

Source: ALBION LABORATORIES INC.

- A collation of the chapters on the Albion website:

<http://www.albionminerals.com/knowledge/chelates-not-created-equal>

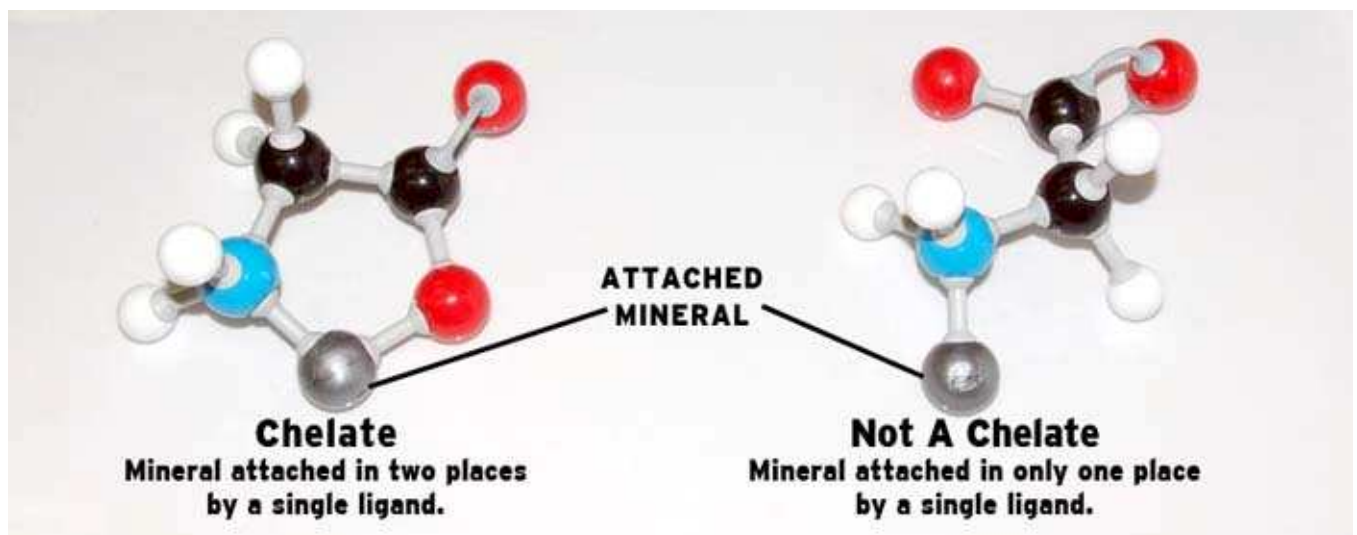
## Why Chelated Minerals are Not Created Equal

Once you've made the step to understand there is a difference between vitamins and minerals and then made the jump in understanding there is a difference between inorganic and organic minerals, you are ready to make a quantum leap to understand why organic chelated minerals are different.

This is where we must start to get scientific, after all, the word chelate is a very specific scientific word that has almost become trendy in the marketplace. Certainly the word chelate is often misinterpreted and then, not surprisingly, misused. Because of this, "chelate" is almost reaching the point of being genericized in reference to nutritional minerals. This is why Albion Human Nutrition feels a strong and compelling need to help educate the industry and consumer regarding mineral chelates.

### Technically, what is a chelate ?

"Chelate" is a specific term identifying a type of bond between an inorganic mineral atom and an attached molecule structure referred to as a ligand. The mineral portion of a chelate is an element and the attached organic ligand is a molecule. When this ligand attaches to the mineral to form a new molecule, it must attach itself in two locations - not just one. This is the broad basis of what a "chelate" is.



### What are chelated minerals ?

Chelated minerals is a scientific term referring to a very specific molecular reaction that happens between a molecule and a nutritional mineral. Chelation is a natural process that takes place in the gut to facilitate transportation of nutritional minerals

across the intestinal wall as a part of digestion. As our body is not very efficient at producing chelated minerals we look to these mineral forms in nutritional supplements to assure greater efficiencies of absorption.

