LiposoMore

LiposoMore® – Advanced Liposomal Ingredients
Delivering Premium Nutrition Through Science & Innovation

A Liposomal Brand Exclusively Owned by
Joyful Nutritional Supply Co.,ltd.

Comprehensive Technical Dossier and Product Monograph: LiposoMore™ Liposomal Calcium Citrate

1. Executive Summary and Strategic Product Positioning

1.1 Introduction to the Liposomal Revolution

The global nutraceutical landscape is undergoing a fundamental transformation, shifting from a focus on simple nutrient abundance to a paradigm of precision delivery and bioavailability. In this evolving market, **LiposoMore™ Liposomal Calcium Citrate** represents a pinnacle of nutritional engineering. Manufactured by **Joyful Nutritional Supply Co., Ltd.**, this product addresses the persistent physiological challenges associated with traditional calcium supplementation—namely, poor absorption, gastrointestinal distress, and low compliance rates.

Calcium is the most abundant mineral in the human body, vital not only for skeletal integrity but also for vascular contraction, muscle function, nerve transmission, and intracellular signaling. However, the "Calcium Paradox" remains a significant clinical hurdle: despite high dietary or supplemental intake, many individuals fail to maintain adequate serum and osseous calcium levels due to inefficient absorption mechanisms and antagonistic dietary factors.[1] Traditional salts, such as calcium carbonate, rely heavily on gastric acid for ionization, posing a severe limitation for aging populations or those on proton pump inhibitors (PPIs). Furthermore, unabsorbed calcium often forms insoluble soaps in the intestines, leading to the discomfort that drives high discontinuation rates.[3]

LiposoMore™ utilizes advanced **Liposomal Encapsulation Technology (LET)** to circumvent these barriers. By encasing high-purity Calcium Citrate within a phospholipid bilayer—a structure analogous to the human cell membrane—this delivery system mimics biological transport mechanisms. The result is a "Trojan Horse" effect that protects the mineral payload through the harsh gastric environment and facilitates direct uptake at the intestinal

epithelium, significantly enhancing bioavailability while rendering the product gentle on the digestive tract.[1]

1.2 Brand Heritage and Manufacturer Expertise

Joyful Nutritional Supply Co., Ltd., headquartered in Shenzhen, China, has established itself as a pioneer in the functional ingredient sector. Driven by a philosophy of science-backed innovation, the company specializes in the development of advanced delivery systems for high-value nutrients. The **LiposoMore**™ brand is the culmination of years of research into lipid-based carriers, designed to elevate the efficacy of standard ingredients like Vitamin C, Glutathione, Iron, and now, Calcium Citrate.[5]

The manufacturing facility operates under stringent quality management systems, aligning with **ISO 9001** and **HACCP** principles to ensure reproducibility and safety. The commitment to quality is evidenced by the rigorous testing protocols applied to every batch, covering physicochemical consistency, heavy metal purity, and microbiological safety. This dossier provides a transparent, in-depth technical analysis of LiposoMore™ Calcium Citrate, intended for product formulators, quality assurance professionals, and regulatory affairs specialists seeking a premium calcium solution.[7]

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2. Product Identification and Chemical Characterization

2.1 Nomenclature and Classification

The product is technically defined as a microencapsulated mineral powder. It is not merely a physical mixture but a structured complex where Calcium Citrate is embedded within a lipid matrix.

- **Commercial Name:** LiposoMore™ Liposomal Calcium Powder
- **Active Ingredient:** Calcium Citrate (Tribasic Calcium Citrate Tetrahydrate)
- **CAS Number (Calcium Citrate):** 5785-44-4 [8]
- **Encapsulating Agent:** Phospholipids (derived from Non-GMO Sunflower or Soy Lecithin)
- **Product Code:** JN-Series (e.g., JN-2025xxxx)
- **Chemical Family:** Organic Mineral Salt / Phospholipid Complex
- **Physical Form:** Free-flowing White Powder

2.2 Molecular Structure and Composition

The core active ingredient, **Calcium Citrate**, possesses the molecular formula **$Ca_3(C_6H_5O_7)_2 \cdot 4H_2O$** with a molecular weight of approximately 570.5 g/mol.[8] Unlike inorganic salts like carbonate, citrate is an organic salt where calcium is chelated to citric acid.

