Product Review: *Protein Powders and Drinks Review -- for Body Building, Sports & Dieting*

Initial Posting: 6/11/13 Updated 1/28/15

Photo: ConsumerLab.com

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Update:
Shakeology Greenberry (6/28/2013): In response to ConsumerLab.com's report of lead contamination (12.7 mcg per serving) in this shake mix, the distributor of this product, Beachbody, posted an online message stating that ConsumerLab.com may be misleading consumers by not distinguishing between harmful heavy metals and those that are naturally occurring in plants, vegetables and minerals (including naturally occurring lead). It further stated that it is specifically because Beachbody uses whole-food plant based natural ingredients that it does include naturally occurring heavy metals along with the countless other benefits nature provides. This posting was sent to ConsumerLab.com by one of our members.

To be clear, the lead found in plants and minerals -- and in this product -- is *not* a safe form and *is* a harmful heavy metal. Lead contamination of plants generally occurs due to contamination of the environment in which they have grown -- often caused by industrial pollution or proximity to roadways where, in the past, cars had used leaded gasoline. For additional information about lead contamination, see the report below.

What It Is:

To increase protein in the diet, one can turn to meats, which are complete protein sources because they provide all the essential amino acids. The downside to meats, especially red meat, is that they can also provide significant amounts of saturated fat and cholesterol. Another way to increase protein intake is by combining large servings of incomplete proteins such as legumes and grains, but this increases carbohydrate and calorie intake. Powders and drinks offer a protein alternative without significantly increasing consumption of fats, carbohydrates, cholesterol, or calories.

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:

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.

Building and maintaining muscle mass is not only of importance to athletes. Aging is associated with a progressive loss of skeletal muscle mass and strength. Resistance-type exercise training has been established as an effective strategy to prevent or even reverse age-related loss of skeletal muscle and strength. It has been shown that **protein supplementation after resistance-type exercising increases post-exercise muscle protein synthesis and inhibits muscle protein breakdown**, helping muscle to build during the post-exercise recovery period. This finding explains the emergence of "recovery" drinks which typically contain about 10 to 20 grams of protein per serving in addition to the carbohydrates and minerals traditionally found in sports drinks.

A review of 22 studies found that **protein supplementation also increases muscle mass and strength gains during prolonged resistance-type exercise training programs in both younger and older individuals** (Cermak, Am J Clin Nutr 2012). Specifically, after training two to five times a week over periods of

ranging from 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. (See ConsumerTips™ for information about the forms of protein: whey, casein, soy, and rice.) The amount of fat loss in subjects was not significantly affected by protein supplementation.

One very small 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).

Quality Concerns and What CL Tested for:
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 31% of the selected protein powders failed quality testing, including two for lead contamination, which is always of concern with products those 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.

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.coms' tests of protein products in 2010 did not fine 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.

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 Selected). 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 possible lead contamination (see Testing Methods and Passing Score).

What CL Found:
Among 16 products which ConsumerLab.com selected to test, five failed to pass tests for the following reasons:

- *Prolab Advanced Essential Whey Milk Chocolate* provided only 31.9% of its listed amount of protein per scoop containing just 7.3 grams of protein instead of 23 grams. In addition, it provided 16 more grams of carbohydrates than claimed (including 3.4 more grams of sugar).
- *Dymatize Nutrition Elite Casein Smooth Vanilla* claimed to contain no cholesterol but had 10.2 grams per scoop. It also claimed no sugar but contained a small amount 1.2 mg per scoop.
- *Optimum Nutrition Gold Standard 100% Egg Rich Chocolate* contained almost three times the amount of cholesterol claimed on its label: It claimed only 5 mg of cholesterol per scoop but had 14.2 mg.
- *Nature's Plus Spiru-Tein Vanilla* contained 4.2 more grams of sugar than the 8 grams it claimed on its label. It also provided 6.7 more grams of total carbohydrates. Rather than the 99 calories listed on its label, it provided 125 calories per serving. These results are nearly identical to those found by ConsumerLab.com when this product was last tested in 2010.
- *Shakeology Greenberry* was contaminated with 12.7 mcg of lead per scoop (40 grams).It is difficult to know the source of this lead as the product has an extensive list of ingredients. Although lead at this level may not in itself be toxic to adults, lead is stored in the body and unnecessary exposure should be avoided. This product should not be consumed by children, as they are susceptible to lead poisoning at levels as low as 6 micrograms per day (from all sources of exposure combined), nor should it be used by pregnant women. In fact, California requires a warning label on supplements which contain more than about 1 mcg of lead per daily serving. Other adults can tolerated 70 mcg of lead daily, but should still avoid unnecessary exposure to lead.

