ALBION®
HUMAN NUTRITION

RESEARCH NOTES

A COMPILATION OF VITAL RESEARCH UPDATES ON HUMAN NUTRITION

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HEALING, IMMUNITY AND ANABOLICS

The complex interplay of the various components of the human body is a constant source of interest to scientists. So too is the myriad of roles played by each of the various elements which are considered to be essential nutrients. There is a common thread among the systems of the human body that control our ability to heal from injury, ward off or recover from infectious disease, and positive nitrogen balance (anabolic state). However, the means to accomplish these functions is not as simple as one would like. If it were, all a person would have to do is eat a lot of protein. After all, isn't protein the key to having a positive nitrogen balance which would give rise to healing, immunity and the other benefits of anabolism? In fact, much work has been done to show that while protein has a very positive influence here, because the body is a complex interplay of components, essential nutrients play many different roles in its function. No single element of this dynamic equilibrium is the sole answer to any of its systems. Simply stated, more than protein is needed.

Research has uncovered many nutrients that play important roles in tissue healing, maintaining and stimulating the immune system and in generation of growth and lean body mass. The immune system is positively impacted by protein, omega-3 and omega-6 fatty acids, vitamins A, C and E, the B-complex vitamins, as well as the minerals zinc, manganese, iron, selenium, copper, magnesium, calcium, sulfur, iodine and chromium. (Ashmead, H.D., "Increased Superoxide Dismutase Activity Resulting from Ingested Amino Acid Chelated Minerals", Proc Albion Int. Conf. Human Nutr., Jun 21-22, 1995; Lehmann, S., "Immune Function and Nutrition. The Clinical Role of the Intravenous Nurse." Intravenous Nurse, 14(6): 406-20, 1991, Nov-Dec.) Some nutrients play more roles in one system than others, but all play roles.

ARGININE'S EMERGING ROLES

Anabolics/Growth and Arginine

Arginine has been seen, in repeated studies, to be a consistent and potent stimulus for growth hormone release. Research documenting this effect can be found as far back as the late 60's and early 70's. The exact mechanism is believed to be that arginine induced growth hormone release is medicated mainly by a decrease in somatostatinergic tone (Clin Endocrinol, vol. 36, no. 5, 1992 May, Koppeshaar HP, et al.). Somatostatin is a peptide which has the job of inhibiting the release of growth hormone. By decreasing somatostatinergic tone, arginine decreases somatostatin's ability to inhibit the release of growth hormone, and thus leads to an increase in the release of growth hormone. In a more recent human study, M. Hurson, et al (J. Paren and Enteral Nutr, 19 (3): 222-30, 1995, May-June) examined the effect of arginine supplementation on the metabolism of healthy, nonsmoking, elderly volunteers. A two-week course of supplemental arginine was found to cause significant increase in serum insulin-like growth factor-I (IGF-I) and an improved and positive nitrogen balance. No adverse effects were observed with the use of the supplemental arginine.

Immunity and Arginine

Lately, there has been much interest in the use of arginine to stimulate immune response. Supplementation with arginine has been shown to cause a positive effect on the immune system and to promote wound healing. L-arginine significantly increases natural killer cell and lymphokine-activated killer cell activity, and was further found to increase lymphocyte mitogenic reactivity. (Surgery 115[2]: 205-212, 1994 Feb, Brittenden J. et al) This means that arginine has a positive impact on the body's cell-mediated immunity. Earlier studies in animals (J Parent and Enteral Nutr, 9[4]:428-34, 1985, July-Aug, Tachibana K, et al) demonstrated that arginine supplements enhanced the phagocytic (bacteria or foreign particle digesting) activities of the alveolar (small lung air cell) macrophages (phagocytes that digest dead tissue, degenerated cells, and bacteria cells), lead to a net positive nitrogen balance, and suppressed tumor growth due to its ability to activate the immune system.

