The Best Ingredients for Good Health

VitaCholine

ALBION MINERALS

BALCHEM
Human Nutrition & Pharma

BALCHEM®
Human Nutrition & Pharma

IS…

- Superior delivery of health benefits
- Strong science and innovative technologies
- Recognized worldwide for quality, efficacy and safety

VitaCholine®

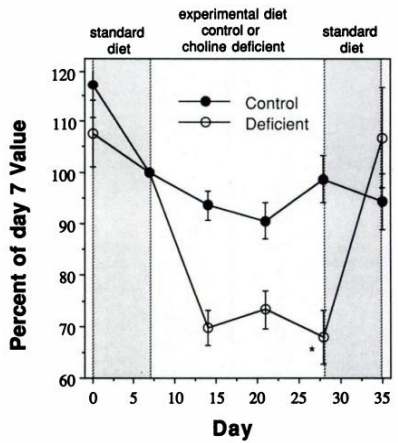
ALBION®
MINERALS

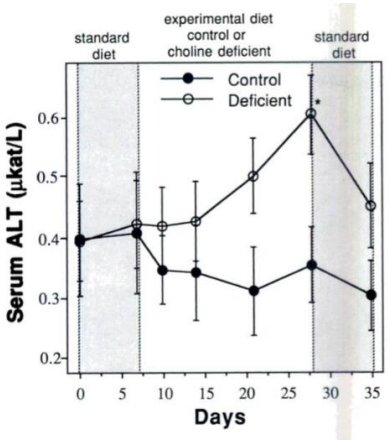
What is Choline?

What is choline?	***Choline*** is an essential nutrient found in the cell membranes of most living organisms. Plants, animals and humans all need ***choline*** in order to survive.
Why is choline called an essential nutrient?	An ***essential nutrient*** is a nutrient that our bodies cannot synthesize in sufficient quantities to meet our needs and thus must be supplemented through dietary intake. These nutrients often play many different roles in metabolism and are necessary to the proper structure and/or function of our bodies. Examples include, vitamins, minerals, protein, fats, carbohydrates and, of course, ***choline***.

Choline is an Essential Nutrient

- Healthy male volunteers, after one week of a standard diet
  - Randomized into 2 groups (n=16):
    - 1) 500 mg choline (control) and 2) without (deficient) for 3 weeks
    - Final week all received choline
- Results showed
  - choline-deficient group:
    - Plasma choline ↓ (30%)
    - Serum alanine aminotransferase ↑



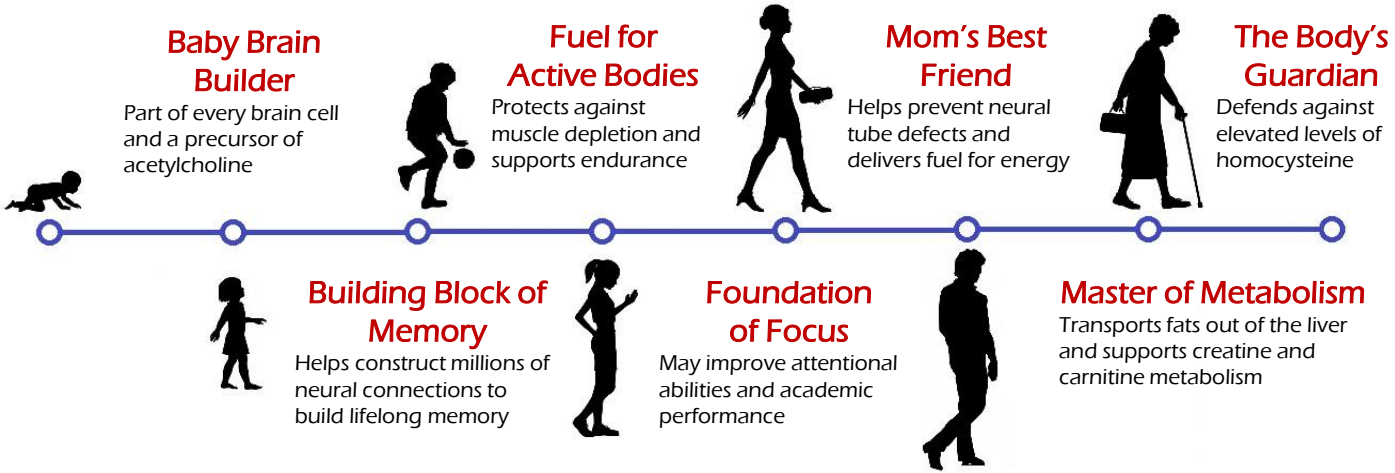


Zeisel S.H., et al. FASEB J. 1991, 5, 2093-8.

