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Protein Powders, Shakes, and Meal Replacements Review

Find Out Which Protein Products Passed or Failed Our Tests

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Summary

- **Health benefits of protein powders:** Extra protein (typically about 30 to 50 extra grams per day) from a powder or drink can help athletes build muscle and strength when used in conjunction with resistance-type exercise. It's not clear that extra protein provides the same benefits for older adults. Supplementing with protein may help people with diabetes maintain blood sugar levels and even help reverse diabetes if taken as part of low calorie diet (see What It Does).

- **What type of protein powder is best?** Protein products vary based on the source of protein (e.g., whey, casein, soy, rice, pea, egg, hemp, peanut, and cricket). All can help build muscle, but, in general, whey is most popular as it is a complete protein and rather quickly digested. Casein is digested more slowly — which is why it is sometimes taken in the evening to counter loss of muscle at night. Vegans may be more interested in plant sources, such soy, pea, rice, and hemp. See ConsumerTips™, Protein for more about each type of protein. Note that protein powders are ultra-processed foods, having been separated from whole foods sources (see What It Is).

- **What did CL's tests of protein powders find?** Among the protein products that ConsumerLab.com selected for review, ***three failed our tests***, one of which was found to be contaminated with lead and contain more fat, sodium, and calories than listed. Interestingly, none of the failures related to protein content (see What CL Found and How Products Were Evaluated).

  Among products that were Approved, the lowest cost to obtain an equivalent amount (20 grams) of protein was 42 cents while it was over $5 for some products with many additional ingredients.

- **Which protein powders are CL's *Top Picks*?** Based on a combination of quality, cost, and taste, calories, and ingredients (as summarized for each product in the Results table), we identified a *Top Pick* for each of the following categories:
  - **Whey protein**
  - **Casein protein**
  - **Egg protein**
  - **Pea protein**
  - **Hemp protein**
  - **Peanut protein**

- **Soy protein**
- **Cricket protein**
- **Meal replacement**

- **How to use protein powders:** Protein taken after, rather than before, exercise may be more beneficial (See What It Does). Protein powders are typically mixed with water or other liquids such as milk or juice, but be aware that these can add calories (See What to Consider When Using). Also be aware that taste of powders varies by protein type, flavorings, the addition of sugar or other sweeteners, and that some powders mix more easily into liquids than others (see the taste and mixability comments in the Results Table).

- **Protein powder safety and side effects:** Protein supplements may cause gastrointestinal discomfort in some people, and individuals with lactose intolerance or milk allergies may want to avoid certain milk-based proteins. Although increasing protein intake is not associated with a decrease in kidney function in healthy adults, people with, or at high risk of, kidney disease may be advised to limit protein intake (see Concerns and Cautions).

Products tested in 2022 and 2023

What It Is:

To increase protein in the diet, one can turn to meats and protein-rich dairy, like yogurt. The downside to meats and dairy (unless reduced fat) is that they can also provide significant amounts of saturated fat and cholesterol. Another way to increase protein intake is with large servings of protein-rich legumes and grains, but this increases carbohydrate and calorie intake. Protein powders offer a source of protein without these other components. However, it must be remembered that protein powders are ultra-processed foods, and the whole foods from which they are derived can provide important nutrients beyond protein, such as vitamins, minerals, healthful fats and oils, complex carbohydrates, and fiber. Protein powders may or may not have hallmarks of other ultra-processed foods, such as added sweeteners, flavors, and colors.

Unlike nutrition *bars* (see Nutrition Bar Product Review), which need to contain a good amount of carbohydrates to give them a reasonable texture, feel and taste, protein powders and drinks do not. Consequently, makers of protein powders and drinks have a great deal of flexibility in the nutritional content of these products. For example, it is quite possible to find powders and drinks with half the fat and carbohydrates of most nutrition bars, while often offering twice the protein. Of course, the nutrition numbers can change significantly depending on the type of liquid with which you choose to mix the powder (see ConsumerTips™ for the nutrient content of milks and juices). For people seeking a powder or drink as a meal replacement, it is important to understand overall nutritional needs, as also discussed in the ConsumerTips™ section.

Protein powders typically come in canisters or packets ready to be mixed with water, milk, juice, or other beverage. Protein drinks often come in ready-to-use cans or bottles. These products are marketed as dieting aids, meal replacements, energy boosters, endurance/recovery products, and as concentrated sources of protein -- typically for athletes seeking to build muscle and strength.

What It Does:

How much protein is needed?

Protein is necessary to build, maintain, and repair muscle. The Academy of Nutrition and Dietetics (AND) -- formerly the American Dietetic Association (ADA) -- currently recognizes a daily protein requirement of about 0.40 gram/pound of bodyweight for sedentary individuals, 0.55 to 0.65 gram/pound for endurance athletes and 0.65 to 0.80 gram/pound for strength athletes. Based on a body weight of 150 lbs., this works out to about 60 grams for sedentary individuals, 90 grams for endurance athletes, and 109 grams for strength athletes. As you can see, a person's need for protein can more than double depending on their level of activity.

The AND also states that the daily maximum usable amount of protein for adults is 1 gram/pound, or 150 grams for a 150 lb. person. This amount, however, should not be consumed at one time, since the usable amount of protein for muscle synthesis from a single meal is believed to be roughly 30 grams.

Analysis of data from the National Health and Nutrition Examination Survey (2005-2014) found that many older adults don't get enough protein in their diets, and this is particularly true for women. Those not getting at least 0.36 gram/pound of bodyweight were, for men, 31% of 51-60 year-olds, 37% of 61-70 year-olds, and 42% of those over 70. For women, it was 45% of 51-60 year-olds, 48% of 61-70 year-olds, and 50% of those over 70. Non-Hispanic blacks and those who were single, divorced, or widowed were least likely to meet protein intake requirements. It should be noted that the analysis was industry-funded (Abbott Nutrition) (Krok-Schoen, J Nutr Health Aging 2019). A study (not funded by industry) among people aged 60+ years in South Florida similarly found that those with the lowest average protein intakes were African Americans (0.29 gram/pound), followed by European (Caucasian) Americans (0.38 gram/pound), while Hispanic Americans had the highest protein intakes (0.44 gram/pound) (Gropper, J Nutr Geron Geriat 2019). There is evidence that protein intake by older people may need to be about 25% to 50% higher than the current daily recommendations in order to better stimulate muscle creation and reduce muscle loss -- putting intake at 0.45 to 0.55 grams per pound (Deutz, Clin Nutr 2014).

Building and maintaining muscle mass:

Combined with regular resistance exercise, protein supplementation can help to increase muscle mass and strength gains in younger adults — although it's not clear if protein supplementation has the same benefit in older adults.

A review of 38 randomized controlled trials among older adults (age 50 and older) showed muscular benefits with resistance training, but combining protein supplementation with training did *not* show greater effects on muscle mass, strength and physical performance than resistance training alone (Tian, J Nutr 2025).

In contrast, a review of 22 studies in both young and older individuals found that after training two to five times a week for 6 to 24 weeks, subjects getting supplemental protein gained an additional 1.5 lbs. of muscle and could leg press an additional 30 lbs. compared to subjects not getting the extra protein. The reviewed studies involved various types of supplements — most of which included whey protein — given immediately before, during, and/or after the exercise session (Cermak, Am J Clin Nutr 2012). (See ConsumerTips™ for information about the forms of protein: whey, casein, soy, and rice.) Similarly, a subsequent review of 49 studies found that **increasing total daily protein intake *up to* 0.73 grams per pound of bodyweight** (109.5 grams per day for a 150 lb. adult), significantly enhanced changes in muscle strength and size during prolonged resistance exercise training in both younger and older adults. Consuming more than this amount of protein per day provided no additional benefit. All sources of protein were beneficial, including protein supplements (whey, soy, casein, pea) or whole foods (i.e., beef, yogurt, eggs) (Morton, Br J Sports Med 2017).

If you already consume ample protein from your diet, extra protein won't help, even with exercise, although it may improve some aspects of body composition. A study of older men who consumed, on average, about 93 grams of protein daily found that completing 12 weeks of resistance exercise training (3 sessions per week) and consuming supplementary protein (21 grams) after exercise and each night before sleep did not improve muscle strength or size compared to exercise training and consuming a non-protein placebo (Holweda, Nutr Physio Metab 2018).

Similarly, a study among untrained, postmenopausal women (average age 58) found that completing 12 weeks of resistance training three times weekly and consuming 0.77 grams of protein (including a powdered whey protein isolate supplement) per pound of body weight daily, plus an additional 30 grams of whey protein isolate powder following each training session, did *not* significantly improve measures of strength or body composition compared to resistance training with regular protein intake (average protein intake: 0.41 grams per pound of body weight, which is close to an amount considered adequate for older adults). However, both groups showed significant improvements in skeletal muscle mass, some measures of muscle thickness, and strength compared to a control group that did not train or supplement with protein (Ioannidou, J Nutr Health Aging 2024).

In addition, a 10-week study among 19 **Pilates**-trained women (average age 31) showed that participating in Pilates at least twice weekly and taking about 18 grams of whey protein powder twice daily, in addition to consuming about 80 grams of protein/day as part of the diet, did *not* significantly improve body weight, BMI, muscle mass, or hip or waist circumference, nor did it improve core muscle endurance or joint flexibility compared to placebo + Pilates, although both groups showed improvement in most of these outcomes compared to baseline (Karpouzi, J Int Soc Sports Nutr 2025). It seems probable that daily protein intake from the diet — which was about 0.6 grams/lb and within the daily protein requirement recommended for endurance athletes — was sufficient to support adaptations to Pilates training.

It has been suggested that to optimally stimulate muscle growth, it is best to divide the daily protein intake over three meals (Padden-Jones, Curr Opin Clin Nutr Metab Care 2009).

However, combining protein supplementation with **high-intensity *interval* training (HIIT)** does not seem to help — at least not in younger adults. HIIT involves short periods of intense exercise with rest intervals. An 8-week study among 47 people (average age 31) found that performing low-volume HIIT for 14 to 24 minutes on a stationary exercise bicycle three times weekly and afterward consuming 40 grams of whey protein (*Fresubin Protein*, Fresenius Kabi) or non-protein placebo (maltodextrin) did not improve fat mass or skeletal muscle mass compared to baseline for either group. Although both groups showed reductions in systolic and diastolic blood pressure and increases in power output and maximum amount of oxygen used by the body during exercise (a reflection of cardiovascular health), there were no significant differences between the two groups, indicating that protein supplementation did not improve training adaptations (Reljic, Nutrients 2022).

Resistance exercise and protein supplementation can be particularly beneficial in older adults, who are at risk for **progressive loss of skeletal muscle mass and strength** (known medically as sarcopenia), which may increase fall risk (Clynes, Calcif Tissue Int 2015). Protein supplementation ***after* resistance-type exercising** has been shown to help build muscle during the post-exercise recovery period. A three-month study in Brazil among older women (average age 67) who normally participated in regular resistance exercise (about 3 days per week) found that, compared to placebo, 35 grams of a hydrolyzed whey protein powder (providing 27.1 grams of protein) consumed immediately after exercise modestly increased lean soft tissue (muscle, tendons, etc.) (3.8% vs. 2%) and muscle strength as measured by volume load (45.4% vs 35.4%). Women who consumed whey protein also had a greater reduction in a cardiovascular risk measure (ratio of total cholesterol to high density lipoprotein), which decreased 11.8% versus 2.9% in the placebo group. There was no significant change in body fat in either group (Fernandes, Exp Gerontol 2018). A later study by the same researchers found that taking protein immediately before exercise also increased lean soft tissue and improved cholesterol, but, to their surprise, only when protein was taken ***after* exercise** did it significantly **improve metabolic health** (based on fasting blood glucose and cholesterol levels) and **reduce body fat** (Nabuco, Nutr Metab Cardio Dis 2018). (It may also be best to include protein supplementation as part of a meal, as explained in the **When to take** section, further below).

A study in Taiwan among 72 older adults (average age 74) with slow walking speed due to **knee osteoarthritis** and **sarcopenia** showed that those who supplemented with protein while also participating in resistance training achieved normal walking speed after only about 14 weeks compared to 25 weeks for those in the exercise-only group. The supplement dose was about 24 grams twice daily of a protein powder consisting of 50% whey protein, 30% casein protein, and 20% soy protein. The exercise was moderate- to high-intensity, supervised resistance exercise three times weekly for two weeks, followed by at-home resistance exercise once daily for 10 weeks, with instructions to maintain usual physical activity thereafter. The average daily intake of protein *from the diet* (without supplementation) was low (0.37 grams/lb) (Liao, Nutrients 2023).

Be aware that simply *eating extra protein, without exercise, does not help build muscle or increase strength*, as demonstrated in several clinical studies (Bhasin, JAMA Int Med 2018; Mori, Geriatr Gerontol Int 2018; Zhu, J Nutr 2015). However, ***it may help with maintenance***. A study in China among 123 older adults (average age 70), nearly 40% of whom consumed less than the recommended daily amount of protein for older adults, found that taking 16 grams daily of whey, soy, or whey-soy blend (1:1 ratio) protein powder while maintaining regular daily activity helped maintain lean mass and physical performance compared to a control group in which, over 6 months, 1% of muscle mass was lost and there were slight declines in gait speed physical performance. The protein powders were taken as 8 gram servings dissolved in 100 mL of water and consumed with breakfast and dinner, and the type of protein taken did not make a difference (Li, J Acad Nutr Diet 2021).

A 12-month study of 218 older people (75-96 years of age, mostly women) with sarcopenia (muscle loss) in Finland who were already consuming adequate protein (about 0.45 grams per pound of body weight) in their diets found only a slight, but not statistically significant, performance benefit from supplementing with 20 grams of protein twice daily (from a whey-enriched protein beverage consumed between meals) versus supplementing with a low-protein beverage (providing equal calories) or snacking between meals on regular protein-rich foods. All participants were instructed to do light resistance exercises at home and given 20 mcg (800 IU) of vitamin D to take daily during the study (Bjorkman, JAMDA 2019). Additionally, a study in Canada found that neither whey nor casein supplementation (10 grams per meal, 3 times daily) led to greater improvements in muscle quality or function than no protein supplementation in sixty elderly men who were already ingesting amounts of protein above the recommended daily allowance (averaging 0.61 grams per pound of body weight) and who underwent 12 weeks of mixed power training 3-times per week. The three groups benefitted equally from the training (Dulac, Br J Nutr 2020).

A study in Austria among 116 older people (average age 73) showed that, although increasing dietary protein intake to 0.72 grams per pound daily did *not* enhance muscle strength, aerobic endurance, walking speed, flexibility or mobility in response to strength training compared to increasing dietary protein intake to 0.45 grams per pound daily, which is considered adequate for older adults, those in the high protein group showed a modestly greater increase in muscle mass (1.12 vs. 0.49 lbs.) and slightly greater decrease in body fat (1.03 lb. decrease vs. 1.3 lb. *increase*) during the 8 weeks of resistance training compared to the adequate protein group (Unterberger, Clin Nutr 2022).

If you are confined to bed rest, whey protein supplementation may help you retain muscle mass. This was suggested by a study in Texas (partially funded by the dairy industry) in which 20 healthy adults (ages 60 to 80) were assigned to 7 days of bed rest. Some ate a diet in which protein came from a mix of animal and plant sources while others ate a similar diet in which protein from whey isolate replaced some of the other protein. Both groups experienced a 20% reduction in knee strength, but the whey group tended to retain more leg muscle while losing more body fat — although differences between groups did not reach statistical significance. After five days of rehabilitation, the whey group recovered leg strength faster. The researchers noted that the apparent benefit of whey may relate to its relatively high leucine content, as leucine can stimulate muscle synthesis (Arentson-Lantz, J Gerontol Biol Sci Med Sci 2019).

A study in Australia also suggests that higher intakes of protein, along with adequate calcium intake from foods, may also reduce the risk of fractures and falls in elderly adults. The study involved 7,195 men and women (average age 85) living in one of 60 long-term care facilities. Approximately half of the facilities served their usual menu (the control diet -- providing a total of 700 mg calcium and 58 grams of protein per day), while the other half of the facilities served the standard diet with additional milk, yogurt, and cheese (providing a total of 1,152 mg of calcium and 69 grams of protein per day). After three months, there was an **11% lower risk of falls** among residents in the facilities that served the additional milk, yogurt and cheese, and after five months, a **33% lower risk of all fractures, and a 46% lower risk of hip fractures**, compared to these risks in facilities that served the control diet (Juliano, BMJ 2021). [Note: Be aware that some older adults may temporarily experience low blood pressure two to three hours after consuming whey protein.]

Collagen is not a preferred protein source for building muscle. A study among 22 women 60 to 80 years of age in Canada who performed resistance exercise showed whey protein (*Whey Protein Isolate 895*, Fonterra) to be much more effective at building muscle than collagen protein (*Gelita* hydrolyzed collagen protein, Bodybalance) (Oikawa, Am J Clin Nutr 2019). Consequently, if you take **collagen** (perhaps for its possible modest benefit with regard to wrinkles or osteoarthritis), don't expect the muscular benefits of a protein powder.

Maintaining muscle and improving fat loss:

Supplementing with whey protein may improve fat loss in people who are obese when used with dieting and exercise, but it does not seem to reduce feelings of hunger or suppress food intake when used without diet and exercise. When taken after gastric bypass surgery, whey protein may help preserve muscle mass that can decrease with rapid weight loss.

A study among **obese young men** found that giving extra protein during a 4-week period of dieting (40% fewer calories than normal) and **intense exercise** (6 days per week) caused them to *lose more fat* (2.9 lbs. more) and *gain more muscle* (2.4 lbs. more) than men to whom additional protein was not provided. All participants ate similar prepared meals and consumed 3 to 4 drinks per day of a dairy beverage that, for some, contained added whey protein isolate (about 34 extra grams per drink) but also less fat to offset the calories of the extra protein. Although the protein-supplemented group gained more muscle, their increase in strength was the same as that of the group receiving the lower amount of protein - a finding that surprised the researchers (Longland, AJCN 2016).

In a 3-month trial in Brazil among 26 older women (average age 69) with **sarcopenic obesity** (i.e. age-related muscle loss in someone who is obese), the women consumed, as a drink, either 35 grams of hydrolyzed whey protein or placebo immediately following whole body resistance training 3 times per week. Those consuming whey protein experienced greater decreases in total fat (-3.3% vs. -0.3% for placebo) and greater increases in muscle in their arms and legs (6% vs 2.5% for placebo). Daily total energy intake did not change in either group during the study, but participants in both groups tended to follow a relatively low-calorie diet (about 1,540 to 1,620 Calories daily) (Nabuco, Clin Nutr ESPEN 2019).

In contrast, a study of obese men that did *not* involve dieting or exercise found that drinking a 450 mL diet beverage containing 30 grams of whey protein (versus the same beverage without whey) slowed stomach emptying but did *not* reduce feelings of hunger or the amount of food eaten at a meal three hours later (Oberoi, Nutr Diabetes 2020).

A study in Iran among 78 adults (average age 41) who underwent **bariatric surgery for weight loss** (i.e., mini gastric bypass) showed that taking 15 grams of whey protein powder providing 11.3 grams of protein twice daily for 3 months after surgery resulted in less fat-free mass loss (-5.95% vs. -9.54%) and muscle mass loss (-5.93% vs. -9.05%) compared to those taking placebo, and the differences were statistically significant, but it did *not* result in significantly greater weight loss, lower BMI, or greater reduction in body fat, visceral fat, or trunk fat (Sabooni, Clin Nutr ESPEN 2025).

Maintaining muscle during chemotherapy

In malnourished advanced cancer patients in Italy undergoing chemotherapy and receiving nutritional counseling, 3 months of daily supplementation with 20 grams of whey protein isolate (added by patients to their water or foods) resulted in improved body composition, muscle strength, body weight, and reduced toxicity (-9.8%) to chemotherapy compared to a control group that received only nutritional counseling. (Both

groups also had access, as needed, to an energy-dense liquid formula). However, the change in self-reported quality of life during the study was not statistically different between the two groups and supplementation actually averaged only 12 grams of whey protein isolate per day due to incomplete compliance by patients (Cereda, Cancer Med 2019).

Recovery after hospitalization

A clinical study among 622 **hospitalized older adults** (average age 78) with moderate or severe malnutrition showed that drinking 237 mL (8 fl oz) of an oral nutritional supplement (*Ensure Protein Max* by Abbott Nutrition, which funded and conducted the study) twice daily during hospitalization and for 90 days after discharge did *not* reduce the length of hospitalization or the readmission rate, but did improve the nutritional status and reduce the risk of dying during that period by 51% compared to placebo (Deutz, Clin Nutr 2016). Each drink provided 20 grams of protein (from milk, soy, caseinate, and whey), 350 Calories, 11 grams of fat, 44 grams of carbohydrate, 1.5 grams of beta-hydroxy-beta-methylbutyrate (HMB), 160 IU of vitamin D and "other essential micronutrients."

Weight loss

Protein supplements may have some benefit for weight loss in people who are overweight, but the effect appears to be modest.

A 12-week study in 133 overweight adults (average age 37) following a reduced-calorie diet (500 Calories per day below energy needs) and exercising for 2.5 hours per week showed that those consuming a protein and fiber supplement shake (*Shakeology Chocolate flavor* by Beachbody — which funded the study) 30 minutes before breakfast and lunch did *not* lose more body fat than those consuming a placebo drink with the same amount of calories but little protein (both groups lost about 1% body fat). However, those consuming the protein and fiber shake lost somewhat more *weight* than the placebo group (7.3 lbs. vs. 4 lbs.). Each protein shake provided 17 grams of protein (whey and pea) and 6 grams of fiber, and the placebo shake provided 1 gram of protein and 3 grams of fiber (Glynn, J Nutr 2022).

Diabetes, blood sugar and insulin response:

Protein supplementation appears to aid in the control of blood sugar levels and, possibly, the treatment of diabetes.

A study among centrally obese, **insulin resistant** men found that consuming 20 grams of whey protein 15 minutes before a meal, or during the meal, significantly reduced the increase in blood sugar after the meal compared to not consuming the whey protein or consuming the same amount of whey protein 15 minutes after the meal (Allerton, Br J Nutr 2018).

A small, one-day study in people with **type 2 diabetes** found that drinking whey protein before a high glycemic meal resulted in improved insulin response compared to those who did not receive the protein. In the study, 15 men and women (whose diabetes was well controlled with the medications sulfonylurea or metformin) drank either 50 g whey protein (in 250 ml water) or plain water before a high glycemic meal. Over a three hour period following the meal, glucose levels were 28% lower, early insulin response was 96% higher, and overall insulin response was 105% higher after ingestion of whey protein compared to placebo (Jakubowicz, Diabetologia 2014). In addition to helping increase insulin secretion and slowing gastric emptying (Ma, Diabetes Care 2009), a study among 18 adults with type 2 diabetes that was not well controlled (average HbA1c 7.3%) showed that consuming a single serving of 15 grams of whey protein 10 minutes before eating breakfast reduced post-meal blood sugar levels by 16% over the next 4 hours compared to placebo, and this reduction was attributed to a 40% increase in the function of beta-cells (cells in the pancreas that make insulin) and 22% reduction in post-meal clearance of insulin (Smith, J Clin Endocrinol Metab 2023).

