InterClinical Professional

InterClinical Professional New Product Training

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1. Why use fully reacted chelates?
2. Introducing new InterClinical Trace Nutrients Products
3. Comparison of the the original and reformulated products

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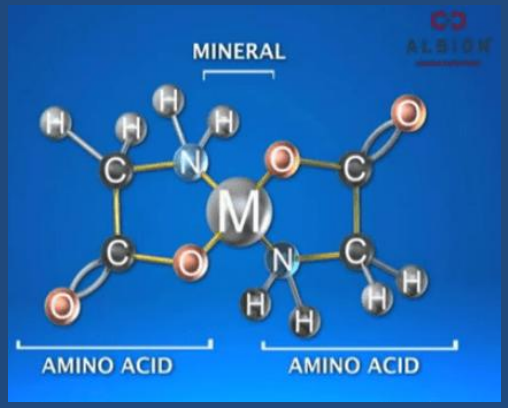
How chelation works…

- To ensure minerals get to the cell in an intact form they can be bonded to a natural delivery system such as an amino acid.
- The amino acid forms the functional group or ligand that binds to a mineral such as zinc, manganese or magnesium.
- Chelates are formed by a variety of manufacturing processes.
- A “fully reacted” chelate means that all the mineral bonds are joined to the ligand and no bonds are available for interacting with other substances.



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Benefits of *Fully Reacted* Amino Acid Chelates

- This creates a uniform and unvarying potency and the bonds are well attached at two points forming a claw with a secure hold on the mineral.
- A chelate which is not fully reacted may not have all the bonds attached to the ligand, potentially leaving it open to react with other substances in the GI tract potentially causing less mineral to reach the tissues.
- A chelate that is not fully reacted may possibly cause other issues such as GI disturbances.
- Initial research by Albion chemicals suggests fully reacted amino acid chelates show very good absorption at low doses. Independent research is not available at this time

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General Benefits of Amino Acid Chelates

- *They are less likely to interact with the food in the digestive tract.(2,3)*
- *They form stable complexes with the chosen mineral.(2)*
- *Absorption is not pH dependent.(5)*
- *Studies suggest they may have higher bioavailability compared to non-chelated forms. (2,3,5,6,7)*
- *There is a reduced likelihood of them causing gastric irritation.(1,7)*
- *They exhibit lower toxicity - due to passive diffusion (2,8)*

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Why use glycine as a chelate ligand?

- Glycine is an ideal ligand as its small size increases its ease of absorption.
- Glycine acts as a powerful buffer slowing the rate of increase in the intestinal luminal pH thereby by stimulating Claudin upregulation (active transport).
- Glycine improves the solubility of the whole compound leading to improved bioavailability.
- Glycine occupies the reactive sites of minerals, reducing complexing with phytates and other absorption inhibitors.

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Why use glycine as a chelate ligand?

Properties of amino acids

Amino acid residue	pK_a of ionizing side chain[a]	Average residue mass[b] (daltons)	Monoisotopic mass (daltons)[b]	Occurrence in proteins[c] (%)	Percent buried residues[d] (%)	V_i[e] (Å^3)	van der Waals volume[f] (Å^3)	Accessible surface area[g] (Å^2)	Ranking of amino acid polarities[h]
Alanine	–	71.0788	71.03711	7.5	38 (12)	92	67	67	9 (7)
Arginine	12.5 (>12)	156.1876	156.10111	5.2	0	225	148	196	15 (19)
Asparagine	–	114.1039	114.04293	4.6	10 (2)	135	96	113	16 (16)
Aspartic acid	3.9 (4.4–4.6)	115.0886	115.02694	5.2	14.5 (3)	125	91	106	19 (18)
Cysteine	8.3 (8.5–8.8)	103.1448	103.00919	1.8	47 (3)	106	86	104	7 (8)
Glutamine	–	128.1308	128.05858	4.1	6.3 (2.2)	161	114	144	17 (14)
Glutamic acid	4.3 (4.4–4.6)	129.1155	129.04259	6.3	20 (2)	155	109	138	18 (17)
Glycine	–	57.0520	57.02146	7.1	37 (10)	66	48		11 (9)
Histidine	6.0 (6.5–7.0)	137.1412	137.05891	2.2	19 (1.2)	167	118	151	10 (13)
Isoleucine	–	113.1595	113.08406	5.5	65 (12)	169	124	140	1 (2)
Leucine	–	113.1595	113.08406	9.1	41 (10)	168	124	137	3 (1)
Lysine	10.8 (10.0–10.2)	128.1742	128.09496	5.8	4.2 (0.1)	171	135	167	20 (15)
Methionine	–	131.1986	131.04049	2.8	50 (2)	171	124	160	5 (5)
Phenylalanine	–	147.1766	147.06841	3.9	48 (5)	203	135	175	2 (4)
Proline	–	97.1167	97.05276	5.1	24 (3)	129	90	105	13 (–)
Serine	–	87.0782	87.03203	7.4	24 (8)	99	73	80	14 (12)
Threonine	–	101.1051	101.04768	6.0	25 (5.5)	122	93	102	12 (11)
Tryptophan	–	186.2133	186.07931	1.3	23 (1.5)	240	163	217	6 (6)
Tyrosine	10.9 (9.6–10.0)	163.1760	163.06333	3.3	13 (2.2)	203	141	187	8 (10)
Valine	–	99.1326	99.06841	6.5	56 (15)	142	105	117	4 (3)