Essential Nutrition for Life

VitaCholine™ The Quality Choice™

Choline benefits men and women across all life stages:



From birth through advanced years, choline is ***fundamental*** to good health

Choline in the Body

Liver Health

Choline helps export fat from our livers for conversion to energy.

• *phosphatidylcholine* •

Brain Health

Choline helps the brain send messages throughout our bodies.

• *acetylcholine* • • *sphingomyelin* •

Cellular Integrity

Choline is part of each and every cell membrane in our bodies.

• *phosphatidylcholine* •

Genetic Processes

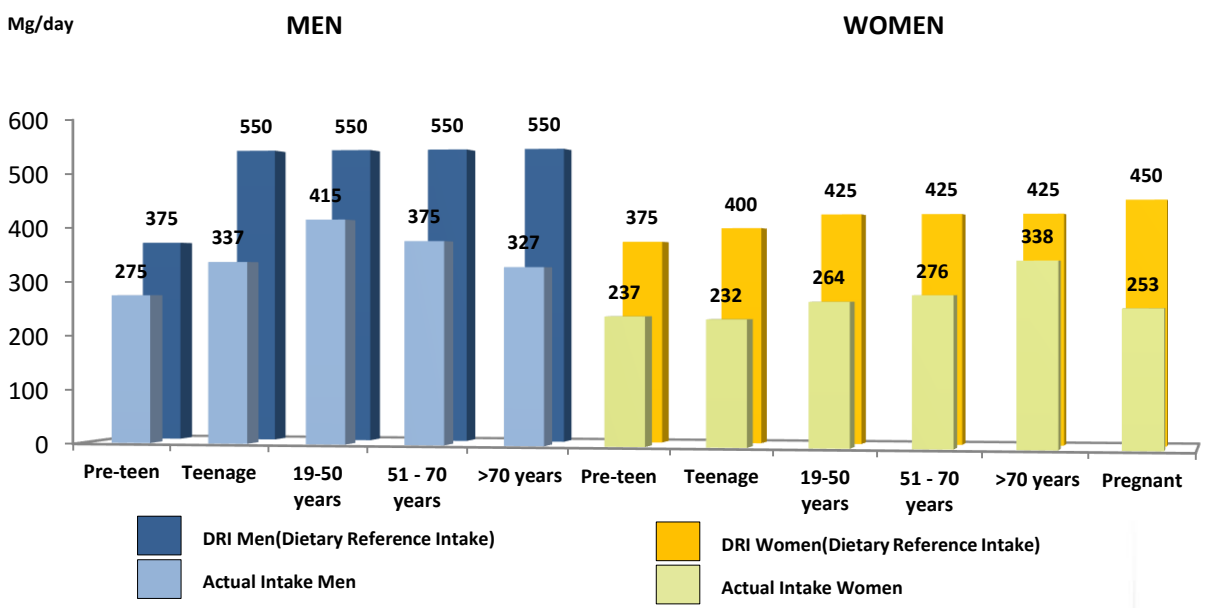
Choline helps ensure our DNA is activated for proper protein production.

• *betaine* • • *methylation* •

• *s-adenosyl methionine* •

90% are Not Getting Enough

VitaCholine™ The Quality Choice™



NHANES 2003-2004 study (Jensen et al. 2007)

The Best Choline Food Sources are Often Unappetizing or Unpopular

VitaCholine™ The Quality Choice™

- Liver is the single best source of choline
- Eggs are an excellent source, but aren't a daily choice for many due to cholesterol concerns
- Meats, fish and certain vegetables are good sources, but even a choline-focused diet still falls short[1]

1, http://vitacholine.com/wp-content/uploads/2017/11/Choline-Healthy-U.S.-Style-Menu-Model-High-Res-10.12.17.pdf

BALCHEM®
Human Nutrition & Pharma

Choline Advancements

VitaCholine™ The Quality Choice™

The past three years have seen major advancements in choline science and policy. This dramatic increase in news is driving consumer awareness and has choline poised to be the next big nutrient!

