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Whey Protein and Fructose, an Unhealthy Combination

In recent years, there has been a disturbing trend, particularly in the rapidly growing sports nutrition supplement industry to promote both whey protein isolates and fructose as being "ideal" nutrients for building muscle and promoting strength and endurance. Many commercial products directed at the bodybuilder and athlete emphasize these two "nutrients" as their main ingredients, usually without essential fats or fibre in the formula. The question that needs to be asked is what scientific basis is behind these products and what are the potential dangers of long-term consumption of these products?

The manufactures and marketers of whey protein promote whey protein as being a superior protein for humans, particularly regarding athletic performance. They quote "scientific studies" to support their claims with statements such as: "Scientific Study shows whey protein increases nitrogen retention up to 417% higher": "84% more effective for gaining weight": "388% to 834% less nitrogen loss": "Whey Peptides provide "statistically higher nitrogen retention," "improved anabolism" and "better growth" and "weight gain was statistically better on whey protein oligopeptides": "Statistically higher nitrogen retention", "lower nitrogen excretion", "better growth was a result of better protein synthesis", and "improved protein anabolism", etc.

To support these statements the marketers of whey protein refer to a study published in the JOURNAL OF PARENTERAL AND ENTERAL NUTRITION, 1989; vol. 13, No. 4, pages 382-386, by Poullain M.G., Cezard J.P., Roger L., Mendy F. The advertisements only refer to the name of the Journal and do not inform the reader of the full name of the study which is "**Effects of whey proteins, their oligopeptide hydrolysates and free amino acid mixtures on growth and nitrogen retention in fed and starved rats.**"

This study compared whey protein with a free form amino acid mixture designed to mimic the amino acid structure of whey protein oligopeptides. **All of the above statements refer to the effects between whey protein and the amino acid mixture on the growth of starved rats.** The study did not compare other proteins such as egg, casein, or soy protein, so no inference can be drawn as to the "superiority" of whey protein over these other proteins in a starving rat, much less than in the adult human athlete. The marketers of these whey proteins would have you believe that the adult human athlete has the same protein requirements as a starved rat. The metabolism of a rat, particularly a starving rat, is vastly different than that of the human athlete. This is the worst kind of misleading advertising as these marketing statements infer that the study is based on humans, and that whey protein is superior to all other proteins.

While whey protein contains many nutritive components, it is not ideal as a stand-alone protein supplement. Whey protein is not only highly soluble, but it contains a disproportionate concentration of branch chain amino acids (BCAA's). While promoted as benefits by protein marketers, both of these characteristics have been shown in humans, to negatively impact both the digestion and metabolic fate of ingested whey proteins ^(1,2).

It has been demonstrated in humans that whey protein rapidly exits the stomach and may be incompletely absorbed by the GI tract, which may not only prove wasteful, but could potentially increase the chance of GI upset and bloating ⁽¹⁾.

A recent study demonstrated that the ingestion of whey protein might actually increase the breakdown of pre-existing muscle tissue. This effect is due to the rapid oxidation of BCAA's, which renders them useless for incorporation into new muscle tissue ⁽²⁾.

In summary, whey protein moves through the human system too quickly, particularly in the absence of dietary fibre, for the nutrients and growth factors to be fully utilized.

There is also considerable concern about the long-term health risks of animal protein in general. Long-term consumption of animal proteins can cause significant hypercholesterimia and elevated blood levels of

homocysteine (a derivative of methionine which can damage the artery walls if allowed to accumulate in the body's blood and tissues). Elevated homocysteine increases the risk of vascular disease. Meat, egg and milk are high in cholesterol, and their proteins are high in methionine, a sulphur amino acid, an excess of which has been shown to interfere with the metabolic breakdown of homocysteine⁽³⁾ by suppressing the action of Vitamin B6, Folic Acid and Vitamin B12. Individuals consuming a diet high in animal protein, whose plasma lysine to arginine ratio is 3.5 to 1 or higher value as in whey protein, have a significantly increased atherosclerosis risk due to excessive dietary lysine. Animal protein has a L/A ratio of 3-4/1, while plant protein has a L/A ratio of 1-1.25/1⁽⁴⁾.

Whey Protein and Bone Loss

A recently completed study⁽¹⁰⁾ comparing bone loss in the lumbar spine in peri-menopausal woman showed that the control group who supplemented the diet with whey protein, significant bone loss occurred. In the group who supplemented the diet with isoflavone-rich soy protein, significant positive effect on bone mineral density (BMD) and bone mineral content (BMC) occurred. The researchers at Iowa State University concluded that regular consumption of isoflavone-rich soy protein could translate into a decrease in lifetime risk of osteoporosis. By analogy, regular consumption of milk proteins such as whey could increase the lifetime risk of osteoporosis.

Whey Protein increases creatine kinase activity after strenuous activity.