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Magnesium Plus

This formulation is involved in:

- Calcium metabolism
- Muscle contractions
- Energy production
- Over 300 essential metabolic reactions
- Protein synthesis
- Synthesis of the antioxidant glutathione
- Carbohydrate and lipid metabolism
- Normal electrolyte balance
- The synthesis of DNA and RNA
- The development of healthy bones and teeth
- Bone mineralisation
- Normal blood coagulation

Magnesium Plus

Each tablet contains:

Magnesium *as magnesium glycinate dihydrate (an amino acid chelate)*	100 mg
Pyridoxal 5-phosphate (*Active B6 equiv. vitamin B6 2 mg*)	2.92 mg
Menaquinone 7 *(natural vitamin K2)*	10 mcg

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Magnesium Plus – *Focus on Ingredients*

- Contains magnesium in a fully reacted chelated amino acid form
- Pyridoxal 5-phosphate is a bioavailable, active form of Vitamin B6.
- Vitamin B6 and magnesium are both needed for the production of energy in the body.
- Magnesium has an integral role in calcium metabolism and is important for normal bone structural integrity.
- Natural vitamin K is complements magnesium's bone effects as it is required for the action of osteocalcin. Osteocalcin has a regulatory function in bone calcium turnover and bone mineralisation.

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Manganese Plus

Manganese Plus
Each tablet contains:

Manganese	15 mg
(*As manganese II glycinate , an amino acid chelate)*	
Thiamine nitrate (vitamin B1)	1 mg

This formulation is involved in:

- Amino acid metabolism
- Carbohydrate metabolism
- Cartilage and bone synthesis
- Energy production support
- Key enzyme formation: metalloenzymes, Pyruvate decarboxylase and Super oxide dismutase
- Free radical protection
- Heart health
- Metabolism of carbohydrates into energy
- Nerve function support
- Synthesis of DNA precursors

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Manganese Plus – *Focus on Ingredients*

- This formula contains manganese glycinate as a fully reacted amino acid chelate.

- Manganese glycinate is complemented by synergistic nutrient vitamin B1 (thiamine) as these nutrients are interdependent and a shortage of one can affect levels of the other. (1)

- Thiamine facilitates the synthesis of important DNA precursors and supports healthy heart and nervous system function and helps convert carbohydrates into energy and assists in the maintenance of healthy heart and nerve function.

References

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MolyZinc

This formulation is involved in:

- Metalloenzyme formation
- Sulphur amino acid metabolism
- Energy production
- Carbohydrate, protein and fat metabolism
- Healthy immune function
- Skin repair and maintenance
- Healthy eye function
- Neurotransmitter synthesis e.g. *GABA, dopamine, serotonin.*
- Healthy cardiovascular function
- Hormone regulation
- Bile synthesis from cholesterol

MolyZinc Plus
Each tablet contains:

Molybdenum *(As molybdenum trioxide)*	100 mcg
Ascorbic acid *(vitamin C)*	30 mg
Zinc *(as amino acid chelate)*	5 mg
Pyridoxal 5-phosphate (*active B6 equiv. vitamin B6 1 mg*)	1.5 mg

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MolyZinc - *Ingredients in Focus*

