breakfast showed better appetite control and in addition, participants consumed fewer calories at lunch following the egg-based breakfast.
- In a 3-month trial among subjects with type-2 diabetes, those who consumed 2 eggs per day for 6 days a week reported less hunger and greater satiety than those who consumed fewer than 2 eggs per week.

Protein and Beyond

The six grams of high-quality protein supplied by one large egg is just the beginning of an egg's nutritional story. It is a rare protein source that contains, in its whole state, the complement of other essential vitamins and nutrients found in eggs, 13 in all, including choline, lutein, zeaxanthin and vitamin D, identified by the Dietary Guidelines Advisory Committee (DGAC) in 2010 as a nutrient of concern.

In 2015 DGAC listed eggs among several nutrient-dense foods, defined as foods that are naturally rich in vitamins, minerals and other substances that may have positive health effects.

Very few food sources such as the egg, naturally contain vitamin D, which among other benefits contributes to bone health. Studies suggest adequate vitamin D might play a role preventing cancer, hypertension and type-2



diabetes, among other physiological benefits.¹⁶

Choline and lutein in particular have received increased attention lately due to their contributions to human health, such as cognition and eye health. Choline, an essential nutrient, helps preserve cell structure and integrity, aids with brain development and function, memory, metabolism and mood, according to the National Institutes of Health.¹⁷

The American Optometric Association lists and discusses in depth the benefits that lutein and zeaxanthin provide for eye health to prevent cataracts and age-related macular degeneration.¹⁸

A recent study in *Nutrients* discusses the food sources and bioavailability of lutein and zeaxanthin in connection with age-related macular degeneration protection and concluded a broad dietary pattern that includes green leafy vegetables and other foods, such as eggs and selected nuts, can aid eye health. The report stated that research suggests the bioavailability of these compounds (lutein, zeaxanthin) is higher (from eggs) than from vegetable sources, citing serum lutein and zeaxanthin levels measured over a period of several weeks.¹⁹

Protein's Practical Side

Prepared Foods

The category of prepared meals has witnessed steady interest in the breakfast category, including handheld sandwiches, breakfast bowls and other prepared meals containing egg. Preformed egg patties or egg scrambles pose an obvious choice for many of these applications to help simplify manufacturing. Egg ingredients contribute more subtle benefits in other prepared foods putting into play one or more of the 20-plus functional properties ranging from adhesion to whippability.



Confections and Frozen Foods

The proteins found in egg whites help control crystallization in select confections and frozen foods. Crystallization impacts food quality and mouthfeel by lending a gritty texture to a substance that is supposed to be smooth and creamy. Many confections involve a super-saturated solution of sugar and water. While saturation is desired, if it occurs too quickly, crystallization will result. Egg white introduced as an interfering agent slows the process of saturation, forming finer crystals for a smooth, creamy texture. In ice cream, egg yolk disperses fat throughout the ice cream mix to prevent it from clumping. Eggs aid in whipping properties to help achieve desired overrun. And the combination of protein and fat present in eggs can help prevent the aggregation of crystal-forming compounds.

Baking with Eggs

Baked goods rely on taste, texture and appearance for sales, and egg ingredients contribute to all three of these attributes, plus a portion of their shelf life. Frequently it is the protein content of the egg that is responsible for functional qualities that benefit baked goods, although when whole egg is used, the lipid component factors in as well.

Comprehensive new studies conducted by a clean label product development consultancy across a wide range of applications helped define the performance of egg ingredients compared to a variety of ingredients marketed

and positioned as egg replacements. Overall the research found that egg ingredients provide superior functionality and flavor to baked goods and other food products tested. In fact, in conclusion the research team said there is no single replacer that can duplicate the multiple functional properties that eggs supply to food and baking applications.²⁰

The researchers proceeded by selecting a control formula for common baking applications, prepared the gold standard version, including egg ingredients, then prepared other test samples switching out egg ingredients with replacers. Extensive analyses compared several physical points for texture and form, while sensory panelists evaluated the products for taste and mouthfeel.

Baked goods tested in this manner included many industry standard products such as angel food cake, blueberry muffins, brownies, cheesecake, chocolate chip cookies, frozen waffles, pumpkin pie filling, sponge cake, sugar cookies, sweet dough and yellow batter cake among others. Complete findings can be found on realeggs.org.

Gluten-free products, most particularly in the baking area, benefit from egg functionality. Formulators can find baked goods within the gluten-free sector a particular challenge, due to the amount of gluten in traditional breads, muffins and any formulation that relies heavily upon traditional flours. In the case of gluten-free baked goods, the protein within egg ingredients can help add much needed protein to a formulation, which is lacking due to the absence of wheat flour and the lower protein content contributed by most substitute or alternative flours. In addition, the functions that eggs contribute, including binding, foaming, emulsification and coagulation can aid with product structure, texture, appearance and of course, flavor.

Incredibly Flexible

Eggs offer a protein ingredient available in multiple forms to suit different manufacturing environments. In addition to the categories mentioned above, the 20-plus functional benefits of eggs fit into almost every product category from appetizers through desserts.

Just a few of the functionalities include:



ADHESION



AERATION



BINDING



COAGULATION



EMULSIFICATION



LEAVENING



WHIPPING

More complete details about each individual functional property is available at www.AEB.org/Functionality.

Egg ingredients are available in dried, liquid or frozen versions of whole eggs, egg yolk or egg white, depending on requirements. Pre-prepared egg products that have been scrambled, boiled or formed into patties also are available to help speed production of prepared meals, bowls or assist in foodservice operations. Designations for kosher, halal, cage-free, conventional and other formats are all listed in the Buyers' Guide, available online and updated on a regular basis to provide the most current information about egg suppliers.

The answer to the question, 'which protein is on your product label?' – REAL eggs. The only complete protein that can completely satisfy manufacturing and processing parameters while satisfying your customer base.



Clamoring for Clean Label

There isn't a single manufacturer that isn't familiar with clean label marketing—or at least their definition of what that term means to consumers. The problem is that definition is multifaceted and constantly shifting. The clean label concept can include natural, minimally processed ingredients, “free-from” ingredient listings, transparency, nutrition and health, sustainability and even low-sugar or low-salt. The term “mindful eating” also can play into the clean label concept as an indicator of consumers more thoughtfully making food choices.

However, most manufacturers report that some of the challenges involved with clean label formulating include the finished product's taste, texture and appearance. Shelf life can also be affected due to the missing functions supplied by ingredients that might need to be removed in order to achieve a cleaner label. Yet manufacturers must conquer these barriers since all of the statistics, from Nielsen to Innova, report clean label continues to gain momentum within all consumer groups.

There is an ingredient that can help overcome functional challenges and that's the egg. Egg ingredients supply more than twenty functional properties that can help with the finished product's texture, taste, appearance and shelf life.



Egg ingredients can help formulators create clean label products that don't require consumers to compromise on the eating experience they've come to expect.



A more in-depth examination of the clean label challenges according to demographic group and the myriad ways egg ingredients can help formulations is available in one of our most recent white papers, “The Complex Challenge of Clean Label” found at www.AEB.org/CleanLabel.

And for any questions about egg functionality, a great place to start is the encyclopedic listing of egg ingredient benefits from adhesion to whippability found here: www.AEB.org/Functionality.

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About the American Egg Board (AEB)

The American Egg Board (AEB) is the research, education and promotion arm of the U.S. egg industry. Its mission is to increase demand for eggs and egg products through research and education. The AEB supports American egg farmers by promoting the consistent high-quality and functionality of U.S. eggs and egg products. Visit AEB.org for more information.

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