

POWERING HEALTHY TOMORROWS

Powering Healthy Tomorrows with the Innovations of Today

*Technology for women's health,
companion products, and personalized
nutrition*

*Presented by: Sarah Gonçalves
Senior Business Development | Nutraceuticals*

 **Ingredients
+Specialties**
From **UnivarSolutions**



Powering healthy tomorrows | Agenda



Key takeaways

- **Why bioavailability matters** | Consumers expect supplements to deliver proven efficacy (and price!) driving a demand for bioavailable ingredients
- **Leading technologies** | Focus on the efficacious ingredients of today such as chelated minerals, liposome enhanced botanicals, and bioavailable formats that raise the standard
- **Formulation focus** | Innovation is centered on developing targeted formulas for Women's Health, Personalized Nutrition and GLP-1 agonist companion



Definitions | Bioavailability and influencing factors

Bioaccessibility, Bioavailability, and Bioactivity

Bioaccessibility: The share of a compound from a meal or supplement that is **released from the matrix during digestion** and made available for absorption in the gut or transformed by gut microbes

Bioavailability: The portion of a **nutrient compound** that makes it **absorbed during digestion, and reaches the target tissues** either intact or as an active metabolite to exert a biological effect (or stored)

Bioactivity: the ability of a dietary compound to elicit a **measurable biological effect**, and the degree to which it reaches its site(s) of action in a biologically effective form

Factors Affecting Bioavailability



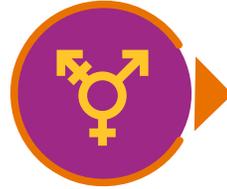
Genetics and Health Conditions

Polymorphisms in nutrient transporters and metabolizing enzymes, gastrointestinal pathologies, and impaired pancreatic or hepatic function



Age

Immature GI tracks, altered gastric pH, delayed gastric emptying or reduced enzymatic activity



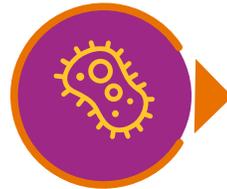
Sex & Hormones

Endocrine modulation of nutrient transport and metabolism (eg. Estrogen-mediated effects on choline, calcium, and iron uptake)



Lifestyle factors

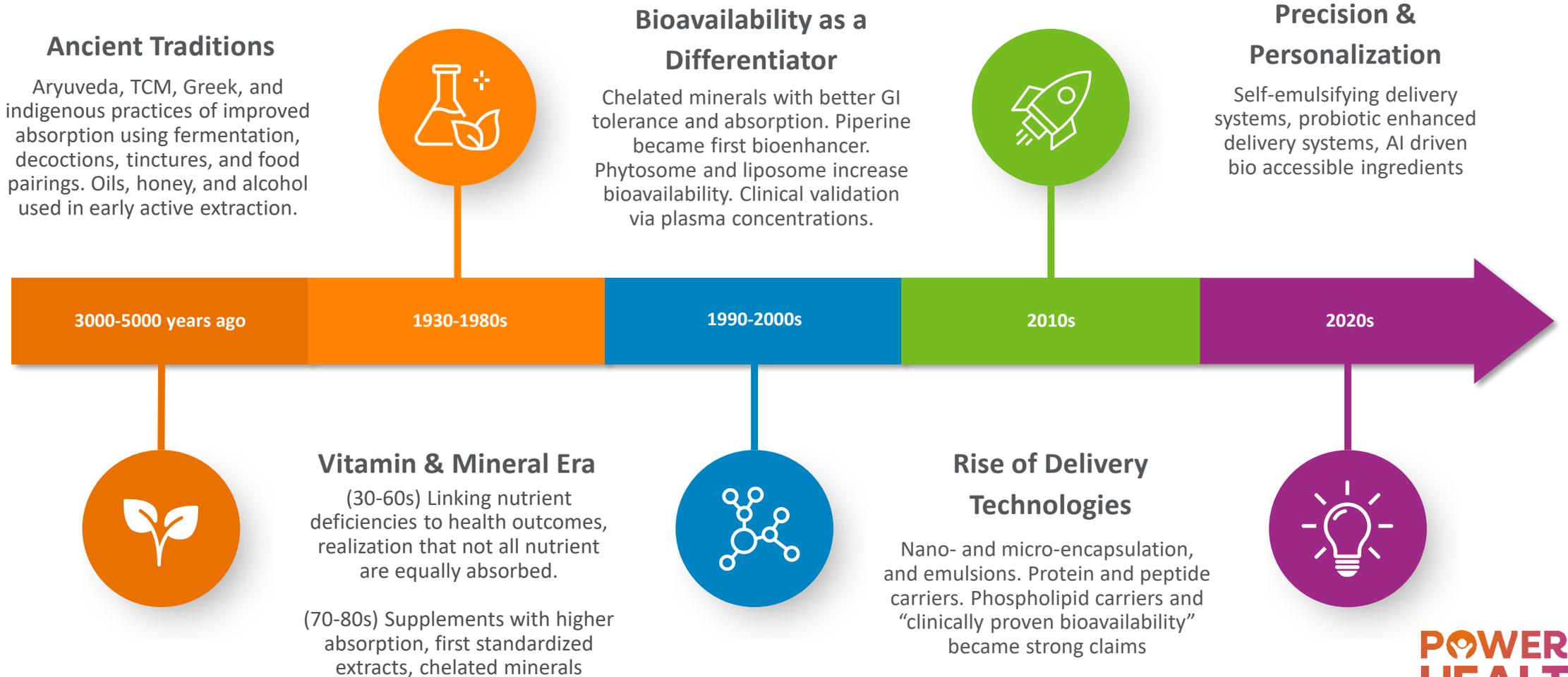
Dietary pattern, alcohol consumption, medication use, smoking, and physical activity impact



Microbiome Diversity

Interindividual differences in microbial composition and activity, influenced by diet, antibiotics, infections, and host-microbe interactions

History | Bioavailability and bioaccessibility



Overview | Technologies



Chelated Minerals

Minerals bound to ligands (amino acids, organic acids, or peptides) that form stable complexes that enhance solubility, stability, intestinal absorption, and bioavailability

Common Examples:

- Magnesium Bisglycinate
- Zinc Citrate
- Chromium Picolinate



Liposomal Delivery

Liposomal delivery improves absorption of hard-to-absorb botanicals by protecting lipophilic actives and enhancing transport across cell membranes.