Interestingly, the effect of protein on blood sugar and insulin levels may depend, to some degree, on the type of protein. A study in nine healthy men (average age 30) *without* insulin resistance or diabetes found that, taken on an empty stomach, whey protein elicited a greater increase in insulin levels over 3 hours than equal amounts of protein from isolates of rice or potato, with potato having the least effect. At 1 hour, this caused a temporary dip in blood sugar with whey protein, while blood sugar was steadier with the other two. The men consumed one of three protein drinks (mixed with 8.5 oz. of low-sugar orange juice) that provided similar amounts of protein (about 45.5 g) and carbohydrates (7 to 10 grams) from the three sources. The researchers suggested that differences in the rate at which amino acids, particularly BCAAs, are absorbed from the different protein sources may play a role in their impact on blood sugar and insulin, and this may occur faster with whey protein than with plant proteins (Lorinczova, Nutrients 2021).

A longer-term study of 30 men and women with type 2 diabetes in the U.K. found that following a very low calorie diet (that included protein) *reversed* diabetes (fasting plasma glucose fell below 7 mmol/L) in 40% of patients (87% if based on those who had been diabetic for less than four years). Participants in the study were taken off all antidiabetic medication and, for the first 8 weeks, consumed a very low calorie daily diet of just 3 shakes (OPTIFAST from Nestle -- which was not involved in the study) consisting of 43% carbohydrate, 34% protein, and 19.5% fat, and providing 624 kcal per day, as well as up to 240 grams of non-starchy vegetables providing up to 76 additional kcal, and at least 2 liters of calorie-free

beverages. Normal physical activity was maintained and one-to-one weekly counseling support was provided. Over the next two weeks, shakes were gradually replaced with solid foods and a diet providing adequate calories for weight maintenance. The reversal of diabetes was sustained for the next 6 months during which participants continued with an individualized weight maintenance diet and physical activity was encouraged. On average, participants lost 31 lbs. during the first 8 weeks and remained close to the lower weight for the duration of the study (Steven, Diabetes Care 2016). (Note: OPTIFAST in the UK differs from that in the U.S., having a higher fat concentration and serving size.)

Dialysis:

Dialysis (hemodialysis) treatment of people with kidney failure may decrease protein in the blood (measured in terms of serum albumin). Serum albumin levels less than 4.0 grams/dL have been associated with increased risk of mortality in such patients (Owen, N Engl J Med 1993). Protein supplementation of dialysis patients who had serum albumin levels of 3.5 grams/dL or less was associated with a 69% reduction in mortality compared to such patients not supplemented with protein. The protein was given orally as either *Novasource Renal* (21.6 grams of protein per 237 mL serving) or *Liquacel* (16 grams of protein per 30 mL serving) (Benner, J Renal Nutr 2018). It is not necessary to supplement all dialysis patients with protein. A study that followed 10,043 dialysis patients showed no difference in mortality between patients given protein regardless of albumin status compared to patients given protein only when albumin was low — below 3.5 grams/dL (Weiner, ASN Kidney Week 2020).

Blood flow

A study among 99 individuals in their late 60s and early 70s found that those supplementing for 12 weeks with 50 grams of whey protein isolate versus a placebo of 50 grams of maltodextrin (a carbohydrate) daily had a modest but statistically significant reduction in aortic stiffness versus a slight increase stiffness in the maltodextrin group. However, the study found no effect on blood flow through the carotid arteries to the brain and no effect on overall cognitive function. The study was funded by the dairy industry (which produces whey from milk) (Lefferts, Nutrients 2020).

Aging skin and wrinkles?

Unlike collagen (a protein that uniquely contains hydroxyproline), there does not appear to be any clinical evidence in people that other proteins, such as whey, help reduce wrinkles. The closest evidence of any benefit comes from a study in mice fed whey peptides twice daily for 17 weeks while being exposed to chronic UVB radiation three times weekly. This resulted in smaller increases in skin thickness (due to inflammation) and less reduction in skin elasticity compared to mice not fed whey peptides (Kimura, J Nutr 2014).

Quality Concerns and Tests Performed:

Neither the U.S. Food and Drug Administration (FDA) nor any other federal or state agency routinely tests nutrition powders and drinks for quality prior to sale. Some labeling discrepancies can be spotted by calculating the expected calories in a product, based on the protein, fat and carbohydrate contents on the label and seeing if the total calories match the calories actually listed on the label (see ConsumerTips™). However, most problems, and the magnitude of such problems, can be determined only with laboratory testing.

As pointed out in an article in the *Journal of Nutrition* about the quality of protein supplements (Maughan, J of Nutr 2013), other potential issues include the absence of active ingredients, inclusion of unwanted or harmful substances, and poor manufacturing practices. The article cites ConsumerLab.com's 2010 review in which one protein powder was found to contain excess sugar and two were contaminated with lead -- which is always of concern with products made from plant-based materials or containing minerals. The article concludes that risks associated with protein powders can be reduced by using only products that have been tested by quality assurance programs such as ConsumerLab.com's.

A study of contaminants in popular protein powders published in 2018 indicated that the majority contained detectable amounts of the heavy metals arsenic (83.5%), cadmium (73.7%), and lead (71.4%), and 28.6% contained mercury (Clean Label Project, 2018). **Plant-based proteins tended to be contaminated with higher amounts of metals, while egg- and milk-based (whey and casein) proteins contained the smallest amounts.** Review of the published data (which lacked product names) by ConsumerLab, however, showed that, based on a 35 gram serving, none of the 133 samples exceeded reasonable safety limits for arsenic or mercury, but 10 exceeded limits for cadmium and three for lead. The average detectable amount of cadmium per serving was only 1.6 mcg (well below the 4.1 mcg daily safe limit), but ten samples contained between 4.6 mcg and 10.7 mcg. In ConsumerLab's experience, elevated cadmium in protein powder tends to be due to chocolate flavoring with cocoa powder (a known source of cadmium), not the protein ingredient itself. The average detectable amount of lead was 0.66 mcg per 35 g serving (well below the 2.5 mcg limit applied by ConsumerLab for protein powders), but four samples contained between 2.7 mcg and 4.3 mcg. "Organic" products had about twice the concentration of heavy metals as other products — an issue ConsumerLab has noted in its reviews over the years. Subsequent testing by Clean Label Project of 160 top-selling protein powders (brands not disclosed) published in 2025 found that almost half of the tested

products exceeded at least one of California's Proposition 65 limits for heavy metals. **Products with the highest levels of heavy metals — particularly lead and cadmium — included those that were organic, plant-based, and/or chocolate-flavored**: On average, organic protein powders contained three times more lead and twice the amount of cadmium as non-organic products, while plant-based products contained three times more lead and five times more cadmium than whey-based products. Chocolate-flavored powders contained, on average, four times more lead and a whopping 110 times more cadmium than those that were vanilla-flavored (Clean Label Project, 2025).

Similarly, an analysis in Europe found that plant-based proteins (made from soy, pea, or other sources, such as rice and pumpkin and sunflower seeds) had higher levels of heavy metals than whey protein. Among plant-based proteins, pea protein tended to have the highest levels of lead as well as cadmium (2.7 mcg and 2.1 mcg, respectively, per 30-gram serving). This would exceed ConsumerLab's limits for lead for children as well as adults. On a positive note, the plant-based protein supplements, on average, also contained significant amounts of essential minerals, such as copper (348 mcg -- nearly 40% of the recommended daily intake for adults), iron (4 mg -- half the recommended daily intake of 8 mg for men, and for women age 51 and older), and molybdenum (49 mcg-- just above the recommended daily intake for adults) (Bethencourt-Barbuzano, J Trace Elem Med Biol 2025).

Arsenic contamination is of particular concern with products made from rice, including protein powders made from rice. Arsenic is a toxic heavy metal and known carcinogen that can damage organs. In 2012, FDA tests found arsenic levels in twelve rice protein supplements (product names were not provided) to range between 0.1 mcg and 5.7 mcg per serving (or between 4 ppb and 152 ppb) (See the Warning for more about this). The cancer warning threshold of the State of California is 10 mcg of arsenic per daily serving, meaning that if someone consumed more than one serving of some of these products in one day, they could exceed this amount.

More than 50% of the protein powders tested by the Clean Label Project in 2018 contained **BPA** (bisphenol A), a chemical used to make certain plastics that is considered to be a hormone disruptor and potentially harmful to a developing baby. Twenty-one percent of samples contained more than 3 mcg per serving, the limit for dermal contact in California without a label warning of potential reproductive harm to women. It is likely that that BPA leached from the packaging (BPA can leach from polycarbonate plastic), so *choosing a product packaged in a BPA-free container may reduce the risk* (we indicate which products make this claim in the "Notable Features" column of our Results Table)). Organic products appeared to contain slightly less BPA than other products. Interestingly, subsequent testing by Clean Label Project of 160 top-selling protein powders (brands not disclosed) published in 2025 found that only 3 of the powders contained detectable bisphenols (including BPA and BPS) (Clean Label Project, 2025).

Several years ago, a quality concern specific to protein products was contamination with **melamine**. Melamine has been illegally used in place of protein in some products because it is cheaper than protein but can make poor quality or diluted material appear to be higher in protein by elevating the total nitrogen content detected by simple protein tests. Kidney stones, kidney failure and death were reported in 2007 and 2008 due to melamine used in place of protein in pet foods, milk, and infant formulas. However, ConsumerLab.com's tests of protein products in 2010 did not find melamine in any products, and no cases of melamine contamination have been reported in recent years. Consequently, products in the current review were not tested for melamine.

Another way to fool tests for protein is the **substitution of lower-cost amino acids**, because the standard test for protein first breaks down the protein, by hydrolysis, into amino acids and then reports the total amount of amino acids as being the amount of protein. However, in 2013, ConsumerLab checked 30 products for this (by doing amino acid analysis before and after the hydrolysis step) and didn't find any discrepancies. In 2016 we checked another 31 products and, again, found no evidence of spiking. Consequently, this extra step (which is expensive) is no longer routinely performed in our Review.

An analysis of combined results of the Clean Label Project study and a smaller 2010 study of 15 protein products by Consumer Reports concluded that the protein powders, at their recommended servings, did not pose an increased risk to human health from heavy metals, but this did not assess cancer risks nor the combined effect of exposure to multiple heavy metals (Bandara, Toxicol Rep 2020).

To see which problems might exist with current protein/nutrition *powders* and *drinks*, and as part of its mission to independently evaluate products that affect health, wellness, and nutrition, ConsumerLab.com again purchased a variety of these products (see How Products were Evaluated). The products were first evaluated to make sure that their listed ingredients and claims were in compliance with FDA labeling regulations. Products were then tested for the accuracy of their label claims regarding total calories, total carbohydrates, total sugars, total protein, total fat (including a breakout of saturated fat and trans-fat), sodium and cholesterol. All products were tested for lead, cadmium, and arsenic, and mercury. Products claiming to be gluten-free were tested for gluten levels (For details, see Testing Methods and Passing Score).

What CL Found:

Among the 18 protein products ConsumerLab.com selected and tested, **three failed to pass tests** for the following reasons:

- ***Truvani Plant Based Protein — Vanilla Flavored*** contained 310.2 mg of sodium per scoop -- 141% of the listed 220 mg.
- ***Ancient Nutrition Plant Protein+ - Vanilla*** was contaminated with 5.7 mcg of lead per scoop as well as containing 221.9% of its listed total fat (3.3 g instead of 1.5 g), 128% of its listed calories (115.2 instead of 90), and 14 mg of sodium instead of none.
- ***Orgain Organic Protein™ - Creamy Chocolate Fudge Flavored*** contained 382.1 mg of sodium per scoop — 131.8% of the listed 290 mg. (Similarly, in 2018, ConsumerLab found that a vanilla bean flavor of this product had 181% of its listed sodium as well as a little more saturated fat than claimed.)

The remaining 15 products that ConsumerLab selected for review met quality standards and were Approved. All of the products that claimed to be gluten-free met that claim. Through ConsumerLab.com's voluntary Quality Certification Program, in which products undergo the same testing, an additional five products were found to meet quality standards.

Other than the lead contamination found in *Ancient Nutrition*, none of the other products failed tests for heavy metals — an improvement over past years when elevated levels of cadmium has been found in chocolate or cocoa containing products (cadmium is a common contaminant in cocoa and chocolate). In 2020, we found arsenic contamination in one of two cricket proteins, likely due to the feed source for the crickets used in that product. The source of the lead in *Ancient Nutrition* is difficult to know, as it lists more than 20 botanical ingredients.

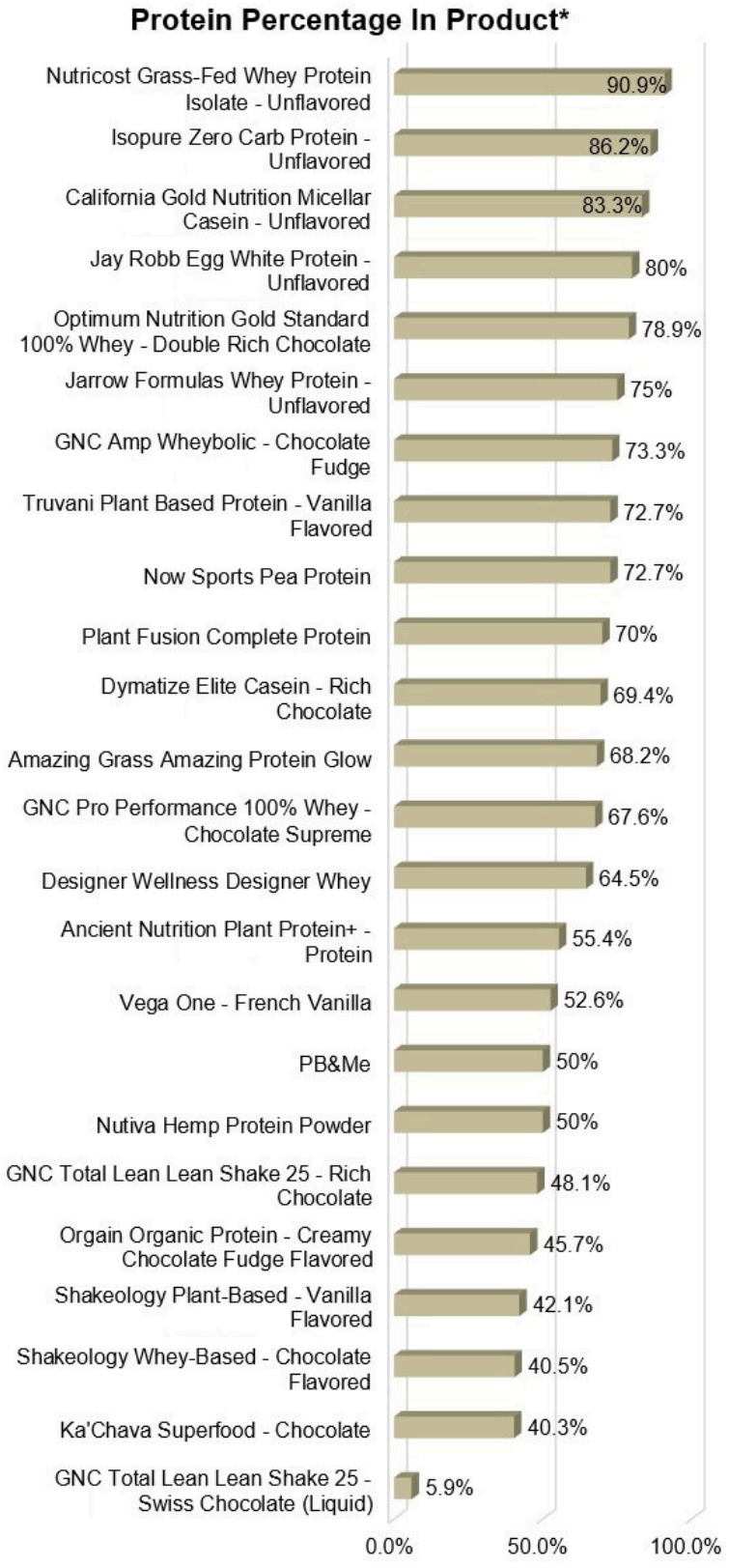
Choosing a protein type

The best choice of protein will depend, in part, on your individual needs and preferences. For example, whey protein isolates are typically lower in fat, cholesterol, carbohydrates and lactose This is why a product like *Nutricost Grass-Fed Whey Protein Isolate — Unflavored* and *Isopure Zero Carb Protein — Unflavored* had the highest protein percentage by weight among all the products, as shown below. Whey concentrates and most whey and casein products are good sources of calcium.

People looking for a vegan option may prefer soy or other plant-based protein such as pea or hemp, and these can be good sources of iron, although plant protein powders typically have a lower percentage of protein (about 40% to 73%) by weight due to their higher concentrations of carbohydrates. (Note: We included one bottled liquid product in our tests, which was found to be 5% protein. Although this may seem low relative to other products, it is mostly due to the fact that it was the only product already diluted in liquid, as opposed the powdered products.)

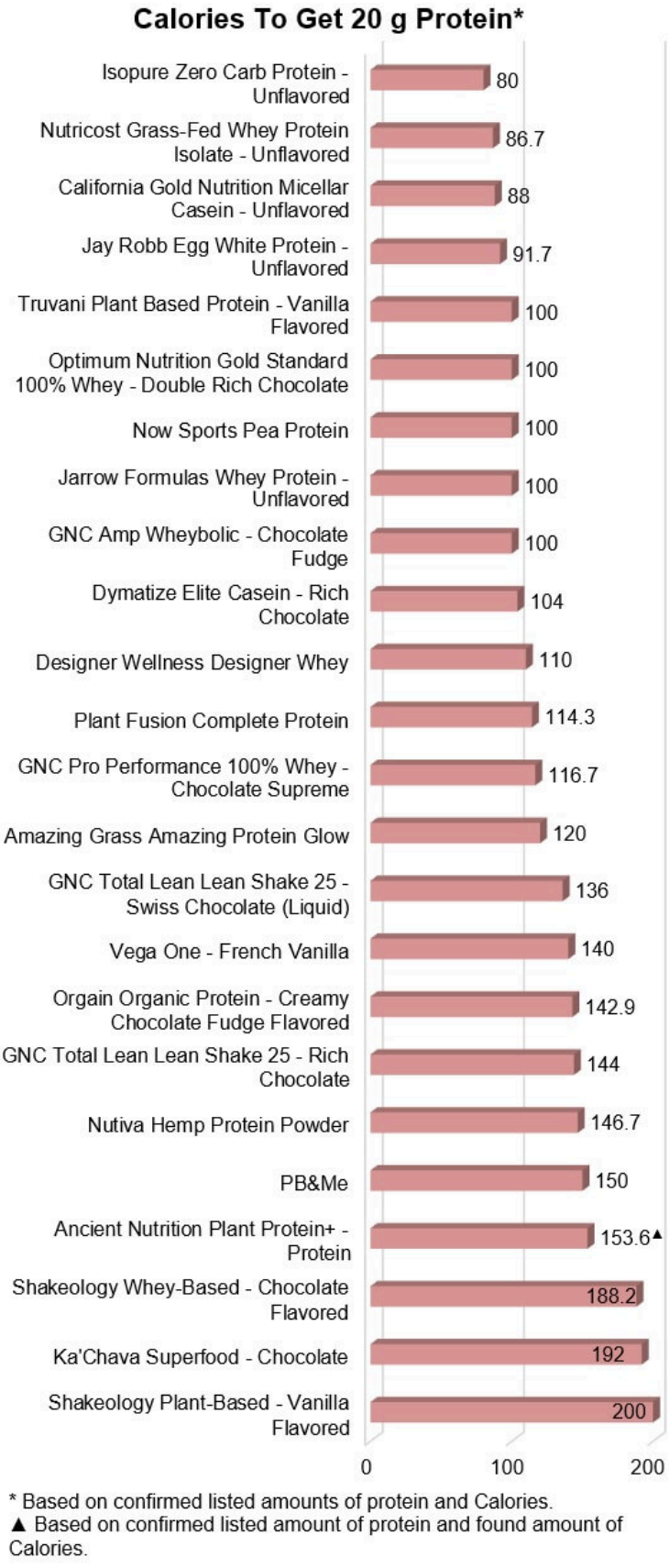
Be sure to see ConsumerTips™ for more information about each protein source. Also see the last column of the Results Table which shows what else is claimed to be in a single serving of each product.

Be aware that many products contain low-calorie non-sugar sweeteners, like stevia and monk fruit, and these can cause an aftertaste (see out Taste information in 2nd column of the Results Table).



Calories to get protein

If you want protein but the fewest calories, you'll find that with products that have the highest concentration (percentage) of protein without added ingredients. As shown in the graph below, these tend to be unflavored dairy-based or egg-based products. Since protein has 4 Calories per gram, products start at about 80 Calories per 20 grams. More complex products have as many as 200 Calories per 20 grams of protein, especially if they include oils or sugars.



* Based on confirmed listed amounts of protein and Calories.
▲ Based on confirmed listed amount of protein and found amount of Calories.

Consider cost

Among products that were Approved for quality, ConsumerLab.com calculated the cost to obtain an equal amount of protein (20 grams) and this is shown in brackets in the 7th column in the Results table below. This is one indication of value. Among products that were Approved, the lowest cost to obtain an equivalent amount (20 grams) of protein was 42 cents from *Now Sports® Pea Protein - Pure Unflavored*. The lowest cost for 20 grams from whey was 63 cents and it was 84 cents for casein, $1.23 for hemp, $2.36 for egg, and more ($3.50 to 5.50) for some products listing

many additional ingredients. For example, *Ka'Chava* also provides significant amounts of many essential vitamins and minerals but costs $4.66 per 2-scoop serving of powder, or $3.73 per 20 grams of protein. The convenience of ready-to-drink protein shakes and drinks also comes at a premium --*GNC Total Lean Lean Shake 25 — Swiss Chocolate* costs $2.50 per bottle, which works out to $2 per 20 grams of protein.

Top Picks:

Based on quality, value, taste, calories, and other factors, our *Top Picks* for each type of protein are noted below:

- **Whey protein:** ***Nutricost Grass-Fed Whey Protein Isolate — Unflavored*** had the highest concentration (90.9%) of protein and was the second least expensive whey protein among Approved products (73 cents per 20 grams of protein, if purchasing a 5 lb container), making it our *Top Pick* for whey. Being an isolate, it is very low in carbs (less than 1 gram per scoop, including just 0.3 grams of lactose) and fats (1 gram per scoop), although, as a result, it produces a thin drink when mixed with liquid, having a slight powdered-milk taste. It's palatable, but you might want to mix it into a liquid providing more flavor and/or texture. *Jarrow Formulas Whey Protein — Unflavored* costs a little less (63 cents per 20 grams) than *Nutricost* but has a significantly lower concentration of protein (75%), resulting in more calories to get protein, and it includes lecithin as an ingredient, which can add a stickiness on the lips after drinking. (Our previous *Top Pick* for whey in 2018, *MyProtein Impact Whey Isolate — Unflavored*, was not tested this year but remains a reasonable choice, although at a slightly higher cost and slightly lower concentration of protein (88%) than *Nutricost*).

  If you want whey protein that is flavored, our *Top Pick* is ***Optimum Nutrition Gold Standard 100% Whey — Double Rich Chocolate*** (71 cents per 20 grams of protein). It is a blend of whey protein isolate, concentrate, and hydrolyzed whey protein, so it has some carbohydrates (3 grams per scoop, including 0.67 grams of lactose) and a few more calories, but it also provides 130 mg of calcium. It has a mildly sweet, somewhat bland chocolate flavor. As a sweetener, the product contains **acesulfame potassium**, which some research has linked with increased risk of cancer, although reviews of data from more than 90 studies found no clear evidence of cancer-causing potential. A "*Delicious Strawberry*" version was among our *Top Picks* for whey in 2018.