Advancements in Choline Science and Policy

2015

- **U.S. Department of Agriculture** identifies choline as one of four 'shortfall nutrients' with inadequate intakes across all adult dietary patterns
- A study published in the *British Journal of Nutrition* finds inadequate choline intakes across Europe

2016

- **U.S. Food and Drug Administration** establishes a choline RDI of 550mg, allowing for a Daily Value listing on food and supplement labels
- Research in the *Journal of the American College of Nutrition* finds that ~90% of Americans don't get enough choline in their diet

2017

- **American Medical Association** votes to call for increased choline levels in prenatal vitamins as part of their annual meeting of delegates
- A study of choline intakes published in *Nutrients* discovers that only 8% of pregnant women are consuming recommended amounts of choline

2018

- **American Academy of Pediatrics** issues a policy statement calling out choline as one of several key 'brain-building' nutrients
- Research from a clinical study published in *The FASEB Journal* shows that higher prenatal choline intakes result in improved infant cognition

More Choline for Mom Enhances DHA Uptake & Increases Infant Processing Speeds

Cornell University research suggests that more choline during pregnancy benefits child cognition:

CHOLINE = DHA UPTAKE

Higher choline intakes, coupled with adequate DHA, may lead to higher phospholipid DHA concentration

CHOLINE = PROCESSING SPEED

Increased choline intake during pregnancy was correlated with improved processing speeds, a marker of intelligence in infants

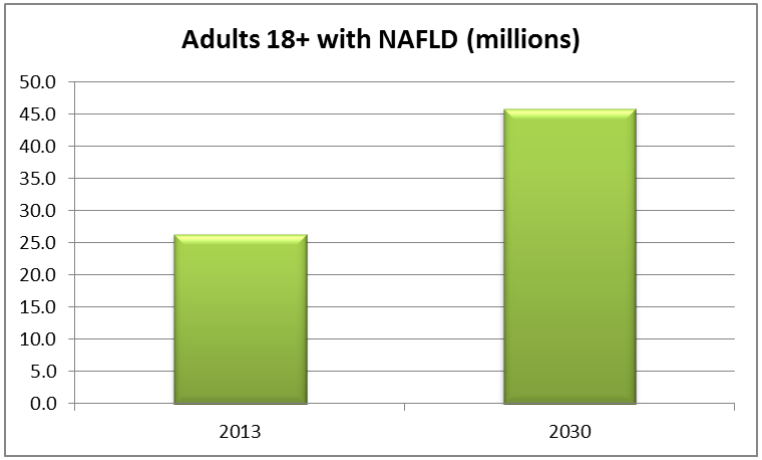
West AW, Yan J, Jiang X, Perry CA, Innis SM and Caudill MA, Choline intake influences phosphatidylcholine DHA enrichment in nonpregnant women but not in pregnant women in the third trimester. AJCN, 2013; doi: 10.3945/ajcn.112.050211

Caudill MA, Strupp BJ, Muscalu L, Nevins JEH, Canfield RI. Maternal choline supplementation during the third trimester of pregnancy improves infant information processing speed: a randomized, double-blind, controlled feeding study. FASEB Journal, published online before print December 7, 2017; doi:10.1096/fj.201700692RR

Liver Health is a Growing Segment

Non-Alcoholic Fatty Liver Disease (NAFLD) is rising

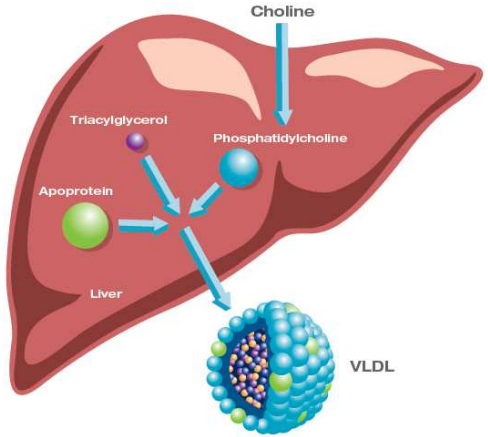
- Estimates predict that 45 million U.S. adults will suffer from NAFLD by 2030



1. 2014 Consumer Survey on Dietary Supplements, Council for Responsible Nutrition, http://www.crnusa.org/CRNconsumersurvey/2014
2. http://newhope360.com/business/nifty-ways-love-your-liver

