# James L. Holly, M.D.

## Whey and Glutathione - Part III
## By: James L. Holly

Milk is 87% water and 13% solids. The milk solids are composed of 30% fat, 6% ash and minerals, 37% lactose and 27% proteins. Of the milk proteins, 80% are caseins and 20% are whey proteins. When cheese is produced the liquid whey separates from the "curd," or casein. The whey proteins are then separated from the liquid whey and purified to various concentrations. The composition of whey protein products will vary based upon:

- source of the milk
- method of production
- type of cheese being produced
- individual manufacturer specifications

"Whey protein isolate" is the purest form of whey protein and contains between 90--95% protein. It contains little if any fat or lactose. "Whey protein concentrate" will vary between 25-89% protein. "Whey protein concentrate" at an 80% protein content is the form most readily available as a protein powder supplement.

Hydrolyzed Whey Protein

Hydrolysis breaks the protein chains down into smaller segments called peptides. Hydrolyzed whey protein is more easily digested and has a reduced potential for allergic reactions versus non-hydrolyzed whey protein. The quality of the protein remains very high. Sports nutrition products and infant formulas often use hydrolyzed whey protein for these reasons.

What Components are found in Whey Protein?

- Beta-lactoglobulin -- Makes up approximately 50-55% of whey protein. Beta Lactoglobulin binds fat soluble vitamins making them more available to the body. Provides an excellent source of essential and branched chain amino acids, helping prevent muscle breakdown and is beneficial to patients with liver disease.

- Alpha-lactobumin -- Makes up 20-25% of the whey protein. This is the primary protein found in human breast milk. It is high in tryptophan with potential benefits in sleep regulation and mood improvement under stress.
- Immunoglobulins -- Makes up 10--15 % of the whey protein. Provides immunity enhancing benefits to infants and others. This is the predominant whey protein component found in colostrum.
- Bovine Serum Albumin -- Makes up 5-10% of whey protein.
- Glycomacropeptide -- Helps inhibit the formation of dental plaque and dental cavities. It does not contain phenylalanine which is important for those with PKU.
- Lactoferrin -- Makes up 1-2% of the whey protein. Inhibits the growth of bacteria including some pathogenic bacteria and fungi due to its ability to bind iron. Iron is an essential nutrient often required for bacterial growth. The USDA recently approved the use of lactoferrin on meat to prevent the growth of pathogens such as E. Coli and Salmonella. Promotes the growth of beneficial bacterial such as Bifidus. Helps infants establish good microbial conditions in the intestines. Regulates iron absorption and bio-availability. May help to reduce inflammation. An anti-oxidant that naturally occurs in many body secretions such as tears, blood, breast milk, saliva and mucus.
- Lactoperoxidase -- makes up approximately .5% of the whey protein. Inhibits the growth of iron-dependent bacteria.
- Lysozyme -- makes up less than 0.1% of the whey protein. Contains immunity enhancing properties.

Whey protein is a high quality complete protein containing all of the essential amino acids required by the body each and every day.

The USDA scores the quality of proteins with the Protein Digestibility Corrected Amino Acid Score (PDCAAS). Whey protein has a score of 1.14. The highest value scored by the USDA is 1.0.

Another method to measure protein quality is based upon the evaluation of the growth of animals consuming a fixed amount of dietary protein from a single source. This is called the Protein Efficiency Ratio (PER). Whey proteins have a PER of 3.2 which is one of the highest single source proteins.

A third measure of protein quality is based on the measurement of the fraction of the nitrogen in the diet that remains after the nitrogen losses in the waste products have been subtracted. This is called the Biological Value (BV). Whey protein has a BV of 100, which is higher than the value of casein (milk protein), soy protein, beef, or wheat gluten.

Glutathione Levels and Whey

In our recent discussion of Glutathione, we have suggested that the daily consumption of whey will increase Glutathione levels. In one preliminary clinical study, which used the whey protein concentrate from Immunotec Research, each participant took two pouches

per day for the first three months, and then for the last three months half were randomly chosen to take only one pouch per day. Each pouch contains about 9 grams of high quality undenatured bioactive protein. At the end of the trial, the following results were found.

- increase in well being of participants;
- increase in participant level of energy;
- lymphocytes which were non-responsive to foreign antigens were now effective against microbes;
- level of free radical damage decreased to normal levels;
- antibodies decreased to normal levels, which reflected a reduction in viral, etc.burden;
- decrease in number of relapses;
- reduced the population size of intracellular microbes by inhibiting their multiplication (this included viruses, mycoplasmas and small bacteria);
- success was achieved for participants afflicted with multiple chemical sensitivities; and
- two pouches per day produced the most beneficial results.

