The Wonders of Whey Protein

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Until about 1980, about half of all the whey produced was dumped as waste product into local waterways. However, two events took place to change how whey was addressed: First, more strict environmental laws were forbidding regular dumping of industrial byproducts; and second, researchers started to investigate all the benefits of using whey, which created a new source of revenue. This article will discuss the many benefits of whey protein products, and what the research says about how it can benefit those involved in strenuous exercise.

Many active people today have heard of whey protein, but many may not know exactly what it is. Whey is the thin, watery portion of milk that is obtained by coagulation and removal of the curd (casein) during cheese production. The whey proteins are then separated from the liquid whey and purified to various concentrations of whey protein. Not only are whey products used in such foods as baked goods, toppings, salad dressings, and emulsifiers, they are also used as high-quality protein sources in energy bars, protein powders, infant formulas, and medical nutritional formulas.

Whey contains almost all the vitamins and minerals of milk. Alfa- and beta-lactalbumin, which are immunoglobulins, comprise between 70 – 80% of whey. These provide high levels of essential amino acids and branched chain amino acids (BCAA). Many of the individual components found in whey can now be isolated to carry out specific needs or can be further added to commercial whey products.

It is felt that, when comparing whey protein to casein, whey is a superior product. Whey appears to offer more benefits to the immune system, is digested and absorbed faster, is a higher-quality protein, and may have better antioxidant properties.

Whey also appears to exert more beneficial effects than soy protein as whey offers a more complete protein and does not inhibit absorption of other nutrients. Research has shown that eating soy foods can be beneficial to a healthy diet because they supply the body with what are known as phytoestrogens or isoflavones. However, when these substances are concentrated, as when in supplement form, it is believed that too much of a good thing may actually be harmful to your health. Therefore, consuming soy in forms other than as food is not recommended at this time.

There are several forms of whey protein (see Table 1):

- *Whey powder* is produced by taking the whey directly from cheese production, clarifying it (removing fat), pasteurizing it, and drying it to provide a fine white powder.
- *Whey protein concentrate* typically uses what is called ultra filtration technology to filter or concentrate whey components. Ultra filtration basically causes the larger protein molecules to remain while filtering out lactose and ash, which results in a higher concentration of protein. Although the concentration of protein can range between 25 – 89%, most products contain at least 80%.
- The highest concentration of protein comes in *whey protein isolate*. These products have a protein concentrate of 90% or higher as a result of both micro filtration and ion exchange. Micro filtration is much like the above-mentioned ultra filtration, except the filter is smaller. To get higher protein concentration, additional lactose and fat are removed. This process maintains the naturally occurring bioactive components present in whey that are mentioned below. Because this form of whey is so low in lactose, those who are lactose-intolerant can often safely take this product.

Table 1

Typical Whey Protein Ingredient Composition			
Whey Components	**Whey Powder**	**Whey Protein Concentrate**	**Whey Protein Isolate**
Protein	11% to 14.5%	25% to 89%	90% +
Lactose	63% to 75%	10% to 55%	0.5%
Milk fat	1% to 1.5%	2% to 10%	0.5%

Many sports nutrition products, infant formulas, and medical nutritional formulas use products with hydrolyzed whey protein. The process of hydrolysis breaks down the protein into smaller segments called peptides. Peptides are small chains of amino acids. This makes the protein easier to digest and reduces the potential for allergic reactions.

High quality whey protein powders are available in all forms, combined with many other ingredients or found as just plain whey protein. Other ingredients found in whey products are creatine, extra BCAAs, and glutamine. Many are sweetened with sugar, artificial sweetener, or an herbal sweetener known as Stevia. Some also have added flavors, such as vanilla. Whey protein isolate provides the highest yield available, but this does not necessarily mean it's a superior product over whey protein concentrate. In fact, many products contain both. Most products supply an average of 20 grams of protein per serving, but this can vary greatly, depending on the product and its goals. Ultimately, taste will determine a person's favorite product. The most common way to use the powders is by adding to fruit or juice to make a smoothie, or to add it to foods such as cottage cheese.

Most recommendations for the amount of whey protein intake depend on the individual needs. Most research does not support a total protein need higher than 0.6 – 0.9 grams per pound of body weight and an intake of 25 grams of whey protein appears to be adequate to fit these needs, along with a healthy diet.

Probably the most researched and used benefit in eating whey protein is to the immune system. Numerous studies have shown that whey proteins, which are high in the amino acid cysteine, help enhance the body's immune system by raising glutathione levels[1]. Glutathione is a powerful antioxidant with the ability to help the body reduce the risk of infections by making the immune system more responsive. Antioxidants help fight against disease. Commonly known antioxidants are vitamins, such as vitamin C, E and A.