According to a recently published study⁽¹¹⁾ creatine kinase activity, an indicator of muscle damage following strenuous aerobic exercise, actually increased after participants consumed whey protein, whereas the increase after each bout of exercise lowered for those participants who consumed Supro®Soy beverage. The same study also showed that soy protein limited an exercise-induced increase in plasma myeloperoxidase, which is an inflammation marker. Comparatively, whey consumption had no effect on the level of inflammation monitoring.

Milk proteins such as colostrum and whey also contain IGF-1, a potent growth hormone. IGF-1 has been linked to cancer in humans. For a more detailed review, see the articles: Milk and the Cancer Connection and Breast Cancer, RBGH and Milk.

The important quality of protein is its digestibility and absorption. The scientifically accepted protein rating for pre-school and school age children and for adults is the Protein Digestibility Corrected Amino Acid Score (P.D.C.A.A.S.). The PDCAAS is mandated by the FDA as the measure of protein digestibility. Milk, egg and isolated soy protein have the highest possible score, equivalent to 1, which is better than beef or chicken.

High quality isolated soy protein shares all the positive benefits of whey, egg and milk proteins in that it is a complete protein with the highest possible PDCAAS, while being cholesterol free, and with methionine levels more in line with human needs. Soy protein is not only cholesterol free, but contains saponins that decrease cholesterol absorption by competing for cholesterol binding sites⁽⁵⁾. In addition, soy protein contains other components including isoflavones (especially Genistein) which help lower cholesterol and lower the risk of cardiovascular disease⁽⁶⁾. Genistein also stimulates bone formation by increasing both bone mineral content and density⁽⁷⁾.

Adequate protein is essential to support fitness training and hard physical labour. Protein requirements are based on total energy need, body mass, type of activity, level of training, age, sex, and climate, temperature and altitude. Protein however is not the only macronutrient necessary for maintaining good health, and for improving athletic performance. Carbohydrates, essential fats and dietary fibre also play essential roles. The most important consideration is the balance between these four macronutrients. Most research indicates that dietary protein should make up between 15% and 30% of total calories, while carbohydrates should be between 50% and 70%, and essential fats should make up between 15% and 20% of total calories (saturated

fats should be as close to 0 as possible). Fibre intake should be at least 12 grams per 1000 calories per day.

Protein level of 30% of total calories is optimal only for the most advanced strength athletes who are involved in a rigorous training programme. For example, a 220 lb. professional body builder who consumes 5000 calories a day can use a maximum of 375 grams of protein daily. Any excess of this amount will be either burned as calories, or excreted. A moderately active athlete who consumes 3500 calories a day would need approx. 25% of total calories from protein or 220 grams of protein daily. On the other hand, the average individual who consumes 2000 calories a day would only require 15% of total calories from protein or 75 grams of protein daily.

The promotion of fructose as a safe and natural sugar is another of the myths fostered on the public by the makers and marketers of this highly refined commercial sweetener ⁽⁸⁾.

Commercial fructose is not obtained from fruit but rather it is usually synthesized from genetically modified corn. Fructose is a highly refined source of empty calories and a causative or contributing factor in heart disease, diabetes, cancer, obesity and accelerated ageing.

A trail of medical studies dating back more than twenty-five years fingers high fructose consumption as a causative factor in heart disease. It raises blood levels of cholesterol and triglycerides, it makes blood cells more prone to clotting, and it may accelerate the ageing process.

According to John Yudkin, MD., PhD., professor emeritus at Queen Elizabeth College, London, and an expert in the health effects of sugar, "People should avoid it". There's good reason to believe that, from an evolutionary standpoint, our bodies can't handle large quantities of sugar, particularly fructose.

In medicine, the first alarms about the link between sugar consumption and heart disease were sounded by Yudkin in the late 1960s. At that time, he was chairman of the department of nutrition at Queen Elizabeth College, London. Disturbed by inconsistencies in the evidence linking animal fats to heart disease, Yudkin began searching for another dietary factor.

An expert in carbohydrate metabolism, Yudkin initially focused on sucrose consumption. In laboratory and human tests, he found that sucrose increased blood levels of cholesterol, triglyceride, uric acid, insulin and cortisol - all associated with an increased risk of heart disease. Sucrose also raised blood pressure and increased the fragility of blood platelet cells, making them more prone to clotting. As dramatic as those findings were, the real surprise came according to a study when he substituted fructose for sucrose in his experiments. "The effects of eating sucrose in the quantities we eat are magnified with fructose. Fructose is the dangerous part," he said. In contrast, glucose did little more than cause cavities.

Fructose has been touted for years as a safe sugar for diabetics because it doesn't trigger a rapid rise in blood sugar. That is somewhat true, but the cardiovascular consequences may outweigh the benefit for diabetics, who already face a higher than average risk for developing heart disease.

