ALBION®
HUMAN NUTRITION

RESEARCH NOTES

A COMPILATION OF VITAL RESEARCH UPDATES ON HUMAN NUTRITION

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Are You Getting What You Think You Are In Your Mineral Supplements?

ELEMENTAL LEVELS OF MINERALS AND WHAT YOU SHOULD KNOW!

Over time, one of the issues that is consistently brought up by people in the nutritional supplement industry and by the consumer involves the elemental quantity of mineral(s) that can be fit into a given single dosage unit. This is especially true in the case of tablets and capsules. Current regulations call for supplement companies to state on the label the actual amount of each mineral (referred to as elemental amount) in each dosage unite. The labeling also requires that the source of the material be revealed. Below is an example of how this is typically done.

Example:
Each tablet contains:
Calcium *(Amino Acid Chelate)*
100mg

In this example, each tablet contains 100 mg of elemental calcium from the compound called calcium amino acid chelate. Many assume that this means the tablet contains 100 mg of calcium amino acid chelate. This is not correct. The actual weight of the total compound, calcium amino acid chelate, needed to provide 100 mg of elemental calcium is much higher than the 100 mg. For the calcium amino acid chelate that Albion routinely produces, only 18% of the total weight of this compound is elemental calcium and the rest would be primarily the amino acid portion of this compound (about 82% of the compound's weight). As seen below, it would require about 555 mg of the 18% compound, calcium amino acid chelate, to provide 100 mg of elemental calcium.

.18 X *(weight of calcium amino acid chelate)* = 100 mg *(weight elemental calcium)*
X = 100 / .18 = 155 mg *(weight of calcium amino acid chelate)*

HOW TO DETERMINE THE AMOUNT OF A COMPOUND NEEDED TO DELIVER THE ELEMENTAL MINERAL LEVEL

Following is a way to determine a good estimate of the theoretical amount of a mineral compound that is needed to deliver the desired elemental quantity. First the molecular weight of the mineral compound must be determined. Let's use calcium lysinate as an example. Calcium lysinate, if manufactured using the Albion process, would typically be made from one mole of calcium and two moles of lysine (in simple terms, a mole is a type of elementary entity). Less lysine in the compound (i.e. 1:1) results in lower stability of the calcium lysinate. The molecular weight of the calcium portion of the compound is 40.08 A.M.U. (Atomic Mass Units), and the molecular weight of lysine is 146.19 A.M.U. Therefore, the total molecular weight for the calcium lysinate would be the sum of the molecular weight of calcium, plus two times the molecular weight of lysine, as shown.

Molecular Wt. of Calcium Lysinate
40.08 A.M.U. *(molecular wt. of calcium)* + 2 *(146.19 A.M.U. - molecular wt. of lysine)* = 40.08 + 292.38 = 332.46 A.M.U. *(is the molecular wt. of calcium lysinate)*

In the above example, the elemental content of calcium in calcium lysinate would be 40.08 / 332.46, or about 12%

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calcium. Since molecular weights are directly proportional to the compounds' milligram or gram weights, the ratios of the components of the compounds are always the same. Thus, 332.46 mg of calcium lysinate in a 2:1 ratio would provide 40.08 mg of elemental calcium.

As a point of reference for future calculations like this, the following tables list the molecular weights of most of the known nutritionally valued minerals, the molecular weights of chemical entities that are typically bound to these minerals and the approximate elemental mineral content of some common mineral compounds.

Table 1
Mineral Molecular Weight

Mineral	Symbol	Molecular Weight
Boron	B	10.81
Magnesium	Mg	24.305
Phosphorus	P	30.97376
Potassium	K	39.098
Calcium	Ca	40.08
Vanadium	V	50.9414
Chromium	Cr	51.96
Manganese	Mn	54.938
Iron	Fe	55.847
Copper	Cu	63.546
Zinc	Zn	65.38
Selenium	Se	78.96
Molybdenum	Mo	95.94
Cobalt	Co	58.9332
Nickel	Ni	58.70
Tin	Sn	118.69