Getting protein at lowest cost:
ConsumerLab.com calculated the cost to obtain an equal amount of protein (20 grams) from each product from quality approved products. Here's what we found:

- Whey protein: The cost per 20 grams of protein ranged from a low of 61 cents (*Body Fortress Super Advanced Whey Isolate*) to a high of $1.50 (*Marked 100% Whey Protein Complex*).
- Casein/milk protein: For the one approved casein/milk protein product, *Pure Protein Shake Cookies n' Creme*, the cost was $1.54
- Soy protein: For the one approved soy protein product, *Genisoy Soy Protein Shake Chocolate Flavor*, the cost was $1.39
- Mixed protein: The lowest cost to obtain 20 g of protein was 69 cents from *Twinlab Whey Fuel*, which has a combination of whey and other milk proteins, while the highest cost was $2.06 from *Endurox*, a sports recovery product with whey and soy proteins.
- Meal replacement/Diet: These products are the most expensive ways to get protein, as they are the most likely to contain substantial amounts of other nutrients and ingredients. The lowest cost to obtain 20 g of protein was 94 cents from *Met-Rx Engineered Nutrition Meal Replacement Extreme Chocolate*, while the highest cost was $5.14 from *Slim Fast 3-2-1 Plan Chocolate Royale.*

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 27 protein/nutrition powder and drink products. Products are grouped by main ingredient (e.g., Protein -- Whey) or type of use (e.g., Meal Replacement/Diet) and appear alphabetically within these groups. (Note: Some products could be categorized into more than one group, e.g., "Meal Replacement/Diet" and "Protein -- Whey," but are shown in one category only). ConsumerLab.com selected 16 products. Eleven products (each indicated with an CL icon) were tested at the request of their manufacturers/distributors through 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 and sugars; total fat, saturated fat, and trans fat; sodium and cholesterol; and calories all of which were checked in testing. Contamination with lead above allowed limits is also shown. The "Protein" column lists the type of protein in each product (learn how the types differ in the ConsumerTips section on Protein). More detail about the protein content, as well as the full list of ingredients, is available for each product by clicking on the word "Ingredients" in the first column.

Products listed as "Approved" met their ingredient claims. Those that did not are listed as "Not Approved" with an explanation of the problem found in red font.

RESULTS OF CONSUMERLAB.COM TESTING OF NUTRITION POWDERS AND DRINKS
Click on $ Price Check beneath a product name to find a vendor that sells it.
To find retailers that sell some of the listed products click here.

Product Name (Serving Size, and Suggested Daily	APPROVED (Passed)	Did Not Exceed	Nutrition or Supplement Facts on Label (Figures are per serving unless otherwise noted)	Cost for Daily Suggested Serving