- Molybdenum is an essential component of several metalloenzymes including *xanthine oxidoreductase, sulphite oxidase, aldehyde oxidase* and *mitochondrial amidoxime*.
- Zinc appears to facilitate the function of the enzyme crARC, a cofactor of the molybdenum-dependent enzyme *sulphite oxidase*. In this way zinc may act as a molybdenum synergist, assisting its catalytic activity.(1)
- Vitamin B6 and molybdenum each play unique but complementary roles in the metabolism of important sulphur-containing amino acids. (2)
- Vitamin C has a critical function in reducing metals into the appropriate oxidation state needed for efficient ion transport across the intestinal border. In this way, Vitamin C may help facilitate efficient uptake of molybdenum.(3,4,5)

References

1. Chamizo-Ampudia A, Galvan A, Fernandez E, Llamas A. The Chlamydomonas reinhardtii molybdenum cofactor enzyme crARC has a Zn-dependent activity and protein partners similar to those of its human homologue. Eukaryotic cell. 2011 Oct 1;10(10):1270-82.
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Potassium Plus

Potassium Plus	
Each tablet contains:	
Potassium *(As chelated potassium with gluconate)*	150 mg
Nicotinamide (vitamin B3)	5 mg
Pyridoxal 5-phosphate (*Active B6 equiv. vitamin B6 2 mg*)	2.92 mg
Beta-carotene *(natural)*	500 mcg

This formulation is involved in:

- Energy production
- Carbohydrate metabolism
- Normal neurological function
- Fatty acid, cholesterol and steroid synthesis
- Immune function
- Neurotransmitter synthesis e.g. GABA, dopamine, serotonin.
- Cardiovascular function
- Haemoglobin formation
- Red blood cell growth
- Homocysteine metabolism
- Hormone regulation
- Hormone modulation

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Potassium Plus *Ingredients in Focus*

- Potassium gluconate is a highly bioavailable form comparable to natural dietary sources. (1)
- Lowered potassium levels may occur in conditions which dramatically affect body fluid balance.(6, 2)
- Ideal potassium to sodium ratio appears to be 1:1 whereas actual potassium intakes are lower as shown in Australian and NZ large-scale studies.(3, 4, 5)
- Nicotinamide is a potassium channel activator. It induces vasodilation by opening membrane-bound adenosine triphosphate-dependent potassium channels.(7)
- Pyridoxal 5-Phosphate may support potassium by assisting fluid balance regulation and by being intimately involved in the electrical functioning of the heart, nerves and musculoskeletal system.
- Both beta-carotene and potassium are associated with thyroid-normalising processes in the body. (8, 9)

References

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Zinc Plus

This formulation is involved in:

- Proper growth and development
- Over 200 enzymes in the body
- Healthy immune function
- Normal male physiology and function
- Maintaining healthy skin
- Reproductive hormone metabolism
- Minor wound healing
- Sperm production, ovulation and fertilisation
- Cell membrane structure and integrity
- The formation of the antioxidant superoxide dismutase
- Healthy vision and eye function
- Carbohydrate, protein and fat metabolism
- DNA synthesis

Zinc Plus
Each capsule contains:

Zinc (as amino acid chelate) *(zinc glycinate monohydrate)*	25	mg
Pyridoxal 5-phosphate (*Active B6 equiv. pyridoxine 3 mg*)	4.38	mg
Methionine	5	mg

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Zinc Plus - *Ingredients in Focus*

- Preclinical trials show zinc glycinate supplementation may provide more efficient absorption compared to inorganic sources of zinc, as measured by the post-supplementation expression of various zinc-transporters. (1)

- Pyridoxal 5-phosphate (P5P) the metabolically active form of Vitamin B6 acts as a zinc synergist, playing a role in the metabolism of carbohydrates, proteins, and fats and in DNA synthesis.

- P5P has an integral role in maintaining a healthy immune system.

- The amino acid methionine also acts a zinc synergist due to its favourable effect of improving zinc absorption. (2,3)

References

1. Huang D, Zhuo Z, Fang S, Yue M, Feng J. Different zinc sources have diverse impacts on gene expression of zinc absorption related transporters in intestinal porcine epithelial cells. Biological trace element research. 2016 Oct 1;173(2):325-32.
2. Lönnerdal BO. Dietary factors influencing zinc absorption. The Journal of nutrition. 2000 May 1;130(5):1378S-83S.
3. House WA, Van Campen DR, Welch RM. Influence of dietary sulfur-containing amino acids on the bioavailability to rats of zinc in corn kernels. Nutrition Research.1996 Feb 1;16(2):225-35.

