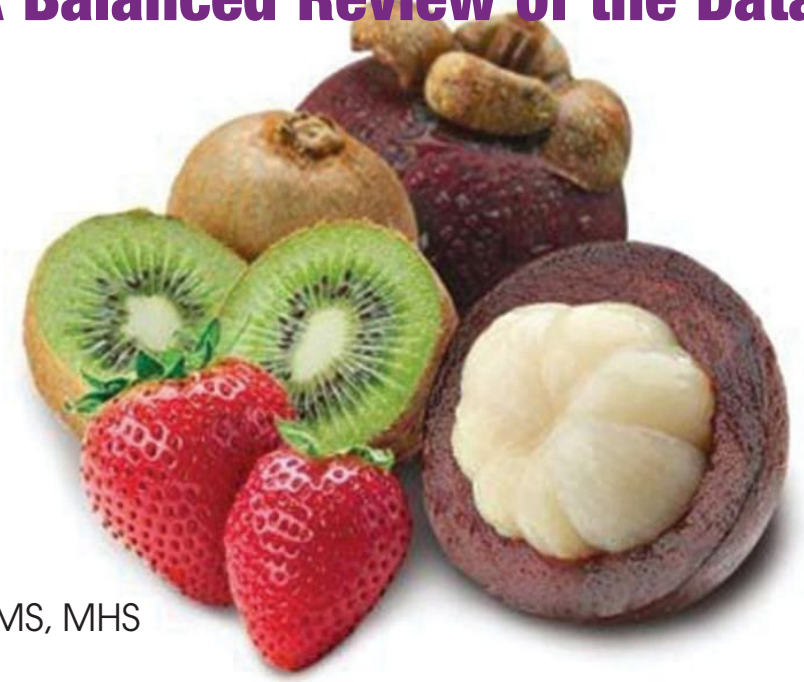
Glyconutrients:

A Balanced Review of the Data



By Gene Bruno, MS, MHS

The term "glyconutrient" was first used in the 1990s to refer to eight plant monosaccharides (i.e. sugars) obtained from a dietary supplement designed to supply a reproducible source of the principal carbohydrates found in the sugar chains of glycoproteins and glycolipids.[1] These eight major monosaccharides are found in the sugar chains present in glycoconjugates, a major class of molecules that include glycoproteins, glycolipids and proteoglycans. While glycoconjugates undisputedly play many important roles in wellness and disease, is there any value in supplementing with glyconutrients?

The Eight Plant Monosaccharides

To start the discussion, let's first identify the eight plant monosaccharides that make up glyconutrients. Five of the eight plant monosaccharides consist of galactose, glucose, mannose, xylose and fucose. Then, depending upon the source, the remaining three consist of arabinose, glucosamine and rhamnose[2], or N-acetylgalactosamine (GalNAc), N-acetylglucosamine (GlcNAc) and N-acetylneuraminic acid.[1] According to some[3], the eight monosaccharides that make up glyconutrients seem to have been chosen somewhat randomly since there are others that could also have been included.

The Argument for Supplementation

Some dietary supplement companies have made the argument for supplementation with glyconutrients because we may not be receiving these beneficial sugars in the right amounts from the food we eat.[4] Other sources have argued that some of the eight monosaccharides have diminished markedly in fruits and vegetables, and many of us are not eating sufficient amounts of fruits and vegetables in the first instance.[1] In addition, it has been argued that not all of the eight sugars can be derived from glucose via various enzymatic reactions as previously thought. According to Sierpina and Murray:

"… there is now evidence indicating that glucose may not be sufficient, at least under certain circumstances. For example, mannose is incorporated into glycans without involving glucose. Some of the sugars and the polysaccharides (plant gums) from which they are derived exert biologic effects independent of glucose (e.g., the use of glucosamine in the management of osteoarthritis, and the use of mannose and fucose in the treatment of certain congenital disorders of glycosylation)."[1]

The Argument Against Supplementation

The basis for the argument against supplementation with glyconutrients includes the contention that, although sugars such as glucose are essential for normal functioning of the body, true deficiencies are rare except in malnourished patients. According to Memorial Sloan-Kettering Cancer Center:

"Humans can convert saccharides into different forms according to the body's needs. More complex polysaccharides, such as beta-glucan, have been studied for their immunomodulating effects, but it is unclear if the marketed products contain substantial amounts of such polysaccharides."[2]