Common Examples:

- Curcumin (turmeric)
- Resveratrol (grape)
- Silymarin (milk thistle)



Better Bioavailability

Nutrients or forms of nutrients that exist in a biologically active and highly bioavailable state, require little to no conversion before exerting effects

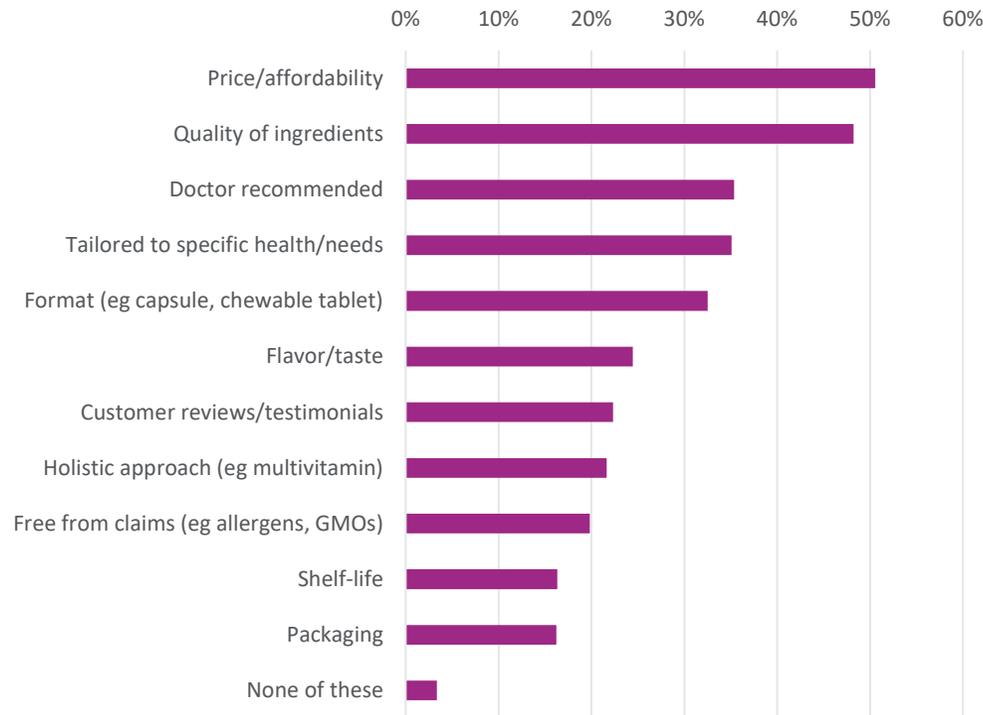
Common Examples:

- Alpha-glycerolphosphoryl choline
- Methylated Vitamins
- Omega-3s

Consumers Pay for Efficacy | Demand for Bioavailable Ingredients

From affordability to bioavailable: where purchase drivers converge

"Which of these factors influence your decisions when purchasing VMS products? Please select all that apply."



Base: 1,165 internet users aged 18+ who use VMS products regularly

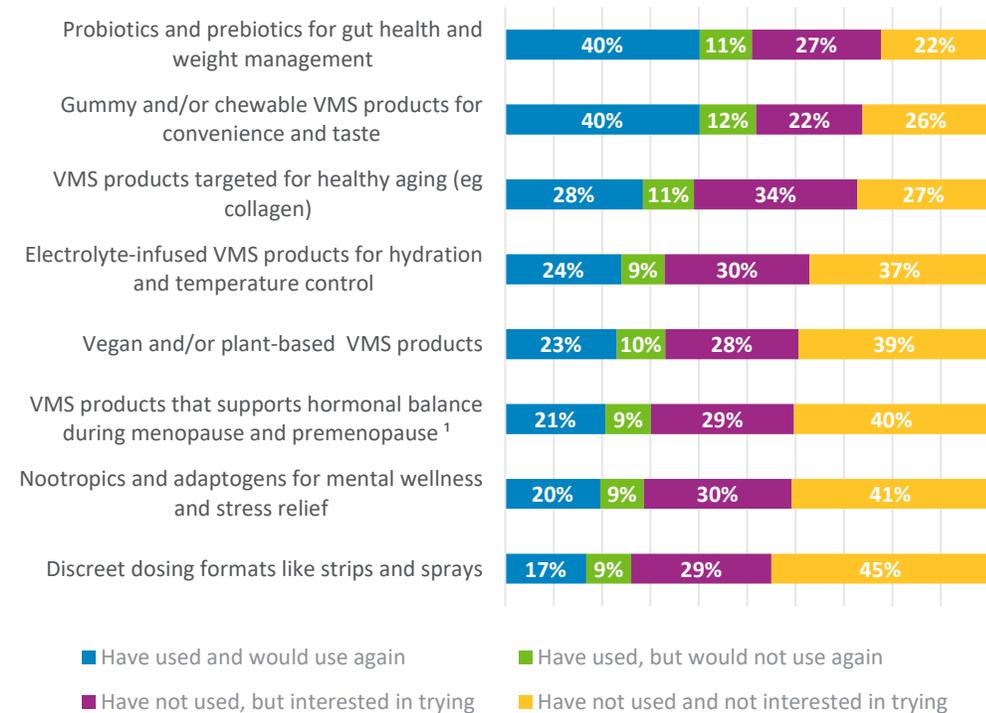
Source: Kantar Profiles/Mintel

Research Partner: N/A

Fieldwork: July 2024

Ingredients + Specialties from Univar Solutions

"Which of the following VMS innovations have you used, or would be interested in trying?"



Base: 2,000 internet users aged 18+

Source: Kantar Profiles/Mintel

Research Partner: N/A

Fieldwork: July 2024



The unique needs of the GLP-1 RA users

Closing the nutrient and performance gaps

Muscle Loss

- Up to 20–30% of weight lost can come from lean muscle mass.
- Risk of reduced strength, function, and metabolic health.

Nutrient Gaps

- Strong appetite suppression leads to significantly lower food intake.
- Risk of inadequate nutrient consumption.

Metabolic Adaptations

- Weight regain is common once treatment ends.
- As much as two-thirds of lost weight may return within a year.



GI Issues

- Digestive side effects are common.
- Can negatively impact gut comfort and overall nutrient absorption.

Dehydration

- Reduced thirst response increases likelihood of dehydration.
- May affect energy, cognition, and physical performance.

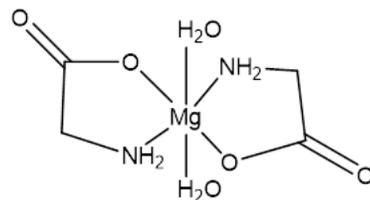
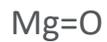
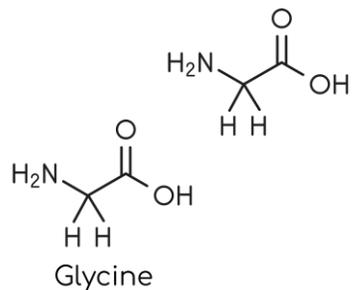
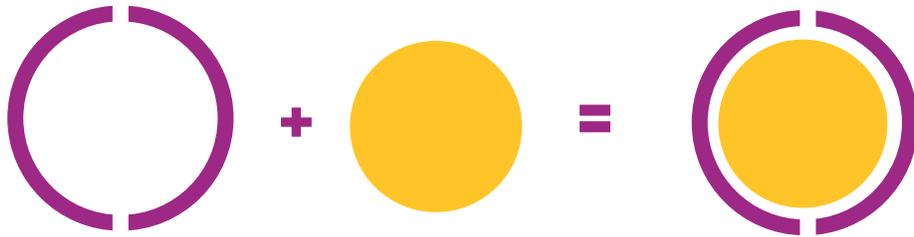
Chelated minerals | Definition and benefits

What is a chelate?