This structure inherently provides better water solubility and pH-independent absorption.

In LiposoMore™, this core is surrounded by **Phospholipids**. These are amphiphilic molecules containing a hydrophilic head (phosphate group) and two hydrophobic tails (fatty acid chains). In an aqueous environment during manufacturing, these phospholipids self-assemble into bilayers.

- **The Head Group:** typically Phosphatidylcholine (PC), faces the aqueous exterior and the aqueous interior (if a multi-lamellar structure is formed).
- **The Tail Group:** creates a hydrophobic barrier that shields the core.

The interaction between the calcium ions and the phosphate groups of the lipid bilayer can further stabilize the structure, creating a robust vesicle that resists varying osmotic pressures and pH changes during digestion.[10]

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3. Technical Specifications and Quality Standards

The following data represents the release specifications for LiposoMore™ Calcium Citrate. These parameters are critical for ensuring lot-to-lot consistency and determining the suitability of the ingredient for various dosage forms (capsules, sachets, functional foods).

3.1 Physicochemical Parameters

Parameter	Specification	Typical Result	Method	Significance
Appearance	White Powder	Conforms	Visual	Indicates purity and lack of oxidation (which would yellow the lipids).
Odor	Odorless / Characteristic	Odorless	Organoleptic	Essential for consumer acceptance in powder drinks; absence of rancid lipid notes.

Assay (Elemental Calcium)	**≥ 16.0%**	**17.22%**	Titration / ICP	Defines the potency. The ~1% overage ensures label claim compliance at the end of shelf life.[7]
Assay (Calcium Citrate)	**≥ 80.0%**	**82.0%**	HPLC / Calc.	Confirms the ratio of active mineral to lipid carrier.
Loss on Drying (LOD)	**< 10.0%**	**4.2%**	USP	Critical for stability. Low water activity prevents lipid hydrolysis and microbial growth.[7]
Bulk Density	0.40 – 0.60 g/mL	0.52 g/mL	USP	Important for capsule filling volume and sacheting equipment calibration.
Particle Size	100% thru 80 Mesh	Conforms	Sieve	Ensures smooth mouthfeel and rapid dispersion in liquids.
pH (10% Solution)	6.0 – 7.5	6.8	Potentiometric	Neutral pH ensures compatibility with various food matrices

				and prevents gastric irritation.

Analysis of Assay Values:
The Certificate of Analysis (COA) indicates an elemental calcium content of 17.22%. Pure Calcium Citrate Tetrahydrate is approximately 21% elemental calcium by weight.13 The reduction to ~17% in the final powder reflects the "loading capacity" of the liposomal system. The remaining mass consists of the phospholipid encapsulation material. This ratio is optimal; a higher calcium load might compromise the integrity of the liposome (insufficient lipid coverage), while a lower load would require unacceptably large pill sizes for the consumer. The ≥80% Calcium Citrate specification confirms that the bulk of the powder is indeed the beneficial mineral source, with the lipid component acting as a functional excipient.7

3.2 Heavy Metal Purity Profile

Heavy metal contamination is a primary concern for mineral supplements sourced from the earth. Joyful Nutritional Supply employs **Inductively Coupled Plasma Mass Spectrometry (ICP-MS)**, a technique capable of detecting trace metals at parts-per-billion levels, ensuring compliance with the strictest global standards (including California Proposition 65 and EU Regulation 1881/2006).

Contaminant	Specification	Typical Result	Regulatory Context
Lead (Pb)	< 10.0 ppm	**< 3.0 ppm**	Safe for adult supplements; specific dose calc. needed for Prop 65.
Arsenic (As)	< 1.0 ppm	**< 1.0 ppm**	Extremely low; well below USP limits for elemental impurities.
Cadmium (Cd)	< 1.0 ppm	**< 0.1 ppm**	Critical for kidney health; result is negligible.
Mercury (Hg)	< 0.1 ppm	**< 0.1 ppm**	Result indicates high-purity

			sourcing free from environmental contamination.
Total Heavy Metals	< 20 ppm	**< 10 ppm**	General purity indicator.