In a recent study, John Bantle, MD., of the University of Minnesota sequentially placed 18 Type 1 (insulin dependent) and Type 11 (non-insulin-dependent) diabetics on two diets. The only difference between the diets was that one contained carbohydrate as starch, which is digested as glucose, and the other contained carbohydrate as fructose. When the diabetics consumed the fructose, the diabetics had fewer spikes in blood sugar levels. Three of the Type 1 diabetics were able to reduce their insulin intake, a positive change. However, according to Bantle's report in the Nov. 1992 Diabetes Care, the diabetics' total cholesterol rose an average 7 percent, and their "bad" low-density lipoprotein (LDL) cholesterol rose almost 11 percent. The fructose increased the risk of heart disease.

Bantle also noted the same effects in a study of 14 healthy volunteers who sequentially ate a high-fructose diet and one almost devoid of the sugar. While on the fructose diet, the subjects' total cholesterol increased by 9 percent and the LDL fraction increased by 11 percent.

Add fructose to the typical North American high fat diet, as most people do, and the risk of heart disease increases even more. Sheldon Reiser, PhD., of the US. Department of Agriculture's Human Nutrition Research Center in Beltsville, Md., studied 21 men eating two kinds of high fat diets. The diets were the same except for the carbohydrate. One used simple starch, the other 20 percent fructose. The cholesterol and triglyceride levels of all the men increased while they consumed the high-fructose/high-fat diet, but not while they ate a high-starch/high-fat diet. Ten of the men began the study with high blood levels of insulin - another risk factor for heart disease - and their cholesterol and triglyceride levels rose a whopping 30 - 50 percent.

Fructose and sucrose contribute to heart disease in yet another way. Dietary sugars increase what doctors call "spontaneous platelet aggregation", an unnatural tendency toward blood clotting. But published in the Aug. 1, 1990, *Thrombosis Research*, fructose promotes abnormal clotting much more than does any other common sugar.

Recent research by Forrest Neilsen, PhD., of the USDA's Human Nutrition Research Centre in Grand Forks, ND. found that fructose interferes with copper absorption, an essential mineral needed to create haemoglobin in red blood cells. "Copper is affected by fructose." Neilsen said. "With a high intake of high-fructose corn syrup, people might show signs of copper deficiency and may need to enhance their copper intake." In addition, when five volunteers ate a diet with 20 % fructose, their total cholesterol and LDL cholesterol shot up. But the combination of suppressed copper and high fructose also increased the number of free radicals, damaged molecules that contribute to cancer and ageing.

There's another significant side effect of fructose. It cross links protein in what biochemists call the Maillard reaction which occurs in the human body., and it is suspected as a factor in diabetes and ageing, according to William Dills, PhD., a chemist at the University of Massachusetts at Dartmouth. Dills noted in the November 1993 *American Journal of Clinical Nutrition* that the relationship between the "Maillard reaction-related cross-link in proteins, cells and tissues and the overall ageing process appears indisputable."

According to a study published in the April 2004 issue of *The American Journal of Clinical Nutrition*, "Consumption of high-fructose corn syrup (HFCS) in beverages may play a role in the epidemic of obesity." HFCS was introduced into the food supply just before 1970 and increased rapidly to constitute more than 40% of the sweeteners used by 2000. The increase in HFCS just preceded the rapid increase in the prevalence of obesity that occurred between the National Centre for Health Statistics survey in 1976-1980 and the next survey in 1988-1994. Obesity is one of the main causes of non-communicable diseases. The economic and healthcare costs of NCDs are already high in many developed countries. In the US alone that cost has risen to more than \$120 billion annually .

Additionally ⁽⁹⁾:

- fructose feeds acid-producing mouth bacteria; increases mouth acidity by 100 times; results in tooth decay (dental caries);
- stresses pancreas (insulin levels double); long term results may be diabetes;
- stresses adrenal glands; increases adrenalin levels;
- serves as food that increases the growth of candida, bacteria and fungi;
- inhibits the body's ability to metabolize essential fatty acids;
- inhibits production of vital, hormone-like, regulatory prostaglandins;
- increases the likelihood of gout by increasing uric acid production;
- inhibits immune function; increases risk of allergies & cancer;
- blocks activity of growth hormone;

- depletes chromium, zinc, B-complex vitamins and other essential nutrients from the body

As can be seen in these paragraphs, there is cause for concern regarding regular consumption of whey protein and fructose, particularly when they are used together as is the case in many of the popular sport nutrition supplements. There are many other health concerns concerning these two "foods" which interested individuals may discover, but which is beyond the scope of this short essay.

The most important consideration in choosing a sport nutrition supplement for long term use is the quality and balance of the four macronutrients: protein, carbohydrate, essential fats and fibre. Beware of the marketing hype that promotes whey protein and fructose as "ideal" nutrients for athletic performance because they are not. These marketing statements are designed to sell products, not to promote long-term good health.

Good health is obtained through a proper balance of wholesome food and food supplements, adequate exercise, positive mental attitude and avoidance of those things that have been shown to cause harm, which include (but not limited to) tobacco, alcohol, saturated fat, refined sucrose and fructose and animal protein.

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