In addition, a lawsuit filed by the Texas Attorney General has accused some dietary supplement companies (Mannatech) selling glyconutients of using "… false, misleading or deceptive acts or practices …" to "… sell [glyconutrients] as a way to cure, mitigate, treat, or prevent diseases, illnesses or

serious conditions, despite [their] admission that the products do not cure any disease, and despite the fact that this marketing violates both federal and state food and drug laws …"[5]

The Scientific Evidence

Let's temporarily step away from the arguments for and against, and examine the scientific literature on glyconutrient supplementation in human subjects:

Asthma. In a randomized double-blind placebo-controlled trial[5], 87 children with asthma were treated with glyconutrients and/or phytonutrients. Results showed that the glyconutrient group has a non-statistically significant trend toward fewer exercise-induced asthma symptoms. Both groups experienced significant improvements in peak flow variability (i.e. exhaling). This six-month study did not show any improvements in the primary outcome measure of quality of life. It did not show any improvements in secondary measures, including emergency room visits, missed school days due to asthma, nighttime symptoms, nebulizer treatments required, rescue medication treatments required or days of allergy symptoms. In short, the best than can be said is that this study suggests glyconutrients may have a marginal benefit for asthmatic children.

Cystic Fibrosis. A retrospective study[6] was conducted to evaluate the potential benefits of glyconutrient supplementation in cystic fibrosis patients who were all being treated with standard medical therapy. Out of 108 patients who responded to a questionnaire (the method used for evaluation), 90.7 percent reported positive changes in cystic fibrosis symptoms, 70.4 percent reported improved pulmonary symptoms, 28.7 percent reported reduced chronic cough, 15.7 percent reported less nebulizer use, 77 percent reported improved digestive function and 33.3 percent reported less difficulty in gaining weight. While this study was promising, retrospective analyses are well-known to be confounded by recall bias, placebo effect and patient/parent expectations. A blinded, placebo-controlled, randomized trial is needed to validate this preliminary report.

Myasthenia Gravis. A 52-week, open-label, matched-crossover pilot study[7] was conducted to examine the effect of nutraceutical supplementation as an aid in support of various innate physiological mechanisms involved in 19 myasthenia gravis (MG) patients. Patients were started on a fixed serving of nutraceutical supplements, with servings to be increased if needed to support a response rate of approximately 75 percent. The supplement intervention consisted of 1 tsp. glyconutrient powder three times daily in food or juice, .25 tsp. phytonutritient powder three times daily in food or juice, one plant phytosterol complex three times daily, and one vitamin and mineral supplement three times daily. The results showed a statistically significant decrease in quantitative MG scores of 72.3 percent, and statistically significant subjective score improvement of 43.9 percent in activity of daily living, 44.8 percent in energy, 44.3 percent in endurance, 48.1 percent in productivity and 47 percent in quality of life. Although the results of this study were good, the fact that several dietary supplements were used at the same time make it impossible to attribute the positive effects specifically to the gluconutrient supplementation.

Brain Activity. A randomized, double-blind, placebo-controlled study[8] was designed to evaluate the effects of a single dose of a glyconutrient supplement on resting brain activity in 20 healthy male college students. The results showed that, relative to placebo, the glyconutrient supplement significantly enhanced power in three brain wave frequencies (theta, alpha and beta) that are known to be associated with attention and arousal. Whether the apparent enhancement of arousal is associated with improved task performance was not determined; however the next study reviewed suggests that there may be positive benefits.

Cognition & Memory. Two randomized, double-blind, placebo-controlled, counterbalanced studies[9] were conducted on 62 college students to assess the influence of glyconutrients on perception, cognition and memory. These studies demonstrated that participants receiving the glyconutrient supplement performed significantly more accurately on the visual discrimination task and the first session of the simple working-memory test.

Conclusion

The research results for glyconutrient supplementation are mixed. At this time, it appears that there may be a basis to glyconutrient supplementation for promoting cognitive function (although there are certainly other nutraceuticals capable of doing the same or better for less cost). In any case, until additional, well-designed studies are conducted, an assessment of the data suggests that the jury is still out on glyconutrient supplementation. **VR**

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Gene Bruno, MS, MHS, the dean of academics for Huntington College of Health Sciences, is a nutritionist, herbalist, writer and educator. For more than 30 years he has educated and trained natural product retailers and health care professionals, has researched and formulated natural products for dozens of dietary supplement companies, and has written articles on nutrition, herbal medicine, nutraceuticals and integrative health issues for trade, consumer magazines and peer-reviewed publications.