Number of Servings on Label) *Promoted Uses* Click on "Ingredients" for Full Listing	or *NOT APPROVED* (Failed)	Contamination Limit for Lead, Cadmium, and Arsenic	Protein (grams) Claimed Protein Source (Added Amino Acids)	Total Carbohydrate/ Sugar (grams)	Total Fat/ Sat. Fat/ Trans Fat (grams)	Sodium / Cholesterol (mg)	Calories	on Label [Cost per 20 g of protein] Other Notable Ingredients/Features[1] Price Paid
Protein -- Whey: (Also see Shakeology® Greenberry under Meal Replacements with Protein section)								
Body Fortress® Super Advanced Whey Isolate Vanilla Creme (1 scoop (35 g) per serving, no recommended daily serving size) *Strength & Recovery* Mfd. by Healthwatchers (DE), Inc. Ingredients	**APPROVED**	✓	30 Whey protein isolate (Also glutamine, arginine, alanine, lysine, BCAAs)	1 / <1	<0.5 / <0.5 / NL Found <0.01 g of trans fat	85 / 5	130	$0.92[2] [$0.61] **Lowest cost for protein from whey** Calcium, phosphorus, magnesium, potassium $23.98/2 lb (32 oz) container (approx. 26 servings)
EAS® 100% Whey Protein Chocolate (2 scoops (39 g) per serving, up to 3 daily) *Strength & Recovery* Dist. by Abbott Nutrition Ingredients $ Price Check	**APPROVED**	✓	26 Whey protein concentrate	7 / 2	2 / 1 / 0	170/ 80	150	$0.91-$2.72 [$0.70] Calcium, iron, potassium $52.61/5 lb (2.27 kg) container (approx. 58 servings)
GNC AMP Amplified Wheybolic Extreme 60™ Chocolate (3 scoops (79 g) per serving, 1 to 2 per day) Dist. by General Nutrition Corporation Ingredients $ Price Check	**APPROVED**	✓	60 Whey protein isolate (Also glutamine, arginine, leucine)	7 / 2	1 / 0.5 / NL Found <0.01 g of trans fat	300 / 15	280	$4.00-$8.00 [$1.19] Calcium, potassium, enzymes $25.00/1.22 lb (553 g) container (approx. 7 servings)
GNC Pro Performance 100% Whey Protein Chocolate Supreme (1 scoop (35.5 g) per serving, 1/2 to 2 per day) *Strength & Recovery* Dist. by General Nutrition Corporation Ingredients	**APPROVED**	✓	24 Whey protein concentrate, whey protein isolate	6 / 2	2 / 1 / 0	70 / 65	140	$0.46-$1.85 [$0.77] Calcium, iron $25.00/2.11 lb (958.5 g) container (approx. 27 servings)
Jay Robb® Whey Protein Vanilla (1 scoop (30 g) per serving, no recommended daily serving size) Dist. by Jay Robb Enterprises Inc. Ingredients $ Price Check	**APPROVED**	✓	25 Cold-processed cross-flow microfiltered whey protein isolate	1 / 0	0 / 0 / 0	150 / 0	110	$1.67[2] [$1.33] Vitamin C, potassium $38.31/24 oz (680 g) container (approx. 23 servings)
Marked™ 100% Whey Protein Complex Gourmet Chocolate (1 scoop (36.5 g) per serving, 1 to 2 per day) *Strength & Recovery* Dist. by Nutra Manufacturing Ingredients $ Price Check	**APPROVED**	✓	20 Micronized whey protein concentrate, whey protein concentrate, whey protein isolate (Also leucine, glutamine, arginine)	8 / 2	2 / 1 / NL Found 0.06 g of trans fat	240 / 70	130	$3.00 [$1.50] Dietary fiber (3 g), calcium, potassium $35.99/2 lb (909 g) container (approx. 24 servings)
Muscletech™ Nitro Tech Milk Chocolate (1 scoop (37 g) per serving, 1 to 4 a day) *Strength & Recovery* Dist. by Iovate Health Sciences, U.S.A. Ingredients $ Price Check	**APPROVED**	✓	30 Whey protein isolate (Also alanine, glycine, glutamine, BCAAs)	2 / 1	1.5 / 1 / 0	150 / 25	140	$1.52-$6.08 [$1.01] Enzymes $37.99/2 lbs (907 g) container (approx. 25 servings)
Prolab® Advanced Essential Whey Milk Chocolate (1 scoop (30 g) per serving, no recommended daily serving size) *Strength & Recovery* Dist. by Prolab Nutrition, Inc. Ingredients	***NOT APPROVED***	✓	23 Whey protein concentrate, whey protein isolate Found 15.7 g less protein per serving	3 / 1 Found additional 16.0 g of total carbohydrates and 3.4 g of sugar per serving	1 / 0.5 / NL Found 0.03 g of trans fat	43 / 30	125	$0.83[2] [$0.72] Calcium, enzymes *Contains no wheat* $24.99/2 lb (907 g) container (approx. 30

