ALBION®
HUMAN NUTRITION

RESEARCH NOTES

A COMPILATION OF VITAL RESEARCH UPDATES ON HUMAN NUTRITION

March, 2000 Volume 9, No. 1

RESEARCH ODDS & ENDS

As many know, Albion is heavily involved in mineral research and technology. Albion is constantly evaluating research protocols, with a goal of improving nutrition in plants, animals and man. Many of the research projects that Albion helps fund are published in a wide variety of scientific journals. We have shared some of these studies in this newsletter over the years. It may surprise some people to know, however, that many interesting research trials that we have sponsored have never been submitted for publication for one reason or another. This doesn't make their findings any less significant. They are just unpublished.

In this edition, a few unpublished research gems and one or two other published studies of note are summarized and reviewed. The findings are noteworthy and could give some valuable applications.

THE CHELAZONE® PATENT #4,863,898 AMINO ACID CHELATED COMPOSITIONS FOR DELIVERY TO SPECIFIC BIOLOGICAL TISSUE SITES.

According to this patent, Albion has discovered a way to make a unique amino acid chelate having a ligand to divalent metal mole ratio of 2:1, low molecular weight and proper stability constant that can be formulated for delivery of its nutritional payload to specific tissue sites in mammals. After these absorbed "so-called" Chelazones® have a propensity to migrate to one or more target sites.

In line with this patent, Dr. D. Graff of Weber State University, under direction from the late Dr. H. Ashmead, performed the following study on the "Chelazone" concept employing the ligand arginine chelated in a special way to the mineral zinc.

ZINC ARGININE AMINO ACID CHELATE
Study by: Dr. D. Graff
Weber State University, Aug 1985

The objective of the following experiment was to determine the targeting of various amino acid chelates into the male reproductive organs, since the literature points out that 80% of seminal fluid is composed of arginine. Furthermore, arginine has been found useful in cases of sterility.

Eighteen rats weighing 200 grams +/- 10 grams were divided into three groups of 6 animals each. Chelates containing 0.06 moles of arginine and 0.06 moles of glycine, respectively, were chelated with 1.0 mole ^{65}zinc from zinc chloride and an additional 1.0 mole of ^{65}zinc chloride was used as a control. Next 10 microliters of each chelate and the inorganic zinc were orally administered to the respective groups of 6 rats, each.

After 24 hours, the animals were sacrificed. The following male reproductive tissues and organs, including the testes, epididymis and seminal vesicles, were examined for radioactive metal isotopes. The ligand was not tagged or measured in this experiment, since the ligand's purpose in this experiment was to serve as a carrier. Table 1 shows the results.

Table 1 **cc pm/mg tissue 24 hours post treatment**

TISSUE	^{65} ZINC GLYCINE	^{65} ZINC ARGININE	^{65} ZINC CHLORIDE
Testes	0.96	1.26	Negligible
Epididymis	0.73	1.03	Negligible
Seminal Vesicle	1.98	2.53	Negligible

In all animals, the rate of zinc uptake into the reproductive tissues/ organs was greater with the zinc arginine chelate. The seminal vesicles and contents generally contained more activity than either the testes of epididymis. This experiment supports literature reports in which the targeting of arginine to the seminal fluid and testes is reported.

NOTE: As it can clearly be seen, both chelates of zinc-glycine and arginine, migrated to the male reproduction area at greater rates than did the zinc salt form. In this study, it is clear that the Zinc Arginine Chelate is the real "Chelazone®", since it had an even greater male gonadal uptake than did the zinc glycine chelate. It was absorbed into the male gonadal tissue at rates that were 27% to 41% greater than the standard chelate. Since this area of the male has a higher need for both zinc and arginine for proper health and functioning, isn't Zinc Arginine Chelate a good choice for a zinc containing product for men?

Albion Chelate Absorption

Over the years, it has been observed that Albion's patented, totally reacted mineral amino acid chelates follow a different absorption pathway through the intestines than do other mineral forms, and this is a factor that has lead to their superior absorption.

BIOAVAILABILITY OF MAGNESIUM CHELAZOME®
Study by: Dr. D. Graff
Weber State University, 1996

With the ever increasing interest in the health benefits of magnesium, more attention has been paid to the absorption mechanism of this mineral from the intestine. It has been stated that magnesium's absorption has been observed to follow both active and passive transport processes in the ileum and colon and a little in the jejunum. Ashmead, et al (Intestinal Absorption of Metal Ions and Chelates, Springfield: C Thomas 1985) believed that actual mucosal cell uptake of magnesium occurs only after binding the cations to integral proteins imbedded in the cell membrane or if the magnesium is prechelated to amino acids. In this later case, the absorption of the magnesium follows a peptide absorption pathway rather than the mineral ion absorption pathway.