  Note: If you are lactose intolerant, milk-based proteins (aside from isolates) may contain one or more grams of lactose per serving. Amounts found are shown in the 5th column. Some products include the enzyme lactase to help digest the lactose.

- **Casein protein:** Both of the casein products that we tested were made with "micellar" casein, which is just whole casein and it is absorbed more slowly than whey or a caseinate. A special bonus from whole casein powders is that they naturally include a large amount of calcium -- around 600 mg per serving! Our *Top Pick* is the unflavored product, ***California Gold Nutrition Micellar Casein — Unflavored***. It's 83.3% protein and costs only 74 cents per 20 grams of protein. It has bland, powdered milk flavor with a very slight metallic taste. It becomes frothy when mixed in liquid. If you want flavor, *Dymatize Elite Casein — Rich Chocolate* costs just a little more (84 cents to get 20 grams of protein) and produces a thicker drink, although we found it a bit too sweet, which lingered after finishing. (Note: In 2018, we tested *Universal Casein Pro — Vanilla Soft Serve* and found that it contained 2.6 more grams of carbs than the 3 grams listed.)

- **Egg protein:** Our *Top Pick* for egg protein is ***Jay Robb Egg White Protein — Unflavored***. It has a salty, egg white taste, like egg drop soup, when mixed in water. Be aware that it is naturally higher in sodium than most other protein powders (360 mg per scoop providing 24 grams of protein) and relatively expensive ($2.36 per 20 grams of protein).

  Interestingly, when we last tested this product in 2016, it could not be approved because we found it to contain cholesterol, although it had listed none. Now it declares 5 mg of cholesterol, which is correct. In 2018, we tested *PaleoThin Organic Egg White Protein — Unflavored*, which was also Not Approved because it contained 20.4 mg of cholesterol per scoop although it claimed none. That product appears to continue to declare zero cholesterol on its label.

- **Pea protein:** ***NOW Sports Pea Protein - Natural Unflavored*** is, once again, our *Top Pick* for pea protein. It is also our ***overall Top Pick among protein powders***. It provides protein at a much lower cost than any other protein product, just 42 cents per 20 grams, although this may be partly explained by the jumbo-sized (7 pound) container in which we purchased it. Being plant-based, it is vegan, and it is also likely to be an environmentally better choice than dairy-based proteins, such as whey, although, like most other protein powders and drinks, it does come in a large plastic container. It has a mild pea flavor (it is made from yellow peas) with a slight bitterness — likely because it is a pea protein *isolate*. It can be consumed on its own in liquid (it mixes easily and smoothly) but would be even better in a vegetable smoothie. Be aware that it is naturally higher in sodium than most other products (320 mg per scoop).

  Pea protein may also contain phytate, which can potentially bind to and reduce the absorption of minerals consumed around the same time. However, this is likely not a problem for people consuming a balanced diet and can also be avoided by taking pea protein separately (at least 2-3 hours apart) from other supplements or foods with minerals. In addition, according to correspondence by ConsumerLab with NOW (on 1/10/23), the concentration of phytate in their pea protein powder is only 6.1 mg/g, which is about the same as in dried peas of 2.2 to 12.2 mg/g (Schlemmer, Mol Nutr Food Res 2009), and not as high as the 20 mg/g reported in a more concentrated preparation (see **below**).

We also tested two vanilla-flavored pea proteins this year: *Truvani Plant Based Protein* was Not Approved, as we found more sodium than listed; *Vega One* passed testing, although it is much more expensive, at $2.20 per 20 grams of protein, which is five times the cost of getting protein from *NOW*. (In 2016, *Nature's Way Alive Ultra Shake Pea Protein — Vanilla* was Approved but cost much more -- $1.21 per 20 grams of protein, and *Naturade Pea Protein* failed for containing 181 mg more sodium than listed.)

This year we also tested three products in which pea protein was *blended* with other protein sources (see the "Mixed" sources section): *Orgain Organic Protein — Creamy Chocolate Fudge Flavored* was found to contain more sodium than listed and was Not Approved, while *PlantFusion Complete Protein — Vanilla* and *Amazing Grass Protein Glow- Wild Berry Hibiscus* passed testing, but are much more expensive than *NOW* at $1.27 and $2.31, respectively, per 20 grams of protein. (In 2018, *Garden of Life Sport Organic Plant-Based Protein Vanilla*, which is primarily pea protein, passed testing. It had a moderate price, a pleasant vegetable flavor, and is sweetened with stevia — which some people may like, and others may not.)

- **Hemp protein:** One product in this category was tested, ***Nutiva Organic Hemp Protein Powder***, and it was Approved for quality, just as it was when we tested it in 2018 and 2016. It is our *Top Pick* for hemp protein, providing 20 grams of protein for $1.23. Although it is just hemp, it has a complex vegetable flavor. A nice feature of this product, and hemp in general, is that it provides a large amount of fiber — 6 grams per scoop, along with 2 to 3 grams of unsaturated fat (i.e., hemp oil). As a result, only 50% of the powder is protein, but it's a worthwhile tradeoff if you are seeking these other nutrients. It also naturally provides significant amounts of potassium, iron, magnesium and zinc, is naturally lower in sodium than pea protein, and is made without any sweeteners. Be aware that *Nutiva* has a slightly gritty mouthfeel and quickly settles out when mixed, so it would be best as part of a smoothie.

- **Peanut protein:** We only tested one product in this category, ***PB & Me***, but it is our *Top Pick* for peanut protein. Unlike raw peanuts, which naturally contain twice as much oil as protein, the majority of the peanut oil has been removed from this product, leaving a powder that is about 50% protein, with the rest being fiber and a little sugar and other carbs, and just 1.5 grams of oil (as unsaturated fats). Although it has somewhat more calories than other protein sources (150 Calories to get 20 grams of protein), it is moderately priced (87 cents per 20 grams of protein), and adding this to water creates, essentially a very low fat, high protein peanut butter.

- **Soy protein:** We didn't test any soy protein powders this year. In 2018, we tested *Vitacost Soy Protein Isolate - Natural Chocolate Flavor*, which was Approved. While it is a soy protein isolate, it provided as much sugar (from fructose) as protein (15 grams of each per scoop), giving it far more carbs than any other protein powder and had a slightly gritty mouthfeel. It was not a *Top Pick*.

- **Cricket protein:** We also did not test cricket protein this year. However, in 2020, *EXO Pure Cricket Powder* was our *Top Pick* for cricket protein. We judged it superior in quality, taste, and value to the other cricket powder tested, *Entomo Farms Cricket Protein Powder*, which was found to be contaminated with arsenic. *EXO* is a fine, light brown powder that mixes well and evenly in liquid and has a mild, savory flavor, somewhat similar to beef bouillon. In contrast *Entomo* was a more coarse, dark brown powder with a deeper flavor (and an odor similar to lawn fertilizer) and some crunchiness that we found less appealing. Both naturally provided significant amounts of vitamin B-12 (which we confirmed in testing). Being animal-based, both contained small amounts of saturated fat and some cholesterol.

- **High-Protein, Meal Replacement:** Some protein products are suitable as occasional meal replacements if they include significant amounts of carbohydrates (including fiber), as well as healthful fats, and essential minerals and vitamins. As these can contain a variety of types of protein, we have not grouped these together in the table above, but have indicated (in the first column) that each "Can be a meal replacement." We believe that seven of the tested products can be considered as meal replacements, each of which provides 6 to 7 grams of fiber per serving. They are *GNC Lean Shake 25* (powder), *Ka'Chava*, *Nutiva Hemp*, the three *Shakeology* powders, and *Vega One*.

  While each of these have pros and cons, our *Top Pick* as an occasional, high-protein meal replacement is ***Vega One — French Vanilla*** (the only flavor we tested) and here's why. First, it has the highest percentage of protein among these products (52.6%, or 20 grams per 38-gram scoop). Second, it is high in fiber (6 of its 10 grams of carbohydrates), low in saturated fat (just 1 gram out of 3.5 grams of fat), and relatively low in sodium (210 mg), making it relatively heart-healthy. Third, it offers good amounts of essential nutrients such as vitamin D (10 mcg or 400 IU), calcium (140 mg) and iron (5.4 mg), as well as vitamins B-12 and C. Finally, it is relatively well priced at $2.20 per scoop. The product is sweetened with **inulin**, which may cause GI discomfort at high doses (10 grams or more), and **stevia**, which some people find has a bitter aftertaste.

GNC Lean Shake 25 powder, ***Ka'Chava*** and the ***whey-based (chocolate) Shakeology powder*** also provide many of the nutrients in *Vega One*, but they include several grams of added sugar, while *Vega One* has none, and most of the fat in *GNC* and *Ka'Chava* is saturated. These three have even larger amounts of calcium than *Vega One*, but perhaps too much, since some, if not most, of it is from added calcium, which is not ideal. The **plant-based *Shakeology* powders** have little calcium and little in the way of vitamins other than some vitamin C.

Nutiva Hemp Protein Powder, is perhaps the most healthful option, but it needs to be mixed with some type of milk and perhaps a banana to be tasty — it has just 1 gram of sugar. A 4-tablespoon (30 gram) serving provides 15 grams of protein, 8 grams of carbohydrates (of which 6 is fiber), no sodium, and 3 grams of fat — none of which is saturated. It also provides a substantial amount of magnesium (246 mg) and good amounts of iron (6 mg) and zinc (4 mg), as well as some calcium (51 mg). However, you won't get vitamins.

While many products met their claims and are listed below as "Approved," this does not necessarily mean that each provides what's right for you. Use the information in our ConsumerTips™ section for guidance. You can then easily compare the products using the table below — with the assurance that ConsumerLab.com has checked these figures to be true.

Test Results by Product:

Listed below are the test results for 25 protein/nutrition powder and drink products. Products are grouped by main ingredient (e.g., whey, casein, etc.) and appear alphabetically within these groups. ConsumerLab.com selected 18 products. Seven other products (each indicated with a CL flask) were tested at the request of their manufacturers/distributors through ConsumerLab.com's voluntary Quality Certification Program and are included for having passed testing.

Also shown are the labeled serving sizes as well as the labeled amounts per serving of: protein; carbohydrates, fiber and sugar; total fat, saturated fat, and trans-fat; sodium and cholesterol; and calories — all, except fiber, were checked in testing. Amounts of lactose found in products are listed for those who have trouble digesting lactose. Contamination with lead, arsenic, cadmium, and mercury above allowed limits and the accuracy of "gluten-free" claims are also shown. The "Protein" column lists the type of protein in each product as well as the percentage of the product that was protein (learn more about each type of protein and how they differ in the ConsumerTips™ section). More detail about the protein content, as well as the full list of ingredients, is available in the last column. The 7th column compares products on price and the cost to obtain 20 grams of protein, while the 8th column identifies other nutrients and key features of products, such whether they are organic or vegan, and labeled precautions.

Products listed as "Approved" met their ingredient claims and other quality requirements. Those that did not are listed as "Not Approved" with an explanation of the problem found in red font. **Swipe sideways on the table to view all columns.**

Results of ConsumerLab.com Testing of Protein Powders, Shakes, and Drinks

Values based on listed serving sizes (NL = Not listed)

(Price Checks are not included in printed reviews)

Approval Status **Product Name**	**Serving Size** **Suggested Daily Servings** ***Taste/ "Mixability"***	**Heavy Metals** **Gluten-Free**	**Protein (grams), Source and Form**	**Total Carbohydrates/ Fiber/ Sugar (grams)** **Lactose Found**	**Fats: Total/ Sat. / Trans (grams)** **Sodium/ Cholesterol (mg)** **Calories**	**Cost for Suggested Serving** **[Cost Per 20 g of Protein]** **Price**	**Notable Features**	**Full List of Ingredients Per Serving (Protein information is bolded)**
Whey Protein:								

APPROVED Designer Wellness® Designer Whey® - Vanilla  Dist. by Designer Protein, LLC	1 scoop [31 g] Add 1 scoop into 6-8 oz/177-236 ml water, milk or non-dairy beverage and shake or blend. *Mild vanilla flavor. Slightly sweet, with lingering sweetness.* *Mixes in, but is clumpy and otherwise thin.*	Metals: Pass Gluten-Free: Pass	20 (64.5% of serving is protein) Designer Whey Full Spectrum Peptides: (GMO-free and rBGH-free Whey Protein Concentrate, GMO-free and rBGH-free Whey Protein Isolate, L-Glutamine, L-Leucine, Taurine, L-Phenylalanine)	6 / 3 / 2 0.62 g	1.5 / 1 / 0 90 / 55 110	$0.85/scoop [$0.85] $24.99/2 lb [908 g] pouch (approx. 29 servings)	Vitamin D 5 mcg, thiamin 1.5 mg, riboflavin 1.7 mg, vitamin B6 2 mg, pantothenic acid 10 mg, calcium 200 mg, phosphorus 200 mg, magnesium 100 mg, zinc 5.2 mg & potassium 100 mg per scoop *Kosher. No Artificial Flavors, Sweeteners Or Preservatives* *Additional Information* *Vitamin D 5 mcg, thiamin 1.5 mg, riboflavin 1.7 mg, vitamin B6 2 mg, pantothenic acid 10 mg, calcium 200 mg, phosphorus 200 mg, magnesium 100 mg, zinc 5.2 mg & potassium 100 mg per scoop* *Kosher. No Artificial Flavors, Sweeteners Or Preservatives. rGBH-Free & Non-GMO*	1 scoop Calories 110, Total Fat 1.5 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 55 mg, Sodium 90 mg, Total Carbohydrate 6 g, Dietary Fiber 3 g, Total Sugars [Includes 1 g Added Sugars] 2 g, **Protein 20 g**, Vitamin D 5 mcg, Thiamin 1.5 mg, Riboflavin 1.7 mg Additional Information 1 scoop Calories 110, Total Fat 1.5 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 55 mg, Sodium 90 mg, Total Carbohydrate 6 g, Dietary Fiber 3 g, Total Sugars [Includes 1 g Added Sugars] 2 g, **Protein 20 g**, Vitamin D 5 mcg, Thiamin 1.5 mg, Riboflavin 1.7 mg, Vitamin B6 2 mg, Pantothenic Acid 10 mg, Calcium 200 mg, Phosphorus 200 mg, Magnesium 100 mg, Zinc 5.2 mg, Potassium 100 mg. Ingredients: **Designer Whey Full Spectrum Peptides: (GMO-free and rBGH-free Whey Protein Concentrate, GMO-free and rBGH-free Whey Protein Isolate, L-Glutamine, L-Leucine, Taurine, L-Phenylalanine)**, Digestive Health Blend: [GMO-free Prebiotic Vegetable Fiber, Probiotics: (Lactobacillus Acidophilus, B.

							Whey. Gluten Free. ***Precaution:*** *Contains Milk. Do not use for weight reduction. Consult your physician before use if you are pregnant, nursing, anticipating surgery or if you are under medical supervision.*	Longum, L. Plantarum), Vegetarian Protease Enzymes], Natural Vanilla Flavor, Electrolyte Blend: (Calcium Phosphate, Magnesium Oxide), Sunflower Lecithin, B-Vitamin Blend: (Calcium Pantothenate, Pyridoxine Hydrochloride, Thiamin Mononitrate, Riboflavin), Zinc Gluconate, Stevia Leaf Extract, Xanthan Gum, Sodium Alginate, Cinnamon, Monk Fruit, Annatto, Mixed Tocopherols, Vitamin D3 (Cholecalciferol).

APPROVED GNC Amp Wheybolic™ - Chocolate Fudge  Dist. by General Nutrition Corporation	1 scoop [27.3 g] Consume 2 scoops in 8 fl. oz. of cold water or your favorite beverage. Wheybolic™ can be consumed first thing in the morning pre-work out and/or post-workout. For maximum results, reference usage benefits and consume 2 scoops twice daily. *Smooth, milk chocolatey flavor. Very sweet, with lingering non-sugar sweetness.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	20 (73.3% of serving is protein) L-Leucine (from micronized L-leucine, whey protein isolate, hydrolyzed whey protein)	3 / 0 / 1 No measurable lactose	1 / 0 / NL 110 / 10 100	$1.40/scoop [$1.40] $69.99/3 lb [1,362.5 g] container (approx. 50 servings)	Calcium 90 mg, chromium 25 mcg, potassium 165 mg, L-leucine 3.1 g & Velositol® 250 mg, enzyme blend 200 mg per scoop *Informed-Choice.org Trusted by Sport seal. Gluten Free. Banned Substance Free. Gluten Free, No Soy.* **Precaution:** Contains: Milk Additional Information Calcium 90 mg, chromium 25 mcg, potassium 165 mg, L-leucine 3.1 g & Velositol® 250 mg, enzyme blend 200 mg per scoop *Informed-Choice.org Trusted by Sport seal. Gluten Free. Banned Substance Free. Gluten Free, No Soy.* **Precaution:** Contains: Milk. Warning:	1 scoop Calories 100, Total Fat 1 g, Saturated Fat 0 g, Cholesterol 10 mg, Total Carbohydrate 3 g, Dietary Fiber 0 g, Total Sugars1 g, **Protein 20 g**, Calcium 90 mg, Chromium (as Chromium Picolinate & Chromium Histidinate) 125 mcg, Sodium 110 mg, Potassium 165 mg Additional Information 1 scoop Calories 100, Total Fat 1 g, Saturated Fat 0 g, Cholesterol 10 mg, Total Carbohydrate 3 g, Dietary Fiber 0 g, Total Sugars1 g, **Protein 20 g**, Calcium 90 mg, Chromium (as Chromium Picolinate & Chromium Histidinate) 125 mcg, Sodium 110 mg, Potassium 165 mg, **L-Leucine (from Micronized L-Leucine, Whey Protein Isolate, Hydrolyzed Whey Protein) 3.1 g**, Velositol® (Amylopectin/ Chromium Complex) 250 mg, Enzyme Blend (Blend of Lactase & Bromelain) 200 mg. Other Ingredients: **Protein Blend (Whey Protein Isolate, Hydrolyzed Whey Protein)**, Cocoa Powder (Processed with Alkali), Sunflower Creamer (Sunflower Oil, Maltodextrin, Sodium Caseinate, Mono & Diglycerides, Natural

							Cancer and Reproductive Harm. Consult your physician prior to using this product if you are pregnant, nursing, taking medication, or have a medical condition. Discontinue use two weeks prior to surgery.	Tocopherols, Tricalcium Phosphate), Natural & Artificial Flavor, Salt, Gum Blend (Cellulose Gum, Xanthan Gum, Carrageenan), Sucralose, Sunflower Lecithin, Acesulfame Potassium, Silicon Dioxide.

APPROVED GNC Pro Performance® 100% Whey - Chocolate Supreme  Dist. by General Nutrition Corporation	1 scoop [35.5 g] Mix one scoop (35.4 g) in 6 fl. oz. of cold water, milk or your favorite beverage and blend well. Consume 1-2 servings per day. Best enjoyed post-workout and/or throughout the day as an additional source of protein. *Chocolate / powdered milk flavor. Moderately sweet.* *Mixes with some small clumps.*	Metals: Pass Gluten-Free: Pass	24 (67.6% of serving is protein) 100% whey protein blend (whey protein concentrate, whey protein isolate)	6 / 1 / 2 1.9 g	2 / 1 / NL 80 / 80 140	$1.40/scoop [$1.17] $34.99/1.96 lb [887.5 g] container (approx. 25 servings)	Calcium 130 mg, iron 0.8 mg & potassium 330 mg per scoop *Banned Substance Free® seal. Informed-Choice.org Trusted by Sport seal. Kosher. No Artificial Flavors, No Artificial Colors, No Preservatives, Gluten Free.* **Precaution:** Contains: Milk Additional Information Calcium 130 mg, iron 0.8 mg & potassium 330 mg per scoop *Banned Substance Free® seal. Informed-Choice.org Trusted by Sport seal. Kosher. No Artificial Flavors, No Artificial Colors, No Preservatives, Gluten Free.* **Precaution:** Contains: Milk and Soybeans.	1 scoop Calories 140, Total Fat 2 g, Saturated Fat 1 g, Cholesterol 80 mg, Total Fiber 1 g, Total Sugar [Includes 1 g Added Sugars] 2 g, **Protein 24 g**, Calcium 130 mg, Iron 0.8 mg, Sodium 80 mg, Potassium 330 mg. Ingredients: **100% Whey Protein Blend** **Additional Information** **1 scoop** **Calories 140, Total Fat 2 g, Saturated Fat 1 g, Cholesterol 80 mg, Total Fiber 1 g, Total Sugar [Includes 1 g Added Sugars] 2 g, Protein 24 g, Calcium 130 mg, Iron 0.8 mg, Sodium 80 mg, Potassium 330 mg.** **Ingredients: 100% Whey Protein Blend (Whey Protein Concentrate, Whey Protein Isolate), Cocoa Powder (Processed with Alkali), Natural Flavors, Cellulose Gum, Soy Lecithin, Xanthan Gum, Acesulfame Potassium, Sodium Chloride, Sucralose.**

							Notice: Use this product as a food supplement only. Do not use for weight reduction.	
APPROVED Isopure® Zero Carb Protein - Unflavored  Mfd. by The Isopure Company, LLC	1 scoop [29 g] For healthy adults, consume enough protein to meet your daily protein requirements with a combination of high protein supplements throughout the day as part of a balanced diet and exercise program. *Very mild, milk flavor. Very slight stickiness on lips.* *Mixes evenly with no clumps.*	Metals: Pass Gluten-Free: Pass	25 (86.2% of serving is protein) Protein isolate	0 / NL / 0 0.09 g	0 / NL / NL 160 / 5 100	$1.22/scoop [$0.97] $56.99/3 lb [1,360 g] container (approx. 47 servings)	Calcium 80 mg per scoop *No Added Colors / Flavors / Sweeteners. Keto-Friendly. rBST Free Whey. GMO Free. Gluten & Lactose Free. Zero Carb / Sugar / Fat.* **Precaution:** Contains: Milk and Soy. Notice: Use This Product As A Food Supplement Only. Do Not Use For Weight Reduction.	1 scoop Calories 100, Total Fat 0 g, Cholesterol 5 mg, Sodium 160 mg, Total Carbohydrate 0 g, Total Sugars [Includes 0 g Added Sugars] 0 g, **Protein 25 g**, Calcium 80 mg. Ingredients: **Protein Isolate**, Soy Lecithin.

APPROVED Jarrow Formulas® Whey Protein - Unflavored  Dist. by Jarrow Formulas®	1 leveled scoop [24 g] Mix 1 leveled scoop of Jarrow Formulas® Whey Protein with 4 to 6 oz. of cold water, soy milk, juice or your favorite beverage. For a protein smoothie, blend with crushed ice and add juice or fruit to taste. Mat also be used with cereals, yogurt or pancakes to increase the protein in the diet. *Tastes like thin powdered milk. Slight stickiness on lips.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	18 (75% of serving is protein) 100% ultrafiltered whey protein	1 / 0 / 1 0.74 g	2 / 1 / 0 50 / 55 90	$0.57/leveled scoop [$0.63] $21.57/2 lb [908 g] container (approx. 38 servings)	Calcium 124 mg & potassium 95 mg per leveled scoop *rBST Free. No Added Hormones. Gluten Free. Contains No artificial flavors or artificial sweeteners.* **Precaution:** Contains: Milk. Use This Product As A Food Supplement Only. Do Not Use For Weight Reduction.	1 leveled scoop Calories 90, Total Fat 2 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 55 mg, Sodium 50 mg, Total Carbohydrate 1 g, Dietary Fiber 0 g, Total Sugars [Includes 0 g Added Sugars] 1 g, **Protein 18 g**, Vit. D 0 mcg, Calcium 124 mg, Iron 0 mg, Potas. 95 mg. Ingredients: **100% Ultrafiltered Whey Protein** and lecithin (from sunflower).