								servings)
Six Star Pro Nutrition® Whey Protein Plus Triple Chocolate (1 scoop (42 g) per serving, no recommended daily serving size) *Strength & Recovery* Dist. by Iovate Health Sciences U.S.A. Ingredients $ Price Check	**APPROVED**	✓	30 Whey protein concentrate, whey protein isolate Added lycine, isoleucine, valine, glutamine, glycine	8 / 2	1.5 / 1 / 0	65 / 50	170	$1.09[2] [$0.73] Calcium, enzymes $22.99/2 lb (885 g) container (approx. 21 servings)
Solgar Whey To Go - Vanilla Naturally Flavored (1 scoop (25 g) per serving, no recommended daily serving size) Mfd. by Solgar, Inc. Ingredients $ Price Check	**APPROVED**	✓	20 Micro-filtered whey protein isolate, micro-filtered whey protein concentrate Added glutamine, BCAAs	2 / <1	0.5 / <0.5/ NL Found 0.02 g of trans fat	55 / 10	90	$1.03[2] [$1.03] Calcium, phosphorus, magnesium, potassium *Gluten free* $37.20/32 oz (907 g) container (approx. 36 serving)
Protein Casein/Milk:								
Dymatize Nutrition® Elite Casein Smooth Vanilla (1 scoop (32 g) per serving, 1 per day) Dist. by Dymatize Enterprises, Inc. Ingredients	***NOT APPROVED***	✓	24 Milk protein concentrate	4 / 0 Found additional 1.2 g of sugar per serving	1 / NL / NL Found 0.29 g of saturated fat and 0.14 g of trans fat	55 / 0 Found additional 10.2 mg of cholesterol per serving	120	$1.16 [$0.97] Calcium *Gluten free* $32.53/2 lb (908 g) container (approx. 28 servings)
Pure Protein® Shake Cookies 'n Creme (1 can (11 fl. oz.) per serving, no recommended daily serving size) Dist. by Worldwide Sport Nutrition Supplements, Inc. Ingredients $ Price Check	**APPROVED**	✓	35 Milk protein concentrate	4 / 1	1.5 / 0.5 / 0	160 / 15	170	$2.70[2] [$1.54] Dietary fiber (2 g), calcium, phosphorus, iron, magnesium $2.70/One 11 fl. oz. can
Protein Soy:								
Genisoy® Soy Protein Shake Chocolate Flavor (3 tbsp (35 g) per serving, no recommended daily serving size) Dist. by Downright Healthy Foods LP Ingredients $ Price Check	**APPROVED**	✓	14 Soy protein isolate	17 / 13	1 / 0 / 0	170 / 0	130	$0.97[2] [$1.39] Vitamins A, B6, B12, C & E, calcium, iron, thiamine, riboflavin, niacin, folate, biotin, pantothenic acid, phosphorus, iodine, magnesium, zinc, selenium, copper $17.49/22.2 oz (630 g) container (approx. 18 servings)
Protein Rice: See Metagenics® UltraMeal® Rice under "Meal Replacements with Protein" section								
Protein Egg:								
Optimum Nutrition™ Gold Standard™ 100% Egg Rich Chocolate (1 scoop (32.5 g) per serving, 1 per day) Mfd. by Optimum Nutrition Ingredients	***NOT APPROVED***	✓	24 Egg albumen	4 / 0	1 / 0.5 / 0	420 / 5 Found additional 9.2 mg of cholesterol per serving	120	$1.48 [$1.23] Calcium, iron $39.99/2 lb (909 g) container (approx. 27 servings)
Protein Mixed Sources:								
The Biggest Loser® Protein Powder Vanilla Bean (2 scoops (22.5 g) per serving, no recommended daily serving size) Dist. by Designer Protein, LLC Ingredients $ Price Check	**APPROVED**	✓	12 Whey protein concentrate, soy protein isolate (Also leucine)	7 / 4	2 / 0.5 / 0	110 / 20	90	$1.00[2] [$1.67] Dietary fiber (3 g), potassium, calcium, vitamin D, iron $12.99/10 oz. (283 g) container (approx. 13 servings)
Endurox® R4® - Fruit Punch (2 scoops (74 g) per serving, no recommended daily serving size)	**APPROVED**	✓	13 Whey protein concentrate, soy protein isolate	52 / 39	1.5 / 0.5 / 0	220 / 15	280	$1.34[2] [$2.06]