Table 2
Chemical Entities Typically Bound to Minerals in Supplements

Entity	Approximate Molecular Weight
Aspartate Acid (Aspartate)	133.10
Citric Acid (Citrate)	192.12
Glycine (Glycinate)	75.07
Carbonate	60.0
Gluconic Acid (Gluconate)	196.16
Lysine (Lysinate)	146.19
Oxide	16.0
Taurine (Taurinate)	125.14
-Ketoglutaric Acid (-ketoglutarate)	146.10
Malic Acid (malate)	134.09
Lactic Acid (Lactate)	90.08
Succinic Acid (Succinate)	118.08
Sulfuric Acid (Sulfate)	98.08
Picolinic Acid (Picolinates)	123.11

Table 3
Some Mineral Compounds
Their Approximate Weights & Their Theoretical Elemental Content

Compound	Mole Ratios	% Elemental Mineral by Wt.
Calcium Citrate	Calcium : Citrate (2:3)	24.12% calcium
Calcium Carbonate	Calcium : Carbonate (1:1)	40.04% calcium
Magnesium Taurinate	Magnesium : Taurine (1:2)	9% magnesium
Calcium Glycinate	Calcium : Glycine (1:2)	20%
Magnesium Aspartate	Magnesium : Aspartate (1:2)	8%
Zinc Picolinate	Zinc : Picolinate (1:2)	21%

*Please note that the values in the tables are approximate and that the mineral compound's elemental content percentage can vary slightly. In come cases, a mineral chelate, like magnesium aspartate, can be made in a 1:1 ratio, which could lead to an elemental content of magnesium being as high as 15 to 16%, but this is not typically the case when stable chelates are formed.

Tablet Weights & Sizes

What would be the approximate weight of the active ingredients (nutritional components) needed to deliver the elemental quantities of minerals in the following examples of some typical nutritional products?

Example 1:		
Each tablet contains:		
Calcium (Citrate)	24% Ca	100 mg
Zinc (Picolinate)	21% Zn	10 mg
Magnesium (Taurinate)	9% Mg	50 mg

To deliver these elemental quantities, each tablet would contain the following weights for each compound:

Calcium Citrate	416 mg
Zinc Picolinate	47 mg
Magnesium Taurinate	555 mg
Total weight of Actives	1107 mg

If one were to calculate the need for an additional 5 to 10% of tablet manufacturing aids, plus an added amount of active for quality assurance purposes, this tablet would weigh approximately 1100 mg, or so...

Example 2:		
Each tablet contains:		
Calcium (Glycinate)	20%	300 mg

This would require about 1500 mg of active ingredient, and with allowances, for excipients and such, the tablet would weight about 1700 mg. That is about 20% larger than a typical Centrum® tablet!

Example 3:		
Each tablet contains:		
Calcium (Lysinate)	12% Ca	500 mg
Magnesium (Taurinate)	9% Mg	250 mg
Zinc (Histidine)	17% Zn	12.5 mg

This formulation would require the following weights of each compound to achieve its labeled elemental mineral content:

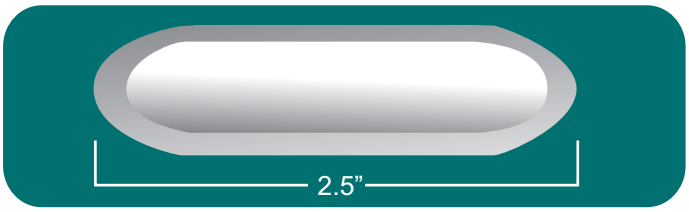
Calcium Lysinate	4166 mg
Magnesium Taurinate	2777 mg
Zinc Histidinate	74 mg
Total weight of actives	7017 mg

This tablet would have to weigh about 7500 to 8000 mg, or be about 5 to 6 times the size of a Centrum® tablet!!! The figure below depicts this tablet's size. Surprisingly, some companies claim to market a product of this potency!

Why the concern about elemental content and tablet size? Albion Laboratories strongly believes that the consumer should get exactly what he things he is getting when good money is spent on a quality nutritional supplement, and the more we help to inform people about areas that can be gray, the better chance they will have of getting what they want and need.

Please not that most true, totally reacted mineral amino acid chelates, or even Krebs Cycle complexes, can have mineral contents that are from 10 to 20% by weight, with most being less than 20%

Size of 8000 mg tablet



CONCLUDING REMARK

Check the label on mineral supplements, and based on what is stated above, make sure that the type of mineral and quantity is feasible before you buy it or recommend it to others.

Look for the Albion name on product labels for products that you can trust!

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