Chelating Ligand – a ligand that forms two or more bonds with the mineral

Mineral Salt – the mineral of choice (must be a good fit for the ligand)

Chelated Minerals – Mineral with a protective shell



FEATURE	NUTRITIONAL / COMMERCIAL BENEFIT
Superior bioavailability	Greater efficacy per dose → support clinical substantiation
Greater stability	Less interaction with inhibitors and other nutrients → longer shelf-life
Lower chemical reactivity	Does not dissociate into charged particles which can react and degrade vitamins and other ingredients in the supplement, rendering them useless → enables multiple ingredient blends with simpler labels
Enhanced solubility	More efficient transport of mineral molecules within the body and flexible delivery formats
More digestible	Prevents dissociation of the mineral ion to reduce the risk of gastrointestinal side effects → stronger consumer adherence and higher repeat purchases

Chelamax® | Proven Chelation



Not all organically bound minerals are chelated.

Innophos has developed the most advanced analytical testing in the industry with our three-step verification process. This ensures full chelation of all Chelamax® products.

1. X-Ray diffraction - confirms structure
2. TGA - used to confirm purity
3. FT-IR - produces a fingerprint for lot-to-lot comparison

Chelamax®

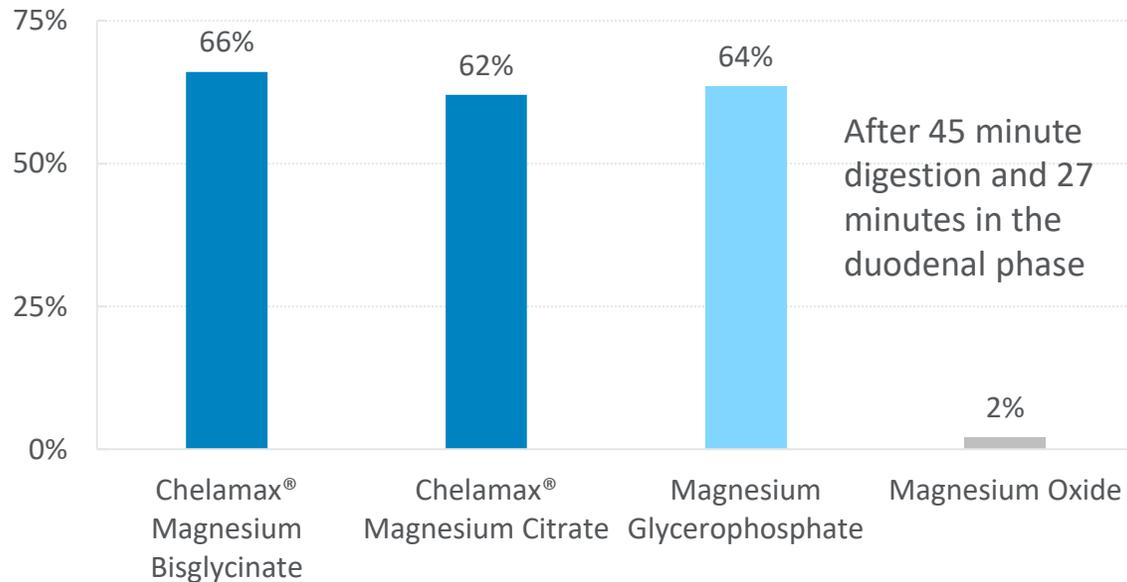
Calcium Ascorbate	Calcium Bisglycinate	Calcium Citrate	Chromium Picolinate	Magnesium Bisglycinate
Magnesium Citrate	Vanadium Bismaltoxalate	Zinc Bisglycinate	Zinc Citrate	Zinc Picolinate

Chelamax® | Magnesium In Vitro Study

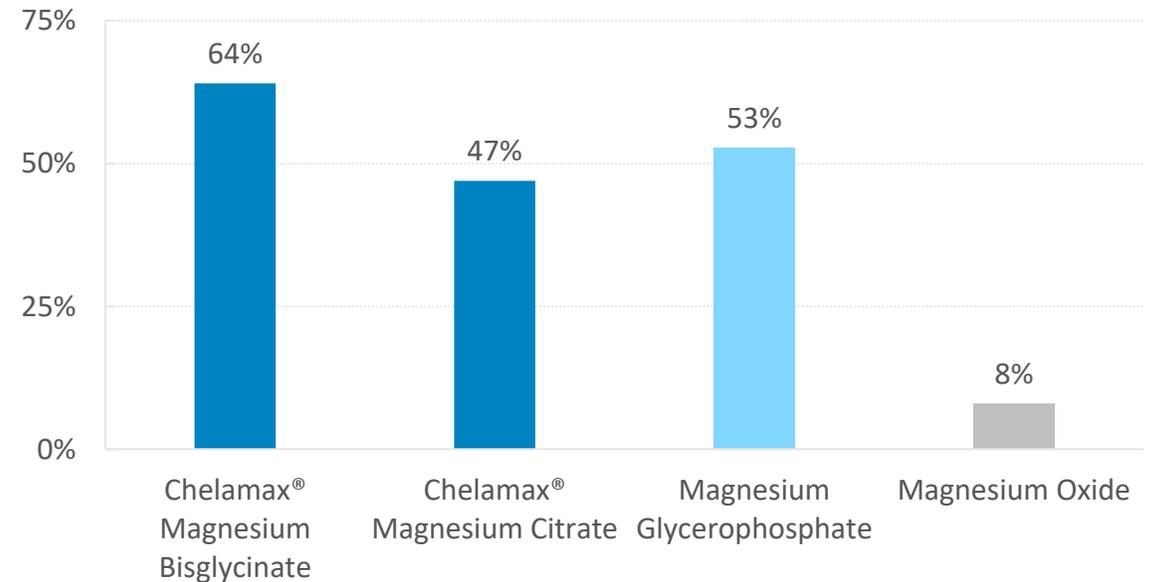


More than 60% of Chelamax® Magnesium Bisglycinate was absorbed through the membrane which corresponded to over 90% of the bio accessible magnesium