Strength & Recovery Dist. by Motts LLP Ingredients $ Price Check			protein isolate (Also glutamine)					Vitamins C & E, calcium, magnesium, potassium $37.49/4.56 lb (2.07 kg) container (approx. 28 serving)
Marked™ Mass Gainer Gourmet Chocolate (4 scoops (182 g) per serving, 1 to 2 per day) *Strength & Recovery* Dist. by Nutra Manufacturing Ingredients $ Price Check	**APPROVED**	✓	50 Whey protein concentrate, soy protein isolate, hydrolyzed whey protein, milk protein concentrate, whey protein isolate	115 / 6	4.5 / 2.5 / 0	270 / 105	700	$4.00-$8.00 [$1.44] Dietary fiber (5 g), vitamins A & C, calcium, iron, potassium $21.59/2.5 lb (1,134 g) container (approx. 6 servings)
Nature"s Bounty Optimal Solutions Complete Protein & Vitamin Shake Mix Vanilla Bean (2 scoops (33 g) per serving, no recommended daily serving size) Mfd. Nature's Bounty, Inc. Ingredients	**APPROVED**	✓	15 Pea protein isolate, whey protein concentrate, rice protein concentrate	14 / 6	1.5 / NL / NL Found 0.49 g of saturated fat and 0.026 g of trans fat	135 / 20	120	$1.04[2] [$1.39] Vitamins B6, B12, C & D, thiamin, riboflavin, niacin, folic acid, biotin, pantothenic acid, calcium, iron, magnesium, potassium, probiotic, enzymes, flaxseed *Suitable for vegetarians, contains no wheat, gluten free, yeast free* $13.56/1 lb (453 g) container (approx. 13 servings)
Nature's Plus® Spiru-Tein® - Vanilla (1 scoop (34 g) per serving, no recommended daily serving size) *Energy* Mfd. by Natural Organics Laboratories, Inc. Ingredients	***NOT APPROVED***	✓	14 Rice protein, pea protein, isolated soy protein	11 / 8 Found additional 6.7 g of total carbohydrates and 4.2 g of sugar per serving	0 / 0 / 0	140 / 0	99 Found additional 25.8 calories per serving	$1.02[2] [$1.46] Vitamins A, B6, B12, C, D & E, calcium, iron, thiamin, riboflavin, niacin, folic acid, biotin, pantothenic acid, phosphorus, iodine, magnesium, zinc, selenium, manganese, chromium, molybdenum, inositol, choline *Suitable for vegetarians, yeast free* $32.79/2.4 lb (1,088 g) container (approx. 32 servings)
Twinlab® Whey Fuel™ Triple Thick Chocolate (1 scoop (31 g) per serving, 1 to 2 per day) *Strength & Recovery* Mfd. by Twinlab Corporation Ingredients $ Price Check	**APPROVED**	✓	21 Whey protein concentrate, milk protein isolate, whey protein isolate	4 / 1	1.5 / 1 / 0	65 / 35	120	$0.72-$1.45 [$0.69] **Lowest cost protein from mixed sources** Calcium, phosphorus, magnesium $20.99/2 lb (907 g) container (approx. 29 servings)
Meal Replacements with Protein:								
Atkins™ Day Break® - Strawberry Banana Shake (1 container (11 fl. oz.) per serving, no recommended daily serving size) Dist. by Atkins Nutritionals, Inc. Ingredients $ Price Check	**APPROVED**	✓	10 Milk protein concentrate, whey protein concentrate	10 / 0	9 / 2.5 / 0	250 / 15	140	$1.57 [$3.15] Fiber (7 g), potassium, Vitamins A, C, D & E, calcium, thiamin, niacin, phosphorus, iron, riboflavin, folate $6.29/Four 11 fl. oz. containers
GNC Total Lean™ Lean Shake™ - Swiss Chocolate (2 scoops (48 g) per serving, 2 per day) Dist. by General Nutrition Corportation Ingredients	**APPROVED**	✓	9 Milk protein concentrate	30 / 5	2 / 0.5 / 0	250 / 5	180	$5.37 [$2.15] Fiber (8 g), vitamins A, B6, B12, C & E, calcium, iron, thiamin, riboflavin, niacin, folic acid, biotin, pantothenic acid, phosphorus, iodine, magnesium, zinc