At Albion we create these chelated minerals in our laboratories under very carefully controlled conditions. Albion's most commonly used molecule to create organic chelated nutritional minerals is glycine. Glycine is an amino acid the body readily identifies and is efficiently absorbed across the intestinal wall. Albion's glycine amino acid chelates are actually small enough to be transported right into the cell itself.

### **Why are minerals important to the body ?**

Each of the following systems in the body utilize minerals. Research shows that imbalances or deficiencies in mineral nutrition can affect these systems:

- Immune System: Copper (Cu), Zinc (Zn), Iron (Fe) and Selenium (Se)
- Energy Production: Magnesium (Mg), Phosphorus (P) and Manganese (Mn)
- Hormone System: Iron (Fe), Manganese (Mn), Zinc (Zn), Copper (Cu), Magnesium (Mg) and Potassium (K)
- Vitamin Production: Cobalt (Co)
- Blood Production: Copper (Cu) and Iron (Fe)
- Enzyme Systems: Zinc (Zn), Copper (Cu), Potassium (K), Manganese (Mn), Magnesium (Mg), Iron (Fe), Calcium (Ca) and Molybdenum (Mo)
- Skeletal System: Calcium (Ca), Magnesium (Mg), Zinc (Zn), Manganese (Mn), Boron (B) and Phosphorus (P)

### **What is bioavailability ?**

Bioavailability is the measure of the amount of an ingested nutrient that is absorbed and made available to the body for metabolic use. Bioavailability is important because nutritional intake must be available to various body systems for growth, maintenance of body tissues, reproduction and other performance factors. No matter how high the nutrient levels or how well formulated the product, if the nutrient is not bioavailable for use by body tissue, then money and effort have been waste

### **How are mineral amino acid chelates absorbed ?**

Because the body is very efficient at absorbing individual amino acids, it allows a mineral chelated to an amino acid to be carried along with its amino acid ligand into the intestinal cell during absorption. Clinical studies have shown that the intestinal absorption pathway of an amino acid chelate is different than minerals from inorganic metal salts. As the amino acid chelate approaches the intestinal wall, it remains the same molecule that was ingested. The chelate does not require digestion prior to

absorption due to size. The glycine amino acid chelate for example is stable and does not become disassociated in the stomach.

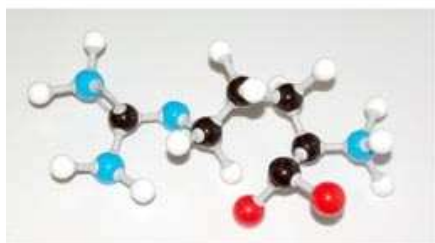
On the intestinal wall are finger-like projections called villi. The villi increase the surface area for the amino acid chelate to be absorbed. On each villus are microvilli. It is through the membranes of the cell walls of the microvilli that the amino acid chelate is absorbed. Once inside the cells, the components of the chelate are used by the body as any mineral and amino acid would be after absorption. Chelating with ligands like glycine to form a glycine amino acid chelate makes more of the ingested minerals available for metabolic purposes (growth, reproduction, immunity, etc.) compared to other inorganic and organic mineral forms (metal proteinates or amino acid complexes).

### About Ligands

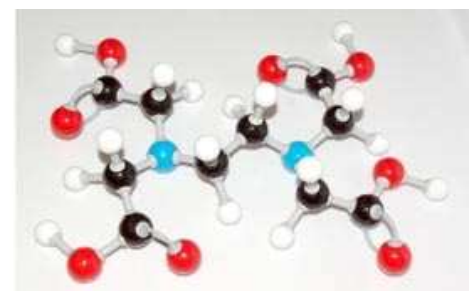
The definition of a chelate does not specify ligand type or size. This is a very important fact to remember. There are a host of molecules that can serve as a ligand. Some possible ligands are so bad for the environment they are controlled by strict regulation. Others are so large they must be broken apart in order to be absorbed. If the ligand must be broken apart to be absorbed, it is not much better than an inorganic mineral. The ligand type will also give the resulting chelate different properties. Ligand choice is a differentiating feature of chelated mineral products. See illustration below of different types of ligands.

