Zoonutrient Supplementation via Functional Food Formulas

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"Let food be thy medicine and medicine be thy food."

- Hippocrates

"An ounce of prevention is worth a pound of cure."

- Benjamin Franklin, Poor Richard’s Almanac

We have long known that foods contain the nutrients we need to sustain life. Nonetheless, nutrition and food scientists continually are finding new and beneficial components in food, beyond the nourishment and disease-fighting components of macronutrients, vitamins and minerals. Indeed, the very concept of what benefits foods can provide continuously is evolving. The previous emphasis on health maintenance through recommended nutrient allowances and dietary guidelines recently has evolved into a focus on the promising use of foods to promote optimal health and reduce the risk of chronic diseases. ¹ Today, nutritionists describe foods that are rich in certain "ingredients" that may provide a health benefit beyond the traditional nutrients they contain as "functional foods."² These functional food ingredients are sometimes described as "quasi-nutrients" and are best exemplified by two main groups: phytonutrients and zoonutrients.

It has long been appreciated that food plants contain significant levels of low molecular weight, secondary metabolites with important roles for plant protection.³ Only more recently has the role of these plant chemicals, aka phytonutrients, been appreciated in optimizing human health.⁴ Just as plant foods may provide phytonutrients, animal foods may also contain beneficial substances called zoonutrients (zoh-uh-noo’-tree-uhnts). Zoonutrients are food molecules that have been shown to have potential in modifying multiple physiological functions including anti-inflammatory, antihypertension and antimicrobial actions, stimulation of beneficial bacteria, the maturation of intestinal cells and the education of the immune system.⁵
The currently more familiar anti-inflammatory, anticlotting and triglyceride-lowering effects of the omega-3 oils of cold-water fish largely are an attribution of their zoonutrients: EPA and DHA. In October 1997, the International Whey Conference reported the following seven findings concerning zoonutrients in whey:

2. Certain whey peptides boost immune status by increasing the body’s main cellular protector, glutathione.
3. Whey protein, by increasing thymus development, has reduced colon cancer in rats.
4. One powdered whey supplement in conjunction with photodynamic therapy reduced tumor size by 60 percent in rats.
5. Certain whey peptides may aid dieting by dramatically increasing the release of cholecystokinin (CCK), an appetite suppressant.
6. Three whey peptides (lactoferrin, lactoperoxidase and immunoglobulin) act as antibacterial preservatives and free-radical scavengers.
7. Whey contains growth factors (IGF-I and II) proven to assist in gut- and wound-healing, inside and out. (Note: Colostrum is even more powerful in this aspect.)

**Whey Protein**

Whey protein often is described as a "nutritionally perfect protein" in the sense that it contains all the essential and nonessential amino acids required by the human body in a highly bioavailable form. Whey protein’s quality is variously described by such terms as high biological value (BV), high protein efficiency rating (PER), and high net protein utilization (NPU). In fact, human breast milk is 80 percent whey protein!

Undenatured whey protein is rich in cystine, the thermolabile amino acid which represents a uniquely effective cysteine delivery system for the cellular synthesis of glutathione. Both cysteine and glutamine, along with glycine, are necessary for the synthesis of the tripeptide glutathione (GSH), one of the major detoxifiers (Phase II sulfonation) and antioxidants of the body. Enhancing glutathione levels also helps reduce the risk of infections by improving white blood cell functions. However, the unique disulfide cystine bonds of whey are heat sensitive (thermolabile) so only carefully processed, undenatured whey proteins deliver bioavailable cystine dipeptides for intracellular conversion to cysteine, thus maximizing glutathione levels with its important immune, antioxidant and detoxification benefits. 6
Health-Enhancing Potential of Undenatured Whey Protein Zoonutrients

Whey protein is not only a great source of high-quality protein macro-nutrition and, when undenatured by heat, the best functional food for enhancing endogenous glutathione production, it also can be, if properly processed, a rich source of a multitude of unique peptide zoonutrients.