								magnesium, zinc, selenium, copper, manganese, chromium, molybdenum $42.99/27 oz. (768 g) container (approx. 16 servings)
GNC Total Lean™ Lean Shake™ 25 - Rich Chocolate (2 scoops (52 g) per serving, 2 per day) Dist. by General Nutrition Corportation Ingredients $ Price Check	**APPROVED**	✓	25 Whey protein concentrate, milk protein concentrate, whey protein isolate	17 / 4	3 / 1.5 / 0	280 / 60	200	$4.84 [$1.93] Fiber (8 g), vitamins A, B6, B12, C & E, calcium, iron, thiamin, riboflavin, niacin, folic acid, biotin, pantothenic acid, phosphorus, iodine, magnesium, zinc, selenium, copper, manganese, chromium, molybdenum $38.69/29.3 oz. (832 g) container (approx. 16 servings)
Metagenics® UltraMeal® Rice Natural Chocolate Flavor (2 scoops (52 g) per serving, 2 per day) Mfd. by Metagenics, Inc. Ingredients $ Price Check	**APPROVED**	✓	15 Rice protein concentrate Added lysine	26 / 14	5 / 1 / 0	65 / 0	190	$5.14 [$3.42] Fiber (4 g), vitamins A, B6, B12, C, D & E, potassium, calcium, thiamin, niacin, folate, biotin, phosphorus, magnesium, copper, chromium, iron, riboflavin, pantothenic acid, iodine, zinc, manganese *Contains no wheat, gluten free* $35.95/26 oz. (728 g) container (approx. 14 servings)
Met-Rx® Engineered Nutrition® Meal Replacement Extreme Chocolate (1 packet (72 g) per serving, 2 per day) Mfd. by Met-Rx Nutrition, Inc. Ingredients $ Price Check	**APPROVED**	✓	39 Milk protein concentrate, Whey protein concentrate, egg white	17 / 2	3 / 1 / 0	400 / 20	240	$3.66 [$0.94] Fiber (3 g), potassium, Vitamins A, B6, B12, C, D, E & K, calcium, riboflavin, pantothenic acid, iodine, zinc, copper, chromium, chloride, iron, thiamin, niacin, folic acid, biotin, phosphorus, magnesium, selenium, manganese, molybdenum *Gluten free* $32.94/18 packets
Shakeology® Greenberry (1 scoop (40 g) per serving, no recommended daily serving size) Dist. by Beachbody, LLC Ingredients	***NOT* APPROVED**	Found 12.7 mcg of lead per daily serving	16 Whey protein isolate	19 / 11	<0.5 / 0 / 0	95 / 10	140	$3.83[2] [$4.79] Fiber (3 g), vitamins A, B1, B2, B3, B6, B12, C, D, E, K1, folic acid, biotin, pantothenic acid, calcium, iron, phosphorus, iodine, magnesium, zinc, copper, manganese, chromium, molybdenum, blends of greens, fruits herbs, pre- and probiotics, enzymes *Gluten free* $114.99/2.6 lb (1,200 g) container (approx. 30 servings)
Slim Fast! 3—2—1 Plan Shake Mix Chocolate Royale (1 scoop (26 g) per serving, no recommended daily serving size) Dist. by Unilever Ingredients	**APPROVED**	✓	2 Milk protein concentrate	18 / 10	4 / 0.5 / 0	130 / <5	110	$0.51[2] [$5.14] Fiber (4 g), vitamins A, B6, B12, C, D, E & K, calcium, iron, thiamin,

Ingredients $ Price Check								riboflavin, niacin, folate, biotin, pantothenic acid, phosphorus, iodine, magnesium, zinc, selenium, copper, manganese, chromium, molybdenum $17.49/31.18 oz. (884 g) container (approx. 34 servings)

Tested through CL's Quality Certification Program prior to, or after initial posting of this Product Review.