APPROVED Top Pick for Whey Protein Nutricost® Grass-Fed Whey Protein Isolate - Unflavored  Dist. by Nutricost®	1 scoop [33 g] Blend 1 scoop daily with 8-12 oz cold water, milk, or your preferred beverage. *Tastes like thin powdered milk.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	30 (90.9% of serving is protein) Grass-fed whey protein isolate	<1 / 0 / <1 0.3 g	1 / 0 / 0 120 / 17 130	$1.09/scoop [$0.73] $74.95/5 lbs [2,268 g] container (approx. 68 servings)	Calcium 105 mg, potassium 115 mg, phosphorus 83 mg & magnesium 25 mg per scoop *Grass-Fed Product. Non GMO. Gluten Free Product.* **Precaution:** Contains: Milk.	1 scoop Calories 130, Total Fat 1 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 17 mg, Sodium 120 mg, Total Carbohydrate <1 g, Dietary Fiber 0 g, Total Sugars [Includes 0 g Added Sugars] <1 g, **Protein 30 g** Additional Information 1 scoop Calories 130, Total Fat 1 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 17 mg, Sodium 120 mg, Total Carbohydrate <1 g, Dietary Fiber 0 g, Total Sugars [Includes 0 g Added Sugars] <1 g, **Protein 30 g**, Vitamin D 0 mcg, Calcium 105 mg, Iron 0 mg, Potassium 115 mg, Phosphorus 83 mg, Magnesium 25 mg. Ingredients: **Grass-fed whey protein isolate**.

APPROVED Top Pick for Whey Protein With Added Flavor Optimum Nutrition® [ON] Gold Standard® 100% Whey - Double Rich Chocolate  Mfd. by Optimum Nutrition, Inc.	1 scoop [30.4 g] For best results, mix up your shake 30-60 minutes after you work out, or have it as an anytime snack in your balanced, high-protein diet. *Somewhat bland chocolate flavor, mildly sweet.* *Mixes in, but some large clumps.*	Metals: Pass Gluten-Free: Pass	24 (78.9% of serving is protein) Protein blend (whey protein isolate, whey protein concentrate, hydrolyzed whey protein)	3 / <1 / 1 0.67 g	1.5 / 1 / NL 50 / 35 120	$0.86/scoop [$0.71] $63.99/5 lb [2,270 g] container (approx. 74 servings)	Calcium 130 mg, iron 0.7 mg & potassium 210 mg per scoop *Informer Choice Regularly Tested For Banned Substances seal. No Artificial Growth Hormones. Gluten Free.* **Precaution:** Contains: Milk And Soy. Use This Product As A Food Supplement Only. Do Not Use For Weight Reduction.	1 scoop Calories 120, Total Fat 1.5 g, Saturated Fat 1 g, Cholesterol 35 mg, Sodium 50 mg, Total Carbohydrate 3 g, Dietary Fiber <1 g, Total Sugars 1 g, **Protein 24 g**, Calcium 130 mg, Iron 0.7 mg, Potassium 210 mg Additional Information 1 scoop Calories 120, Total Fat 1.5 g, Saturated Fat 1 g, Cholesterol 35 mg, Sodium 50 mg, Total Carbohydrate 3 g, Dietary Fiber <1 g, Total Sugars 1 g, **Protein 24 g**, Calcium 130 mg, Iron 0.7 mg, Potassium 210 mg. Ingredients: **Protein Blend (Whey Protein Isolate, Whey Protein Concentrate, Hydrolyzed Whey Protein)**, Cocoa Powder (Processed with Alkali), Sunflower and/or Lecithin, Natural and Artificial Flavor, Acesulfame Potassium.
Casein Protein:								

APPROVED Top Pick for Casein Protein California Gold Nutrition® Micellar Casein - Unflavored  Dist. by Madre Labs, LLC	2 rounded scoops [30 g] Combine 2 slightly rounded scoops (30 g) with 6-12 fl oz cold water or the liquid of your choice (e.g. dairy milk, coconut milk, almond milk, rice milk, soy milk, etc.) May be minimally sweetened if desired. For best results, use a blender-type bottle, shaker cup or electric blender. Our Micellar Casein should not be blended with a spoon. *Bland, powdered milk flavor - very slight metallic taste.* *Mixes evenly and becomes frothy.*	Metals: Pass Gluten-Free:	25 (83.3% of serving is protein) Micellar casein (from bovine milk)	<1 / 0 / <1 0.45 g	0 / 0 / 0 35 / 20 110	$0.93/2 rounded scoops [$0.74] $14.00/1 lb [454 g] container (approx. 15 servings)	Calcium 650 mg per 2 rounded scoops *No Artificial Colors, Flavors or Sweeteners. No Filler, Gluten, Soy or GMOs. No rbST.* **Precaution:** Contains Milk. This product is not manufactured with eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, soy or gluten. Processed in a third-party, audited, and registered cGMP compliant facility that may process other products that contain these allergens Additional Information Calcium 650 mg per 2 rounded scoops *No Artificial Colors, Flavors or Sweeteners. No Filler, Gluten, Soy or GMOs. No rbST.*	2 rounded scoops Calories 110, Total Fat 0 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 20 mg, Sodium 35 mg, Total Carbohydrate <1 g, Dietary Fiber 0 g, Total Sugars [Includes 0 g Added Sugars] <1 g, **Protein 25 g**, Vitamin D 0 mcg, Calcium 650 mg, Iron 0 mg, Potassium 0 mg. Ingredients: **Micellar Casein (from Bovine Milk)**.

							Precaution: Contains Milk. This product is not manufactured with eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, soy or gluten. Processed in a third-party, audited, and registered cGMP compliant facility that may process other products that contain these allergens or ingredients. Notice: Use this product as a food supplement only. Do not use for weight reduction. Sourced and made in the USA.	

APPROVED Dymatize® Elite Casein® - Rich Chocolate  Dist. by Dymatize Enterprises, LLC	2 scoop [36 g] Mix two scoops (included) of Dymatize Elite Casein with 10-12 fl. oz. (200-240 mL) of your favorite beverage. For optimal results, drink in the evening before bed, in place of small meals, or any other time a steady amino release is desired. *Thick, sweet, chocolatey. Slight lingering sweetness.* *Mixes very evenly and smoothly.*	Metals: Pass Gluten-Free: Pass	25 (69.4% of serving is protein) Micellar casein	3 / <1 / 0 0.22 g	2 / 0 / 0 180 / 20 130	$1.05/2 scoops [$0.84] $52.49/4 lb [1,800 g] container (approx. 50 serving)	Calcium 590 mg, iron 1.3 mg & potassium 410 mg per 2 scoops *Banned Substance Tested Informed-Choice.org Trusted by Sport seal. Gluten Free.* **Precaution:** Contains: Milk And Soy. Notice: Use this product as a Food Supplement only. Do not use for weight reduction.	2 scoops Calories 130, Total Fat 2 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 20 mg, Sodium 180 mg, Total Carbohydrate 3 g, Dietary Fiber <1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, **Protein 25 g**, Vitamin D 0 mcg, Calcium 590 mg, Iron 1.3 mg, Potassium 410 mg. Ingredients: **Micellar Casein** Additional Information 2 scoops Calories 130, Total Fat 2 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 20 mg, Sodium 180 mg, Total Carbohydrate 3 g, Dietary Fiber <1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, **Protein 25 g**, Vitamin D 0 mcg, Calcium 590 mg, Iron 1.3 mg, Potassium 410 mg. Ingredients: **Micellar Casein**, Sunflower Creamer (Sunflower Oil, Maltodextrin, Micellar Casein, Soy Lecithin, Sodium Citrate, Tricalcium Phosphate), Cocoa Powder (Processed With Alkali). Less Than 2% Of: Natural Flavors, Salt, Sucralose, Acesulfame Potassium, Potassium Chloride, Cellulose Gum, Xanthan Gum, Sunflower Lecithin.
Milk Protein Combinations (Whey/Casein/Milk):								

APPROVED Can be considered for meal replacement GNC Total Lean® Lean Shake™ 25 - Rich Chocolate  Dist. by General Nutrition Corporation	1 heaping scoop [52 g] As a meal replacement, mix one serving (one heaping scoop) (52 g) with 8-10 fl. oz. of cold water. Mix well. Drink two shakes daily in conjunction with a healthy weight management program. *Artificial chocolate flavor, moderately sweet, with some lingering sweetness.* *Forms many very small, soft clumps when mixed.*	Metals: Pass Gluten-Free:	25 (48.1% of serving is protein) Whey protein concentrate, milk protein concentrate, whey protein isolate	18 / 8 / 4 1.5 g	3 / 2 / 0 290 / 60 180	$3.12/heaping scoop [$2.50] $49.99/1.83 lb [832 g] container (approx. 16 servings)	Calcium 450 mg, iron 5 mg, potassium 350 mg, vitamin A 300 mcg RAE, vitamin C 30 mg, vitamin E 3 mg, thiamin 0.3 mg, riboflavin 0.3 mg, niacin 4 mg, vitamin B-6 0.4 mg, folate 135 mcg DFE, vitamin B-12 1.3 mcg, biotin 60 mcg, pantothenic acid 2 mg, phosphorus 250 mg, iodine 75 mcg Additional Information Calcium 450 mg, iron 5 mg, potassium 350 mg, vitamin A 300 mcg RAE, vitamin C 30 mg, vitamin E 3 mg, thiamin 0.3 mg, riboflavin 0.3 mg, niacin 4 mg, vitamin B-6 0.4 mg, folate 135 mcg DFE, vitamin B-12 1.3 mcg, biotin 60 mcg, pantothenic acid 2 mg, phosphorus 250 mg, iodine 75 mcg, magnesium	1 heaping scoop Calories 180, Total Fat 3 g, Saturated Fat 2 g, Trans Fat 0 g, Cholesterol 60 mg, Sodium 290 mg, Total Carbohydrate 18 g, Dietary Fiber 8 g, Total Sugars [Includes 2 g Added Sugars] 4 g, **Protein 25 g**, Vitamin D 0 mcg, Calcium 450 mg, Iron 5 mg, Potassium 350 mg, Vitamin A 300 mcg RAE Additional Information 1 heaping scoop Calories 180, Total Fat 3 g, Saturated Fat 2 g, Trans Fat 0 g, Cholesterol 60 mg, Sodium 290 mg, Total Carbohydrate 18 g, Dietary Fiber 8 g, Total Sugars [Includes 2 g Added Sugars] 4 g, **Protein 25 g**, Vitamin D 0 mcg, Calcium 450 mg, Iron 5 mg, Potassium 350 mg, Vitamin A 300 mcg RAE, Vitamin C 30 mg, Vitamin E 3 mg, Thiamin 0.3 mg, Riboflavin 0.3 mg, Niacin 4 mg, Vitamin B-6 0.4 mg, Folate 135 mcg DFE (80 mcg Folic Acid), Vitamin B-12 1.3 mcg, Biotin 60 mcg, Pantothenic Acid 2 mg, Phosphorus 250 mg, Iodine 75 mcg, Magnesium 105 mg, Zinc 3 mg, Selenium 14 mcg, Copper 0.4 mg, Manganese 0.4 mg, Chromium 24 mcg, Molybdenum 15 mcg.

								105 mg, zinc 3 mg, selenium 14 mcg, copper 0.4 mg, manganese 0.4 mg, chromium 24 mcg & molybdenum 15 mcg per heaping scoop **Precaution:** Contains: Milk and Coconut. Warning: Cancer and Reproductive Harm. Consult your physician prior to using this product if you are pregnant, nursing, taking medication, or have a medical condition. Discontinue use two weeks prior to surgery. Notice: Use in conjunction with the Total Lean® meal and exercise plan found on totallean.com. Do not use in diets supplying less than 400 calories per day without	Ingredients: **Whey Protein Concentrate**, Maltodextrin, Cocoa Powder (Processed with Alkali), **Milk Protein Concentrate**, Natural & Artificial Flavors, **Whey Protein Isolate**, Oat Bran, Cellulose Powder, Creamer (Coconut Oil, Corn Syrup Solids, Sodium Caseinate (a Milk Derivative), Mono- & Diglycerides, Dipotassium Phosphate & Sodium Silico Aluminate), Gum Blend (Cellulose Gum, Xanthan Gum, Carrageenan), Nonfat Dairy Milk, Tricalcium Phosphate, Calcium Carbonate, Resistant Corn Starch, Fructooligosaccharides, Magnesium Oxide, Vitamin & Mineral Blend (Vitamin A Acetate, Sodium Ascorbate, dl-alpha Tocopheryl Acetate, Thiamin Hydrochloride, Riboflavin, Niacinamide, Pyridoxine Hydrochloride, Folic Acid, Cyanocobalamin, Biotin, Calcium D-Pantothenate, Ferric Orthophosphate, Potassium Iodide, Zinc Oxide, Sodium Selenite, Copper Oxide, Magnesium Sulfate, Chromium Chloride, Sodium Molybdate, Maltodextrin), Sunflower Lecithin, Sucralose, Acesulfame Potassium.

							medical supervision.	

APPROVED GNC Total Lean® Lean Shake™ 25 - Swiss Chocolate  Dist. by General Nutrition Corporation	1 bottle, 14 fl oz [414 ml] Shake Well Before Drinking. Use as a meal replacement or convenient snack. Chill before drinking. Refrigerate after opening. *Smooth but artificial chocolate flavor, moderately sweet, with some lingering sweetness. Slight stickiness on lips.* *A smooth liquid from bottle.*	Metals: Pass Gluten-Free: Pass	25 (5.9% of serving is protein) Proprietary protein blend (milk protein concentrate, whey protein concentrate, calcium caseinate)	6 / 3 / 2 No measurable lactose	6 / 1.5 / 0 390 / 20 170	$2.50/bottle [$2.00] $9.99/4 bottles	Vitamin D 5 mg (200 IU), calcium 500 mg, iron 5 mg, potassium 475 mg, vitamin A 225 mcg, vitamin C 23 mg, vitamin E 4 mg, vitamin K 30 mcg, thiamin 0.3 mg, riboflavin 0.3 mg, niacin 4 mg, vitamin B-6 0.4 mg, folate 100 mcg DFE, vitamin B-12 0.6 mcg Additional Information Vitamin D 5 mg (200 IU), calcium 500 mg, iron 5 mg, potassium 475 mg, vitamin A 225 mcg, vitamin C 23 mg, vitamin E 4 mg, vitamin K 30 mcg, thiamin 0.3 mg, riboflavin 0.3 mg, niacin 4 mg, vitamin B-6 0.4 mg, folate 100 mcg DFE, vitamin B-12 0.6 mcg, biotin 7.5 mcg, pantothenic acid 1.3 mg, phosphorus 600 mg, iodine 38	1 bottle Calories 170, Total Fat 6 g, Saturated Fat 1.5 g, Trans Fat 0 g, Cholesterol 20 mg, Sodium 390 mg, Total Carbohydrate 6 g, Dietary Fiber 3 g, Total Sugars [Includes 0 g Added Sugars] 2 g, **Protein 25 g**, Vitamin D 5 mg (200 IU), Calcium 500 mg, Iron 5 mg, Potassium 475 mg Additional Information 1 bottle Calories 170, Total Fat 6 g, Saturated Fat 1.5 g, Trans Fat 0 g, Cholesterol 20 mg, Sodium 390 mg, Total Carbohydrate 6 g, Dietary Fiber 3 g, Total Sugars [Includes 0 g Added Sugars] 2 g, **Protein 25 g**, Vitamin D 5 mg (200 IU), Calcium 500 mg, Iron 5 mg, Potassium 475 mg, Vitamin A 225 mcg, Vitamin C 23 mg, Vitamin E 4 mg, Vitamin K 30 mcg, Thiamin 0.3 mg, Riboflavin 0.3 mg, Niacin 4 mg, Vitamin B-6 0.4 mg, Folate 100 mcg DFE (60 mcg Folic Acid), Vitamin B-12 0.6 mcg, Biotin 7.5 mcg, Pantothenic Acid 1.3 mg, Phosphorus 600 mg, Iodine 38 mcg, Magnesium 100 mg, Zinc 2.8 mg, Selenium 14 mcg, Copper 0.2 mg, Manganese 0.6 mg, Chromium 9 mcg, Molybdenum 11 mcg. Ingredients: Filtered

								mcg, magnesium 100 mg, zinc 2.8 mg, selenium 14 mcg, copper 0.2 mg, manganese 0.6 mg, chromium 9 mcg & molybdenum 11 mcg per bottle *Gluten & Lactose Free.* **Precaution:** Contains: Milk. Contains a trivial amount of lactose. Suitable for individuals following a lactose-free diet. Contains lactase, a natural enzyme that breaks down lactose so you can digest dairy without discomfort. Notice: Use in conjunction with the Total Lean® Meal and Exercise Plan found on totallean.com. Do not use in diets supplying less than 400 calories per	Water, Diafiltered Skim Milk, **Proprietary Protein Blend (Milk Protein Concentrate, Whey Protein Concentrate, Calcium Caseinate)**, and less than 2% of: Sunflower, Safflower and/or Canola Oil, Cocoa (Processed with Alkali), Maltodextrin, Vitamin & Mineral Blend (Calcium Phosphate, Magnesium Phosphate, Potassium Phosphate, Sodium Ascorbate, Ferric Orthophosphate, Zinc Amino Acid, Tocopheryl Acetate, Biotin, Vitamin A Palmitate, Niacinamide, Phytomenadione, Potassium Iodide, D-calcium Pantothenate, Chromium Chloride, Copper Amino Acid, Cyanocobalamin, Sodium Molybdate, Sodium Selenite, Folic Acid, Cholecalciferol, Pyridoxine Hydrochloride, Riboflavin, Thiamin, Manganese Sulfate), Lactase, Natural & Artificial Flavors, Cellulose Gel, Cellulose Gum, Acesulfame Potassium, Datem, Sucralose, Carrageenan, Salt.

							day without medical supervision.	
Egg Protein:								

APPROVED Top Pick for Egg Protein Jay Robb® Egg White Protein - Unflavored  Dist. by Jay Robb Enterprises Inc.	1 scoop [30 g] Take one scoop daily. Mixes easily with 12 oz liquid of choice. *Tastes like egg-drop soup, slightly salty.* *Mixes with some clumps.*	Metals: Pass Gluten-Free:	24 (80% of serving is protein) Egg protein	2 / <1 / NL No measurable lactose	NL / NL / NL 360 / 5 110	$2.83/scoop [$2.36] $32.11/0.75 lb [340 g] pouch (approx. 11 servings)	Calcium 40 mg & potassium 370 mg per scoop *No Dairy. No Soy Ingredients. No Gluten Ingredients. Non-GMO. Nothing Artificial. Suitable For Lactose Intolerance. No MSG. No Acesulfame-K* *Additional Information* *Calcium 40 mg & potassium 370 mg per scoop* *No Dairy. No Soy Ingredients. No Gluten Ingredients. Non-GMO. Nothing Artificial. Suitable For Lactose Intolerance. No MSG. No Acesulfame-K. No Artificial Flavors. No Artificial Sweeteners. No Artificial Colors. No Aspartame. No Sucralose. No Dairy.* ***Precaution:***	1 scoop Calories 110, Cholesterol 5 mg, Total Carbohydrate 2 g, Dietary Fiber <1 g, **Protein 24 g**, Calcium 40 mg, Sodium 360 mg, Potassium 370 mg. Ingredients: Egg albumen and Sunflower lecithin.

							Contains: Egg. This product is processed in a facility that also processes Milk, Soy, Egg, Wheat, Tree Nuts, Fish. Use This Product As A Food Supplement Only. Do Not Use For Weight Reduction.	
Pea Protein:								

APPROVED Top Pick for Overall Protein Powder and Pea Protein Now Sports® Pea Protein - Pure Unflavored  Dist. by Now Foods	1 level scoop [33 g] Add 1 level scoop daily to 12 oz. of cold water, juice, or your favorite beverage. Stir or blend. *Smooth, slightly thick, powdery, vegetal/pea flavor. Slight bitterness.* *Mixes evenly.*	Metals: Pass Gluten-Free:	24 (72.7% of serving is protein) Yellow pea protein isolate	1 / 0 / 0 No measurable lactose	2 / 0 / 0 320 / 0 120	$0.51/level scoop [$0.42] $49.34/7 lb [3,175 g] container (approx. 96 servings)	Calcium 43 mg, iron 8 mg & potassium 83 mg per level scoop *Informed Sport seal. Non GMO Project Verified seal. No Soy. No Dairy. Halal. Kosher. Vegan. Steroid Tested. Vegan. No Artificial Sweeteners* *Additional Information* *Calcium 43 mg, iron 8 mg & potassium 83 mg per level scoop* *Informed Sport seal. Non GMO Project Verified seal. No Soy. No Dairy. Halal. Kosher. Vegan. Steroid Tested. Vegan. No Artificial Sweeteners. No Aspartame. No Sucralose. No Acesulfame-K.* ***Precaution:*** *Not manufactured with wheat, gluten, soy, corn, milk,*	1 level scoop Calories 120, Total Fat 2 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 320 mg, Total Carbohydrate 1 g, Dietary Fiber 0 g, Total Sugars [Includes 0 g Added Sugars] 0 g, **Protein 24 g** Additional Information 1 level scoop Calories 120, Total Fat 2 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 320 mg, Total Carbohydrate 1 g, Dietary Fiber 0 g, Total Sugars [Includes 0 g Added Sugars] 0 g, **Protein 24 g**, Vit. D 0 mcg, Calcium 43 mg, Iron 8 mg, Potas. 83 mg. Ingredients: **Yellow Pea Protein Isolate**.

							egg, fish, shellfish or tree nut ingredients. Produced in a GMP facility that processes other ingredients containing these allergens. Notice: Use this product as a food supplement only. Do not use for weight reduction.	

***NOT* APPROVED** due to excess sodium Truvani® Plant Based Protein - Vanilla Flavored  Dist. by Nomolotus, LLC	1 scoop [29 g] Enjoy 1 scoop with at least 8 oz if water, milk, almond milk, or other milk alternative in a shaker cup or blender. *Smooth, extremely sweet, vegetal flavor. Lingering sweetness.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	20 (69% of serving is protein) Organic pea protein concentrate	5 / 2 / 2 No measurable lactose	3 / 1 / 0 220 / 0 Found 310.2 mg sodium per serving (141% of listed amount of 220 mg) 130	$2.44/scoop [$2.44] $49.99/1.3 lb [594 g] pouch (approx. 20 servings)	*USDA Organic seal. Certified Vegan Vegan.org seal. Certified Gluten Free GFCO.org seal. Non GMO Project Verified seal. No Dairy. No Stevia. No Gums. No Soy. No Flow Agents. No Emulsifiers. No Weird Ingredients.* *Additional Information* *USDA Organic seal. Certified Vegan Vegan.org seal. Certified Gluten Free GFCO.org seal. Non GMO Project Verified seal. No Dairy. No Stevia. No Gums. No Soy. No Flow Agents. No Emulsifiers. No Weird Ingredients.* ***Precaution:** Allergen Information: This product is manufactured in a facility that processes other products which may contain wheat, tree nuts,*	1 scoop Calories 130, Total Fat 3 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 220 mg, Total Carbohydrate 5 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 2 g Additional Information 1 scoop Calories 130, Total Fat 3 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 220 mg, Total Carbohydrate 5 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 2 g, **Protein 20 g**, Vitamin D 0 mg, Calcium 0 mg, Iron 0 mg, Potassium 0 mg. Ingredients: **Organic Pea Protein Concentrate**, Organic Vanilla Powder, Organic Pumpkin Seed Concentrate, Organic Monk Fruit Extract, Organic Chia Seed Protein Concentrate.

							shellfish, fish, peanuts, and eggs. Warning: Consuming this product can expose you to lead, which is known to the state of California to cause birth defects or other reproductive harm. Notice: Use this product as a food supplement only. Do not use for weight reduction.	

