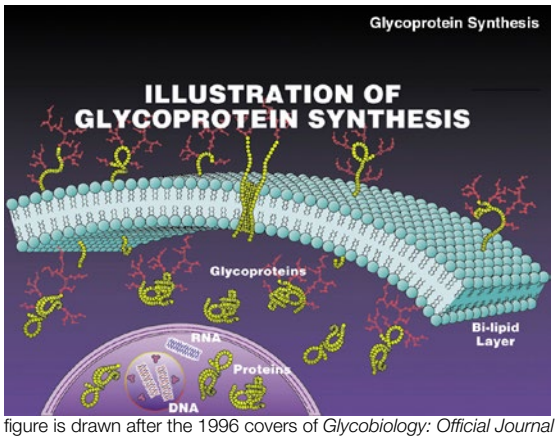
Glyconutritionals Revisited

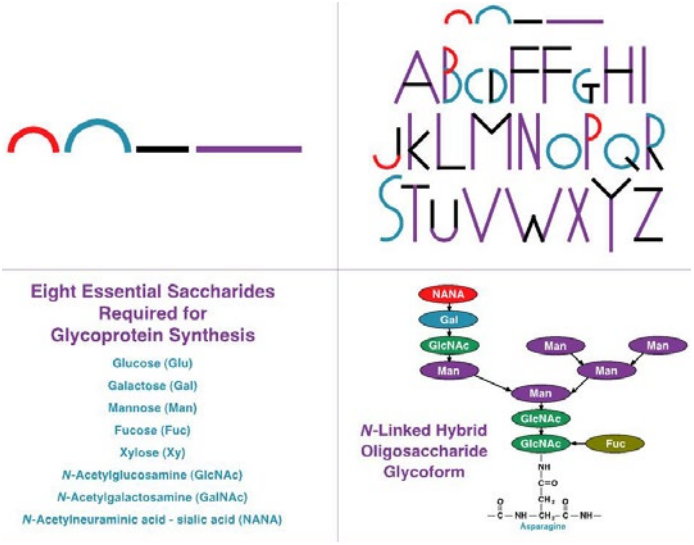
The four major classes of biomolecules are proteins, nucleic acids, lipids (fats) and carbohydrates. Glycoproteins are proteins bound with carbohydrates. "Glyco" means "sweet" and refers to sugars, or carbohydrates. Glycoprotein molecules coat the surface of human cells with a nucleus.



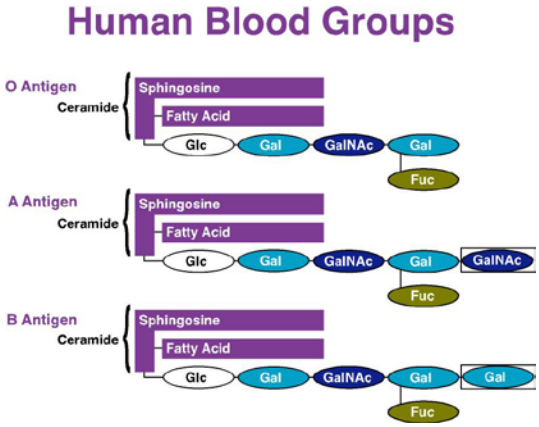
This figure is drawn after the 1996 covers of *Glycobiology: Official Journal of the Society of Glycobiology,* Oxford University Press. The journal acknowledged permission to reprint the original illustration from Oxford GlycoSystems, Ltd.

Nature uses the carbohydrates on cell surface glycoproteins as communication molecules. Eight sugars found on human cell surface glycoproteins are involved in cellular communication (1).

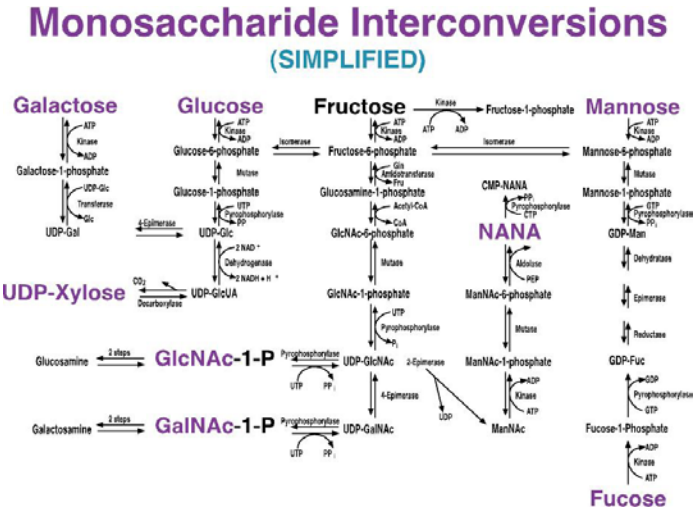
Molecular communication codes are like our written language. Just as four different shapes can be combined to make many letters, and these letters can be combined to make many words, the different carbohydrate molecules combine within our bodies to make many cellular "words".



These words protrude from cell surfaces and are recognized and understood by neighboring cells. The significance of these sugar components of glycoproteins is well illustrated by our different blood types. This figure below shows terminal glycoproteins in the various human blood groups. The only difference between Type O and Types A and B blood is that Types A and B contain an additional sugar molecule. And, types A and B differ only in their terminal sugars. Such seemingly minor distinctions make the difference between life and death in a person given the wrong blood type (2).