In 2003, Ward and Bruce wrote in *Food Technology,* "Different peptides from milk have been well described to modify blood pressure, neurologic activity, immune functions, food intake, intestinal functions, and even dental calcification ... These discoveries have prompted scientists to pursue ... how specific molecules in foods affect health, how foods modulate the immune system and the interaction between beneficial bacteria, pathogenic bacteria, and our innate and acquired immune-protective mechanisms."\(^7\)

Colostrum: Nature’s Most Nutrient-Dense Zoonutrient

Although whey protein can be rich in zoonutrients, colostrum is nature’s most nutrient-dense zoo-nutrient, when properly processed. Robert Preston, MD, president of the International Institute of Nutritional Research, defines colo-strum in the following manner: "When a (mammal) ... gives birth to its offspring, its mammary glands filter out of the blood the immune factors it has acquired through a lifetime of fighting disease-causing organisms. It then concentrates these factors into special, non-milk, immune-supporting fluid called colostrum. A mother animal produces true colostrum for only the first 24 hours after giving birth."\(^8\)

Indeed, besides being very rich in highly bioavailable vitamins and minerals, the colostrum of mammals produced has two main functions: to supply both passive and active immune factors for the otherwise highly susceptible newborn and provide growth factors, not only to the immune system via the thymus, but for cells throughout the body.

Colostrum’s Immune Factors

*Immunoglobulins* are protein molecules that provide passive immunity effects that can be useful, both prophylactically and therapeutically, against allergens, bacteria (including *H. pylori*), viruses, parasites, fungi and yeast. Processing concentration techniques can yield as high as 40 percent IGG colostrum, although such a product would no longer be a "whole" colostrum product, and some other important peptides and factors are thereby diminished.
Proline-rich polypeptides (PRPs) are small, very low-weight molecules (6,000 daltons) that have an active immune-modulating effect upon the thymus. They have been variously described as biological response modulators, infopeptides, transfer factors and colostrinin.\textsuperscript{9,10} Immunodeficiency (Th1-deficit states), as in HIV, EBV and herpes, may be thus counteracted, while immune hyperactivity (Th2 hyperactivity), as in autoimmune and allergic diathesis conditions, may be inhibited.\textsuperscript{11} PRPs isolated from colostrum and taken sublingually have shown great promise as an immune-equilibrating nutraceutical and as a potential therapy for Alzheimer’s disease!\textsuperscript{12}

The concentration of these most bioactive peptides, the proline-rich polypeptides (PRPs), in whole colostrum powder usually is between 1 to 3 percent of the total powder weight. Furthermore, most manufacturers of colostrum powders remove much of the PRP fraction (along with lactose, minerals and water), using ultrafiltration technology, to elevate the passive immunity-supporting immune globulins and the protein content of the powder. This then reduces the active immunity-modulation effectiveness of the colostrum powder. Patented technologies now exist that can fortify whole colostrum such that it provides 6 percent PRPs by weight!

Cytokines are integral to intercellular communications that regulate immune activity and related downstream inflammatory responses. These immune messengers include the interleukins, lymphokines and interferon. The PRPs mentioned above have a modulating effect on the cytokines.

Colostrum’s Growth Factors

Growth factors from mammalian bovine colostrum are by and large not species-specific. Indeed, they are almost identical to human colostrum! The various growth factors in whole colostrum are, by definition, anabolic, stimulating both generation and regeneration of epithelial, mesenchymal and endothelial cells. During periods of low calorie intake, growth factors favor the use of fat for fuel and are therefore protein and "lean body-mass” sparing.

"Dietetics professionals have a unique opportunity to promote whole foods. ... In addition ... functional food products can be developed that further enhance the health benefits of food...a combined functional food and food supplement approach may afford the greatest protection.”\textsuperscript{13}

Functional-food formulas are rapidly becoming an alternative to pills as a means of dietary supplementation. Phytonutrient greens and super fruits have enjoyed rapidly rising popularity. Zoonutrient formulas already
are following the same path. Those wishing to learn more about dairy zoonutrients are encouraged to read my paper "A Brief Overview of Whey and Colostrum and Their Potential as Functional Food Ingredients," available at: www.biopharmasci.com/downloads/WheyWhitePaper.pdf.

References

5. JB German. Department of Food Science & Technology, University of California, Davis.