APPROVED Top Pick for high-protein meal replacement Vega One® - French Vanilla  Dist. by Sequel Naturals ULC	1 scoop [38 g] Pick a beverage (12 fl oz), we recommend ice cold water or non-dairy milk alternative. Add a scoop of Vega One® Organic All-in-One Shake and shake it up or Blend with your favorite fruits and veggies. *Thin, green, sweet, slight vegetal flavor with some vanilla. Lingering sweetness.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	20 (52.6% of serving is protein) Pea protein	10 / 6 / 1 No measurable lactose	3.5 / 1 / 0 210 / 0 140	$2.20/scoop [$2.20] $39.99/1.5 lb [689 g] container (approx. 18 servings)	Vitamin D 10 mcg, calcium 140 mg, iron 5.4 mg, potassium 280 mg, vitamin A 180 mcg, vitamin C 45 mg, vitamin K 60 mcg, thiamin 0.6 mg, riboflavin 0.65 mg, niacin 8 mg, vitamin B6 0.85 mg, folate 32 mcg DFE, vitamin B12 1.92 mcg, biotin 15 mcg Additional Information Vitamin D 10 mcg, calcium 140 mg, iron 5.4 mg, potassium 280 mg, vitamin A 180 mcg, vitamin C 45 mg, vitamin K 60 mcg, thiamin 0.6 mg, riboflavin 0.65 mg, niacin 8 mg, vitamin B6 0.85 mg, folate 32 mcg DFE, vitamin B12 1.92 mcg, biotin 15 mcg, pantothenic acid 2.5 mg, phosphorus 130 mg, magnesium 35 mg, zinc 0.2 mg, manganese 0.35 mg &	1 scoop Calories 140, Total Fat 3.5 g, Saturated Fat 1 g, Trans Fat 0 g, Polyunsaturated Fat 1.5 g, Monounsaturated Fat 1 g, Cholesterol 0 mg, Sodium 210 mg, Total Carbohydrate 10 g, Dietary Fiber 6 g, Total Sugars [Includes 0 g Added Sugars] 1 g Additional Information 1 scoop Calories 140, Total Fat 3.5 g, Saturated Fat 1 g, Trans Fat 0 g, Polyunsaturated Fat 1.5 g, Monounsaturated Fat 1 g, Cholesterol 0 mg, Sodium 210 mg, Total Carbohydrate 10 g, Dietary Fiber 6 g, Total Sugars [Includes 0 g Added Sugars] 1 g, **Protein 20 g**, Vitamin D 10 mcg, Calcium 140 mg, Iron 5.4 mg, Potassium 280 mg, Vitamin A 180 mcg, Vitamin C 45 mg, Vitamin K 60 mcg, Thiamin 0.6 mg, Riboflavin 0.65 mg, Niacin 8 mg, Vitamin B6 0.85 mg, Folate 32 mcg DFE, Vitamin B12 1.92 mcg, Biotin 15 mcg, Pantothenic Acid 2.5 mg, Phosphorus 130 mg, Magnesium 35 mg, Zinc 0.2 mg, Manganese 0.35 mg, Choline 60 mg. Ingredients: **Pea Protein**, Agave Inulin Powder, Golden Flaxseed Powder, Vega

							choline 60 mg per scoop *Non GMO Project Verified seal. USDA Organic seal. Gluten Free. No Grains. No Added Sugars. No Artificial Colors, Flavors, Or Preservatives.* **Precaution:** Manufactured in a facility that also processes peanuts, milk, soy, egg and tree nuts.	One Veggies And Fruits Blend (Carrot Juice Powder, Spinach Powder, Acerola Cherry Juice Powder, Chard Powder, Kale Powder, Lettuce Powder, Pomegranate Juice Powder, Blueberry Powder, Acai Powder), Natural Flavors, Spirulina, Chia Seed Powder, Maca Root Powder, Quinoa Sprouts (Sprouted In Water With Vitamin B1, B2, B3, B5, B6 and B7), Probiotics (Bacillus Coagulans), Sunflower Seed Protein, Pumpkin Seed Protein, Sacha Inchi Powder, Stevia Leaf Extract, Pea Starch, Bromelain, Mushroom Powder, Xanthan Gum.
Hemp Protein:								

APPROVED Can be considered for meal replacement Top Pick for Hemp Protein Nutiva® Hemp Protein Powder  Dist. by Nutiva®	4 tbsp [30 g] Blend 4 Tbsp Hemp Protein Powder with 8 oz milk (almond milk is deal) and a ripe banana. *Vegetal/nutty flavor, slightly bitter.* *Mixes evenly.*	Metals: Pass Gluten-Free:	15 (50% of serving is protein) Organic hemp seed protein	8 / 6 / 1 No measurable lactose	3 / 0 / 0 0 / 0 110	$0.92/4 tbsp [$1.23] $13.99/1 lb [454 g] container (approx. 15 servings)	Calcium 51 mg, iron 6 mg, potassium 419 mg, magnesium 246 mg & zinc 4 mg per 4 tbsp *USDA Organic seal. Non GMO Project Verified seal. Certified Vegan Vegan.org seal. Made without soy, dairy or lactose. Non BPA.* **Precaution:** Notice: Use this product as a food supplement only. Do not use for weight reduction.	4 Tbsp Calories 110, Total Fat 3 g, Saturated Fat 0 g, Trans Fat 0 g, Polyunsaturated Fat 2 g, Monounsaturated Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 8 g, Dietary Fiber 6 g, Total Sugars [Includes 0 g Added Sugars] 1 g, **Protein 15 g** Additional Information 4 Tbsp Calories 110, Total Fat 3 g, Saturated Fat 0 g, Trans Fat 0 g, Polyunsaturated Fat 2 g, Monounsaturated Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 8 g, Dietary Fiber 6 g, Total Sugars [Includes 0 g Added Sugars] 1 g, **Protein 15 g**, Vitamin D 0 mcg, Calcium 51 mg, Iron 6 mg, Potassium 419 mg, Magnesium 246 mg, Zinc 4 mg. Ingredients: **Organic Hemp Seed Protein**.
Peanut Protein:								

APPROVED Top Pick for Peanut Protein PB&Me™ - Peanut Butter  Mfd. by Sahah Naturals Inc.	2 tbsp [12 g] Mix 2 tablespoons of PB&Me with 1 to 2 tablespoons of water and enjoy your delicious healthy peanut butter! *Tastes like slightly thin peanut butter. Slightly sweet (naturally).* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	6 (50% of serving is protein) Peanut protein	4 / 2 / 1 No measurable lactose	1.5 / NL / NL NL / NL 45	$0.26/2 tbsp [$0.87] $9.88/1 lb [453 g] container (approx. 38 servings)	Iron (2% DV) per 2 tbsp *All Natural. Gluten Free.* **Precaution:** Manufactured in a facility that also processes tree nuts.	2 Tbsp Calories 45, Total Fat 1.5 g, Total Carbohydrate 4 g, Dietary Fiber 2 g, Sugars 1 g, **Protein 6 g**, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 0%, Iron 2%. Ingredients: Peanuts.
Mixed Sources of Protein (Vegan):								

***NOT* APPROVED** due to lead contamination and excess fat, sodium, and calories Ancient Nutrition Plant Protein+ - Vanilla  Dist. by Ancient Nutrition, LLC	1 scoop [27.1 g] Adults take one scoop (included) with 8 ounces of water or your favorite hot or cold recipe. *Very sweet.* *Vegetal flavor.* *Mixes evenly.*	Metals: Found 5.7 mcg lead per serving (0.21 ppm) Gluten-Free:	15 (55.4% of serving is protein) Organic protein blend: organic pumpkin seed, organic flaxseed, organic hemp seed, organic chia seed, organic sunflower seed, organic watermelon seed, organic sacha inchi seed	4 / 1 / 0 No measurable lactose	1.5 / 0.5 / NL Found 3.3 g total fat (221.9% of listed amount of 1.5 g) 0 / 0 Found 14 mg sodium instead of listed 0 mg 90 Found 115.2 Calories (128% of listed amount of 90 Cal)	$2.66/scoop [$3.55] $31.96/ 0.72 lb [325.5 g] container (approx. 12 servings)	Calcium 36 mg & iron 9.3 mg per scoop *USDA Organic seal. Igen® Non-GMO Tested seal. CCOF Certified Organic seal. Vegan. Stevia Free.* **Precaution:** Contains: Tree nut (Coconut). Warning: If you are pregnant, nursing, allergic, have a medical condition, or taking any medication, consult a doctor before using this or any other dietary supplement. Notice: Use this product as a food supplement only. Do not use for weight reduction.	1 scoop Calories 80, Total Fat 1.5 g, Saturated Fat 0.5 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 4 g, Dietary Fiber 1 g, Total Sugars 0 g, **Protein 15 g**, Vitamin D 0 mcg, Calcium 36 mg, Iron 9.3 mg, Potassium 0 mg. Ingredients: **Organic Protein Blend** **Additional Information** **1 scoop** **Calories 80, Total Fat 1.5 g, Saturated Fat 0.5 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 4 g, Dietary Fiber 1 g, Total Sugars 0 g, Protein 15 g, Vitamin D 0 mcg, Calcium 36 mg, Iron 9.3 mg, Potassium 0 mg.** **Ingredients: Organic Protein Blend: Organic Pumpkin Seed, Organic Flaxseed, Organic Hemp Seed, Organic Chia Seed, Organic Sunflower Seed, Organic Watermelon Seed, Organic Sacha Inchi (*Plukenetia volubilis*) Seed, Organic Flavor Blend: Organic Vanilla Flavor, Organic Guar Gum, Organic Luo Han Guo Fruit Extract, Organic Adaptogenic Herbal and Mushroom Blend: Organic Coconut Medium Chain Triglycerides, Organic Ashwagandha Root Extract, Organic**

								Avocado Fruit, Organic Reishi Mycelium, Organic Fermented Holy Basil Leaf Extract, Organic Cordyceps Mycelium, Organic Fermented Eleuthero Siberian Ginseng Root, Organic Fermented Rhodiola Root, Organic Fermented Schisandra Berry, Organic Apple Cider Vinegar.

APPROVED Can be considered for meal replacement Ka'Chava® Superfood - Chocolate  Dist. by Tribal Nutrition LLC	2 scoops [62 g] Mix 2 heaping scoops (62 g) of Ka'Chava with 12-14 fluid ounces of cold water, blend well and enjoy. *Sweet, chocolate flavor. Slight lingering sweetness.* *Mixes with some clumps.*	Metals: Pass Gluten-Free: Pass	25 (40.3% of serving is protein) Yellow pea protein, organic whole grain brown rice protein, organic sacha inchi, organic amaranth, organic quinoa	25 / 7 / 7 No measurable lactose	7 / 4.4 / 0 475 / 0 240	$4.66/2 scoops [$3.73] $69.95/32.8 oz [930 g] pouch (approx. 15 servings)	Vitamin A 750 mcg RAE, vitamin C 30 mg, vitamin D 5 mcg, vitamin E 10 mg, vitamin B1 0.75 mg, vitamin B2 0.85 mg, vitamin B3 10 mg NE, vitamin B6 1 mg, folate 333 mcg DFE, vitamin B12 3 mcg, biotin 75 mcg, pantothenic acid 5 mg, calcium 600 mg, iron 7.50 mg Additional Information Vitamin A 750 mcg RAE, vitamin C 30 mg, vitamin D 5 mcg, vitamin E 10 mg, vitamin B1 0.75 mg, vitamin B2 0.85 mg, vitamin B3 10 mg NE, vitamin B6 1 mg, folate 333 mcg DFE, vitamin B12 3 mcg, biotin 75 mcg, pantothenic acid 5 mg, calcium 600 mg, iron 7.50 mg, phosphorus 600 mg, iodine 75	2 scoops Calories 240, Total Fat 7 g, Saturated Fat 4.4 g, Trans Fat 0 g, Cholesterol 0 mg, Total Carbohydrate 25 g, Dietary Fiber 7 g, Total Sugars [Includes 6 g Added Sugars] 7 g, **Protein 25 g**, Vitamin A (as vitamin A palmitate) 750 mcg RAE Additional Information 2 scoops Calories 240, Total Fat 7 g, Saturated Fat 4.4 g, Trans Fat 0 g, Cholesterol 0 mg, Total Carbohydrate 25 g, Dietary Fiber 7 g, Total Sugars [Includes 6 g Added Sugars] 7 g, **Protein 25 g**, Vitamin A (as vitamin A palmitate) 750 mcg RAE, Vitamin C (as ascorbic acid) 30 mg, Vitamin D (as ergocalciferol) 5 mcg, Vitamin E (as d-alpha tocopherol acetate) 10 mg, Vitamin B1 (as thiamin hydrochloride) 0.75 mg, Vitamin B2 (as riboflavin) 0.85 mg, Vitamin B3 (as niacinamide) 10 mg NE, Vitamin B6 (as pyridoxine hydrochloride) 1 mg, Folate 333 mcg DFE (200 mcg folic acid), Vitamin B12 (as cyanocobalamin) 3 mcg, Biotin 75 mcg, Pantothenic Acid (as calcium d-pantothenate) 5 mg, Calcium (as tricalcium phosphate & nat. occurring) 600 mg, Iron

								mcg, magnesium 290 mg, zinc 7.50 mg, selenium 35 mcg, copper 0.81 mg, manganese 0.92 mg, chromium 35 mcg, molybdenum 90 mcg, chloride 370 mg, sodium 475 mg, potassium 550 mg, omega EFA / fiber blend 9.62 g, antioxidant / super-fruit blend 6.1 g, adaptogen blend 1,020 mg, super-greens / vegetable blend 500 mg, probiotic / prebiotic blend 50 mg & digestive enzyme blend 50 mg per 2 scoops *Vegan. Gluten Free. No Soy. No Dairy. No Artificial Sweeteners, Flavors, Colors. No Preservatives.* **Precaution:** Allergen Info: Contains Tree	(as natural occurring) 7.50 mg, Phosphorus (as tricalcium phosphate & nat. occurring) 600 mg, Iodine (as potassium iodide) 75 mcg, Magnesium (as magnesium oxide & nat. occurring) 290 mg, Zinc (as zinc oxide & nat. occurring) 7.50 mg, Selenium (as selenium chelate) 35 mcg, Copper (as copper amino acid chelate) 0.81 mg, Manganese (as manganese amino acid chelate & nat. occurring) 0.92 mg, Chromium (as chromium amino acid chelate) 35 mcg, Molybdenum (as naturally occurring) 90 mcg, Chloride (as sodium chloride and nat. occurring) 370 mg, Sodium (as sodium chloride and nat. occurring) 475 mg, Potassium (as naturally occurring) 550 mg, **Plant-Based Protein Blend [Yellow Pea Protein, Organic Whole Grain Brown Rice Protein, Organic Sacha Inchi (*Plukenetia volubilis linneo*, seed), Organic Amaranth (*Amaranthus caudatus*, seed), Organic Quinoa (*Chenopodium quinoa*, seed)] 27.75 g**, Omega EFA/Fiber Blend [Organic Pure Whole Grain Oat, Organic Acacia Gum, Chia (*Salvia hispanica*, seed),

									Nut (Coconut). This product is manufactured in a facility that may also process eggs, milk, peanuts, sesame, soy, tree nuts, wheat and other allergens.	Flax (*Linum usitatissimum*, seed)] 9.62 g, Antioxidant/Super-Fruit Blend [Organic Coconut Flower Nectar (*Cocos nucifera*, flower bud), Acai Berry (*Euterpe oleracea*, fruit), Organic Maqui Berry (*Aristotella chilensis*, fruit), Camu-Camu Berry (*Myrciaria dubia*, fruit). 100% Organic Strawberry, 100% Organic Tart Cherry, 100% Organic Blackberry, Organic Blueberry, 100% Organic Raspberry] 6.1 g, Adaptogen Blend [Organic Maca Root (*Lepidum meyenii walp*, root), 100% Organic Shiitake Mushroom Mycelia, 100% Organic Maitake Mushroom Mycelia, 100% Organic Reishi Mushroom Mycelia, 100% Organic Cordyceps Mushroom Mycelia, 100% Organic Ginger Root] 1,020 mg, Super-Greens/Vegetable Blend [100% Organic Beet, 100% Organic Carrot, 100% Organic Spinach, 100% Organic Broccoli, 100% Organic Tomato, 100% Organic Kale, 100% Organic Cabbage, 100% Organic Parsley Leaf, 100% Organic Brussel Sprouts, 100% Organic Green Pepper, 100% Organic Cucumber, 100% Organic Celery, 100% Organic Garlic, 100% Organic Green

								Onion, 100% Organic Cauliflower and 100% Organic Asparagus, Chlorella (*Chlorella vulgaris*)] 500 mg, Probioti

***NOT* APPROVED** due to excess sodium Orgain® Organic Protein™ - Creamy Chocolate Fudge Flavored  Dist. by Orgain, LLC	2 scoops [46 g] Mix 2 scoops in ounces of water or almond milk and shake in a shaker cup or use blender. *Sweet, chocolate flavor. Slight lingering sweetness.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	21 (45.7% of serving is protein) Orgain organic protein blend™ (organic pea protein, organic brown rice protein, organic chia seed)	15 / 2 / 0 (Erythritol 5 g) No measurable lactose	4 / 1 / 0 290 / 0 Found 382.1 mg sodium (131.8% of listed amount of 290 mg) 150	$1.35/2 scoops [$1.29] $26.99/2.03 lb [920 g] container (approx. 20 servings)	Calcium 70 mg, iron 6.4 mg & potassium 260 mg per 2 scoops *USDA Organic seal. Quality Assurance International Certified Organic seal. PBFA Certified Plant Based seal. Kosher. No Dairy Ingredients. No Soy Ingredients. Gluten Free. Non-GMO. Vegan.*	2 scoops Calories 150, Total Fat 4 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 290 mg, Total Carbohydrate 15 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Erythritol 5 g, **Protein 21 g**, Vitamin D 0 mcg, Calcium 70 mg, Iron 6.4 mg Additional Information 2 scoops Calories 150, Total Fat 4 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 290 mg, Total Carbohydrate 15 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Erythritol 5 g, **Protein 21 g**, Vitamin D 0 mcg, Calcium 70 mg, Iron 6.4 mg, Potassium 260 mg. Ingredients: **Orgain Organic Protein Blend™ (Organic Pea Protein, Organic Brown Rice Protein, Organic Chia Seed)**, Orgain Organic Creamer Base® (Organic Acacia, Organic High Oleic Sunflower Oil, Organic Rice Dextrin, Organic Sunflower Lecithin, Organic Rosemary Extract), Organic Erythritol, Organic Alkalized Cocoa, Organic Acacia, Organic Natural Flavors, Sea Salt, Organic Reb A (Stevia Extract),

								Organic Guar Gum, Natural Flavor, Xanthan Gum.

APPROVED PlantFusion® Complete Protein - Vanilla  Dist. by Plant Fusion	1 scoop [30 g] Add 1 scoop to 10 to 12 oz. of chilled water or beverage of your choice in a shaker cup or blender. Mix for about 5 seconds. *Smooth, slightly thick, sweet, vegetal flavor. Lingering sweetness.* *Mixes very evenly.*	Metals: Pass Gluten-Free: Pass	21 (70% of serving is protein) PlantFusion® amino acid infused protein blend [pea protein isolate, L-isoleucine, L-leucine, L-valine, L-glutamine, artichoke powder, organic sprouted amaranth powder, organic sprouted quinoa powder, whole algae protein]	2 / NL / NL No measurable lactose	3 / NL / NL 390 / NL 120	$1.33/scoop [$1.27] $39.99/2 lb [900 g] container (approx. 30 servings)	Calcium 10 mg, iron 4 mg, potassium 50 mg & PlantFusion® proprietary enzyme blend 100 mg per scoop *Non GMO Project Verified seal. Certified Vegan Vegan.org seal. Fortified with digestive enzymes and free from major allergens including dairy, soy and gluten. Contains No Dairy* *Additional Information* *Calcium 10 mg, iron 4 mg, potassium 50 mg & PlantFusion® proprietary enzyme blend 100 mg per scoop* *Non GMO Project Verified seal. Certified Vegan Vegan.org seal. Fortified with digestive enzymes and free from major allergens including*	1 scoop Calories 120, Total Fat 3 g, Total Carbohydrate 2 g, **Protein 21 g**, Calcium 10 mg, Iron 4 mg, Sodium 390 mg, Potassium 50 mg, **PlantFusion® Amino Acid Infused Protein Blend [Pea Protein Isolate, L-Isoleucine, L-Leucine, L-Valine, L-Glutamine, Artichoke Powder, Organic Sprouted Amaranth Powder** **Additional Information** **1 scoop** **Calories 120, Total Fat 3 g, Total Carbohydrate 2 g, Protein 21 g, Calcium 10 mg, Iron 4 mg, Sodium 390 mg, Potassium 50 mg, PlantFusion® Amino Acid Infused Protein Blend [Pea Protein Isolate, L-Isoleucine, L-Leucine, L-Valine, L-Glutamine, Artichoke Powder, Organic Sprouted Amaranth Powder, Organic Sprouted Quinoa Powder, Whole Algae Protein] 25 g, PlantFusion® Proprietary Enzyme Blend [Alpha Galactosidase, Bromelain] 100 mg.** **Other Ingredients: Natural Flavors, Guar Gum Powder, Stevia Extract Powder (Reb A), Silica, Sea Salt, Monk Fruit Extract Powder, Organic Tapioca Powder,**

							dairy, soy and gluten. Contains No Dairy, Wheat, Gluten, Eggs, Peanuts, Soy, Tree Nuts, Fish, Shellfish, Preservatives, Artificial Colors or Flavors. Kosher.	**Organic Lucuma Powder, Organic Yacon Powder.**

APPROVED Can be considered for meal replacement Shakeology® Plant-Based - Cookies & Creamy Flavored With Natural Flavors  Dist. by Beachbody, LLC	1 level scoop [38 g] Drink daily. Gently shake the bag to loosen compressed powder then combine one level scoop (38 g) of Shakeology powder with 8 to 12 fl oz cold water or beverage (almond milk, rice milk, juice, etc.) and ice in a blender. Blend until creamy for a frosty shake. Best consumed within 30 minutes. *Moderately sweet, somewhat creamy. Unusual vegetal/cookie flavor that is slightly bitter. Slight lingering sweetness.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	16 (42.1% of serving is protein) Vegan protein blend (pea protein, flax (seed), rice protein, quinoa (seed))	15 / 6 / 7 No measurable lactose	3 / 0.5 / NL 290 / NL 160	$4.33/level scoop [$5.41] $129.95/2.51 lb [1,140 g] pouch (approx. 30 servings)	Vitamin C 25 mg, calcium 25 mg, iron 4 mg, potassium 130 mg, alpha-linolenic acid 250 mg & proprietary superfood blend 30 g per level scoop *Vegan. Gluten-Free. No artificial sweeteners, flavors, colors, or preservatives.* **Precaution:** Allergen Statement: This product is manufactured in a plant that also processes milk, egg, fish Additional Information Vitamin C 25 mg, calcium 25 mg, iron 4 mg, potassium 130 mg, alpha-linolenic acid 250 mg & proprietary superfood blend 30 g per level scoop *Vegan. Gluten-Free. No artificial sweeteners, flavors, colors, or*	1 level scoop Calories 160, Total Fat 3 g, Saturated Fat 0.5 g, Polyunsaturated Fat 1 g, Monounsaturated Fat 0.5 g, Total Carbohydrate 15 g, Dietary Fiber 6 g, Total Sugars [Includes 5 g Added Sugars] 7 g, **Protein 16 g**, Vitamin C 25 mg, Calcium 25 mg, Iron 4 mg, Sodium 290 mg, Potassium 130 mg, Alpha-Linolenic Acid (omega-3) 250 mg Additional Information 1 level scoop Calories 160, Total Fat 3 g, Saturated Fat 0.5 g, Polyunsaturated Fat 1 g, Monounsaturated Fat 0.5 g, Total Carbohydrate 15 g, Dietary Fiber 6 g, Total Sugars [Includes 5 g Added Sugars] 7 g, **Protein 16 g**, Vitamin C 25 mg, Calcium 25 mg, Iron 4 mg, Sodium 290 mg, Potassium 130 mg, Alpha-Linolenic Acid (omega-3) 250 mg, Proprietary Superfood Blend [**Vegan Protein Blend (Pea protein, Flax (seed), Rice protein, Quinoa (seed))**, Pea fiber (seed), Cocoa powder (processed with alkali), Rose hips (fruit), Yacon (root), Acerola juice powder (fruit), Astragalus (root), Bilberry juice powder (fruit), Blueberry (fruit), Camu-Camu (fruit), Chicory fiber (root), Bacillus coagulans, Organic

							preservatives. **Precaution:** Allergen Statement: This product is manufactured in a plant that also processes milk, egg, fish, crustacean shellfish, tree nut, wheat, peanut, and soy ingredients. Warning: Consult with a healthcare professional before use if you are pregnant, breastfeeding, taking any medication, or if you have any medical condition.	cordyceps (fungi), Organic maitake (fungi), Organic reishi (fungi), Spinach (leaf), Enzyme Blend (Amylase, Cellulase, Lactase, Glucoamylase, Alpha-Galactosidase, Invertase), Kale (Brassica oleracea L. var acephala) (leaf), Schisandrea (fruit), Matcha green tea (leaf), Pomegranate juice powder (fruit), Maca (root), Cinnamon (bark), Luo Han Guo extract (fruit), Chlorella] 30 g.