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Growth/Healing and Arginine

Additional studies have shown that L-arginine helps to generate nitric oxide (NO), which among other effects, has a positive impact on the healing of tendons, intestinal mucosa, burns and other cellular damage. Nitric oxide functions to relax smooth muscles, prevent platelet aggregation, functions as a brain neurotransmitter, and mediates tumoricidal and bacterial actions of macrophages. In line with this, D.A. Fryburg directed a study to evaluate the effects of IGF-I, nitric oxide, and the administration of an arginine supplementation regimen on factors related to muscle protein synthesis. In this study, the investigators also examined the effects of a nitric oxide synthase inhibitor on the actions of IGF-I. In the human skeletal muscle, IGF-I exerts both growth hormone-like (increases protein synthesis) and insulin-like (decreases protein degradation and increases glucose uptake) actions, and augments forearm blood flow. Fryburg found that the IGF-I increases the blood flow through a nitric oxide dependent mechanism (nitric oxide is produced in the conversion of arginine to citrulline); total blood flow did not affect the insulin-like response of muscle to IGF-I. (J Clin Invest, 97(5):1319-28, 1996, March) Thus arginine, through its induction of nitric oxide, has a positive effect on the healing effects of nitric oxide.

Several additional studies (See references 1-8) over the last few years have clearly demonstrated that arginine supplementation has a positive impact on the healing process. These studies have indicated that arginine has a positive impact on the healing of gastric ulcers, bone fractures, diabetic foot ulcers, second-degree burns, radiation enteritis, and ulceractive lesions of the small intestines.

Arginine is a very important and useful amino acid and one hat has a positive impact far beyond that of being a structural component of protein. It plays roles in the anabolic process, tissue healing, and the immune system, which gives further evidence to the interrelationship among these diverse physiological components.

ZINC: EFFECTS IN RELATED AREAS

The Immune System and Zinc

Zinc also plays a very central role in the immune system. It affects virtually all aspects of the immune system, from the nonspecific barrier functions of the passive immune system (skin, mucous membranes, etc.), to the specific lymphocytic functions of the active immune system. Zinc is needed for the development of neutrophils and natural killer cells in the nonspecific immune defense, as well as the specific acquired immunity that is attained through the activities of T-lymphocytes and B-lymphocytes. Antibody production, particularly immunoglobulin G, is negatively impacted by a deficiency of the mineral zinc. Zinc functions as an antioxidant and a membrane stabilizer. Its many roles in basic cellular functions, such as DNA replication, RNA transcription, cell division and activation are key to the activities of vital immunologic mediators. Zinc is involved in all four immune defense components: nonspecific passive, nonspecific active, cell-mediated, and antibody (humoral) mediated (Am J Clin Nutr 1998; 68:447S-463S, Shankar A Prasa A).

Anabolics/Growth and Zinc

According to Nishi, there is a complex interrelationship between zinc, growth hormone, gonadal function and the growth hormone, IGF-I axis. (J Am Coll Nutr, 15 [4]:340-44, 1996, Aug.) Zinc deficiency leads to a decrease in growth hormone production and a decrease in the levels of IGF-I. Ripa S. and Ripa R. concluded that chronic zinc deficiency consistently causes delay in pondero-statural growth. Zinc controls growth hormone synthesis and secretion, but ahs been shown to have effects on physical growth that are separate from this pituitary effect. (Minerva Med, 87(1-2):25-31, 1996, Jan-Feb) Zinc supplementation causes significant increases in liver synthesis of IGF-I (also called somatomedin-C), which is known to influence growth of certain body tissues. In zinc deficiency, it has been seen that this is much reduced, even when growth hormone response to growth hormone releasing factor is normal. This demonstrates that there are cases when the pituitary gland plays a lesser role in regulating growth. In chronic zinc deficiency, the reduced liver production of IGF-I is responsible for the reduced physical growth. In addition, it has been seen that receptor resistance to IFG-I disappears after zinc supplementation. Ripa and Ripa concluded that zinc plays an important role at receptor level, as well as its roles in the synthesis and secretion of growth hormone and the synthesis of liver IGF-I. In line with this, a study by Cha and Rajhani, concluded that zinc deficiency inhibited the direct growth effects of growth hormone on long bone, and the growth promoting action of circulation IGF-I. (Biol Trace Elem Res, 32:383-98, 1992, Jan-Mar) A.E. Favier stated that zinc deficiency impairs the metabolism of thyroid, androgen, and growth hormones. (Biol Trace Elem Res, 32:383-98, 1992, Jan-Mar) In addition, Favier stated that zinc supplementation makes it possible, in certain cases, to overcome resistance to growth hormone treatment. This is further support to zinc having roles in growth that extend outside of the pituitary level.