### Here is a short list of ligand options:

Ethylenediamine Tetraacetic acid (EDTA)  
Desferrioxamine  
1,10-Phenanthroline  
2,2'-Bipyridine  
Dimercaprol  
2,3-Dimercapto-1-Propanesulfonic Acid (DMPS)  
Dimercaptosuccinic Acid (DMSA)  
Nitrilotriacetate (NTA)  
Tris(2-aminoethyl)amine  
Glycine Amino Acid



Ligand Type 1



Ligand Type 2

## About Ligand Size

Are we starting to see where there can be differences in mineral chelates? From the host of ligands available on the market let us limit our ligand selection to just one type for illustrative purposes: Glycine.

Glycine is an amino acid that can be in a long chain of atoms, specifically oxygen, nitrogen, carbon and hydrogen. Ligand size or chain length, is a key factor involved in having a chelated mineral that can be absorbed at a highly efficient rate. Ligand molecule size together with the attached mineral atom makes a combined size. This combined size is important because these molecules can get larger than the size of the cell it is suppose to be absorbed into.

It makes just plain sense that if the chelated molecule is too large to go into the cell the only way it can be absorbed is if it hangs around long enough to be broken down in the digestive process. If the “chelate” is present long enough to be broken down, it has a chance to be absorbed but is little better than an inorganic form of mineral. A larger size substantially lowers the effectiveness of the chelate if the ligand must be broken so the body can re-chelate the mineral for absorption. Chances are that the larger chelate will be passed through the digestive system without absorption taking place at all.

Chelate molecule size as determined by the choice of ligand used and the process used to create the specific chelate is a second differentiating feature between chelates in the marketplace.

## The Manufacturing Process

Manufacturing a properly chelated mineral for high efficiency absorption is not an easy process. As you have seen, there are variations in chelates based on ligand choices before we even get to manufacturing stage. Now the question is what manufacturing process does a manufacturer use?

Different processes in the industry, used to claim chelation and possible product outcomes.

- A. **Spray drying of a liquid formulation.** This is the process used by Albion; it is an expensive process, requiring large sophisticated equipment and yields a highly controlled precise product. Variation in this process can be monitored and controlled. Product is ‘flash dried’ at a specific moment in the reaction process yielding a “fully reacted” end product with a guaranteed mineral content range.
- B. **Air drying of a slurry formulation.** This process is common as it is cheap but yields a variable result. As the slurry air dries the reaction process may be complete or not.

- C. **Dry mixing/blending of ligand and mineral.** The result of this process is unreacted, unchelated material. Both the agent and mineral are dry blended in a machine resembling a cement mixer. Manufacturer claims the final chelation process will occur in the digestive process naturally.
- D. **A combination of the above.** Some manufactures will combine method C with B to bring the mineral content up to levels the manufacturer is claiming. The end result here is some level of chelation, possibly, with high levels of inorganic mineral (unreacted mineral) present.

A manufacturer may claim a percentage of mineral content in a product but can he claim a “fully reacted” mineral content and offer indisputable proof? Albion can!

## **Why Albion Chelates?**

Albion is a science and research based company. At the cost of hundreds of thousands of dollars, Albion has conducted clinical studies that prove its raw material selection and manufacturing process is 100% proven to form effective, absorbable chelates? Can they further use those clinical studies to prove their product is fully reacted or even if an effective chelation process has taken place? Of course not.

It is to the advantage of some industry manufactures to genericize the word mineral “chelate”. It gives consumers a false understanding of what a “chelate” is and implies there is no difference between one company’s claim to a fully reacted chelate and the next?

Through precise manufacturing processes, carefully controlled conditions and carefully monitored state-of-the-art facilities, a 100% proven, fully reacted mineral chelate can be created. This process is unique not only for the type of manufacturing process but for each specific nutritional mineral being chelated. This is why Albion has acquired over 100 patents to date on chelation-related manufacturing processes. Albion is so confident its chelated products are the highest quality we stand behind them right to your shelf.