APPROVED Can be considered for meal replacement Shakeology® Plant-Based - Vanilla Flavored  Dist. by Beachbody, LLC	1 level scoop [38 g] Drink daily. Gently shake the bag to loosen compressed powder then combine one level scoop (38 g) of Shakeology powder with 8 to 12 fl oz cold water or beverage (almond milk, rice milk, juice, etc.) and ice in a blender. Blend until creamy for a frosty shake. Best consumed within 30 minutes. *Sweet, vanilla/vegetal flavor. Slight lingering sweetness.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	16 (42.1% of serving is protein) Vegan protein blend (pea protein, flax (seed), rice protein, quinoa (seed))	15 / 6 / 7 No measurable lactose	3 / 0.5 / NL 290 / NL 160	$4.33/level scoop [$5.41] $129.95/2.51 lb [1,140 g] pouch (approx. 30 servings)	Vitamin C 25 mg, calcium 25 mg, iron 4 mg, potassium 90 mg & alpha-linolenic acid 250 mg per level scoop *Vegan. Gluten-Free. No artificial sweeteners, flavors, colors, or preservatives.* **Precaution:** Allergen Statement: This product is manufactured in a plant that also processes milk, egg, fish Additional Information Vitamin C 25 mg, calcium 25 mg, iron 4 mg, potassium 90 mg & alpha-linolenic acid 250 mg per level scoop *Vegan. Gluten-Free. No artificial sweeteners, flavors, colors, or preservatives.* **Precaution:** Allergen Statement: This product is	1 level scoop Calories 160, Total Fat 3 g, Saturated Fat 0.5 g, Polyunsaturated Fat 1 g, Monounsaturated Fat 0.5 g, Total Carbohydrate 15 g, Dietary Fiber 6 g, Total Sugars [Includes 5 g Added Sugars] 7 g, **Protein 16 g**, Vitamin C 25 mg, Calcium 25 mg, Iron 4 mg, Sodium 290 mg, Potassium 90 mg, Alpha-Linolenic Acid (omega-3) 250 mg Additional Information 1 level scoop Calories 160, Total Fat 3 g, Saturated Fat 0.5 g, Polyunsaturated Fat 1 g, Monounsaturated Fat 0.5 g, Total Carbohydrate 15 g, Dietary Fiber 6 g, Total Sugars [Includes 5 g Added Sugars] 7 g, **Protein 16 g**, Vitamin C 25 mg, Calcium 25 mg, Iron 4 mg, Sodium 290 mg, Potassium 90 mg, Alpha-Linolenic Acid (omega-3) 250 mg, Proprietary Superfood Blend [**Vegan Protein Blend (Pea protein, Flax (seed), Rice protein, Quinoa (seed))**, Pea fiber (seed), Rose hips (fruit), Pomegranate juice powder (fruit), Yacon (root), Acerola juice powder (fruit), Astragalus (root), Bilberry juice powder (fruit), Blueberry (fruit), Camu-Camu (fruit), Chicory fiber (root), *Bacillus coagulans*,

							manufactured in a plant that also processes milk, egg, fish, crustacean shellfish, tree nut, wheat, peanut, and soy ingredients. Warning: Consult with a healthcare professional before use if you are pregnant, breastfeeding, taking any medication, or if you have any medical condition.	Organic chaga (fungi), Organic maitake (fungi), Organic reishi (fungi), Spinach (leaf), Enzyme Blend (Amylase, Cellulase, Lactase, Glucoamylase, Alpha-Galactosidase, Invertase), Kale (*Brassica oleracea L. var acephala*) (leaf), Schisandra (fruit), Matcha green tea (leaf), Maca (root), Cinnamon (bark), Luo Han Guo extract (fruit), Chlorella] 30 g. Other Ingredients: Organic cane sugar, Natural flavors, Xanthan gum, Stevia leaf extract, Himalayan pink salt, Mixed tocopherols (to maintain freshness).
Mixed Sources of Protein (Plant-based But Not Vegan):								

APPROVED Amazing Grass® Amazing Protein® Glow - Wild Berry Hibiscus  Dist. by Amazing Grass®	1 scoop [22 g] Add 22 g (about one scoop) with 8 fl oz or more water, milk, or smoothie. *Berry/fruity flavor, very sweet and slightly sour. Lingering sweetness.* *Mixes evenly.*	Metals: Pass Gluten-Free: Pass	15 (68.2% of serving is protein) Organic protein blend (pea protein, brown rice protein)	2 / 1 / 0 No measurable lactose	1.5 / NL / NL 270 / NL 90	$1.73/scoop [$2.31] $25.99/0.73 lb [330 g] container (approx. 15 servings)	Vitamin C 18 mg, thiamin 1.2 mg, riboflavin 1.3 mg, niacin 3.2 mg, vitamin B6 1.7 mg, folate 80 mcg DFE, biotin 30 mcg, pantothenic acid 2.5 mg & iron 4.4 mg per scoop *USDA Organic seal* *Additional Information* *Vitamin C 18 mg, thiamin 1.2 mg, riboflavin 1.3 mg, niacin 3.2 mg, vitamin B6 1.7 mg, folate 80 mcg DFE, biotin 30 mcg, pantothenic acid 2.5 mg & iron 4.4 mg per scoop* *USDA Organic seal. CCOF Organic Is Non-GMO & More seal. Gluten Free. No Sugar Added. Plant Based.* ***Precaution:** Notice: Use This Product As A Food Supplement Only. Do Not*	1 scoop Calories 90, Total Fat 1.5 g, Total Carbohydrate 2 g, Dietary Fiber 1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, **Protein 15 g**, Vitamin C 18 mg, Thiamin 1.2 mg, Riboflavin 1.3 mg, Niacin 3.2 mg, Vitamin B6 1.7 mg Additional Information 1 scoop Calories 90, Total Fat 1.5 g, Total Carbohydrate 2 g, Dietary Fiber 1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, **Protein 15 g**, Vitamin C 18 mg, Thiamin 1.2 mg, Riboflavin 1.3 mg, Niacin 3.2 mg, Vitamin B6 1.7 mg, Folate 80 mcg DFE, Biotin 30 mcg, Pantothenic Acid 2.5 mg, Iron 4.4 mg, Sodium 270 mg. Ingredients: **Organic Protein Blend (Pea Protein, Brown Rice Protein)**, Natural Flavor, Organic Beef Root, Organic Stevia Extract, Organic Pitaya Fruit, Organic Acacia Gum, Organic Acerola Cherry, Orgen-B's® Organic B Complex Blend (Guava, Joly Basil, Lemon Peel Extracts), Organic Hibiscus Flower, Xanthan Gum, Organic Monk Fruit Extract, Organic Greens Blend (Wheat Grass, Kale), Orgen-Bio%AE Organic Biotin (from Sesbania

							Use For Weight Reduction.	Leaf), Organic Rose Petal.
Mixed Sources of Protein (Whey + Plant-based):								

APPROVED Can be considered for meal replacement Shakeology® Whey-Based - Chocolate Flavored  Dist. by Beachbody, LLC	1 level scoop [42 g] Drink daily. Gently shake the bag to loosen compressed powder then combine one level scoop (42 g) of Shakeology powder with 8 to 12 fl oz cold water or beverage (milk, almond milk, rice milk, juice, etc.) and ice in a blender. Blend until creamy for a frosty shake. Best consumed within 30 minutes. *Sweet, herbaceous/ chocolate flavor. Lingering sweetness.* *Mixes evenly, but some small, soft, floating clumps.*	Metals: Pass Gluten-Free: Pass	17 (40.5% of serving is protein) Protein blend (whey protein isolate (milk), pea protein, flax (seed), quinoa (seed))	18 / 6 / 7 0.13 g	2.5 / 1 / NL 170 / 10 160	$4.33/level scoop [$5.10] $129.95/2.78 lb [1,260 g] pouch (approx. 30 servings)	Vitamin A 315 mcg RAE, vitamin C 180 mg, vitamin D 20 mcg, vitamin E 5.25 mg TE, vitamin K2 42 mcg, thiamin 0.42 mg, riboflavin 0.46 mg, vitamin B6 0.85 mg, folate 200 mcg DFE, vitamin B12 1.2 mcg, biotin 260 mg, calcium 260 mg, iron 4 mg, iodine 52.5 mcg, magnesium 147 mg, zinc 5.5 mg, selenium 19.25 mcg, chromium 12.25 mcg, potassium 460 mg, alpha-linolenic acid 250 mg & proprietary superfood blend 30 g per level scoop Additional Information Vitamin A 315 mcg RAE, vitamin C 180 mg, vitamin D 20 mcg, vitamin E 5.25 mg TE, vitamin K2 42 mcg, thiamin 0.42 mg, riboflavin 0.46 mg, vitamin B6 0.85 mg, folate 200 mcg DFE,	1 level scoop Calories 160, Total Fat 2.5, Saturated Fat 1 g, Polyunsaturated Fat 1 g, Monounsaturated Fat 0.5 g, Cholesterol 10 mg, Total Carbohydrate 18 g, Dietary Fiber 6 g, Total Sugars [Includes 5 g Added Sugars] 7 g, **Protein 17 g**, Vitamin A (as beta-carotene) 315 mcg RAE, Vitamin C (as ascorbic acid) 180 mg, Vitamin D (as cholecalciferol) 20 mcg Additional Information 1 level scoop Calories 160, Total Fat 2.5, Saturated Fat 1 g, Polyunsaturated Fat 1 g, Monounsaturated Fat 0.5 g, Cholesterol 10 mg, Total Carbohydrate 18 g, Dietary Fiber 6 g, Total Sugars [Includes 5 g Added Sugars] 7 g, **Protein 17 g**, Vitamin A (as beta-carotene) 315 mcg RAE, Vitamin C (as ascorbic acid) 180 mg, Vitamin D (as cholecalciferol) 20 mcg, Vitamin E (as d-alpha tocopheryl succinate) 5.25 mg TE, Vitamin K2 (as menaquinone-7) 42 mcg, Thiamin (as thiamine HCl) 0.42 mg, Riboflavin 0.46 mg, Vitamin B6 (as pyridoxine HCl) 0.85 mg, Folate (as L-methylfolate) 200 mcg DFE, Vitamin B12 (as methylcobalamin) 1.2 mcg, Biotin 260 mg, Calcium (as dicalcium

								vitamin B12 1.2 mcg, biotin 260 mg, calcium 260 mg, iron 4 mg, iodine 52.5 mcg, magnesium 147 mg, zinc 5.5 mg, selenium 19.25 mcg, chromium 12.25 mcg, potassium 460 mg, alpha-linolenic acid 250 mg & proprietary superfood blend 30 g per level scoop *Gluten-Free. No artificial sweeteners, flavors, colors, or preservatives.* **Precaution:** Contains milk. Allergen Statement: This product is manufactured in a plant that also processes egg, fish, crustacean shellfish, tree nut, peanut, and wheat ingredients. Warning: Consult with a healthcare	phosphate) 260 mg, Iron 4 mg, Iodine (as potassium iodide) 52.5 mcg, Magnesium (as magnesium oxide) 147 mg, Zinc (as zinc oxide) 5.5 mg, Selenium (as sodium selenite) 19.25 mcg, Chromium (as chromium chloride) 12.25 mcg, Potassium 460 mg, Sodium 170 mg, Alpha-Linolenic Acid (omega-3) 250 mg, Proprietary Superfood Blend [**Protein Blend (Whey protein isolate (milk), Pea protein, Flax (seed), Quinoa (seed))**, Cocoa powder (processed with alkali), Pea fiber (seed), Chlorella, Chicory (root extract and root fiber), Yacon (root), Acerola juice powder (fruit), Astragalus (root), Bilberry juice powder (fruit), Blueberry (fruit), Camu-Camu (fruit), *Bacillus coagulans*, Organic cordyceps (fungi), Lycium juice powder (fruit), Ashwagandha (root), Organic chaga (fruit), Organic maitake (fungi), Organic reishi (fungi), Spinach (leaf), Rose hips (fruit), Pomegranate juice powder (fruit), Enzyme Blend (Amylase, Cellulase, Lactase, Glucoamylase, Alpha-Galactosidase, Invertase), Kale (*Brassica oleracea L. var acephala*) (leaf),

							professional before use if you are pregnant, breastfeeding, taking any medication, or if you have any medical condition.	Schisandra (fruit), Matcha green tea (leaf), Maca (root), Cinnamon (bark), Luo Han Guo extract (fruit)] 30 g. Other Ingredients: Organic cane sugar, Natural chocolate flavor, Xanthan gum, Stevia leaf extract, Himalayan pink salt, Mixed tocopherols (to maintain freshness).

Unless otherwise noted, information about the products listed above is based on the samples purchased by ConsumerLab.com (CL) for this Product Review. The samples are from a single lot of the respective product. Be aware that there may lot-to-lot variation in products, particularly natural products. Manufacturers may change ingredients and label information at any time, so be sure to check labels carefully when evaluating the product you use or buy as it may be different from the product we tested. Manufacturers may also change ingredient suppliers, which can affect product quality. Pricing can change over time and vary based on retailer, promotions, and other factors.

The information contained in this report is based on the compilation and review of information from product labeling and analytic testing. CL applies what it believes to be the most appropriate testing methods and standards. The information in this report does not reflect the opinion or recommendation of CL, its officers or employees. CL cannot assure the accuracy of information.

Products tested in 2022 and 2023

ConsumerTips™:

Look out for serving sizes

Suggested serving sizes vary widely among powders and drinks, ranging from about 10 grams to more than 90 grams per serving among powders, and from about one cup (237 mL or 8 fluid ounces) to over two cups for drinks. Keep this in mind when comparing the nutritional quality of products as well as cost.

Protein: Whey, casein, soy, rice, pea, egg, hemp, peanut, or bone broth?

Four types of protein — whey, casein, soy and/or rice — are commonly found in nutrition powders and drinks, although other plant-based protein sources, such as pea and hemp, have become more popular.

Whey and casein are both derived from milk (the protein in milk is 80% casein and 20% whey) and are "complete" proteins, meaning they contain all nine essential amino acids, i.e., the amino acids that cannot be made by the human body and must be obtained from the diet. Although many plant-based proteins are also complete proteins, compared to animal-based proteins, plant-based proteins typically contain a lower ratio of *total* essential amino acids to total protein (26% vs. 37% for plant-based vs. animal-based proteins). This means that to obtain the 10.9 grams of essential amino acids found in 25 grams of whey protein, a person would need to consume 30 grams of potato protein, 34 grams of corn protein, 37 grams of pea protein, 39 grams of rice protein, 40 grams of soy protein, 48 grams of hemp protein, 49 grams of wheat protein or 51 grams of oat-based protein (Gorissen, Amino Acids 2018).

In addition, plant-based proteins can be low in *specific* essential amino acids, meaning that if these sources of protein were the only ones consumed by a person at the recommended daily protein intake of 0.66 grams/kg body weight, the person's daily essential amino acid requirements for each essential amino acid would not be met (Craig, J Am Diet Assoc 2009; Marsh, Med J Aust 2013; Gorissen, Amino Acids 2018). The table below provides information about the limitations of certain plant-based proteins and examples of plant-based protein companions that could be taken together to help ensure essential amino acid requirements are met.

Limitations of individual plant proteins and possible companion proteins

Plant-Based Protein	Limitations	Companion Protein(s)
Corn	Low lysine	Pea Potato Soy
Hemp	Low *total* essential amino acids Low leucine Low lysine	Pea Potato Soy
Oat	Low *total* essential amino acids Low leucine Low lysine Low methionine	Potato Pea or Soy + Rice
Pea	Low methionine	Corn Hemp Potato Rice
Potato	None	Corn Hemp Oat Pea Rice Soy Wheat
Rice	Low lysine	Pea Potato Soy
Soy	Low methionine	Corn Hemp Potato Rice
Wheat	Low *total* essential amino acids Low lysine Low methionine	Potato Pea or Soy + Rice

Sources: Craig, J Am Diet Assoc 2009; Marsh, Med J Aust 2013; Gorissen, Amino Acids 2018

Additional information about the pros and cons of animal-based and plant-based protein sources are discussed below. However, keep in mind that many products are made from a mixture of protein sources and the relative amounts of each type are generally not well revealed.

In terms of **maintaining or building muscle mass**, studies have shown, as discussed below, that soy, rice and pea protein, as well as mycoprotein (which is derived from mold), can be just as effective as whey protein — although it is critical that one is also engaged in routine resistance exercise.

Whey protein taken with meals has shown to **blunt increases in blood sugar levels** (which may help people with type 2 diabetes and insulin resistance), although plant-based **proteins may have less of an effect**.

Whey protein

The majority of "protein" products on the market are whey-based. Because it is milk-derived, powders and drinks made with whey are likely to have some milk fats (about 1 - 2 grams per serving) and a small amount of cholesterol (about 25 milligrams per serving). The USDA recommends a maximum of 300 mg of cholesterol per day based on a 2,000-calorie diet for a healthy individual, so the cholesterol from whey protein is minimal.

Whey is a "complete" protein, meaning that it contains all the essential amino acids and contains the highest branched chain amino acid (BCAA) content found in nature. The branched chain amino acids valine, leucine, and isoleucine tend to become depleted following exercise and are needed for the maintenance of muscle tissue. Whey protein is believed to be digested faster than casein and more completely than soy protein. Some human and animal studies have also suggested it may boost the body's ability to fight cancer.

Popular forms of whey include the following:

- Whey concentrates — Whey contains a large amount of water, which is removed to create a whey concentrate. Most of the concentrate will be protein but will also contain lactose, fat, and cholesterol naturally found in whey. The amount of protein will depend on the level of concentration and can vary from 25% to 80% of the weight of the concentrate. If concentrated without the use of heat (using a "cold" process), the concentrate may still contain the potentially beneficial immunostimulant constituents (immunoglobulins) of whey.

- Whey isolates — Whey protein isolates are typically lower in lactose, fat, and cholesterol than a whey protein concentrate. If purified without the use of heat, they may still contain the potentially beneficial immunostimulant constituents (immunoglobulins) of whey.
- Whey hydrolysates — Essentially this is pre-digested protein that is assimilated into the body more quickly than other, non-hydrolyzed types. This is well suited for use after exercise because of the increased bioavailability of the pre-digested protein. Also, because these products are pre-digested, less energy is needed to digest them.
- Ion-exchange purified whey — This is the purest of all the whey proteins, but may have reduced immunostimulant properties due to chemical processing.

Isolates, hydrolysates, and other purified forms of protein are typically more expensive than standard concentrates due to the additional processing.

One patented brand of whey protein isolate, ***Immunocal/HMS90*** (Immunotec Inc.) is permitted in Canada to be marketed as "**a natural source of the glutathione precursor cysteine for the maintenance of a strong immune system**" based on clinical research showing that *Immunocal* can increase glutathione levels in tissue (Lands, J Appl Physiol 1999). However, any whey product will also contain cysteine which, along with the amino acids glycine and glutamic acid, can be converted to glutathione (Tsutsumi, Austin J Nutri Food Sci 2014). This means that any whey protein isolate could be expected to promote glutathione creation in the body. In fact, one trial found that *Immunocal* , compared to another whey product, was markedly less effective as a glutathione precursor (Micke, Eur J Clinical Investigation 2001). (For more about glutathione, see our Glutathione Supplements Review.)

A study funded by the maker of *Immunocal* found that, among sedentary, older adults (average age 71) who began a resistance exercise program (3 times per week) and took either 20 grams of *Immunocal* or 20 grams of casein daily for 4 ½ months, upper body lean muscle mass and lower body muscle strength modestly increased in both groups, but increases in lower body muscle strength were about 10% greater in those who took *Immunocal* (Karelis, J Nutr Health Aging 2015). However, as noted below, casein is a protein that is not particularly well absorbed and utilized, making the relative results for *Immunocal* less impressive. There is not enough evidence to suggest *Immunocal* provides an advantage over other whey protein isolates, and it costs significantly more than most -- $7.46 per 20 grams versus about $1 for other isolates. *Immunocal Platinum* contains the same amount of protein per serving as *Immunocal* but with additional ingredients, as well as more sodium (150 mg vs 20 mg per serving), and at even greater cost ($8.48 per 20 grams). *Immunocal Platinum* includes 400 mg of creatine monohydrate and modest amounts of potassium, calcium, and magnesium. Immunotec's website, which refers to these extra ingredients as its "Redox Modulating Formula," or RMF, claims that its use of the citrate forms of these added minerals is to help "lower acidity levels in the body and restore its natural pH," as well as "support the strength of bones" and contribute to "overall wellbeing," while the creatine "helps to maintain proper muscle function." However, **creatine** is not needed to maintain proper muscle function and pH is already strictly regulated in the *body*. While citrate forms of minerals, such as potassium citrate, may be taken to lower the pH of *urine* to help prevent kidney stones in people with a history of kidney stones, it is typically taken in much higher doses than provided by *Immunocal Platinum* (i.e., several thousand milligrams per day). *Immunocal Platinum* is also promoted as containing "Cytokine Modulating Proteins," or CMPs, but this appears only to be a marketing term to describe certain molecules in creatine and/or whey protein that may act to modulate inflammation in the body.