Bioaccessibility comparison of Magnesium Samples

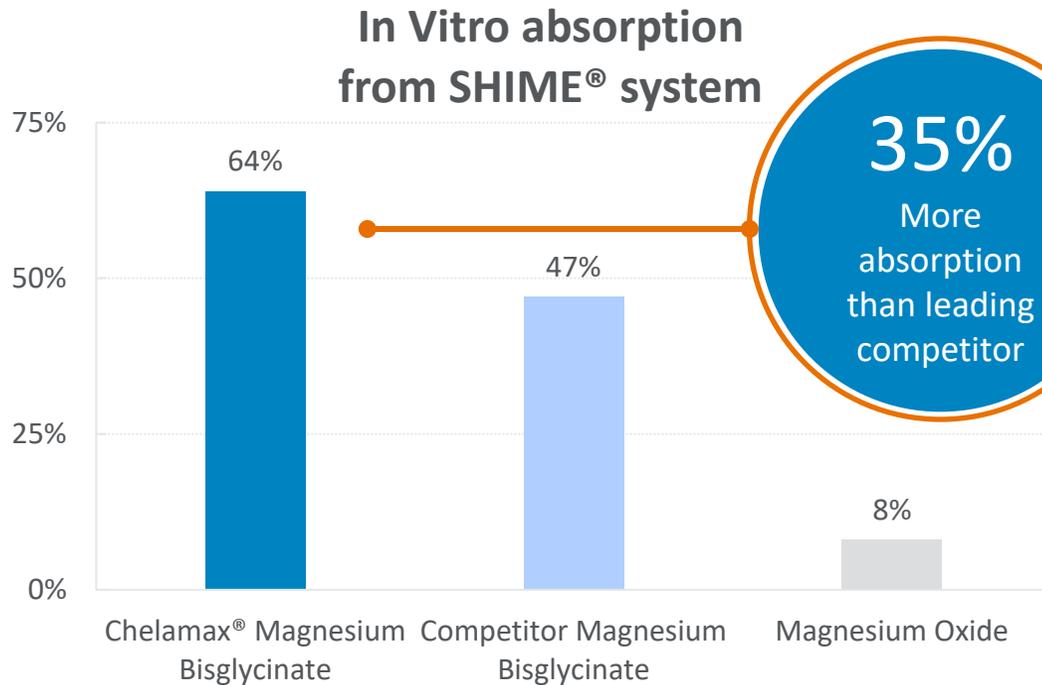


In Vitro absorption from SHIME® system



Chelamax® | Magnesium In Vitro Study

Chelamax® Significantly outperformed the leading competitor



- ✓ High Density
- ✓ Tight Particle Size
- ✓ Stable to Moisture
- ✓ Clean Label

Chelamax® | The Choice for Gummy Supplements



Chelamax®
Magnesium Citrate



Anhydrous
magnesium citrate
USP grade



Magnesium citrate
USP grade



Ingredient	Typical Range
Sugar	60-80%
Water	10-20%
Magnesium Citrate	11-17%
Citric acid	1-3%
Flavor	1%

Chelamax® Magnesium Citrate

- **Higher loading levels** than many commercially available products.
- **More stable** than other sources with no mass gain via moisture absorption when exposed to excess relative humidity.
- **Pleasing texture** while other magnesium citrate sources could not.
- **Less sticky**, exhibiting minimal tooth packing compared to control and thus offering a better sensorial experience for the consumer.

Chelamax[®] Chelated Minerals | Reach New Markets

Use bioaccessible options to improve your next innovation



Personalized Nutrition

Designing products tailored to genetic, microbiome, or lifestyle profiles to maximize nutrient utilization. Allow for lower doses with greater efficacy.



Companion Products

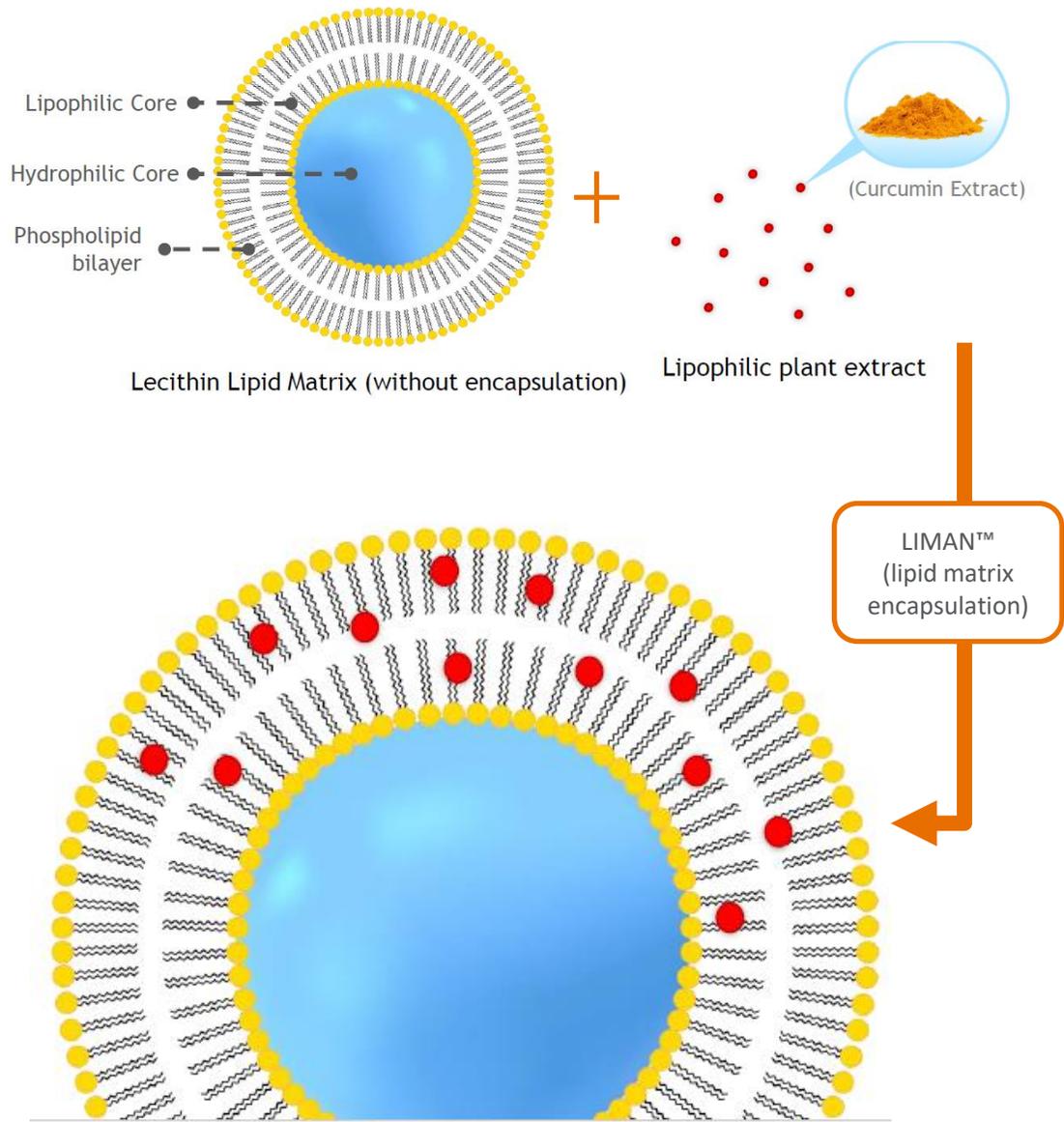
Using highly bioavailable minerals and functional ingredients in hydration sticks, effervescent, and gummies can help restore balance and support long-term health.



Women's Health

Opportunities include PCOS management, prenatal and lactation support, and menopause symptom relief

LIMAN™ | Lipid Matrix Nano-Technology



LIMAN™

- Lecithin, is a hydrophobic mixture of naturally occurring phospholipids and is considered a safe and biocompatible ingredient.
- Lecithin-based micelles improve the solubility, stability and efficacy of the ingredients, representing an efficient delivery system.
- Micellar encapsulation enables molecules to be well-protected in neutral and basic physiological pH conditions and against G.I. microsomal enzymes.
- The slow release of ingredients from the micelle reduces degradation and prolongs the duration of action to increase efficacy.

MaxiCuma[®] | Highly Bioavailable Turmeric Extract



Better bioavailability at a lower dose

Extracted using renewable plant-based ethanol

Passed through patented LIMAN™ technology, converting hydrophobic curcuminoids to **instant cold-water** dispersible actives.