Toxicological Context:
The typical result of <3.0 ppm Lead is significantly below the USP limit of 10 ppm for calcium salts.12 For pediatric applications or products targeting pregnant women, this high purity is a substantial competitive advantage. The extremely low levels of Cadmium (<0.1 ppm) and Mercury (<0.1 ppm) further substantiate the quality of the raw material feedstock used by Joyful Nutritional Supply.7

3.3 Microbiological Safety

Given the organic nature of both the citrate salt and the lipid carrier, microbiological control is essential. Lipids can be a substrate for microbial growth if moisture is not controlled.

Test Item	Specification	Typical Result	Method	Compliance
Total Plate Count	< 1,000 CFU/g	**< 100 CFU/g**	USP	Excellent hygiene.
Yeast & Mold	< 100 CFU/g	**< 10 CFU/g**	USP	Prevents spoilage.
E. coli	Negative / 10g	Negative	USP	Pathogen Free.
Salmonella	Negative / 25g	Negative	USP	Pathogen Free.
S. aureus	Negative / 10g	Negative	USP	Pathogen Free.

These results confirm that the spray-drying or powdering process effectively destroys microbial load and that post-processing handling is conducted in a cleanroom environment to prevent re-contamination.[7]

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4. Advanced Scientific Rationale: The Liposomal

Advantage

4.1 Bioavailability and Mechanism of Action

The defining characteristic of LiposoMore™ is its superior bioavailability compared to non-encapsulated salts.

- **Standard Absorption:** Conventional calcium salts rely on ionization in the stomach (requiring pH < 2.0). Once ionized, calcium is absorbed in the duodenum via active transport (regulated by Calbindin and Vitamin D) and passive diffusion in the jejunum/ileum. This process is easily saturable and inhibited by food components like phytates and oxalates.[1]
- **Liposomal Absorption:** The phospholipid bilayer protects the calcium core from interacting with inhibitors in the gut. More importantly, it facilitates absorption through alternative pathways:
    1. **Transcytosis via M-Cells:** Liposomes can be taken up by Microfold cells in the Peyer's patches (lymphoid tissue), entering the lymphatic system and bypassing the portal vein/liver first-pass metabolism.[2]
    2. **Membrane Fusion:** The phospholipids can fuse directly with the enterocyte cell membranes, releasing the calcium directly into the cytoplasm.[15]
    3. **Paracellular Transport:** The nano-sized vesicles may pass through the tight junctions between cells.

Research cited suggests that liposomal encapsulation can increase the bioavailability of minerals by protecting them from degradation and enhancing cellular uptake. One study noted a **3.2x greater biomarker improvement** with liposomal calcium compared to calcium carbonate.[2]

4.2 Gastrointestinal Tolerance Profile

High-dose calcium supplementation is notorious for causing GI side effects, leading to poor adherence.

- **Reduced Bloating:** Unlike Calcium Carbonate, LiposoMore™ (Citrate core) does not react with stomach acid to produce CO2 gas.
- **No "Calcium Soaps":** In the alkaline environment of the small intestine, free calcium often binds with fatty acids to form insoluble "soaps," causing constipation and hard stools. The liposomal shell shields the calcium from these interactions, maintaining bowel regularity.[3]
- **Mucosal Protection:** Concentrated mineral salts can irritate the stomach lining. The lipid encapsulation acts as a buffer, making LiposoMore™ exceptionally gentle and suitable for sensitive individuals.[6]

4.3 Stability and Protection

The stability of the active ingredient is a key differentiator.

- **Gastric Stability:** The lipid bilayer is resistant to the low pH of the stomach, preventing the premature release of calcium. This "sustained release" effect ensures that calcium is delivered to the absorptive sites in the small intestine rather than being dumped in the stomach.[4]
- **Oxidative Stability:** The formulation likely includes antioxidants (e.g., Vitamin E or naturally occurring tocopherols in the lecithin) to protect the unsaturated fatty acids in the phospholipids from oxidation, ensuring the product remains fresh throughout its 2-year shelf life.[17]

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5. Regulatory Compliance and Certifications

Joyful Nutritional Supply Co., Ltd. ensures that LiposoMore™ meets the diverse regulatory requirements of global markets.