Because whey is derived from milk, whey proteins should be avoided by anyone who is allergic to milk proteins. Similarly, whey protein concentrates contain up to 5% lactose, which may cause gastrointestinal disturbances in people who are lactose-intolerant. This is not an issue, however, with whey protein isolates (Kalman, Foods 2014).

Whey protein may contain estrogens or plant-estrogens, but amounts are extremely small and likely to be of no consequence. Although whey comes from cow's milk which naturally contains estradiol, the estradiol is bound to fat in the milk and there is little to no fat in whey protein powders — so there is little estradiol in whey protein powders (Pape-Zambito, J Dairy Sci 2010). Due to the presence of soy in cattle feed, whey protein powders may also contain very small amounts of isoflavones (the estrogen-like compounds typically found in soy) (Blahova, J Dairy Sci 2016). However, amounts found in whey protein powders are minute: An analysis of a whey protein supplement containing 80% whey protein concentrate found that it contained *less than one milligram* each of the isoflavones daidzein and genistein per 26.3 gram serving (Haun, Sci Rep 2018). In addition, because there is some concern about the accuracy of methods used to detect isoflavones in milk products, some researchers suggest that amounts may be even lower than estimated.

Products such as *V-Whey* by California Performance Co. and *Mooless* by Natreve contain a laboratory-produced form of whey protein (*Perfect Day*), which is marketed as **non-animal whey protein**. *Perfect Day* is produced via fermentation by a non-pathogenic fungus (*Trichoderma reesei*), yielding whey protein that has a similar amino acid profile to whey produced from cows, (including a total of 5 grams of BCAAs per 32-gram serving) but is

made without hormones or antibiotics, considered to be suitable for vegans, and does not contain lactose or cholesterol. However, be aware that *Perfect Day* contains at least 90% beta-lactoglobulin, the major protein in cow's milk and a major milk allergen (FDA, GRAS Notice No. 863; Orcajo Clin Transl Allergy 2015). Therefore, people with a dairy allergy should not consume products containing *Perfect Day* animal protein, and such products are required to bear the allergen statement "Contains Milk Protein" on the label. Whey protein from cow's milk contains less beta-lactoglobulin (58%), but includes other proteins, such as alpha-lactalbumin, immunoglobulins, bovine serum albumin, bovine lactoferrin and lactoperoxidase (Madureira, Food Res Int 2007). According to *Perfect Day*, "While high purity beta-lactoglobulin products are relatively novel, they are equivalent to traditional whey protein and other purified milk protein products from the standpoint of nutritional properties and safety." There do not appear to be studies comparing the *clinical effects* of milk-based whey protein vs. non-animal whey protein.

Casein

The other milk protein, casein, is also a "complete protein" and is extremely high in glutamine -- the predominant amino acid in muscles and throughout the body. However, casein has a lower biological value (BV) than whey, meaning that a lower percentage of protein is absorbed and utilized out of the total protein consumed. Casein is larger than whey and is not as bioavailable. Some studies have shown casein to lead to superior gains in strength over whey -- most likely due to the slower absorption of casein, providing a release of amino acids over a longer period of time.

For athletes looking to maintain lean muscle tissue, it is sometimes recommended that casein be taken before bed because the slow absorption will supply the body with protein through the night when the body enters a catabolic state (breakdown of protein tissue for energy). However, a small study among healthy, active young men who participated in a resistance training program 4 days per week found that, after three months, average increases in muscle strength and lean mass were similar whether casein (35 grams) was consumed at bedtime or earlier in the day (at least six hours before bedtime). Both groups also consumed 25 grams of whey protein immediately after resistance training on exercise days. Increases in muscle strength, lean mass (which increased by an average of about 5 pounds) and self-reported delayed-onset muscle soreness (DOMS) were similar in both groups (Joy, J Int Soc Sports Nutr 2018).

Popular forms of casein are micellar casein (the natural, un-denatured form of casein found in milk) which is more slowly absorbed, and caseinates which are formed by chemically treating casein are more readily absorbed. A common caseinate is calcium caseinate -- which is also good source of calcium.

As casein is the main protein in milk (and even more so in Greek yogurt due to the removal of whey) and, as noted by the National Cancer Institute, "A diet high in dairy foods and calcium may cause a small increase in the risk of **prostate cancer**," there is some concern that casein protein may increase the risk of prostate cancer. Adding to this concern, a laboratory study showed that casein protein promoted the growth of certain prostate cancer cells (but not breast cancer cells) (Park, World J Mens Health 2014) and an observational study of 500,000 men (average age 52) from ten European countries found a 17% increased risk of prostate cancer among those who consumed the most yogurt (median intake 57 grams/day) compared to those who consumed the least (median intake 15 grams/day), while there was no increased risk of prostate cancer from milk, milk beverages or cheeses in general (Allen, Br J Cancer 2008). However, other components of dairy, such as fat content, may play a role, particularly once a person has prostate cancer: A large study among men in the U.S. with localized prostate cancer found that those with the highest versus the lowest intakes of *whole* milk had twice the risk of progression to lethal prostate cancer, while the opposite was true for those with the highest versus lowest intakes of *low-fat* dairy (Pettersson, Cancer Epidemiol Biomarkers Prev 2012). At this point it isn't possible to know if casein protein itself increases the risk of prostate cancer in men but it would seem best to use it in moderation.

Preliminary clinical evidence suggested that peptides in a particular casein hydrolysate (alpha-s1 casein hydrolysate, or ACH), may have a **calming effect**, possibly by acting on GABA receptors (the same receptors targeted by benzodiazepine drugs such as Valium and Xanax) (Messaoudi, Eur J Nutr 2005; Kim, Eur J Clin Nutr 2007). However, more recent studies have shown ***little to no benefit*** with this ingredient for anxiety or sleep. A placebo-controlled study among 43 men and women (average age 49) in Korea who had mild to moderate difficulty sleeping found that a supplement containing 300 mg of ACH (sold as *Lactium*, Ingredia) taken one hour before bedtime for one month was no better than placebo in improving subjective (self-reported) and objective measures (such as time in REM) of sleep than placebo (Kim, Nutrients 2019). Similarly, a placebo-controlled study in Taiwan among 36 men and women with chronic insomnia found that starting with a higher dose of *Lactium* (600 mg 30 minutes before bedtime for two weeks, reduced to 300 mg per night for two weeks) *slightly* decreased the amount of time it took to fall asleep (by 7.7 minutes) compared to baseline. However, this improvement did not reach a *clinically* meaningful difference (defined as a decrease of 8 minutes or more) and was not analyzed for statistical significance compared to the placebo group, which also had a similar decrease in the time it took to fall asleep (by 6.1 minutes). *Lactium* modestly improved self-reported sleep disturbance compared to placebo (-14 points vs -3 points on a scale

from 0 to 147), but only on *one of four* self-assessment scales used to measure symptoms (Chang, Clin Nutr 2024). *Lactium* is an ingredient in *Life Extension's Bioactive Milk Peptides* supplement, although this product contains only 150 mg of *Lactium* per suggested daily serving — less than used in the studies above.

Soy

Soy protein is acceptable to vegetarians and vegans and does not contain much fat or cholesterol, particularly if a soy "isolate" is used. It has long been considered the most "heart healthy" source of protein and, in 1999, the FDA authorized the health claim that eating 25 grams of soy protein a day, in addition to eating a low-fat, low-cholesterol diet, can reduce your risk of heart disease. However, in October 2017, the FDA proposed *revoking this health claim* because studies since 1999 have presented inconsistent findings on the relationship between soy protein and heart disease, such as whether or not it can lower LDL ("bad") cholesterol. The FDA may allow industry to continue to use a heart health claim so long as it "...explains the limited evidence linking consumption of soy protein with heart disease risk reduction."

Soy protein is considered a complete protein, equivalent to human protein, although it contains little of the sulfur-containing amino acid methionine (Gorissen, Amino Acids 2018). This deficiency in methionine is not a problem in normal nutrition for adults and children. For newborns, however, modest supplementation of soy-based formulas with methionine may be beneficial (Young, J Am Diet Assoc 1991). This can also be compensated for by eating foods rich in methionine, such as meats, seafoods, and dairy, and even good portions of plant-based foods such as firm tofu (which is from soy), nuts, seeds, beans, and grains.

A study among 38 men (average age 26) that compared the effects of soy protein supplementation (as part of a plant-based diet) and whey protein supplementation (as part of a mixed foods diet that included meat) showed that, when combined with resistance exercise twice weekly, both forms of protein provided similar, modest increases in lean muscle mass. The men supplemented with soy or whey protein twice daily (at breakfast and in the evening) for 12 weeks. The amount of protein taken as a supplement varied depending on the amount of protein each participant was getting from their diet and was adjusted so that each participant consumed a total of 1.6 grams of protein per kilogram of bodyweight (about 116 grams for a 160 lb. person) per day. Half of the men, who were vegans, took soy protein (*SUPRO XT 221D IP*, Solae LLC -- an average of about 58 grams per day) while the other group, who consumed a mixed-foods diet, took whey protein (*THERMAX 690*, Glanbia Nutritionals -- an average of about 38 grams per day) (Hevia-Larrain, Sports Med 2021).

Soy protein contains soy isoflavones that have weak estrogen-like effects. However, the concentration of isoflavones in soy protein products is much lower than that in soy flour (which contains about 200 mg of aglycone isoflavones per 100 grams of flour) and the amount varies depending on how the soy protein was produced. For example, 100 grams of soy protein concentrate contains only 12 mg of isoflavones if the concentrate was produced by alcohol extraction but about 100 mg if produced by water extraction. (See Product Review of Soy and Red Clover Isoflavones for more information about isoflavones). Analysis of a 39-gram-serving of a supplement containing 80% soy protein concentrate (ALPHA 5812, Solae) showed that it contained 14 mg and 18 mg, respectively, of the isoflavones daidzein and genistein, although consuming two servings daily for three months had *no effect* on blood levels of estradiol in healthy college-aged men (Haun,Sci Rep 2018).

Although animal research has linked excessive intake of soy with reduced fertility, a study among women found that higher intake of soy or soy isoflavones was **not associated with having fewer eggs** — which is related to the chance of getting pregnant and inversely associated with miscarriage risk.

Other clinical studies show no impact on estrogen levels or gynecomastia risk among men taking up to 150 mg of isoflavones daily (Messina, Nutrients 2016). Although a case of gynecomastia with elevated estradiol levels was reported in a 60-year-old man who regularly consumed soy *milk* daily, the amount of milk consumed by this individual (3 quarts daily) provided more than twice this amount of isoflavones (see **Plant-Based Milks Review** for details).

Anyone with thyroid disease or a predisposition to thyroid dysfunction should limit his or her intake of soy-based protein food, due to its potential to affect hormone balance and inhibit the absorption of thyroid hormone medication (Messina, Thyroid 2006). The isoflavones in soy can also affect thyroid hormone levels in people without thyroid disease. A study in adults with normal thyroid function that found consuming 15 grams of soy protein containing approximately 33 mg of aglycone soy isoflavones daily (as estimated based on a daily dose of 66 mg total isoflavones) increased levels of rT3 (reverse tri-iodothyronine) and TSH (thyroid stimulating hormone), and decreased levels of fT4 (free thyroxine) after three months of supplementation. However, levels returned to normal after six months of supplementation (Sathyapalan, Front Endocrinol 2018). (For amounts of isoflavones in soy protein and other soy products see the Soy Isoflavones Review). While soy allergies are rare, those allergic to soybeans should also avoid soy protein.

The effects of soy intake on the risk of prostate cancer are not clear-cut. Higher intakes of soy and soy foods (such as in Asian countries) have been associated with a lower risk of prostate cancer, but a protective effect has not been established — and there is some evidence higher intakes of soy isoflavones may increase the risk of *advanced* prostate cancer. In one study, researchers in the U.S. gave soy to men who were at high risk for recurrence of prostate cancer after having radical prostatectomy to remove prostate cancer. The men consumed a daily drink containing about 20 grams of soy protein isolate. Although there were no apparent adverse events related to the supplementation, there was also no statistical difference after two years in recurrence of prostate cancer between men taking the soy and those getting a placebo (about 28% of the men had cancer recur, judged by PSA levels). It is conceivable, the researchers noted, that soy is protective against prostate cancer when consumption begins early in life but not later when prostate cancer is already present (Bosland, JAMA 2013). A study that followed over 76,000 men in the U.S. for an average of 11 ½ years found no association between soy isoflavone intake and total prostate cancer risk (all types and stages combined), but found that those with the highest dietary intake of soy isoflavones (0.75 mg to 2.03 mg total soy isoflavones per day) had a 91% increased risk of *advanced* prostate cancer compared to those with the lowest intake (0 mg to 0.17 mg total soy isoflavones per day) (Reger, Int J Cancer 2018).

Rice

While much of rice seed is carbohydrate, it also contains protein, which can be separated out enzymatically. An analysis of a protein isolate (Oryzatein-90, Axiom Foods) from organic whole-grain rice showed that while it contained all of the essential amino acids, whey protein isolate contains 39% more essential amino acids and 33% more branched-chain amino acids (Kalman, Foods 2014). Rice protein also has a relatively low amount of lysine (Gorissen, Amino Acids 2018). Nevertheless, giving healthy young men 48 grams of either rice protein isolate (Oryzatein-90) or whey protein isolate 3 days per week immediately after resistance training for two months resulted in similar increases in lean muscle mass and strength (Joy, Nutr J 2013). Rice protein is considered to be hypoallergenic and is believed to be well absorbed. (In 2007, some rice protein concentrates from China that were used in pet foods were found to be adulterated with melamine.)

Pea

Pea protein, like whey and casein, is a complete protein and rich in essential branched chain amino acids (BCAAs). A small clinical study in which intake of pea protein isolate was compared to casein protein concluded that pea protein isolate is a "high quality" protein that meets all amino acid requirements and was equivalent to casein in terms of overall protein quality, although it did find that certain BCAAs (leucine and valine) and the amino acids lysine and phenylalanine are somewhat less digestible from pea protein isolate than from casein and that the estimated proportion of amino acids from pea protein that are eventually converted into proteins and used by the body was somewhat lower with pea than casein protein (Guillin, Am J Clin Nutr 2021). Like soy, protein, pea protein has a relatively low amount of the amino acid methionine (Gorissen, Amino Acids 2018), but this is unlikely to be problematic and it can also be compensated for by eating foods that are rich in methionine.

Be aware that pea protein powder may contain a high concentration of the "antinutrient" **phytate** — which, in the gastrointestinal tract, can bind to minerals such as iron, zinc, and calcium, forming insoluble complexes that cannot be digested or absorbed. Although the risk is unlikely to be a significant health concern among people following a well-balanced diet, it may be a concern for people consuming a diet low in minerals and essential trace elements, particularly if pea protein powder is consumed with meals as a primary protein source (Schlemmer, Mol Nutr Food Res 2009). Consuming pea protein at least 2 to 3 hours apart from a meal or supplements providing minerals should reduce the effect of phytate. The average daily intake of phytate in the U.S. has been estimated to be 750 mg daily, with significantly higher phytate intake among vegetarians (1,250 to 1,550 mg daily) (Schlemmer, Mol Nutr Food Res 2009). A laboratory study found that a pea protein preparation (Propulse; 85.3% protein, which is slightly more concentrated than the 53% to 73% of protein in pea protein powders tested by ConsumerLab) was 2% phytate by weight, i.e., a 33 gram serving would contain 660 mg of phytate. Phytate levels were somewhat lower in a soy protein isolate (1.69% in Supro 620; 90.2% protein) and a soy protein concentrate (1.17% in Promax 70; 69.6% protein), and much lower in a wheat gluten (0.27% in WhetPro 80; 80.8% protein) (Naczk, J Food Sci 1986). However, the amount of phytate in pea protein powder may vary depending on several factors, including the pea plant and method used to prepare the powder. According to information provided to ConsumerLab.com by NOW Foods (on 1-10-23), *NOW Sports Pea Protein* contains only about 0.61% phytate (i.e., 6.1 mg/g), which is comparable to that in dried peas of 2.2 to 12.2 mg/g (Schlemmer, Mol Nutr Food Res 2009).

A placebo-controlled study comparing a pea protein isolate to whey protein, found, interestingly, that all the groups experienced nearly equivalent increases in strength and muscle thickness. However, among men who were weakest at the beginning of the study, the increase in muscle thickness was significantly greater for those getting the pea protein compared to the placebo, whereas there was no statistical difference between the whey pea or whey and placebo (Babault, J Int Soc Sports Nutr 2015). The 12-week study involved healthy young men. They underwent strength training three times a week. Each morning and immediately after workouts (or in the afternoon when there was no workout), they consumed a flavored beverage made with cold water and a powder containing 25 grams of one of the proteins or placebo. The pea protein used was NUTRALYS from Roquette (France) which financed the study. A small study among exercise-trained men and women (average age 38) who participated in

high-intensity functional training four days per week for two months found similar increases in muscle strength with twice-daily supplementation with either pea or whey protein. However, as there was no placebo or control it is impossible to conclude that either protein was beneficial. There were no changes in body composition (fat mass or muscle thickness) in either group. On exercise days, the protein powders (both purchased from *True Nutrition*) were consumed within one hour before exercise and, again, within and one hour after exercise. On non-exercise days it was consumed once in the morning and once in the evening, between meals (Banaszek, Sports 2019).

It is interesting to note that neither of these two studies prove an overall benefit from supplementing with protein, but do demonstrate a benefit from strength training.

Egg

Egg protein powder is usually derived from the egg white (albumen) portion of the egg. It is a complete protein. Although sometimes promoted for its very high biological value (the percentage of protein absorbed and utilized), this is true only at lower levels of intake (about 14 grams daily) (Srikantia, FAO 1981). There is a lack of clinical studies comparing egg white protein supplementation with other types of protein. A small, 8-week study in female athletes (ages 18 to 22) who took 15 grams of egg white protein drink daily before exercise found that it did not significantly increase muscle strength more than a drink containing only carbohydrates (17.5 grams of maltodextrin) (Hida, Nutrients 2012).

Hemp

Hemp protein is derived from the industrial variety of *Cannabis sativa L.* which does not have the psychoactive properties associated with marijuana (Rodriguez-Leyva, Nutr Metab 2010). Like egg white, one of the main proteins in hemp is albumen, which is rich in protein and contains all of the essential amino acids, including branched chain amino acids (BCAAs). On a percentage basis, it contains lower amounts of BCAAs and essential amino acids than whey or soy protein, although it contains more BCAAs than rice or egg white protein. It is exceptionally high in arginine, containing higher amounts than any of the protein sources listed above, but relative low in leucine and lysine (Callaway, Euphytica 2004; Gorissen, Amino Acids 2018). Although there appears to be little published research on the use of hemp protein for muscle building or sports recovery, or comparing its effects with those of other sources of protein, there is some research underway (ClinicalTrials.gov 2016).

Peanut

Peanuts are a good source of protein. Just be aware that peanut protein powders also naturally contain carbohydrates (half of which is fiber) including a little sugar, and some unsaturated oil. Raw peanuts contain even more oil (USDA 2019) — about twice as much oil as protein -- but most of this is removed from peanut protein powders. As a results, each 20 grams of peanut protein powder comes with about 150 Calories, which in roughly 50 to 90% more than other common protein sources like whey, casein, or pea protein. Although peanut protein contains all essential amino acids, it is low in methionine (Gorissen, Amino Acids 2018), as is soy protein and pea protein, but this is not likely to be problematic and can be compensated for by eating foods that are rich in methionine.

Bone broth

Bone broth protein supplements (sold in capsules or as powder) consist of dehydrated broth (typically from chicken bones which have been boiled or simmered). Chicken bones contain all of the essential amino acids, including branched chain amino acids (Dong, Food Chem 2014) and chicken breast bone mainly consists of the amino acids glycine, proline and hydroxyproline and also contains both type I and type II collagen (Losso, J Food Biochem 2013). However, there is little information about the amino acid profile of chicken bone *broth* — which would vary based on how the broth was made, how long the bones were simmered, which bones were used, etc., and there do not appear to be any bone broth supplements which list their amino acid or collagen profile on the label. Bone broths are sometimes promoted to help reduce wrinkles and joint pain, likely based on the fact that collagen may account for a significant percentage of the protein in bone broths. However, there do not appear to be any published clinical studies on the effects of bone broth protein supplementation. One small laboratory study (frequently cited as evidence of the immune "boosting" benefits of bone broth protein) found that traditional chicken soup (including vegetables) inhibited the movement of neutrophils (a type of white blood cell). This movement is normally part of the immune-system's inflammatory response, suggesting not an immune "boosting" effect but a possible anti-inflammatory effect (Bo, Chest 2000). There is some evidence that chicken bone broth can be contaminated with significant amounts of lead (7 mcg per liter [about 4 cups] in broth made from "organic" chicken), likely due to the fact that lead accumulates in bones (Monro, Med Hypotheses 2013). (Interestingly, this study found only 1/3 as much lead in broth made with just chicken "meat," but 35% *more* lead in broth made with just chicken cartilage and skin.) (See the Bone Broth Review for more information and tests of popular bone broths.)

Cricket

There is growing interest in crickets and other insects as more environmentally friendly animal sources of protein than whey or casein (as these are from cows, which produce large amounts of methane). Cricket powder (made from washed, dried, and ground crickets) is about 60% protein and is rich in vitamin B-12 -- easily providing close to, or more than, the daily requirement in a single serving. About 20% to 25% of cricket powder is fat (of

which some is saturated fat, as with other animal-based proteins), with a small amount of carbohydrate (mainly fiber) but no sugar. A current downside to cricket powders is their relatively high cost. Cricket powders vary in color and taste, and as CL discovered in our 2020 tests of cricket powders, may be contaminated with heavy metals such as arsenic -- most likely depending on what they have been fed. A safety review of crickets as food by the (European Food Safety Authority in 2018) noted the "bioaccumulation of heavy metals," particularly "cadmium, arsenic, lead, and tin" as a safety risk of "considerable" concern. Additional concerns were high total aerobic bacterial counts; survival of spore-forming bacteria following thermal processing; and allergenicity (people who are allergic to other insects or shellfish may react to crickets). Other hazards like parasites, fungi, viruses, prions, antimicrobial resistance and toxins were ranked as low risk. Be aware that excessive intake of cricket protein may not be advisable for people with impaired kidney function (see Cautions and Concerns).

Mycoprotein (from fungus)

Mycoprotein (sold under the brand name Quorn) is protein derived from the cultivation of the fungus (mold) *Fusarium venenatum*. By dry weight, mycoprotein is about 25% fiber (about two-thirds of which is beta-glucans — potentially beneficial compounds found in mushrooms) and 45% protein, with essential amino acids making up about 44% of the total protein content (Monteyne, Am J Clin Nutr 2020; Denny, Nutr Bull 2008).