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Healing and Zinc

The usefulness of zinc to promote wound healing in the presence of low plasma zinc has been firmly established (Okada a, et al, Jpn J Surg, 20(6):35-44, 1990, Nov). In this review article, the authors stated that situations, like those seen in surgical stress, trigger the release of various mediators, leading to increased hepatic zinc deposition (needed to maintain the function of liver zinc metalloenzymes), and decreased plasma and skin levels of zinc are seen to have a negative impact on the healing of wounds. A study by Kaji, et al., documented that the use of zinc promoted the repair process of damaged vascular tissue through stimulus of the lipoxygenase pathway that mediates response to endogenous growth factors in the healing process. It has been shown that zinc compounds hastens the healing of gastric ulcers, and that zinc deficiency delayed such healing. (Dig Dis Sci, 40(6):1340-4, 1995, June)

The common theme throughout research points to the fact that it has been well established that zinc plays an essential role in the process of tissue healing.

ZINC AND ARGININE

Zinc has been implicated in steroid endocrinology of the prostate gland and 5 alpha-dihydrotestosterone (DHT) is believed to express androgenic responses in the prostate. In this study, the researchers tested the effects of a substance that they referred to as neutralized zinc (zinc arginine and gluconate). Results indicated significant reduction of prostate weight, 5 alpha-reductase activity and total protein and DNA concentrations in treated epididymis and seminal vesicles; and no significant effect on progeny and blood testosterone levels of treated animals. These results suggest that this neutralized zinc offers a new approach to treatment of prostatitis without affecting spermatogenisis. (Fahim MS; Wang M; Sutcu MF; Fahim Z. Zinc Arginine, a 5 alpha-reductase inhibitor, reduces rat ventral prostate weight and DNA without affecting testicular function. Andrologia, 25(6);369-75, 1993, Nov-Dec.)

Zinc Arginine – the Albion Chelate

Albion Laboratories has produced neutralized zinc arginine as a totally reacted, nutritionally functional chelate, using Albion's patented chelate technology. In the documentation listed throughout this issue, it has been shown that both of these nutrients, zinc and arginine, have positive impacts on the immune system, wound healing, nitrogen balance (anabolic effects), and growth hormone physiology. In putting this chelate together, Albion made a new nutritional ingredient that provided the total benefits of both zinc and arginine in one unique Albion chelate molecule. This ingredient offers the advantages that Albion's totally reacted nutritionally functional mineral chelates offer over other nutrient forms. Inorganic forms of zinc are known to cause some tolerance problems. Short term side effects that can consist of nausea and mild gastric upset. Long term use of the types of zinc supplements can give rise to gastric erosion (this side effect is especially prevalent at higher doses of zinc, 45 mg elemental or higher). L-Arginine, as a free amino acid, is strongly alkaline. Any time one ingests a strongly alkaline substance, the stomach responds with large amounts of hydrochloric acid to neutralize the alkalinity. The acid-rebound leads to some gastric distress and excess gas formation. By forming a nutritionally functional chelate with the zinc and the arginine, the tendency of gastric intolerance of both nutrients has been reduced. Additionally, it has been demonstrated that amino acid chelated forms of zinc are absorbed at a far greater rate than inorganic forms (Scholmerich J, et al, Am J Clin Nutr 1987; 45:1480-86). The study by Scholmerich, et al, suggested that a 15 mg of zinc (as 1:2 chelate/zinc: amino acid molar ration), was at least equivalent to a 45 mg dose of zinc as sulfate.

Patented Zinc Arginine amino acid chelate, from Albion Laboratories, gives you all the benefits of both zinc and arginine together. The studies reported above suggest the nutrients have a positive effect on the immune system, wound healing, nitrogen balance and growth hormone activity. In a single chelate molecule, one has the added benefits of nutritionally functional chelate nutrition with:

- **Higher absorption**
- **Greater tolerance**
- **Enhanced physiological benefits**
- **Better absorption dynamics**
- **Greater safety**

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