One of the largest organs responsible for fighting disease is our gastrointestinal tract. The intestinal tract is a diverse bacterial universe that consists of more than 400 different species of bacteria, each with multiple strains. While both harmful and friendly bacteria coexist in this environment, it's very important for our overall health that the beneficial bacteria dominate. These beneficial bacteria, known as probiotics, are responsible for keeping the gut healthy. Typical examples of probiotics are *Lactobacillus acidophilus* and *Bifidobacterium lactis*. Most people are familiar with these products in the form of yogurt and kefir.

Prebiotics are substances that promote the growth and activity of these beneficial bacteria. Two common examples of prebiotics are fructooligosaccharides (FOS) and inulin, which are non-digestible carbohydrates that act as a food source for the probiotics. Whey proteins have been found to also improve intestinal health by way of their prebiotic value. Components of whey that act as prebiotics include the immunoglobulins, lactoferrin, glycomacropeptide (GMP) and dietary calcium.

Immunoglobulins (Igs) are probably the best-known of these agents. Igs are basically proteins responsible for the body's antibodies, who act as soldiers fighting against pathogens. Examples of Igs are IgG, IgM and IgA. IgG has been shown to bind to the toxins that cause infections leading to diarrhea, dehydration and muscle aches.

Lactoferrin (Lf) is another element that works as a prebiotic. As an iron-binding protein, studies show that this protein survives passage through the stomach and small intestine and is able to seize iron from bacteria in the lower bowel. Since many pathogens have high iron requirements, this property of Lf makes it broadly antimicrobial (capable of destroying or inhibiting the growth of microorganisms) in nature.

Whey protein is a popular protein supplement for fitness primarily because of its high concentration in the branched chain amino acids (BCAAs), leucine, isoleucine, and valine. BCAAs are needed for the maintenance of muscle tissue and appear to preserve muscle stores of glycogen, the storage form of glucose[2], and may help prevent muscle protein breakdown during exercise[3]. Consequently, taking whey as the protein source for pre-exercise and post-exercise, along with a carbohydrate source, may exert a beneficial effect to the training muscles.

A consistent finding in research has shown the immune-boosting benefits of whey. A review by Ha and Zemel[4] concluded that the most significant benefit of taking whey products in exercise was in improved immune function. Several published reviews of the literature concluded that more research is still needed to determine the benefit of amino acid supplementation in exercise training[5, 6].

Studies on other benefits of whey protein to exercise are mixed. When comparing whey protein and exercise to exercise alone in women with HIV, Agin et al[7] found that whey protein had little effect on muscle mass, but did improve quality of life, which again substantiates the immune-enhancing benefits. However, another study showed increased lean tissue and bench press strength when subjects combined whey protein with creatine.

However this combination did not show greater results for squat strength and quadriceps strength[8]. So, combined with other ergogenic aids, whey may offer some athletes a competitive edge.

There are many other benefits to whey protein intake beyond the focus of this article, but are worth mentioning:

1. Whey protein is a key ingredient in many infant formulas because alpha-lactalbumin is the main component in human breast milk
2. Alpha-lactalbumin is high in tryptophan, a natural relaxant. A recent study showed that a diet including alpha-lactalbumin-enriched whey protein was helpful in improving mood levels and increasing serotonin levels in the brain[9].
3. Some studies suggest that whey protein may provide benefits to people with borderline high hypertension. Many studies are currently in progress on this topic.
4. Whey protein shows promise to help fight many cancers through its glutathione antioxidant system (GSH)[1].

So, the often seen statement that whey is an 'ultimate protein' doesn't appear too far off the mark. It can supply an easily digested, complete protein for replenishing the muscles and help boost the immune system as a bonus! It appears to have superior qualities over casein and soy products, and it is widely available. For someone looking for the best protein source to supplement their diet, this would probably be my first recommendation.

A great idea for a home-made smoothie after a workout is to combine in a blender:

1 cup nonfat soy milk

1 scoop of whey protein powder (any kind)

2 tablespoons ground up flax seeds.

Turn blender on for a short second to combine ingredients. Then add between 1 – 1½ cups frozen mixed berries and blend until you have the consistency you want. Further sweeten to taste.

This will provide between 23 – 50 grams protein, approximately 35 grams carbohydrate, 0 – 3 grams fat, about 6 grams fiber from the flax seeds, and around 250 calories. These totals may vary, depending on the products used.

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About the Author

Marjorie has an extensive background in nutrition and exercise. She started teaching exercise classes in 1980 and was the manager of a small health club before returning to school. In 1990, she graduated from Loma Linda University with a degree in Nutrition & Dietetics. In 1996, she started MEG Fitness to provide in-home personal training for older, previously unfit older adults and nutrition counseling, primarily sports nutrition and functional nutritional therapy. She is a Registered Dietitian (RD) and a personal trainer, certified through NSCA. She is currently the secretary for NSCA's Personal Trainers SIG.