In this study, Professor Graff explores the intestinal absorption mechanism(s) available for magnesium uptake.

This animal study used Sprague-Dawley male rats (200-300 grams), that are fed a commercial diet and tap water. The rats were not fasted. The intestines were removed and everted into a buffer solution for this perfusion study. The rate of movement of the magnesium from mucosa to serosa for four (4) different magnesium forms was measured:

- Magnesium Amino Acid Chelate (Albion's Chelazome®),
- Magnesium Chloride,
- Magnesium Sulfate,
- Magnesium Oxide.

The various magnesium solutions were added to the perfusion solutions at the rate of 5 ml per hour.

The study lasted 3 hours and the hourly serosal samples and intestinal segments were assayed for their magnesium contact.

It was seen that calcium interfered with zinc absorption when inorganic zinc oxide was fed, but not when zinc amino acid chelate or zinc polysaccharide were administered.

Table 2

TIME	MG CHELAZOME®	$MgCl_2$	$MgSO_4$	MgO
1 Hour	3.92	4.49	4.23	3.63
2 Hours	3.59	3.47	3.52	2.45
3 Hours	8.56	5.11	4.58	0.14
TOTAL	16.07	13.07	12.31	6.22

RESULTS

Table 2 above presents the data for magnesium content of the serosal solution that shows movement from mucosa of intestine to the serosa, which gives a measure of relative absorption. The data are in ppm.

From the above data, it is clearly evident that the movement of Magnesium Chelazome® from the mucosa to the serosa is significantly greater than that seen with the inorganic magnesium salt forms. It should also be noted that an assay of all the intestinal segments reflected equivalent exposure to magnesium source (exposure to magnesium from oxide was somewhat higher), thus, insuring that the movement across from the mucosa to serosa was not prejudiced by a higher concentration of one of the magnesium forms.

From the data in the above table, it is obvious that the Magnesium Chelazome® was absorbed in greater quantities than equivalent amounts of the magnesium salts. In addition, since the Mg $C1_2$ and $MgSO_4$ were totally solubilized in the mucosal solution, their uptakes were not dependent on solubility. The fact that the quantity of magnesium from these two salt sources in the serosal solutions was similar suggests that the magnesium from the salts followed the same pathway into the cells. In view of the wide difference in serosal magnesium concentrations found for Magnesium Chelazome®, it was concluded that this form of magnesium (Magnesium Chelazome®) follows a different pathway for its absorption. This supports Ashmead's model for amino acid chelates being absorbed via a peptide pathway.

More Evidence

There is an additional advantage to the premise that Albion's patented, totally reacted, nutritionally functional chelates follow a different absorption pathway. Lack of mineral absorption interference. Calcium is known to block zinc absorption. Zinc blocks copper. Not so with Albion chelates.

ABSORPTION AND RETENTION OF ZINC WHEN ADMINISTERED AS AN AMINO ACID CHELATE IN DOG.
Lowe J, Wiseman J, and Cole LA
J Nutri 124:2572S-2574S, 1994

In this animal study, the researchers compared absorption and retention of zinc from three different sources: zinc oxide, zinc polysaccharide and zinc amino acid chelate (Albion supplied). In addition, the researchers further investigated the effect on zinc absorption that the addition of calcium would impart by measuring fecal zinc (inversely related to zinc absorption), along with hair growth and hair zinc content (directly related to zinc retention). The results are seen in Table 3.

CONCLUSION: The amount of zinc absorbed was defined as the difference between consumed zinc and that excreted in the feces. The resulting amount was considered to be absorbed. The extent of real bioavailability was reflected by the increased zinc in the hair.

In addition, supplemental zinc as amino acid chelate resulted in the growth of more hair with improved quality due to a higher zinc content compared to zinc as oxide or polysaccharide. The zinc amino acid was retained at a rate that was 79.7% higher than the polysaccharide and 94.7% higher than oxide in the basic diet. When calcium was added, zinc amino acid chelate had a real bioavailability rate that was 113% higher than the polysaccharide and 190% higher than the oxide.

Table 3

EFFECT OF ZINC SOURCE AND CALCIUM CONTENT OF THE DIET ON ZINC ABSORPTION, RETENTION AND HAIR GROWTH.