Studies reveal:

- 172X more bioavailable than standard 95% curcumin (micronized)
- Longer half-life
- Low dose (100- 250 mg)

Additional features

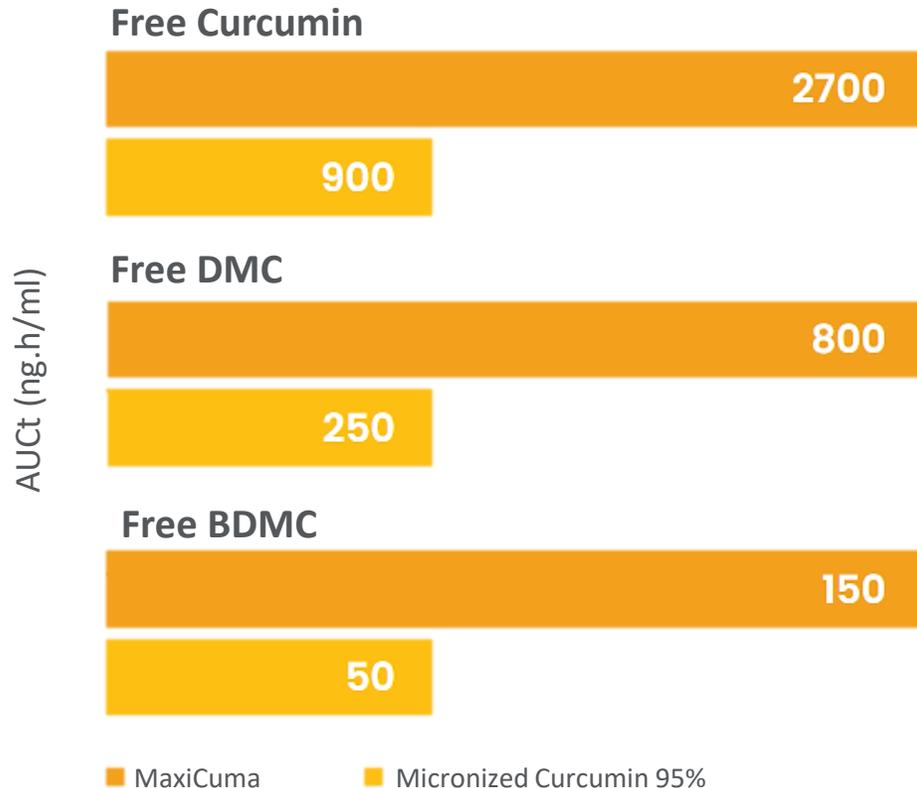
- Neutral in taste
- Sustainable
- No preservatives



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MaxiCuma® | Bioavailability Study

MaxiCuma vs. Micronized Curcumin 95%



Maximum Effectiveness at Ultra-Low Dose

Bioavailability Study of Maxicuma Capsules Versus Micronized Curcumin Capsules as A Single Oral Dose in Fasted Healthy Adult Human Subjects

By Rachchh M, Gokani R, Patel H, Khamar J, Patel A (2023)

- 3 x 500 mg MaxiCuma
- 3 x 500 mg Micronized 95% curcuminoid extract
- 3 x 500 mg Regular Curcumin 95% extract (literature value)

Open label, non-randomized, two-treatment, two-period, two-group crossover study after single oral dose administration in 14 fasted healthy adult humans

172X
more free
curcumin

2.4X
Higher
Cmax

1.6X
Faster
Tmax

3X
Higher
Total AUCt

MaxiCuma® | 172 X More free curcumin



Tradition meets technology for women's health, enhanced for better absorption



Women's Health

Curcumin has been shown in clinical studies to help modulate inflammatory pathways and improve insulin sensitivity, both of which are important in managing PCOS symptoms.



Companion Products

Effervescent curcumin delivers gentle digestive support for GLP-1 RA users, easing gut discomfort while enhancing absorption in a refreshing, low-dose hydration format.



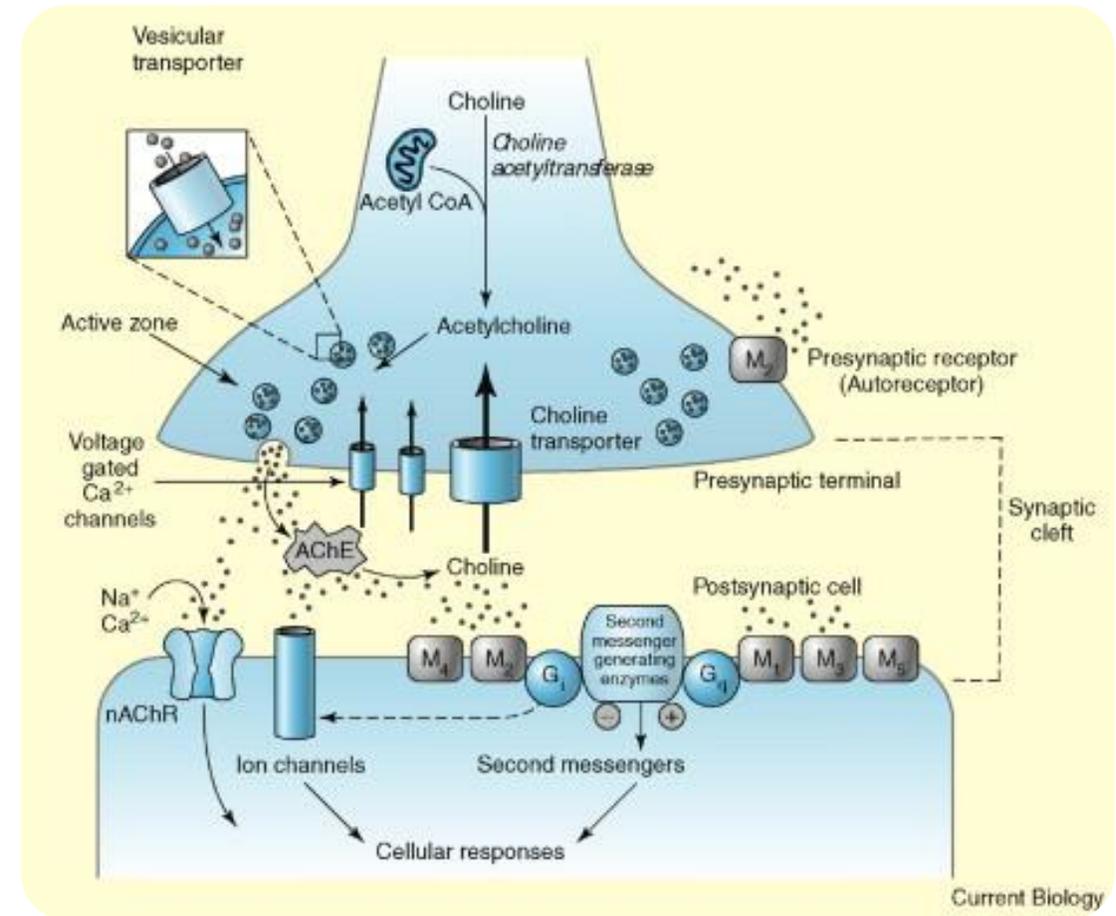
Personalized Nutrition

Curcumin gummies provide a convenient, low-dose solution for personalized nutrition, supporting joint health, mobility, and recovery from daily activity or exercise.