A preliminary 10-week study suggested that mycoprotein supplementation along with resistance training was as beneficial for **increasing muscle mass and strength** as a milk-based protein. However, as there was no placebo or control group (i.e., no protein supplement), it is not possible to conclude that the mycoprotein or milk supplement contributed to muscle gain. In the study, 22 young adults, participated in resistance exercise 5 times weekly. Some followed a vegan diet at least 6 days per week and supplemened with a mycoprotein drink (by Marlow Foods, the manufacturer of Quorn products, which funded and participated in conducting the study) providing 15.3 grams of protein post-exercise and 30.7 grams of protein prior to sleep daily (on non-training days, the post-exercise dose was consumed between meals). Others consumed an omnivorous diet and supplemented with a similar amount of milk-based protein. In both groups, lean mass (i.e., muscle) increased by about 6.8 lbs compared to baseline. Furthermore, both the mycoprotein and milk protein groups showed significantly increased strength for the deadlift, squat, and incline bench press exercises, with no difference between the groups (Monteyne, J Nutr 2023).

Due to its high fiber content, mycoprotein may cause gastrointestinal distress in some individuals (Finnigan, Curr Dev Nutr 2019). Other common adverse reactions have included vomiting, nausea, and diarrhea. Less commonly, hives, breathing difficulties and anaphylactic reactions have occurred. Two deaths due to anaphylactic reactions have occurred among people with asthma who consumed mycoprotein-based food products. As part of a proposed settlement to a class action lawsuit accusing Quorn of deceptive marketing, labels for all Quorn products now state, "*Mycoprotein is a mold (member of the fungi family). There have been rare cases of allergic reactions to products that contain mycoprotein*" (CSPI, Updated 9-6-2017).

not vegan because, in addition to mycoprotein, the products also contain egg albumin as a binding ingredient (Finnigan, Curr Dev Nutr 2019).

Using protein powders and drinks as meal replacements:

The United States Department of Agriculture (USDA) recommends (effective July 26, 2016) that most adults who perform light to moderate activity get roughly 2,000 to 3,000 calories per day from a varied diet in which approximately 55% or fewer calories come from carbohydrates, at least 10% come from protein (meat and vegetable proteins), and about 35% come from fats — with less than 10% of calories coming specifically from saturated fat. Healthcare professionals tend to suggest a somewhat higher percentage of calories from protein (15% to 20%) and a lower percentage from carbohydrates, although recommendations vary. Nutrition powders and drinks can help provide some of these nutrients but they are not recommended as a total substitute for food, as they lack some of the vitamins, minerals, fiber and phytonutrients found in whole foods and sometimes fall short on fat and carbohydrates.

Serving sizes of powders are typically 30 to 45 grams (about the same as that for a nutrition bar, after taking into account the bar's moisture content), although recommended serving sizes vary widely among the powders (from as little as 15 grams to more than 90 grams). As an example, in a 45-gram serving of a high-protein powdered mix, you could expect about 10 grams of carbohydrate (of which sugar may account for two-thirds, unless a non-nutritive sweetener is used), 30 grams of protein, and 2 grams of fat (a third of which is saturated). The other few grams of weight come mostly from moisture. This powder would provide 178 calories, with approximately 23% from carbohydrates, 67% from protein and 10% from fat. As you can see, powders can be a great source of protein, but can leave you short on carbohydrates and fat, if mixed with water. A typical serving of a ready-to-use nutrition drink is about 315 mL (one and one-third cups). Nutrients in a drink can be similar to that for a powder, but typically have slightly less protein and slightly more carbohydrate and fat.

Ingredients you may neither expect nor want:

Some products contain ingredients that you may not expect, such as **added vitamins, minerals, herbs or other special added ingredients**. Recommended Tolerable Upper Intake Levels (ULs) have been established for many vitamins and minerals, so it is advisable to keep track of the amounts that you may be ingesting from the powders and drinks as well as from other foods and supplements (see ConsumerTips™ in the Multivitamin/Multimineral Product Review for Recommended Dietary Allowances (RDAs) and ULs or see the summary at www.ConsumerLab.com/RDAs).

You should also be aware that products, particularly those promoted for "energy," might include **caffeine-containing ingredients**, such as coffee extract, guarana, mate, or cocoa. Be aware that caffeine can enhance the action and increase the side effects of other stimulants. Many powders and drinks are also fortified with an array of vitamins and minerals.

Flavored powders and drinks may also contain an array of sweeteners (most of our *Top Picks* are unflavored. These are listed in the last column of the Results table, above. Some are sugar-based such as sugar, fructose, honey, lactose, maltose, and fruit juices. (For those with trouble digesting lactose, we have shown the amount of lactose found in a serving of each product in the 5th column of the Results table — although most products had little to none). Some have reduced calories, such as the sugar alcohols lactitol, maltitol, mannitol, sorbitol and xylitol. And some have no calories, such as saccharin, aspartame, acesulfame-K, and sucralose. (See article about the **pros and cons of different sweeteners**.)

Be aware that some products have a "net carb" calculation on their labels. In this calculation, the manufacturer deducts the weight of any carbohydrate (including sugars) that supposedly does not raise insulin levels, although it may still contribute calories. The FDA has not approved this practice.

Because of all the possible ingredients, nutritional products should be carefully evaluated before being used particularly by children, pregnant or nursing women, or others with dietary restrictions, such as people with diabetes or hypoglycemia.

Make sure things add up:

To make sure that the calories listed on a product match up with the listed nutrients, you may do the following calculation: multiply the listed weight of each component by the number of calories per gram as shown below, and add them together for the total number of calories.

Carbohydrate (excluding dietary fiber)	4 calories per gram
Protein	4 calories per gram
Fats	9 calories per gram

For example, a product labeled as containing 25 grams of carbohydrates, 15 grams of protein, and 5 grams of fat would have 100 calories from carbohydrates (25 x 4), 60 calories from protein (15 x 4), and 45 calories from fat (5 x 9), for a total of 205 calories. Carbohydrates would, therefore, contribute about 49% of the calories, protein would contribute about 29%, and fat would contribute about 22%.

If your total is more than a few calories off from what the product label states, the product may be hiding something. (Note that manufacturers are allowed to round numbers and certain sugar and fat substitutes may have fewer calories than normal sugars and fats, so don't expect the calculated calories to match the label exactly; allow leeway of up to 10% of the total calories).

Know the nutritional content of the liquids with which you mix a powder:

The nutritional profile of a drink made from powder is obviously going to depend on the liquid with which it is mixed. Below is a listing of the nutritional content of some of the more common liquids used, besides water. Figures shown are based on one cup of liquid (8 fluid ounces), but be aware that the suggested amount of liquid per serving will vary by product. In general, most powders suggest about one cup of liquid per 40 grams of powder.

Nutrients in Common Liquids Mixed with Nutrition Powders				
Liquid (one cup)	**Calories**	**Carbohydrate**	**Fat**	**Protein**
Whole Milk	146	11 g	8 g	8 g
Skim Milk	86	12 g	0 g	8 g
Chocolate Milk, Reduced Fat	190	30 g	5 g	7 g
Orange Juice	110	25 g	1 g	2 g
Apple Juice	117	29 g	0 g	0 g

Source: U.S. Department of Agriculture, Agricultural Research Service. 2006. USDA Nutrient Database for Standard Reference, Release 19. Nutrient Data Laboratory Home Page, http://www.nal.usda.gov/fnic/foodcomp/search/.

When to take:

A review of 34 clinical trials in which people supplemented with protein and participated in resistance exercise found that consuming protein supplements *with* meals, rather than between meals, resulted in a slightly greater percentage of people experiencing an increase in muscle (94% vs. 90%) as well as substantially more people experiencing reductions in fat (87% vs. 59%). As to the reason for the difference, the researchers speculated that supplementing with protein between meals may be akin to "snacking," while having protein at mealtime "may displace some of the energy that otherwise would have been consumed at that meal time." (Hudson, Nutr Rev 2018). Taking into consideration that a study, noted above, found that taking protein *after*, rather than before resistance exercise, resulted in greater metabolic improvement and fat loss, it may be best, if possible, to **supplement with protein *after* exercise, preferably as part of meal**. In addition, **for weight loss, it may be better to spread out protein intake over more than one meal**. This was seen in a small study of overweight-to-obese older adults put on a regimen of physical activity and dieting for one year found that transition to a more even protein intake across meals was associated with a greater decline in BMI (body mass index) and abdominal subcutaneous fat (Farsijani, J Nutr Health Aging 2020).

To reach theoretical "maximal protein stimulation" levels (as discussed in the What It Does section) at each meal, a study in England showed that people in all age groups would need to consume more protein at breakfast, and older people (i.e., in their 70s and 80s) would also need to increase protein intake at lunch — when they tend to consume significantly less protein than younger people (Smeunix, Fron Nutr 2020).

An 11-day study among 24 healthy elderly adults (average age 70) in Denmark found that those who consumed protein evenly throughout the day had, not surprisingly, higher blood levels of amino acids throughout the day and a greater amount of protein synthesis than protein breakdown compared to those who consumed protein mainly in the evening. This suggests that spacing protein intake evenly throughout the day may help maintain muscle mass, although this was not evaluated in the study (Agergaard, Clin Nutr 2023). On the other hand, a study in China among young, healthy, untrained men (average age 21) who already had adequate protein intake from their diets and were put on a 6-week resistance training program found that distributing total daily protein intake (which included an additional 25 grams of whey protein) across meals did *not* increase gains in muscle mass or strength compared to skewing protein intake towards the end of the day (Chen, Nutrients 2022).

To help **reduce the increase in blood sugar after a meal**, consuming 20 grams of whey protein 15 minutes before or during the meal has been shown to help in obese, insulin-resistant men (Allerton, Br J Nutr 2018).

Proper Storage:

It is best to store protein powder in closed container, at room temperature and away from light.

If in a dry, powder form, protein is quite stable and should not degrade at temperatures normally experienced during shipping and storage and has a **shelf life of 9 to 18 months**, or even up to 2 year in some cases, when stored around room temperature (Tunick, J Dairy Sci 2016; Sithole, J Dairy Sci 2005). Although higher temperatures may change a protein's molecular shape, it will continue to provide the same nutritional benefits.

Although the protein is very stable, fats and oils that are also in protein powders can form volatile compounds over time that can make the powder less palatable. For example, the "beany" off flavor of pea protein isolate may be worsened by exposure to ambient light (even at room temperature), leading to a rancid and sulfurous odor as well as change in protein color. Storing the protein in the dark but at higher temperature (86 °F) caused similar but slightly less notable effects (Fischer, Molecules 2022). This change has also been shown with whey protein stored at high temperature (113 °F) (Javidipour, Dairy Sci Technol 2008). Proteins stored at very high temperatures (140 °F) may not mix as well in water due to significant protein clumping (Paul, J Food Eng 2022).

Humidity or water may cause protein powders to clump but not break down. To reduce exposure to moisture, especially in humid climates, it's best to store powdered products in several small containers rather than one large container. Protein powder can be stored in a refrigerator, but this is not necessary and moisture may accumulate inside the container due to condensation each time you take it out and open it.

Cautions and Concerns:

Protein powders and drinks may cause **gastrointestinal discomfort** such as gas, bloating, diarrhea or constipation in some people (Alhakbany, Healthcare (Basel) 2022; Wu, Food Funct 2016). Constipation may be reduced by consuming adequate amounts of fiber (about 25 to 30 grams per day), drinking enough water (at least 8 to 10 cups per day), and exercising. Avoiding products that include sugar alcohols (e.g., erythritol, sorbitol,

and xylitol) may help reducing gas, bloating, and diarrhea.

People with **lactose intolerance** may want to avoid milk-based proteins, other than whey isolate, as they may contain lactose. Some products include lactase enzyme to help digest the lactose that is present.

Allergic reactions to **whey protein** supplements may occur even in individuals who do not have allergic reactions to milk — the source of whey. This was reported in four individuals who had symptoms such as gastrointestinal distress, hives and swelling of the skin, and feeling faint, shortly after consuming whey protein powders or bars (various brands) containing a combination of whey protein concentrate and isolates. Allergen testing confirmed that three of the individuals were allergic to their whey protein supplement, even though two of the individuals were not allergic to cow's milk. The physicians who reported the cases theorized that "there may be factors associated with supplement preparation and processing which result in more immunogenic antigens." (Rorie, J Allergy Clin Immunol 2019). Allergic reactions to **soy, egg, peas** (which share some cross-reactivity with soy and peanuts, and may be of particular concern when in concentrated form such as pea protein isolates), **chia seeds, and flaxseed protein** can also occur and should be avoided by people known to be allergic to these sources of protein (Prager, J Dtsch Dermatol Ges 2023; De Almedia, Ann Allergy Asthma Immunol 2023). (Be aware that peas, chia and flaxseed are not among the food allergens required by the FDA to bear an allergen statement on labels). Allergic reactions to **cricket protein** can also occur in people allergic to shellfish or insects (Kamemura, Mol Immunol 2019).

Consuming whey protein may cause a temporary **decrease in blood pressure**, particularly in older adults (Giezenaar, Nutrients 2018). This seems to occur approximately 2 to 3 hours after ingestion, as shown in a trial among older men (average age 72) in Australia who consumed either 30 grams or 70 grams of whey protein (mixed with 14 oz of flavored water), or a non-caloric control beverage. The men were seated throughout the study. Both doses resulted in a significant decrease in systolic blood pressure (about 24 to 25 mm Hg), which was about a 10 mm Hg greater decrease than experienced with the control drink. There was also a modest decrease in diastolic blood pressure (by 6 to 8 mm Hg), but this was not significant compared to the control drink (average decrease of 4 mm Hg). Although most of the men also had a modestly increased heart rate two to three hours after ingestion of whey (which can help to compensate when blood pressure decreases), the researchers cautioned that people taking medications that slow or limit heart rate responses (such as beta blockers) or those with heart conditions that slow heart rate, may be at greater risk of low blood pressure after consuming protein and should take care when rising from a seated to standing positions in the two to three hours after consuming whey protein (Oberoi, Nutrients 2022). Further research found that increasing the caloric content of a whey protein drink by adding carbohydrates and fats caused a slightly greater reduction in blood pressure than a drink with only the whey protein, suggesting that "pure whey-protein drinks may represent the best approach to maximize protein intake without increasing the potential for deleterious BP falls in older people" (Oberoi, BMC Geriatr 2022).

Whey protein supplementation has been linked with cases of **acne** on the back and chest among teenagers and young adults. Typically, lesions appeared within about 1 to 3 months of starting whey protein supplementation and resolved upon discontinuation of supplementation and treatment with prescription topical medications for acne. Effects of whey protein supplementation on acne lesions appears to be greater in women than men and among those with a family history of acne. Whey protein and other milk derivatives can increase levels of insulin-like growth factor-1 (IGF-1), a hormone that may trigger acne by increasing sebum production and promoting the release of other hormones that tend to clog pores (Cengiz, Health Promot Perspect 2017; Pontes, An Bras Dermatol 2013).

It has been hypothesized that high-protein diets can increase **calcium turnover** from bone, resulting in calcium loss, and it has been suggested that this can be stabilized by the daily consumption of 300 mg of calcium (the equivalent to one 8 oz. glass of milk) on top of your basic daily calcium intake (many protein powders provide extra calcium). *However*, several studies have *not shown a negative effect* on bone from increased protein intake, including a 6-month study among 24 athletically-trained women. Half the women boosted their protein intake by an average of 87% -- mostly with protein powders, but there were no changes in bone mineral density or bone mineral content in either group (Antonio, J Int Soc Sports Nutr 2018).

It has also been hypothesized that high protein intake may increase the **risk of dehydration** by increasing urea production and urine output. For this reason, increasing water and fluid intake when consuming a high protein diet or protein supplements has sometimes been advised. Of course, it's always important to stay adequately hydrated. However, *there is no evidence that high protein intakes increase the need for fluids or increase risk of dehydration in healthy individuals with normal kidney function who maintain their normal fluid intake*. For example, a small study among healthy young men found that consuming a very high protein diet (3.6 mg/kg of bodyweight per day, equivalent to 245 grams of protein for a 150 lb. individual — 4 ½ times the RDA for men) and normal water intake for three months modestly increased blood urea nitrogen (BUN) but had a minimal effect on

fluid status. The researchers concluded that consumption of protein at levels in excess of the upper range of the Dietary Reference Intakes was "not associated with negative effects on hydration status" (Martin, J Am Diet Assoc 2006). Individuals with **kidney disease** should consult with their physician concerning safe protein and fluid intakes, and the risk of dehydration (Martin, Nutr Metab (Lond) 2005).

Protein intake is *not* associated with decreased kidney function in healthy older adults who do not have kidney disease. For example, a large, 10-year study of over 1,600 women ages 42 to 68 found that among women who started out with normal kidney function, there was no association between the amount or type of protein they consumed and decreased kidney function over time. On the other hand, women who started out with mildly **decreased kidney function showed some worsening with increasing amounts of protein intake**, particularly from meat protein. Dairy or vegetable protein was not associated with worsening kidney function (Knight, Ann Intern Med 2003). **To be safe, some experts recommend that individuals with normal kidney function but who are at high risk for developing kidney disease (i.e., those with diabetes, high blood pressure or who have just one kidney) limit protein intake** to 0.45 gram of protein per pound of bodyweight per day (about 75 grams of protein a day for a 150 lb. individual) (Kalantar-Zadeh, Nephrol Dial Transplant 2019). In healthy adults, however, overly *restricting* protein intake does not prevent, and may actually worsen, *age-related* decline in kidney function (Walser, The National Academies Press 1999).

Long-term studies have shown mixed results as to whether higher protein intake **affects cardiovascular disease risk** (Hu, Am J Clin Nutr 1999; Vogtschmidt, Atherosclerosis 2021), although some studies have found intake of *plant* protein to be associated with lower cardiovascular risk than intake of protein from animal sources (including dairy), which tends to contain higher levels of leucine (Naghshi, BMJ 2020). A small study showed that, in both people and mice, high blood levels of leucine activated the signaling of certain immune cells involved in a metabolic process that promotes atherosclerosis (leucine-mediated macrophage mTOR signaling). The study also showed that in people, consuming more than 25 grams of protein per meal (or 22% of daily energy requirements) increased blood levels of leucine above the threshold required to trigger this effect on immune cells. However, the results were based on experiments looking only at the short-term effects of a single, liquid protein meal along with similar amounts of fats and carbohydrates, and the study did not measure the effects of regular high-protein consumption (Zhang, Nat Metab 2024).

Carnitine is sometimes found in protein powders, although it is not known to be of benefit in sports. Research suggests that **carnitine intake may potentially contribute to cardiovascular disease** in certain people. People who eat red meat (as opposed to vegetarians and vegans) maintain organisms in their gut which digest carnitine to the compound TMA, which is then converted in the liver to the compound TMAO which appears to advance atherosclerosis (hardening of the arteries) by reducing the normal clearing of cholesterol (Koeth, Nature Medicine 2013). Supplementing with L-carnitine may potentially foster growth of these organisms, increase levels of TMAO, and have negative long-term cardiovascular effects. Unless it is medically necessary for you to take L-carnitine, it may be prudent to avoid long-term use at high doses (several hundred milligrams). Similarly, as has long been known, it may be prudent to reduce consumption of red meat, a major source of L-carnitine.

Protein consumption can cause dangerously high blood levels of ammonia in people with **urea cycle disorder**, a rare genetic disorder in which the body is deficient in one or more of the enzymes that help to break down ammonia — a byproduct of protein digestion (Genetic and Rare Diseases Information Center 2017). In people with this disorder, high levels of ammonia can build up in the blood and the brain, which can lead to irreversible brain damage, coma or death. Although relatively rare, occurring in an estimated 1 in every 8,500 births, milder forms of this disorder can go undetected in adults who have enough enzymes to handle typical protein intakes. However, even in people with milder forms of the disorder, stressors such as viruses, high protein intake, excessive exercise or dieting, or surgery can cause dangerously high blood levels of ammonia. For example, a 25-year-old woman who did not know she had the disorder became unconscious and died after taking protein supplements, eating protein-rich foods, and exercising in preparation for a fitness competition (See the Warning about this).

Be aware that following a diet consisting mainly of **plant protein can reduce intakes of vitamin B-12 and iodine**. A 12-week study in healthy people (average age 48) showed that those put on a diet in which 70% of protein was plant-based developed 20% lower blood levels of a marker of vitamin B-12 status (holo-transcobalamin II) and about 35% lower 24-hour urinary iodine excretion than those put on a diet in which 70% of protein was from animals. While holo-transcobalamin levels were still considered adequate for most people in the plant-protein group, it was inadequate for about 10% of them compared to only 2% of those in the animal-protein group. This suggests that supplementation with vitamin B-12 and, possibly, iodine may be necessary for some people who replace significant amounts of animal protein in their diet with plant protein. It is notable that none of those in the plant-protein group were allowed to take dietary supplements or consume fortified food products, and for vegetarians, fortified cereals, milk and yogurt may provide sufficient B-12. There was no difference in blood levels of zinc, folate, or iron, although interestingly, those in the plant-protein group actually had highest iron intakes (Pellinen, Eur J Nutr 2021).

It may be prudent for people with **impaired kidney function to avoid consuming cricket protein in large amounts**. Cricket protein appears to exert a high potential renal acid load (PRAL) — the capacity of a food to produce acid when broken down by the body. Diets high in PRAL may cause low-grade metabolic acidosis, which has been linked with impaired kidney function, along with other chronic conditions — although cricket protein has not been linked with metabolic acidosis in humans in clinical studies. The estimated PRAL score (per 100-gram serving size) for edible crickets is 37.59 to 38.76 (Storz, Int J Food Prop 2023), which is much higher than that of protein sources such as lean beef (7.8), chicken (8.7), lean pork (8.8), turkey (9.9), fish such as cod, haddock or trout (6.8 to 10.8), eggs (8.2), whole milk (0.7), or peanuts (8.3) (Remer, J Am Diet Assoc 1995).

Although **liver injury** associated with protein shakes and drinks appears to be rare, there are some published reports of this occurring. Acute **liver inflammation (hepatitis)**, **liver failure**, and subsequent **hepatitis-associated aplastic anemia** (a serious and potentially fatal condition characterized by very low red and white blood cells and platelets) was reported in a 13-year-old boy who had consumed a specific brand of protein shake (*Herbalife Formula 1*) daily for five months, along with intermittent consumption of an *Herbalife Protein* drink mix (Mercedes, J Pediatr Gastroenterol Nutr 2024), although it is not known which, if any, ingredient in the products may have caused the liver injury, and the boy also regularly consumed aloe vera, which has also been linked, in rare cases, with liver injury (see Warning for more details).

As hemp protein may contain very small amounts of delta-9-THC, which is included on California's Proposition 65 list and does *not* include a safe harbor level (a level below which exposure is not believed to cause a significant risk), labels for products that contain *any amount* of delta-9-THC must include a **Proposition 65 warning about the possible risk of reproductive harm** if the product is to be sold in California. The warning is based on evidence showing that exposure of animals to THC during pregnancy or lactation affected the brain, behavior and/or learning ability of the offspring and increased the risk of the offspring becoming addicted to drugs later in life (Proposition 65 THC Fact Sheet). As of October 1, 2022, such products intended for ingestion should include the following statement, although the specific warning language is not mandatory if consumers are provided an alternative warning that is "clear and reasonable": "**WARNING**: Consuming this product during pregnancy exposes your child to delta-9-THC, which can affect your child's behavior and learning ability. For more information go to www.P65Warnings.ca.gov/cannabis," although manufacturers have until October 1, 2023 to be compliant (OEHHA, 8-8-22).

To further assist consumers, ConsumerLab.com licenses its flask-shaped CL Seal of Approved Quality (see The CL Seal) to manufacturers for use on labels of products that have passed its testing. ConsumerLab.com will periodically re-evaluate these products to ensure their compliance with ConsumerLab.com's standards.

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back to top