5.1 Compliance Statements

- **Non-GMO:** The product is manufactured using Non-GMO Calcium sources and Non-GMO phospholipids (e.g., from sunflower or identity-preserved soy). It complies with EU Regulation 1829/2003 regarding genetically modified food and feed.[18]
- **Gluten-Free:** Confirmed to contain <20 ppm gluten, meeting the FDA and Codex Alimentarius definitions for "Gluten-Free" labeling. Suitable for Celiac and gluten-sensitive consumers.[19]
- **BSE/TSE Free:** The product utilizes plant-based lipids and mineral salts. It is free from bovine or transmissible spongiform encephalopathy agents.[7]
- **Irradiation & ETO:** The product is sterilized using thermal or mechanical methods and is free from ionization radiation and Ethylene Oxide (ETO) residues.
- **WADA Prohibited List:** Contains no anabolic agents, hormones, or stimulants prohibited by the World Anti-Doping Agency.

5.2 Labeling Guidance

- **Ingredient Declaration:** "Calcium Citrate," "Phospholipids (from Sunflower/Soy Lecithin)."
- **Allergen Labeling:** If utilizing sunflower lecithin, the product is typically allergen-free. If utilizing soy lecithin, "Contains Soy" must be declared in US/EU jurisdictions. *Check specific batch documentation.*
- **Nutritional Claims:**
  - "High Bioavailability"
  - "Gentle on Stomach"
  - "Supports Bone Density" (Structure/Function claim under US DSHEA).[21]

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6. Storage, Packaging, and Handling

Proper storage is vital to maintaining the liposomal structure and preventing clumping or oxidation.

6.1 Packaging Configuration

- **Standard Pack Size:** 25 kg Net Weight.
- **Primary Packaging:** Double-layer Pharmaceutical Grade Low-Density Polyethylene (LDPE) bags. This provides a moisture and oxygen barrier.
- **Secondary Packaging:** High-Density Polyethylene (HDPE) Drums or Fiber Drums. Robust outer packaging protects against physical damage and light exposure.[7]

6.2 Storage Conditions

- **Temperature:** Store in a cool environment, ideally **15°C - 25°C (59°F - 77°F)**. While the powder is stable at room temperature, prolonged exposure to heat (>30°C) can soften the lipid matrix and lead to caking.[23]
- **Humidity:** Keep in a dry area with Relative Humidity (RH) **< 60%**. Phospholipids are hygroscopic; excess moisture can induce hydrolysis (breakdown of lipids into free fatty acids), causing rancidity and loss of liposomal integrity.[23]
- **Light:** Store away from direct sunlight. UV radiation accelerates lipid oxidation.
- **Handling:** Reseal inner bags immediately after use. Use dry utensils to prevent moisture introduction.

6.3 Shelf Life

- **Duration: 24 Months (2 Years)** from the date of manufacture.
- **Retest:** If stored properly, the product may be stable beyond 24 months, but re-analysis of Peroxide Value (PV) and Microbiology is recommended before use.[7]

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7. Applications and Formulation Guidelines

LiposoMore™ Calcium Powder is designed for versatility in nutraceutical manufacturing.

7.1 Target Dosage Forms

- **Powder Sachets / Stick Packs:** The water-dispersible nature allows for direct-to-mouth or beverage mix formats.
- **Capsules (Hard Shell):** Ideal for two-piece gelatin or HPMC capsules. The powder's bulk density (0.40-0.60 g/mL) allows for efficient filling.
- **Functional Foods:** Fortification of dairy alternatives, nutrition bars, and meal replacements.
- **Tablets:** Can be used, though compression forces should be optimized to prevent

liposome rupture.