Choline | An Essential Nutrient

The importance of choline

- Choline is the precursor to acetylcholine, a neurotransmitter critical for
 - Brain development
 - Cognitive function
 - Muscle movement and coordination
- During early childhood, choline supports brain development, focus, and cognition.
- It is beneficial for pregnant and lactating women, supporting fetal brain development and infant growth
- Research shows that choline supplementation may reduce the risk of cognitive decline and neurodegenerative diseases in order adults



Hyman (2005)

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Recommended Daily Intake | Choline



Over 90% of Americans do not meet the Adequate Intake (AI) levels set by the Institute of Medicine.

Pregnant women

- Approximately 90-95% of pregnant women consume less than the adequate intake of Choline
- Prenatal dietary supplements typically contain little if any choline.
- Inadequate choline may be greater in pregnant and lactating women who do not take folic acid, low vitamin B12 status, with a common variant in methylenetetrahydrofolate dehydrogenase, all which reduce the body's pool of methyl groups needed for metabolism
- Some evidence indicates that lower plasma or serum choline levels are associated with an increase in neural tube defects

Age	Male	Female	Pregnancy	Lactation
Birth to 6 months	125 mg/day	125 mg/day		
7–12 months	150 mg/day	150 mg/day		
1–3 years	200 mg/day	200 mg/day		
4–8 years	250 mg/day	250 mg/day		
9–13 years	375 mg/day	375 mg/day		
14–18 years	550 mg/day	400 mg/day	450 mg/day	550 mg/day
19+ years	550 mg/day	425 mg/day	450 mg/day	550 mg/day

Types of Dietary Choline



Salts

- Choline Chloride (70% Choline)
- Choline Bitartrate (41% Choline)

Phospholipids

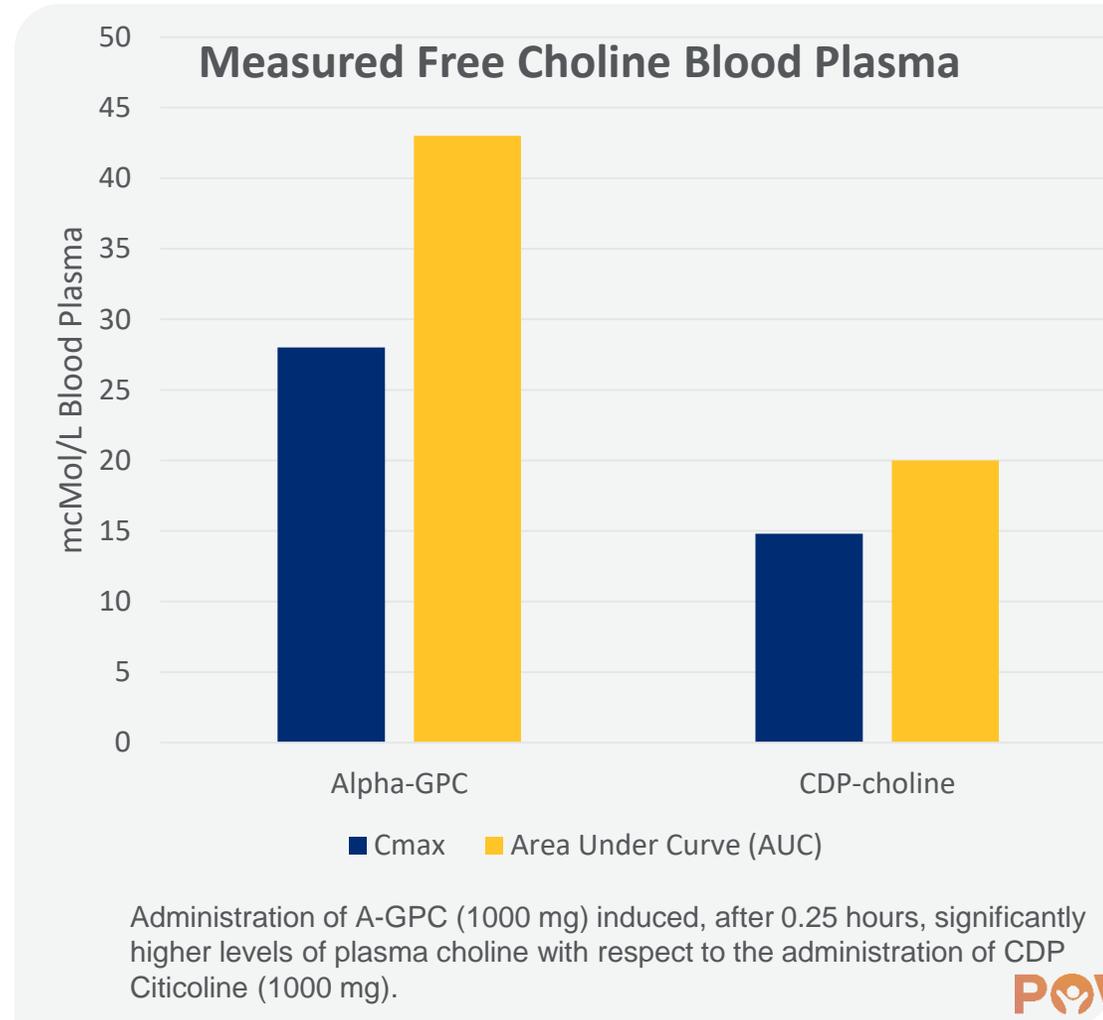
- **Alpha-glycerol phosphorylcholine (41% Choline)**
- Lecithin (as Phosphatidylcholine) (PC) (13% Choline)
- Citicoline/CDP-Choline (21% Choline)
- Phosphocholine

The AlphaSize[®] difference



AlphaSize[®] AGPC out-performs choline salts and citicoline

- A-GPC achieved higher levels of plasma choline over CDP-choline
- A-GPC levels remained in the plasma by 50% longer than CDP-choline
- 40 mg of choline and CDP-choline contained 20 mg choline per 100 mg;
- A-GPC can cross the blood brain barrier, little research shows choline bitartrate to improve memory



AlphaSize® Alpha-GPC



The only GRAS, NDI-approved Alpha-GPC, for safe from prenatal to performance.



AlphaSize® 50 P

AlphaSize® 50 WSP

AlphaSize® 100 P

AlphaSize® 85 L

Regulatory & Safety Leadership

- GRAS (GRN No. 000419)
- USDA organic compliant
- USP monographed
- IGEN non-GMO Certified
- Kosher
- USPTO Patented
- Choline intake compliant (EFSA, FDA)
- NDI (New Dietary Ingredient)

Regulatory & Safety Leadership

- Water-soluble
- Plant-derived
- Allergen-free
- Taste-free
- Thermo – pH stable

AlphaSize® — The most trusted choline source for cognition, prenatal nutrition, and active lifestyles

**POWERING
HEALTHY
TOMORROWS**

Innovation | Reach new markets with AlphaSize®

Science-backed nutrition for mothers, infants, and cognition



Women's Health

Feature AlphaSize® choline deliver an essential nutrient shown to support fetal brain development, cognitive function, and healthy pregnancy outcomes.



