

## Validated Through Scientific Studies

Glyconutrients have been the subject of numerous scientific studies establishing the following results:

- Support Cellular Commutation\*
- Improve Cognitive Function\*
- Improve Memory\*
- Improve Concentration\*
- Improve Attentiveness\*
- Improve Mood\*
- Decrease Irritability\*
- Support Immune System Function\*
- Support Digestive System Function\*
- Stimulates the Immune System\*
- Can Improve the Body's Immune Response to Vaccination Against Bacterial Infections\*
- May Enhance Your Body's Ability to Respond to Pathogens\*
- Enhance the Body's Ability to Respond to Bacterial Vaccines\*
- May Improve the Adaptive Immune Response\*

*\*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.*

### Glycomics, The Study of Sugars in the Body

Glycosylation is the process of attaching sugars to proteins or lipids. To be healthy, we need to have the proper sugars to attach and form the specific messages required for cellular communication.

1990: "Capitalizing on Carbohydrates" article in *Biotechnology Magazine*. Carbohydrates are identified as essential for immune function. Multinational chemical and pharmaceutical concerns identify carbohydrates as forming the next wave of drug development.

## Glyconutrients

Definitive proof! Dr. Azita Alavi and colleagues publish study in the *European Journal of Clinical Nutrition*, 2011 showing for the first time that the oral intake of Ambrotose® powder can have a significant impact on glycosylation status of serum glycoproteins with no adverse effects.

### Glycobiology / Science Websites

Glycoforum

[glycoforum.gr.jp/index.html](http://glycoforum.gr.jp/index.html)

Oxford Glycobiology Institute

[www.bioch.ox.ac.uk/glycob/](http://www.bioch.ox.ac.uk/glycob/)

Society of Glycobiology

[www.glycobiology.org](http://www.glycobiology.org)

Mannatech, Inc.

[www.mannatechscience.org](http://www.mannatechscience.org)

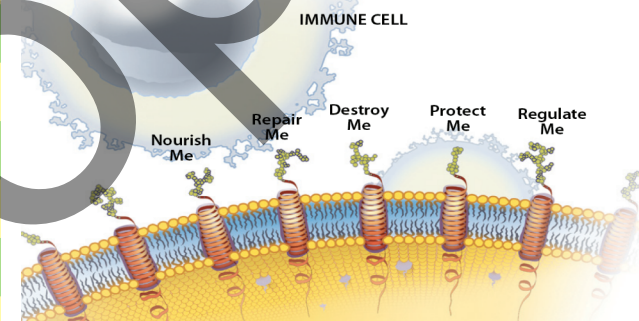
*The only complete glyconutrient product available today with over 50 patents issued worldwide is Ambrotose® Complex.*

*For further information, contact:*

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## GLYCONUTRIENTS

The Missing Link in Human Nutrition



“Glycans - also known as carbohydrates, saccharides or simply as sugars - play central roles in many biological processes and have properties useful in an array of applications.”

*“Transforming Glycoscience: A Roadmap for the Future”*  
The National Academy of Sciences 2012

**Glyconutrients** are NOT vitamins, minerals, proteins, fats, herbs, enzymes or homeopathic drugs... but they may make all of these work better.

## WHAT are Glyconutrients?

**Glyconutrients** may serve an important role in health by supporting **cell-to-cell communication**. Prior to the 1980's, scientists considered sugars to be almost exclusively a source of energy in the body. Recent research reveals that a group of sugars play a critical role in cellular communication. These sugars attach to proteins on the surface of cells to form a complex system for communication. Through this "sugar code", cells communicate many things that a cell needs: nutrition, repair, defense, hormone response, etc.

### The Beneficial Sugars



**Glucose** is readily available in our diets from sugar cane, rice, corn, potatoes, wheat, etc.  
**Galactose** is readily available in our diets from dairy products unless you are lactose intolerant.

The others are typically lacking in our diets due to poor dietary choices and the simple fact that we don't hunt and gather anymore.

## Timeline of Glycoscience

- 1880s:** Monosaccharides are first identified.
- 1952:** Fresh aloe gel heals radiation burns .
- 1970:** 500 glycobiology papers published.
- 1976:** Sugars identified in glycoproteins and glycolipids on human cells.
- 1988:** The term "Glycobiology" appears in the Oxford English Dictionary.
- 1990:** 4,000 glycobiology papers published.
- 1990:** BioTechnology: Vol 8 Role of carbohydrates involved in intercellular communication and immune function defined.
- 1995:** Nature Magazine: Cell surface sugars reported as necessary for normal immune function.
- 1996:** Harper's Biochemistry, Murray, et al.: edited to add chapter on glycoproteins which focuses on the sugars on cell surface for cellular communication.
- 1998:** Acta Anatomica: (special issue on glycoscience) reports the information content of biological sugar combinations exceeds the DNA code.
- 1998:** Study by Berge, et al in "Metabolism" showed galactose and mannose directly incorporated into glycoproteins without glucose conversions.
- 2000:** 8,000 glycobiology papers published.
- 2001:** Science: (Vol 291) features "Carbohydrates and Glycobiology"; reviews structural and functional uses of sugars in cellular physiology.
- 2001:** NIH grants consortium \$34 million to study cell-to-cell communication interactions.
- 2002:** New Scientist: Oct 26, article depicts glycobiology as the future of immunology, neurology, and developmental biology.
- 2004:** 18,032 Medline articles with keyword "glycoprotein" published.
- 2005:** 12th Annual Australian Psych Conf shows glyconutrient supplementation improves memory.
- 2009:** Perceptual and Motor Skills study showing glyconutrient supplementation improves visual discrimination and working memory.
- 2010:** Int'l Journal of Food Microbiology showing glyconutrients exert positive prebiotic effects.
- 2011:** European Journal of Clinical Nutrition study showing glyconutrient supplementation impacts serum glycosylation of healthy adults.
- 2012:** Nat'l Academy of Sciences 191 page report emphasizing the need to fast track glycoscience due to the incredible health possibilities.
- 2014:** Nutri. Neurosci. 1-11 acute effects of Ambrotose on cognitive performance in middle-aged adults

## WHY Can We Benefit From Glyconutrients?

It is understood that the genetic code contains the instructions for normal function of cells. Going from instruction-to-production requires adequate building supplies and energy to make healthy cells. Ideally our diets would provide the necessary nutrients to support health; however, today's modern diet is often sadly deficient in many of the critical nutrients. (see *Journal of the American Medical Association*, vol 287, 2002.) Approximately 90% of the money Americans spend on food is used to buy processed foods. (1999 *Bureau of Economic Analysis, U.S. Dept of Commerce*.) In the last 30 years (see *Timeline*), a growing awareness has emerged of the importance of certain sugars. These important sugars are strategically placed on proteins and lipids that coat the surface of cells and contribute to healthy cell function. As cells interact with each other, proper recognition and communication are critical for normal function, defense, repair, and hormone response.

**"One of the most important health care discoveries of the 21st Century...I believe that the overall immune-supporting potential of glyconutrients represents the best integrative health strategy that science has to offer."**

*John Rollins, PhD*  
Award-winning former  
US Patent and Trademark Examiner  
Mannatech Independent Associate