7.2 Formulation Considerations

- **Dosage Calculation:** To deliver 200mg of Elemental Calcium, use approximately **1,162 mg to 1,250 mg** of LiposoMore™ powder (based on ~16-17.22% assay).
- **Flavoring:** The lipid coating masks the metallic taste of minerals, offering a neutral profile compatible with vanilla, berry, or citrus flavors.
- **Solubility:** Disperses to form a milky suspension in water. Not suitable for clear beverages.[25]

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8. Detailed Analysis of Liposomal Technology in Mineral Delivery

8.1 The Evolution of Calcium Supplementation

To fully appreciate the value of LiposoMore™, one must understand the history of calcium delivery. First-generation supplements relied on **Calcium Carbonate** (derived from limestone or oyster shell). While dense in elemental calcium (40%), it is essentially chalk; it requires significant stomach acid to break down, causes acid rebound, and has poor bioavailability in elderly patients.

Second-generation supplements introduced **Calcium Citrate** and **Calcium Gluconate**. These chemically chelated or organic acid-bound forms offered better solubility independent of stomach pH. Calcium Citrate, for instance, is approximately 2.5 times more bioavailable than Carbonate in low-acid environments. However, they still rely on traditional passive and active transport channels in the gut, which have rate limits.[13]

Third-generation technology, represented by **LiposoMore™**, moves beyond chemical structure to *physical delivery systems*. By utilizing liposomes, we are no longer solely dependent on the chemical solubility of the salt but are leveraging the biological transport mechanisms of lipids.

8.2 Structural Integrity of Liposomes

A frequent question in the industry regarding "liposomal powders" is whether the liposomes remain intact after drying. Joyful Nutritional Supply employs advanced **lyoprotection** techniques. During the drying process, specific cryoprotectants (typically carbohydrate matrices) are used to stabilize the lipid bilayer, preventing the vesicles from collapsing or fusing. Upon rehydration (i.e., when the powder hits the water or the fluids of the stomach), the vesicles re-assemble or maintain their structure, ensuring the payload remains protected.[28]

Analysis using Scanning Electron Microscopy (SEM) and Dynamic Light Scattering (DLS) on similar liposomal powders typically confirms:

- **Particle Size Distribution:** A unimodal distribution centered between 100nm and 250nm.
- **Zeta Potential:** A negative charge (typically -20mV to -40mV), which indicates good colloidal stability and resistance to aggregation.[17]

8.3 Stability in the Gastric Environment

Standard lipids can be digested by lipases. However, the specific phospholipid composition used in LiposoMore™ is selected for its rigidity and resistance to immediate hydrolysis in the stomach. Research indicates that high-quality liposomes can retain >90% of their encapsulated cargo after transit through a simulated gastric environment (pH 1.2), releasing the payload only upon reaching the higher pH and lipase-rich environment of the small intestine, or remaining intact for lymphatic uptake.[29]

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9. Regulatory Landscape and Labeling Claims

9.1 United States (FDA / FTC)

- **Structure/Function Claims:** Under DSHEA, supplements containing LiposoMore™ can carry claims such as "Supports Bone Health," "Helps Maintain Strong Bones," and "Supports Healthy Muscle Function."
- **Liposomal Claims:** The FDA does not have a specific definition for "liposomal." However, truth-in-advertising laws (FTC) require that the product actually contains liposomes. The manufacturing data and COA from Joyful Nutritional Supply provide the substantiation needed to defend the "Liposomal" label claim.
- **New Dietary Ingredient (NDI):** Calcium Citrate and Lecithin are "Grandfathered" ingredients. The physical modification (liposomal encapsulation) generally does not trigger an NDI notification if the manufacturing process does not chemically alter the ingredients, but manufacturers should consult their own legal counsel.

9.2 European Union (EFSA)

- **Novel Food Status:** Liposomal Vitamin C and minerals are generally considered food supplements and not Novel Foods, provided the nanotechnology guidelines are respected (i.e., they are not engineered nanomaterials <100nm with novel properties, but rather micro-encapsulates).
- **Health Claims:** EFSA authorizes specific claims for Calcium, such as "Calcium is needed for the maintenance of normal bones" and "Calcium contributes to normal muscle function." These claims can be applied to the final product containing LiposoMore™-Ca.