Companion Products

Nutrient-dense formats such as effervescent powders, and gummies with Chelamax® minerals and AlphaSize® choline can help offset nutrient gaps and muscle loss seen in GLP-1 users.



Grow-Beverages for Kids

Fortifying milk, toddler formulas, and plant-based delivers the choline kids need for brain development and growth. This creates a strong point of differentiation for “Grow Milks” and functional kids’ beverages.

AlphaSize® A-GPC | Dairy Products



Formulation Recommendations

- **Dosing dependent on customer choline per serving** - current market is 50-60mg of Choline
- Amphiphilic molecule - Similar to lecithin in emulsification, will solubilize in water and milk
- Organoleptics are neutral
- Thermal and pH stable
- After separation and fat standardization but before homogenization, this method ensures that the vitamin is well-incorporated into the milk before it's pasteurized and homogenized

Summary | Thank-you!

- **Why it matters** – Understanding the role of Bioaccessibility, bioavailability, and bioactivity is key to delivering better outcomes for consumers.
- **Technology evolution** – Today’s chelation, liposomal technologies, and better options can help meet consumers demands for price and quality in Women’s Health, Companion products, and personalized nutrition
- **Chelated minerals (Chelamax®)** – Clinically validated superior absorption, solubility, and sensory benefits in all dosage forms.
- **Liposomal Delivery Systems – (MaxiCuma®)** - Clinically studied , highly bioavailable turmeric extract for joint health, women’s health, and companion products.
- **Inherently bioavailable nutrients (AlphaSize® A-GPC)** – The gold standard in choline for cognition, prenatal, and breast-feeding, and functional food innovation.

References



Choline supplementation research

Infants and Children (150-250 mg / day)

- **Supports normal brain development** - additionally linked to Folate production – deficiencies may cause liver disease and disruptions to brain and cognitive development
- **Improve neural and cognitive functioning**
- Synergistic effect with DHA for cognition and growth
- Improvements in learning, behavior, and motor functioning in children with Autism
- Intervention strategy for children with FASD (fetal alcohol syndrome disorders)

Pregnant and Lactation (450 - 550 mg / day)

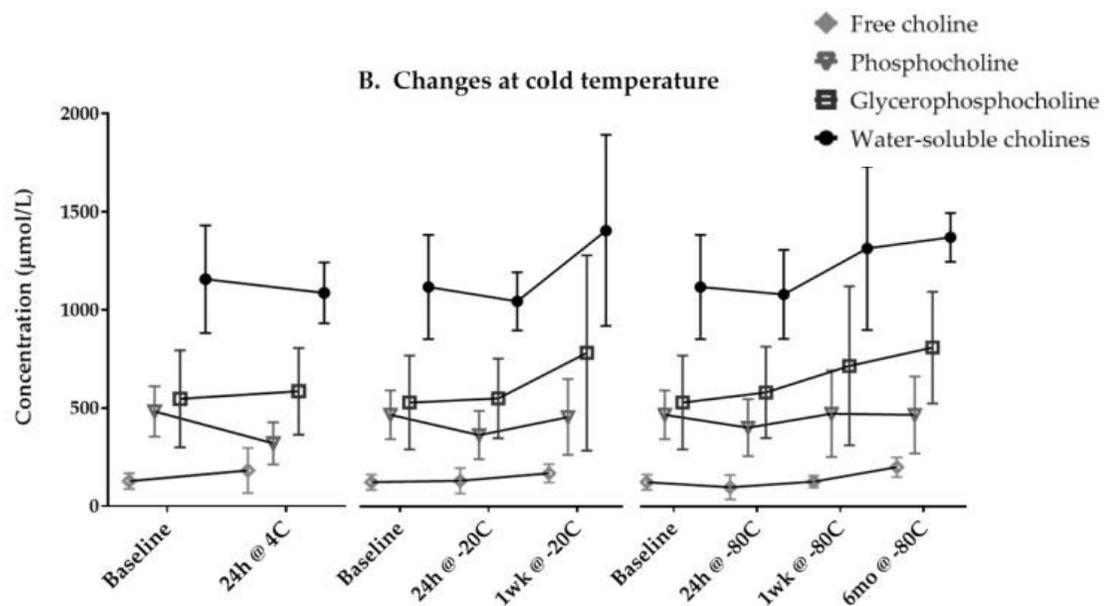
- Passes the placenta for fetal development and blood brain barrier (both adult and fetus)
- May help prevent fatty liver disease, preeclampsia, neural tube defects, cognitive deficits, and fatty liver disease in fetuses, or preeclampsia or hypertension
- higher choline intake in pregnant people is associated with better neurocognitive function in children

Support Cognitive and Motor functions across all age groups

- Maintain and improve memory and recall
- Improve REM percentage during sleep
- Increase attention span and focus
- Boost athletic power output and accelerate gains in speed and strength.
- Improve reaction time, agility, and hand-eye coordination
- May reduce neurodegenerative decline
- Rehabilitation for cognitive impairment
- Ergogenic caffeine replacement