## **How are mineral amino acid chelates absorbed ?**

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On the intestinal wall are finger-like projections called villi. The villi increase the surface area for the amino acid chelate to be absorbed. On each villus are microvilli. It is through the membranes of the cell walls of the microvilli that the amino acid chelate is absorbed. Once inside the cells, the components of the chelate are used by the body as any mineral and amino acid would be after absorption. Chelating with ligands like glycine to form a glycine amino acid chelate makes more of the ingested minerals available for metabolic purposes (growth, reproduction, immunity, etc.) compared to other inorganic and organic mineral forms (metal proteinates or amino acid complexes).

Numerous clinical studies have proven that Albion's metal amino acid chelates are better absorbed than inorganic minerals, metal proteinates, or amino acid complexes. In fact the absorption pathway of a metal proteinate is unknown. Amino acid complexes are hydrolyzed in the stomach and intestine and the minerals absorbed similarly to inorganic metal salts.

Due to pH constraints, minerals from amino acid complexes or digested metal proteinates can only be absorbed in the upper portion of the small intestine (duodenum). Proteinates do require digestion prior to absorption due their large size. Complexes are not stable compounds and will disassociate in the stomach.

### **Why are Albion chelated minerals better ?**

Through years of extensive research, clinical analysis, third party critiques and careful laboratory manufacturing, only Albion can produce this highly effective and bioavailable mineral form. Albion's patented process assures the customer they are getting a unique product in the market place that closely duplicates the natural chelation process which occurs in the body.

Albion's science turns inorganic mineral into very small individual organic mineral molecules which are neutral and therefore highly bioavailable and effective.

#### Size:

Picture in your mind the fuel filter on your car engine. The filter allows fuel to pass through but holds back large particles from entering the engine. The same idea applies to the absorption of minerals from the intestine to the blood stream. Large particles cannot easily pass through the intestinal wall. Many mineral products on the market have molecular weights too large to be absorbed intact. Through patented technology, Albion produces chelated minerals with molecular weights small enough to easily pass through the intestinal wall. The Albion chelate is similar to that which the body itself produces by natural chelation.

#### Neutrality:

The process of chelation results in the final mineral compound becoming neutral, i.e., containing no electrical charge. This is important because electrically charged mineral compounds can interact with other dietary components such as phytates and other oppositely charged molecules, and from substances that are not absorbable. In addition, charged mineral compounds are reactive and can deactivate other

important nutrient factors, such as vitamin E, ascorbic acid, various B-vitamins, and certain medications.

### **What proof does Albion have of producing a truly chelated mineral molecule and its bioavailability ?**

Only Albion has been able to demonstrate that its patented technology produces totally reacted, nutritionally functional mineral amino acid chelates and has incorporated many scientific procedures showing the validity of their chelation technology. Numerous clinical studies have been performed over the years by leading universities and independent researchers, demonstrating the superior bioavailability of Albion's chelates. Only Albion has been able to demonstrate the superior bioavailability of the unique chelates formed via Albion's patented processes.

Testing procedures utilizing some of the following determinative methods are part of the proof.

- X-ray Diffraction
- Electron Paramagnetic resonance Spectrometry (EPR)
- Infrared Spectrometry (IR)
- [Fourier-Transformed Infrared Spectrometry \(FT-IR\)](#)

### **How does one evaluate Albion chelates against other mineral forms ?**

**Simply ask the following questions:**

- Are the minerals truly chelated to amino acids or just complexed or are they simply trace minerals mixed with protein?
- Is there proof of the chelate bond formation in the product?
- Is the product stable when subjected to various pH ranges found in digestion. (pH 2.0 - 7.5)?
- Is the mineral product small enough in size to allow unhindered movement through the intestinal wall?
- Does the product have test data to show that it really works?
- Compare pricing. You may pay less for some reported chelates and complexes, but are they really cheaper? If the product is not truly a chelate then you are essentially buying inorganic minerals at a premium price. Without guaranteed availability, you lose two ways: cost and mineral utilization.