In another study, whey protein was fed to mice. Reported in the journal, Clinical Investational Medicine, this study compared the effects of different sources of whey protein concentrate (20 g/100 g diet) and of casein on the spleen, liver, and heart glutathione content of, and on the immune response of their spleen cells to sheep red blood cells. The data indicated that the humoral immune response is highest in mice fed a dietary whey protein concentrate exhibiting the highest solubility (undenatured conformation) and a greater relative concentration of the thermolabile cysteine rich proteins. In addition, the mice fed this type of whey protein concentrate exhibited higher levels of tissue glutathione. The presence in the serum albumin fraction of glutamylcysteine groups (rare in food protein) and the specific intramolecular bond as related to the undenatured conformation of the molecule are considered to be key factors in the glutathione-promoting activity of the protein mixture.

Glutathione levels and improved immune response with Whey Protein

Another study reported the following results. The nutriceutical modulation of Glutathione by the use of whey protein in AIDS and cancer may well find other applications in disease where oxidative stress and pathology of Glutathione metabolism are largely implicated. In a pilot study, this type of whey protein concentrate was found to be well tolerated in children with AIDS and wasting syndrome and was found associated with an improvement of the nutritional status of the patient. Moreover, the Glutathione promoting activity on the peripheral blood lymphocyte of this protein concentrate was validated in patients with initial low Glutathione levels.

Immunocal: Whey Protein, Glutathione levels and Immune response

Immunocal is produced by a proprietary process that preserves the bioactivity of the whey protein. A pharmaceutical-grade product, it contains no additives which might denature (damage) the whey protein. Immunocal® is used in hospitals in North America, and prescribed by some doctors.

Clinical studies have shown that Immunocal® is superior to other whey proteins in stimulating a positive immune response in the body - up to 10 times more than some of the most popular brands on the market! Research has also demonstrated that 60% - 80% of the biological value of the whey protein is lost in making it "mix instantly" or "easy to mix", as other whey proteins are.

Immunocal® is a very fine powder that can be mixed with any juice or liquid. It can also be mixed with yogurt or apple sauce, or sprinkled over cereal. Immunocal® cannot be mixed in a blender or with any liquid that is above lukewarm temperature, since this may destroy the bioactivity of the product.

Cancer, Glutathione and Whey

Additional studies have been done on animals regarding cancer-causing chemicals to see what effects whey protein concentrate would have on cancer prevention or treatment. The rats fed whey protein concentrate showed fewer tumors and a reduced pooled area of tumors (tumor mass index). The researchers found whey protein offered "considerable protection to the host" over that of other proteins, including soy. In vivo research on cancer and whey showed whey protein concentrate inhibited the growth of breast cancer cells at low concentrations. Finally, and most importantly, a fairly recent clinical study with cancer patients showed a regression in some patient's tumors when fed whey protein concentrate at 30 grams per day.

Whey and Glutathione

New research using whey protein concentrate led researchers to a discovery regarding the relationship between cancerous cells, glutathione (GSH) and whey protein concentrate. It was found that cancer cells subjected to whey proteins were depleted of their Glutathione, and their growth was inhibited, while normal cells had an increase in Glutathione and increased cellular growth. These effects were not seen with other proteins. The exact mechanism by which whey protein achieves this is not fully understood, but it appears that it interferes with the normal feedback mechanism and regulation of glutathione in cancer cells.

Whey and other Conditions

Whey protein appears to have benefit in weight control. Whey protein promotes fat loss, while helping to maintain lean muscle mass. Components in whey protein help promote satiety by increasing the level of cholecystokinin in the GI tract. Cholecystekinin is an appetite-suppressing hormone produced by the human brain.

A growing body of scientific evidence reveals that whey contains various bioactive components that may have a positive effect on cardiovascular health. Certain peptides may protect against hypertension through angiotensin converting enzyme (ACE) inhibition. Peptides may also be involved in inhibiting platelet aggregation and lowering cholesterol levels.

Conclusion:

Glutathione is an important element of good health, immunity, cancer prevention and the slowing of the aging process. As a member of the "antioxidant network," Glutathione interacts with other antioxidants to promote health and wellness. Glutathione cannot be taken as a supplement at today's level of knowledge. However, Glutathione levels can be improved by using whey, alpha lipoic acid, methionine, good nutrition and vitamin C, among other vitamins and minerals.

Remember, it is your life and it is your health.