Stability

Stability of Water-Soluble Choline Forms at Different Storage Conditions

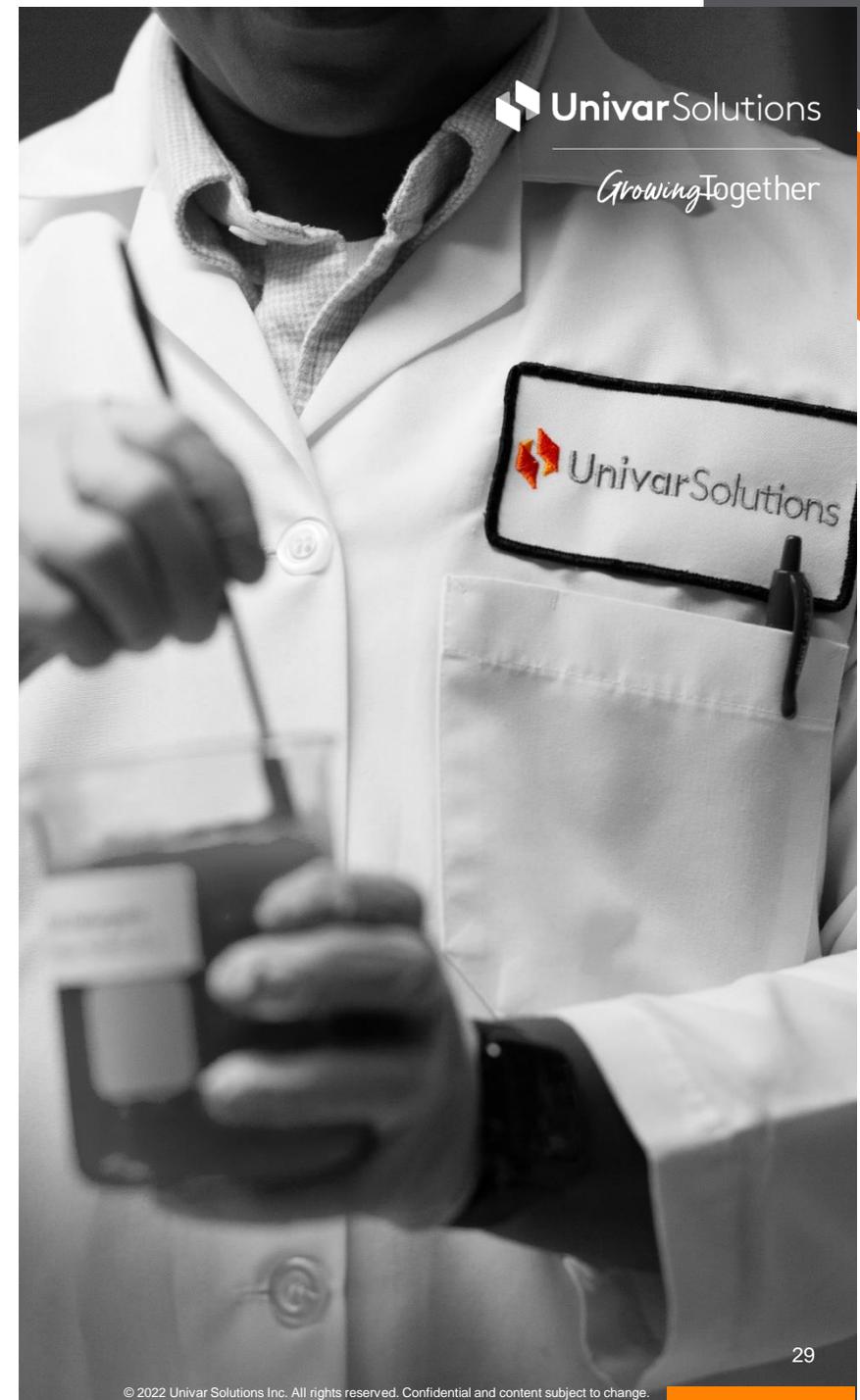


Stability of Water-Soluble Choline Forms during Pasteurization

Choline Form	Before, µmol/L	After, µmol/L	Difference, µmol/L	Difference, %	p-Value ²
<i>Free choline</i>					
Mean ± SD	124 ± 60	124 ± 58	0.6 ± 14	1.3 ± 10	0.893
Median (min; max)	117 (47.9; 293)	120 (44.6; 275)	-1 (-29; 46)	-0.5 (-18; 33.0)	
<i>Phosphocholine</i>					
Mean ± SD	675 ± 220	632 ± 189	-43 ± 73	-4.7 ± 10	0.003
Median (min; max)	676 (230; 1131)	621 (261; 960)	-41 (-238; 111)	-6.5 (-21; 25)	
<i>Glycerophosphocholine</i>					
Mean ± SD	442 ± 181	425 ± 181	-17 ± 43	-3.6 ± 10	0.015
Median (min; max)	381 (243; 904)	387 (211; 994)	-20 (-122; 97)	-5.6 (-21; 26)	
<i>Total water-soluble choline</i>					
Mean ± SD	1241 ± 249	1186 ± 201	-56 ± 124	-3.4 ± 10	0.017
Median (min; max)	1229 (789; 1794)	1136 (792; 1566)	-63 (358; 231)	-4.8 (-20; 27)	

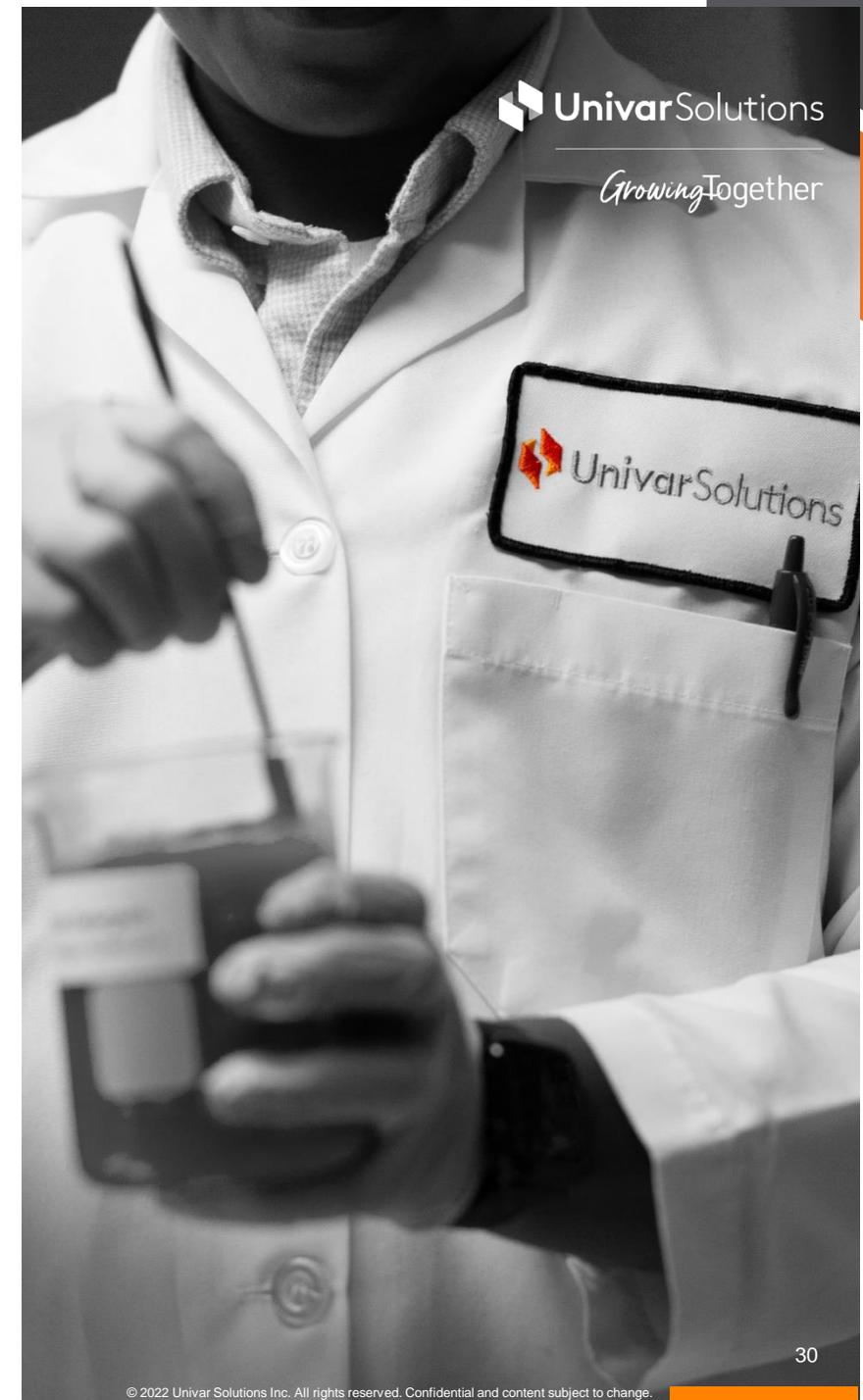
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