Choline:
The Liver's Clean Up Crew

- The liver works to:
  - process nutrients for distribution in the body
  - detoxify the body by metabolism of foreign substances
- Choline prevents the build-up of excess fat in the liver
  - provides raw material to make VLDL "packages" of lipid
  - allows liver to function normally



Allowed Health Claims in Europe & USA

Europe – EFSA approved Health claims

- ✓ Choline contributes to normal homocysteine metabolism
- ✓ Choline contributes to normal lipid (fat) metabolism
- ✓ Choline contributes to maintenance of normal liver function
  - ➢ Product should contain at least 82,5 mg Choline per serving or 100 g or 100 ml

USA – FDA reviewed structure function claims

- ✓ Prenatal use may lead to lifelong improvement of visuospatial memory in children born of the pregnancy
- ✓ Supplementation during infancy and childhood may lead to improved lifelong memory
- ✓ May help memory problems associated with aging
- ✓ May help reduce levels of plasma homocysteine
- ✓ May reduce fatigue and increase vigor during strenuous exercise
- ✓ May promote healthy liver function
  - ➢ 55 mg = good source
  - ➢ 110 mg = excellent source

Commercial Choline Forms

Choline exists in both water-soluble choline forms, typically choline salts, and in covalently bound forms.

Form of choline	% choline (w/w)	Free/ Bound
Choline chloride	74.6%	Free
Choline bitartrate	41.1%	Free
α-glycerylphosphorylcholine (GPC, choline alfoscerate)	40.5%	Bound
Choline dihydrogen citrate	35.2%	Free
Cytidine 5'-diphosphocholine	21.2%	Bound
Phosphatidylcholine	~13-20%	Bound

Table 2. Forms of choline

- Dietary choline from ingestion of non-fortified foods comes in the form of phosphatidylcholine.
- Salts generally have a higher choline cation content, quickly increase serum choline levels (within 1 – 2 hours) and return to normal within 8 – 12 hours.
- Bound forms require enzymatic reactions to break them down into free choline, presumably resulting in slower serum impact.

How Choline is Metabolized

VitaCholine™ The Quality Choice™

After choline is consumed, it passes through the digestive system where free forms dissolve and immediately dissociate into free choline, while bound choline forms require additional enzymatic steps to remove additional elements resulting in free choline being absorbed.

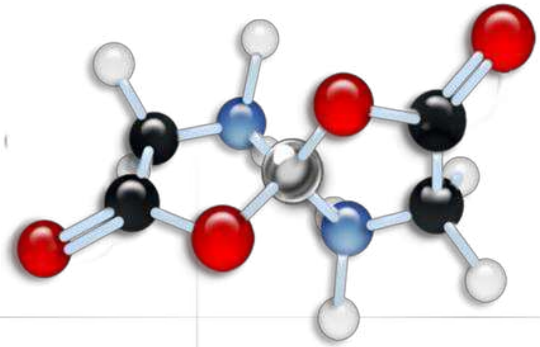
Choline Salts	Dissolution in stomach				
Phosphatidylcholine	Transport to the small intestine	Enzymes remove fatty acid groups	Enzymes remove glycerol group	Phosphocholine: Enzymes remove remaining phosphate group(s)	**Free Choline**
Alpha GPC choline		Enzymes remove glycerol group			
CDP-choline		Enzymes remove a phosphate group			

Why Choose VitaCholine®?

- Widely accepted as the quality choice of choline for use in dietary supplements, infant formula and food
  - *Made only with natural L (+) tartaric acid*
  - *Kosher and Halal*
  - *Non-GMO Project verified*
  - *Meets most current USP and FCC monographs*
- We are the only North American producer of human grade choline
  - *Two manufacturing sites, allowing for dual plant approval (USA and Italy)*
- Choline used in cutting-edge prenatal research at Cornell University
  - *A recent clinical study published in FASEB showed that supplemental choline during pregnancy improves infant information processing speeds*