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Comparison of Original and Reformulated Products

Trace Nutrients Formula	InterClinical Professional Formula Comparison	Rationale for New Ingredients
Zinc Plus Zinc amino acid chelate 25 mg Vitamin B6 (pyridoxine hydrochloride) 5mg	**Zinc Plus** Zinc amino acid chelate 25 mg *(Zinc glycinate monohydrate)* Pyridoxal 5-phosphate *(Active B6, equiv. pyridoxine 3 mg)* 4.38 mg Methionine 5 mg	• **Changing to a fully reacted Zinc chelate** provides the benefit of an unvarying and uniform potency. This is because it *maximises* the amount of zinc attached to the amino acid. (1) • **Pyridoxal 5-Phosphate is the active form of vitamin B6** which can bypasses the enzymatic steps needed for standard B vitamin activity and facilitates greater utilisation for less effort by the body.(2) • **According to Dr David Watts of Trace Elements states that methionine "**helps Zinc absorption and as a sulphur-containing amino acid it helps reduce reactive oxygen species (ROS), protein synthesis and DNA". (Watts, D. personal communication, October 17, 2017).
Magnesium Plus Magnesium (amino acid chelate) 100mg Vitamin B6 (pyridoxine hydrochloride) 2mg	**Magnesium Plus** Magnesium as magnesium glycinate dihydrate *(an amino acid chelate)* 100 mg Pyridoxal 5-phosphate 2.92 mg *(Active B6 equiv. pyridoxine 2 mg)* Menaquinone 7 *(natural vitamin K2)* 10 mcg	• **Changing to a fully reacted magnesium chelate** provides the benefit of an unvarying and uniform potency. This is because it *maximises* the amount of zinc attached to the amino acid. (1) • **Pyridoxal 5-Phosphate is the active form of vitamin B6** which bypasses the enzymatic steps needed for standard B vitamin activity and facilitates greater utilisation for less effort by the body.(2) • **Natural Vitamin K along with magnesium** has beneficial effects on bone mineralisation and cardiovascular health.(5)
Potassium Plus Potassium (gluconate) 100 mg Vitamin B6 (pyridoxine hydrochloride) 5 mg Natural betacarotene (from Dunaliella salina) 180mcg	**Potassium Plus** Potassium gluconate 150 mg *(As chelated potassium with gluconate)* Nicotinamide (vitamin B3) 5 mg Pyridoxal 5-phosphate *(Active B6 equiv. Pyridoxine 2 mg)* 2.92 mg Beta-carotene (natural) 500 mcg	• **Potassium gluconate dose was increased** as this readily available form of potassium because actual intakes are lower than ideal compared to sodium intakes in the population at large. (3) • **Beta-carotene** was used to provide a safe precursor provitamin form of vitamin A and the dosage was increased as a considerable amount of people poorly convert it to active vitamin A. • **Pyridoxal 5-Phosphate is the active form of vitamin B6** which bypasses the enzymatic steps needed for standard B vitamin activity and facilitates greater utilisation for less effort by the body.(2)
Manganese Plus Manganese (amino acid chelate) 12 mg Thiamine nitrate (vitamin B1) 1 mg	**Manganese Plus** Manganese 15 mg *(As manganese glycinate, an amino acid chelate)* Thiamine nitrate *(vitamin B1)* *Equiv Thiamine* 1 mg	• **Changing to a fully reacted Manganese chelate** provides the benefit of an unvarying and uniform potency. This is because it *maximises* the amount of zinc attached to the amino acid.(1) • **Manganese was increased** as experience has shown over 20 years that 12 mg is a safe level and InterClinical felt a slightly higher dose would provide even greater benefits.
MolyZinc Molybdenum (trioxide) 100 mcg vitamin C (sodium ascorbate) 30 mg Zinc (amino acid chelate) 5 mg	**MolyZinc** Molybdenum *(As molybdenum trioxide)* 100 mcg Ascorbic acid *(vitamin C)* 30 mg Zinc *(as amino acid chelate)* 5 mg Pyridoxal 5-phosphate 1.5 mg *(active B6 equiv. vitamin B6 1 mg)*	• **Pyridoxal 5-Phosphate is the active form of vitamin B6** which bypasses the enzymatic steps needed for standard B vitamin activity and facilitates greater utilisation for less effort by the body.(2) • **P5P is a synergist with molybdenum.** Studies show that it helps normalises neuronal activity in people with rare situations where individuals are molybdenum enzyme deficient.(6)

Blue = new ingredients, Red = Increased dosage

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would like to thank you for attending today's training session.