*** - Term "BCAAs"** means branched chain amino acids (leucine, isoleucine & valine)

NL-None listed

1 Not tested but claimed on label.

2 Based on 1 serving daily.

ConsumerTips™ for Buying and Using:

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 or rice?

Four types of protein — whey, casein, soy and/or rice — are commonly found in nutrition powders and drinks. Whey and casein are both derived from milk (the protein in milk is 80% casein and 20% whey). Soy is vegetable-based. The pros and cons of these 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.

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 iso-leucine 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 hydrosolates — 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 most pure of all the whey proteins, but may have reduced immunostimulant properties due to chemical processing.

Isolates, hydrolysates, and other purified forms are typically more expensive than concentrates due to the additional processing. All whey proteins should be avoided by anyone who is allergic to milk proteins.

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 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, casein may be more beneficial 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).

Popular forms of casein are micellar casein (the natural, un-denatured form of casein found in milk) and calcium caseinate, which is a good source of calcium.

Soy

Soy is the most "heart healthy" source of protein, as well as being acceptable to vegetarians. Research clearly shows that soy can lower cholesterol levels. In addition, according to the FDA, 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. Soy does not contain much fat or cholesterol, particularly if a soy "isolate" is used. Soy isolates may also provide higher amounts of soy isoflavones such as genistein, daidzein, and glycitein than a soy protein concentrate, offering other benefits such as a reduction in menopausal symptoms (see Product Review of Soy and Red Clover Isoflavones for more information about isoflavones.)

Soy protein is considered a complete protein, equivalent to human protein, although it contains little of the sulfur-containing amino acid methionine. 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).

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. While soy allergies are rare, those allergic to soybeans should also avoid soy protein.

Higher intake of soy and soy foods (such as in Asian countries) has been associated with a lower risk of prostate cancer, but a protective effect has not been

established. To test for a benefit, researchers in the U.S. recently 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).

Rice

While much of rice seed is carbohydrate, it also contains protein, which can be separated out enzymatically. Rice protein is not a complete protein because it lacks one of the essential amino acids, isoleucine. However, it, like soy, can be combined with other protein sources to provide all the essential amino acids needed in your diet. 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, is a complete protein and rich in essential branched chain amino acids (BCAAs). 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 and the other two (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.

Using protein powders and drinks as meal replacements:

The United States Department of Agriculture (USDA) recommends 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 60% or fewer calories come from carbohydrates, at least 10% come from protein (meat and vegetable proteins), and about 30% 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.

Powders and drinks may also contain an array of sweeteners. Some are sugar-based such as sugar, fructose, honey, lactose, maltose, and fruit juices. 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. Be aware that some products now 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 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/.

Proper Storage:
If in a dry, powder form, protein is quite stable and should not degrade unless temperatures exceed 115° (46° Celsius). However, once a container is opened, the protein can be affected by humidity. Moisture levels above 10% can cause protein to begin to degrade. 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. Do not store these supplements in the refrigerator, because if you remove them and leave them open, moisture may accumulate due to condensation.

On the other hand, liquid supplements, such as ready-to-drink sports drinks, are generally more sensitive to heat and can become unstable and degrade quickly. If you live a hot climate, it may be preferable to refrigerate these, particularly after opening.

Cautions and Concerns:
Increased protein in the diet results in increased protein metabolism and urea production, which in turn increases urine output. The combined factors of a high protein intake and an inadequate fluid intake can result in severe dehydration, which has deleterious effects on performance. Overall, remember to increase fluid consumption if your diet requires a higher than normal amount of protein. High-protein diets can also increase calcium turnover from bone, resulting in calcium loss. However, 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.

Carnitine is sometimes found in protein powders, although it is not known to be of benefit in sports. Recent 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.

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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