ALBION
MINERALS

ALBION CHELATED MINERALS



Minerals are more essential than Vitamins

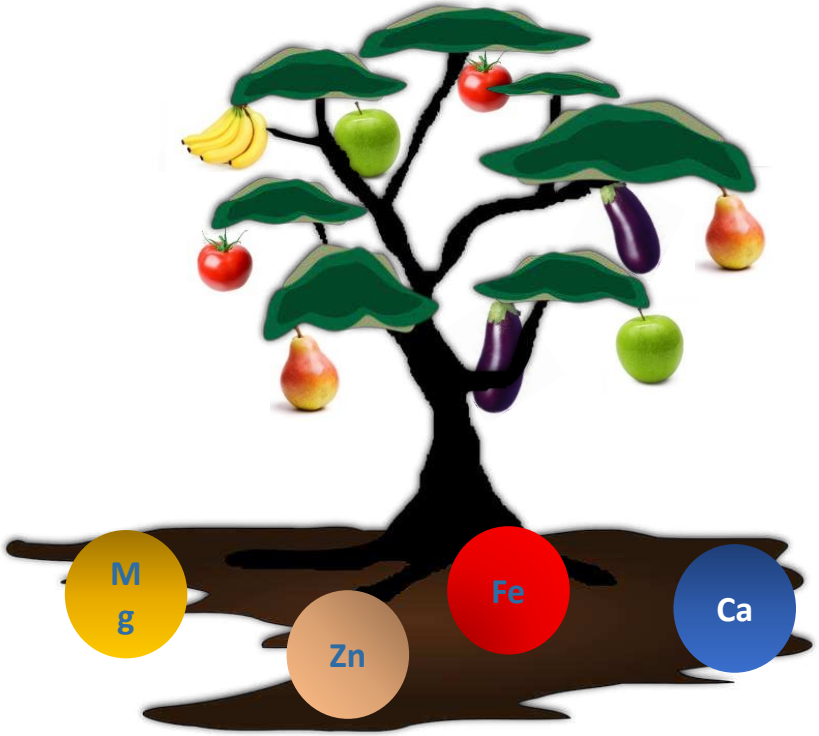
6 Essential Nutrients:

1)Protein
2)Carbs
3)Fat
4)Vitamins
5)Minerals
6)Water

1. Minerals cannot be synthesized by living organisms
2. Most important factor in maintaining all physiological processes
3. Approximately 5% of our body is made up of minerals

FACT

More difficult to get Minerals from current diet



[1] A. Mayer, (1997) "Historical changes in the mineral content of fruits and vegetables", British Food Journal, Vol. 99 Issue: 6, pp.207-211

Large population groups are deficient in essential minerals

ALBION MINERALS

17,3% of global population does not consume adequate Zinc[1]

51% of global population is estimated to still be at risk of calcium deficiency[3]

2 Billion People, over 30% of the world's population – are anaemic, many due to Iron deficiency[2]

15% of the German

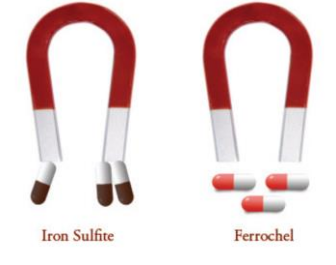
28% of the Mexicans

75% of the Taiwanese adults, Do not consume adequate Magnesium in their diets [4]

[1] WHO, Wessels & Brown, 2012
[2] Macronutrient deficiencies, WHO, 2017 (http://www.who.int/nutrition/topics/ida/en/)
[3] Kumssa, Joy, Anders, & all, 2015
[4] Naithani, Bharadway, & Darbari, 2014

What are the issues with current minerals?

ALBION MINERALS



Charged ions (Fe^{2+}, Ca^{2+}, Mg^{2+}, Zn^{2+}) can easily bind to other particles and lead to bad absorption of minerals

Irritation of the Gastrointestinal (GI) tract irritation. Especially Iron and Magnesium are known to cause GI issues

Minerals can destroy other important nutrient factors, such as Vitamin E,C, various B-Vitamins and certain medications

Results into lower bioavailability of minerals

How does nature do it?

ALBION MINERALS

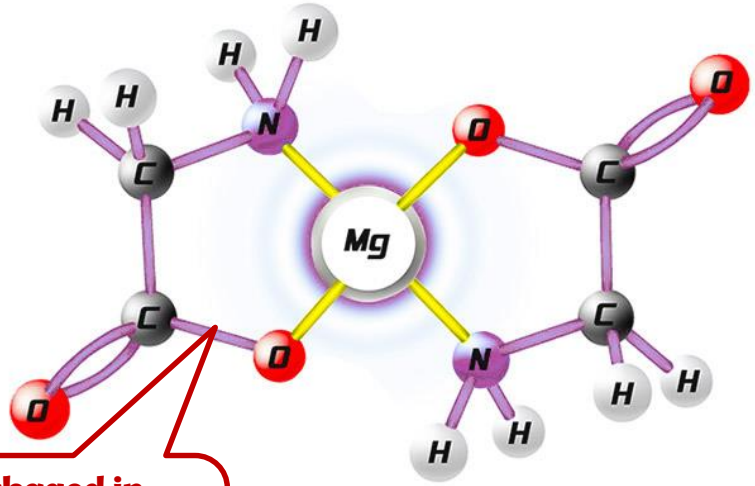
Protect the minerals from:

- **Binding other food**
- **Not causing GI irritation**
- **Increasing absorption and bioavailability**

Packaged in Amino acids, building blocks of proteins

Albion chelated minerals mimic Nature's Benefits and more...

ALBION MINERALS

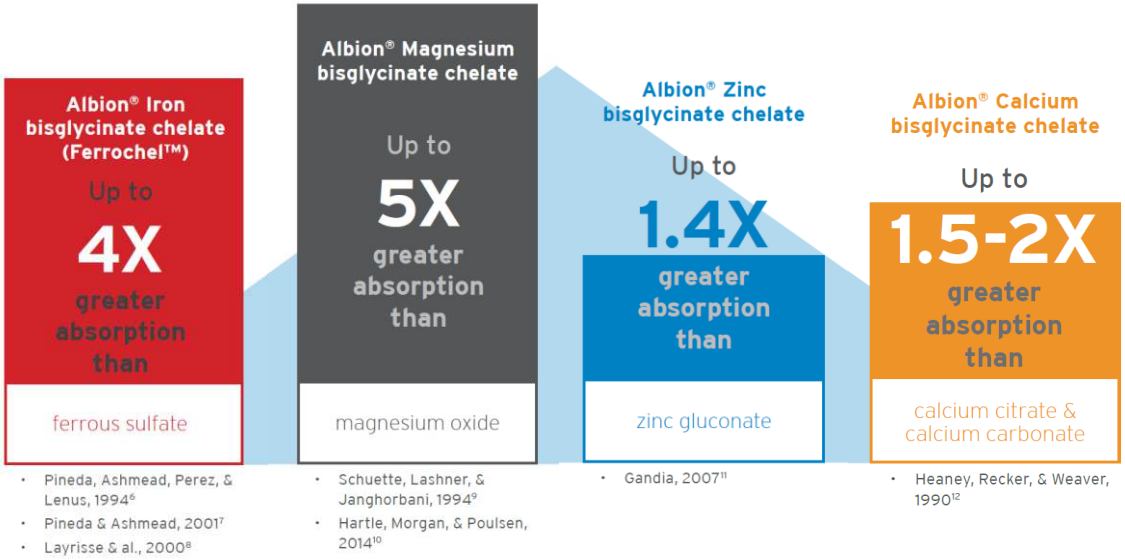


Packaged in Amino acid, Glycine. Soluble in water

- Chelation is a mineral delivery system
- Mineral reacted with a protecting ligand
- Ring structure
- Stable
- Validated