Treatments	Fecal Zinc	Hair Growth Rate	Zinc Deposited In Hair
	$mg \cdot kg^{-1} \cdot d^{-1}$	$mg \cdot d^{-1} \cdot 10\ cm^{-2}$	$\mu g \cdot 25\ d^{-1} \cdot 10\ cm^{-2}$
ZO	3.03^b	4.775^b	10.83^b
ZO+	4.02^a	3.000^d	7.28^c
ZM	2.75^d	6.025^a	21.09^a
ZM+C	2.74^d	6.063^a	21.15^a
ZP	2.59^c	5.215^b	11.73^b
ZP+C	2.90^c	4.18^c	9.91^b
SED	0.02	0.244	0.9

SED, standard error of the difference. Means in the same column with different superscripts differ significantly at P<0.05. ZO, 50 mg Zn • kg^{-1} from zinc oxide; ZM, 50 mg Zn • kg^{-1} from zinc amino acid chelate; ZP, 50 mg Zn • kg^{-1} from zinc-polysaccharide complex; +C denotes the addition of 20 g Ca • kg^{-1}; 4 dogs per treatment.

Albion's Taste-Free Iron Amino Acid Chelate

A few years ago, Albion developed a brand new Iron Amino Acid Chelate, which was taste free. It is believed that one of the reasons that iron possess a strong and objectionable taste lies in the amount of unpaired electrons in iron's outer shell. Albion developed a new iron: Ferric Trisglycinate Chelate (Ferric Glycinate). The electrons are tied up, and the metallic taste is gone. Although Albion's Iron Amino Acid Taste-Free® was the first commercially available Ferric Glycinate (chelate), a study was done using a specially prepared form of this iron and was the subject of the study below.

FERRIC GLYCINATE IRON BIOAVAILABILITY FOR RATS, AS DETERMINED BY EXTRINSIC RADIOISTOPIC LABELING OF INFANT FORMULAS
Langin S, et al.
Nutrition Reports International
Oct 1988 Vol 38, No 4

In this animal study, the researchers were trying to determine the iron bioavailability for ferrous sulfate and ferric glycinate, when added to infant formula. A casein based formula was fortified with each of the assayed iron sources and extrinsically labeled with $^{59}FeCl_3$. Once suspended, they were administered via gastric tube. Iron deficiency is a persistent nutritional problem in infants, because of their rapid growth and typically poor iron store at birth. The use of infant formulas should prevent the anemia common in infants fed mainly with proprietary formulas for long periods. The normal infant absorbs about 5% of ferrous sulfate iron added to milk. A high phosphate content, such as seen in milk has been reported to lower iron bioavailability, perhaps because phosphoproteins accelerate the oxidation of ferrous salts to form strong, practically nonabsorbable, ferric-phosphoprotein complexes.

In infant formulas, ferrous sulfate has shown pro-oxidant properties, which are known to impair nutritional and organoleptic product quality.

Ferric glycinate was developed as an alternative iron for infant formula fortification, in an attempt to reduce nutritional deterioration during storage. Its catalytic properties have proven lower than those of ferrous sulfate in milk-based formulas.

Once the animals were fed the experimental formulas, they were returned to basal diets. Whole body counts for the labeled iron were done three hours after the experimental dose, and then daily for two weeks. The results appear in Table 4 below:

The researcher concluded that ferric glycinate had superior bioavailability and that use of ferric glycinate might be done at a lower dosage in food fortification applications.

Concluding Note

Albion's patented mineral amino acid chelate technology has produced mineral forms that are tissue targeted. Evidence has shown that these minerals are better absorbed, lack mineral absorption interference, and have a dipeptide absorption pathway. No other company has any data that demonstrates such findings about their minerals. That's why only Albion has amino acid chelates with official CAS Registry Numbers and FDA GRAS approval.

Table 4

APPARENT IRON ABSORPTION, RETENTION AND PERCENTAGE OF RADI IRON IN BLOOD.			
Iron Source	**Apparent Iron Absorption % of Dose**	**Iron Retention % of Dose**	**Radi Iron In Blood % of Dose**
FERROUS SULFATE	15.8	8.9	7.5
FERRIC GLYCINATE	30.9	23.3	21.8

LOOK TO ALBION® FOR
THE BEST IN
MINERAL NUTRITION!

The Makers Of

Magnesium Creatine Chelate

$E=MC^2$

(Energy=Magnesium Creatine Chelate)[sm]

Albion Human Nutrition

100 Maple Park Blvd., Suite 110
St. Clair Shores, Michigan 48081 USA
[P] 586•774•9055 | [TF] 800•222•0733
[F] 586•774•8838
[e] info@AlbionMinerals.com