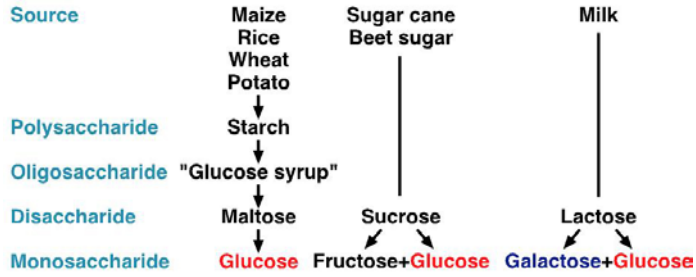
Plants in our diet are the primary building blocks for the sugar portion of these molecules that are so vital to continued good health. A healthy body can break down plant carbohydrates, restructure them into small sugars, then use those sugars to build the glycoforms required for accurate cellular communication and overall wellness. Enzymes are the tools the body uses to build the glyco-portion of glycoforms. Fifteen enzymatic conversions are required to change galactose to fucose (3).



The effectiveness of the enzymatic conversion system to create the needed sugar molecules is not absolute. Some people may be missing one or more of the enzymes needed to make the conversions. The conversion process also requires specific vitamins at certain steps, and these vitamins may be missing. Finally, the conversion process requires time and energy.

The principle sources of dietary carbohydrates are: 1) maize, rice, wheat, and potato, which yield starches composed of glucose; 2) sugar cane and beet sugar, which yield glucose; and 3) milk, which yields galactose and glucose (4).

Summary of Principal Dietary Carbohydrates



People who do not eat dairy products may be deficient in galactose, since the body manufactures galactose from the lactose in dairy products. The remaining six sugars used to make cellular words must either be synthesized by the body through the process described above or obtained from dietary supplements.

Glyconutritionals are dietary supplements designed to provide substrates for the body to use in building the glyco portion of glycoproteins on cell surfaces. Glyconutritionals are designed to make the necessary sugars available to the cells quicker and in greater quantity.

Since 1997, over three million people around the world have safely experienced the benefits of Mannatech's Ambrotose products. These products have been validated in peer-reviewed pre-clinical and clinical published research, including six gold-standard double-blind, placebo controlled trials.† These studies indicate that Ambrotose products do not increase glucose levels in the blood (5) and they support cellular communication by impacting glycoprotein synthesis (6). Ambrotose powders can improve immune system health (7-8), improve cognitive function (5,9-12) and support gastrointestinal health and overall well-being (12).*

REFERENCES

1. Murray RK. Glycoproteins. In: Murray RK, Granner DK, Mayes PA, Rodwell VW, eds. Harper's Biochemistry. Stamford: Appleton and Lange 2000:675-94.
2. Structure and Catalysis. In: Lehninger AL, Nelson DL, Cox MM, eds. Principles of Biochemistry. New York: Worth Publishers 1993:212-52.
3. Zubay GL, Parson WW, Vance DE. Principles of Biochemistry. Dubuque, IA: Wm. C. Brown, 1995.
4. Ensminger AH, Ensminger ME, Konlande JE, Robson JRK. The Concise Encyclopedia of Foods and Nutrition. Boca Raton, Florida: CRC Press, 1995.
5. Best T, Howe P, Bryan J, Buckley J, Scholey A. Acute effects of a dietary non-starch polysaccharide supplement on cognitive performance in healthy middle-aged adults. Nutr Neurosci 2015;18:76-86.
6. Alavi A, Fraser W, Tarelli E, Bland M, Axford J. An open-label dosing study to evaluate the safety and effects of a dietary plant derived polysaccharide supplement on the N-glycosylation status of serum glycoproteins in healthy subjects. Eur J Clin Nutr 2011;1-9.
7. Udani JK, Singh BB, Barrett ML, Singh VJ. Proprietary arabinogalactan extract increases antibody response to the pneumonia vaccine: a randomized, double-blind, placebo-controlled, pilot study in healthy volunteers. Nutr J 2010;9:1-7.
8. Udani JK. Immunomodulatory effects of ResistAid: A randomized, double-blind, placebo-controlled, multidose study. J Am Coll Nutr 2013;32:331-8.
9. Best T, Kemps E, Bryan J. Saccharide effects on cognition and well-being in middle-aged adults: A randomized controlled trial. Dev Neuropsych 2010;35:66-80.
10. Stancil AN, Hicks LH. Glyconutrients and perception, cognition, and memory. Perceptual Mot Skills 2009;10:259-70.
11. Wang C, Szabo JS, Dykman RA. Effects of a carbohydrate supplement upon resting brain activity. Integr Physiol Behav Sci 2004;39:126-38.
12. Best T, Kemps E, Bryan J. Perceived changes in well-being following polysaccharide intake in middle-aged adults. Applied Res Qual Life 2012;7:163-82.

* These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure or prevent any disease.

† Study was at least partially funded by Mannatech. In some cases, this means that Mannatech donated the product that was studied. In other cases, additional funding was provided.