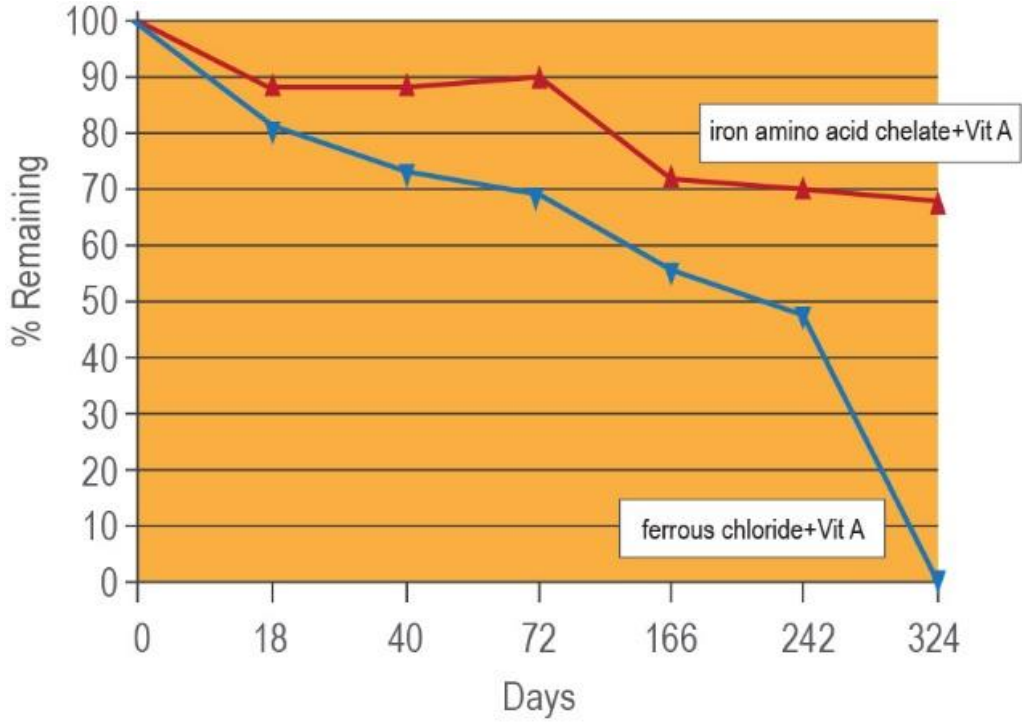
Results into a higher bioavailability

ALBION® MINERALS



Less reactive, stable and less degradation to other Vitamins

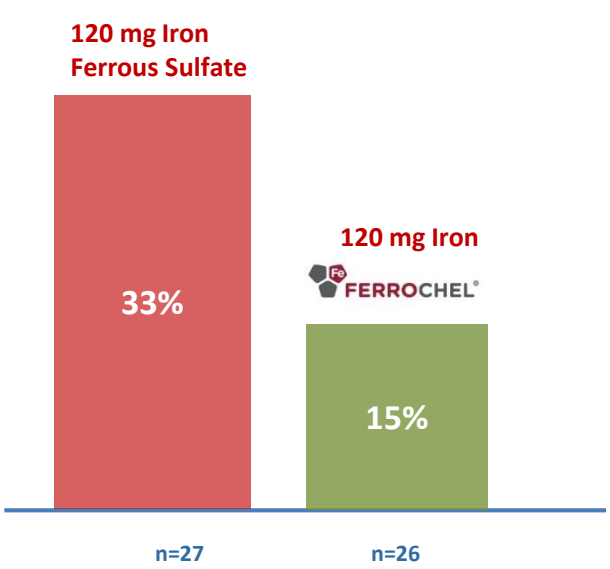
ALBION MINERALS



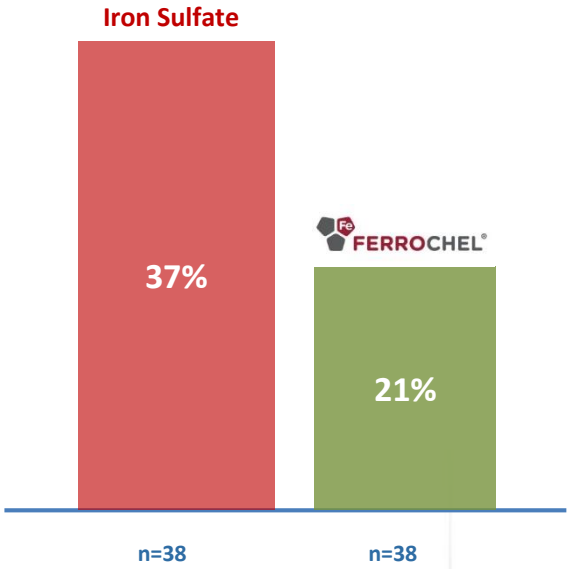
*Marchetti M, e.a. (2000). J Food Comp Analy, 13:875-884
*Albion Laboratories, Inc (1994). Unpublished internal study.

50% less gastric complaints with Albion chelated minerals

Gastric Complaints[1]



Experienced moderate-to-severe side effects[2]



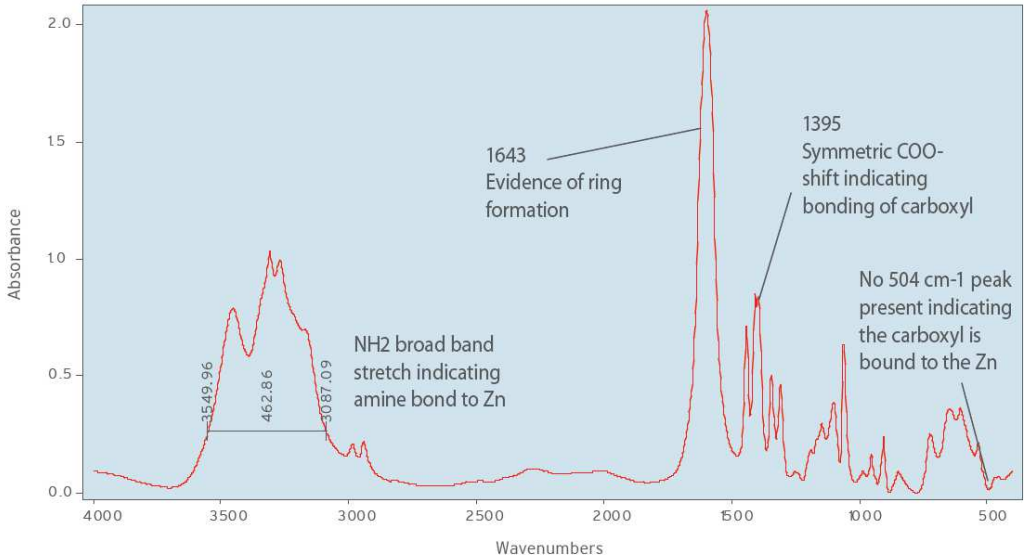
[1] Pineda, O., Ashmead, h. Perez, J., & Lenus, C., 1994., J Appli Nutri, 26:2-12
[2] Coplin, M., & Schuette, S., (1991). Clin Therapeut, 13:606-612

100% Proven Chelated Mineral

ALBION MINERALS

The Real Amino Acid Chelate System

Molecular energy signature (specifically the infrared (IR) spectrum of light) of 1.0% pure Zn bisglycinate sample in KBr

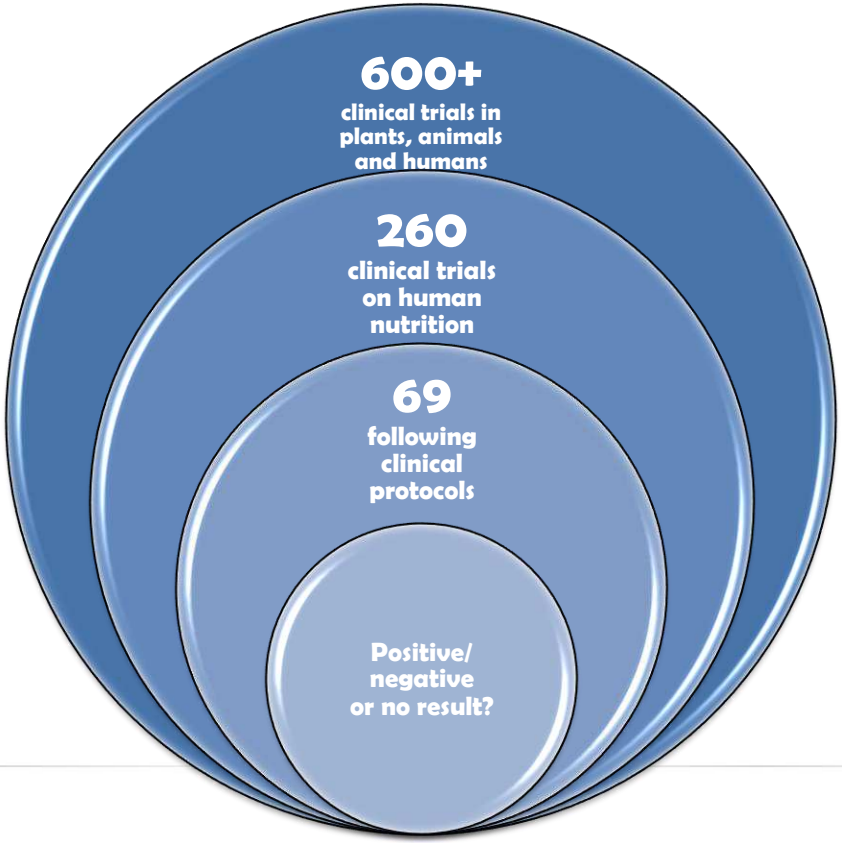


TRAACS®

ALBION MINERALS®

Albion minerals are scientifically proven

ALBION MINERALS



THANK YOU

Marie Garnich
mgarnich@balchem.com

IMCD New Zealand
jthomas@imcd.co.nz

BALCHEM®
Human Nutrition & Pharma