9.3 Labeling Best Practices

When listing LiposoMore™ on a consumer product label, the following formats are compliant and transparent:

- *Supplement Facts Panel:* "Calcium (as Liposomal Calcium Citrate)"
- *Other Ingredients:* "Phospholipids (from Sunflower/Soy Lecithin)," "Calcium Citrate."

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10. Formulation Case Studies

10.1 Project: "Bone Build Gold" – Premium Capsule

- **Goal:** Create a high-absorption bone support capsule for post-menopausal women.
- **Challenge:** Target demographic often has sensitive stomachs and dislikes large pills.
- **Solution:** Use LiposoMore™-Ca.
- **Formula:**
  - LiposoMore™ Calcium Powder: 625 mg (providing 100 mg Elemental Ca).
  - Vitamin K2 (MK-7): 45 mcg.
  - Vitamin D3: 1000 IU.
- **Advantage:** While 100mg elemental Ca seems low compared to 500mg Carbonate, the marketing narrative focuses on *Absorption vs. Excretion*. "It's not what you eat, it's what you absorb." The smaller capsule size improves compliance, and the liposomal form prevents the GI distress that usually causes this demographic to quit supplementation.

10.2 Project: "Athletic Recovery Mix" – Powder Sachet

- **Goal:** Electrolyte and mineral replenishment for endurance athletes.
- **Challenge:** Minerals must dissolve instantly in cold water and taste good.
- **Solution:** LiposoMore™-Ca water-dispersible powder.
- **Formula:**
  - LiposoMore™ Calcium: 1,250 mg (200 mg Elemental Ca).
  - Magnesium Citrate.
  - Potassium Chloride.
  - Natural Lemon Flavor.
- **Advantage:** The liposomal calcium disperses without the gritty "chalky" mouthfeel of calcium carbonate. The rapid absorption supports muscle contraction and prevents cramping during intense physical exertion.

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11. Deep Dive: Comparative Analysis of Calcium Forms

To further justify the premium positioning of LiposoMore™, a comparative analysis against standard market forms is essential.

Feature	Calcium Carbonate	Calcium Citrate (Std)	LiposoMore™ (Liposomal)
Elemental Calcium %	40%	21%	**~16%**
Acid Required for Absorption?	Yes (High dependence)	No	**No**
Bioavailability	Low (<20% in low acid)	Medium	**High (Cellular Fusion)**
GI Side Effects	High (Gas, Bloating)	Low	**Very Low / None**
Food Interaction	High (Binds oxalates)	Low	**Minimal (Protected)**
Cost Efficiency	High (Cheap)	Medium	**Value (Efficacy driven)**
Best Use Case	Budget supplements	General Health	**Premium / Clinical / Sensitive Gut**

Interpretation: While Calcium Carbonate wins on density and cost, it fails on performance and comfort. LiposoMore™ sacrifices some density (requiring more powder mass) but maximizes the biological value of every milligram ingested. In a value-based healthcare market, efficacy and compliance are the new currencies.[1]

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12. Quality Control Methodologies

Joyful Nutritional Supply Co., Ltd. employs advanced analytical techniques to ensure every batch of LiposoMore™ meets specification.

12.1 Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Used for heavy metal testing. Unlike older colorimetric lead tests (which only give a pass/fail

at ~10ppm), ICP-MS quantifies metals down to parts per billion (ppb). This ensures that LiposoMore™ is safe for long-term daily consumption, avoiding the cumulative toxicity risks associated with lower-grade mineral sources.[7]

12.2 High-Performance Liquid Chromatography (HPLC)

Used to verify the phospholipid content and integrity. HPLC allows the separation of intact phospholipids from lyso-phospholipids (degraded fats), ensuring the liposomal shell is fresh and functional.

12.3 Laser Diffraction Particle Sizing

Ensures the powder fineness (mesh size). The specification "100% through 80 Mesh" guarantees a smooth, non-gritty texture in liquid applications. This is critical for "mouthfeel" in functional beverages and dairy products.

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13. Strategic Sourcing and Supply Chain

13.1 Supplier Reliability

Joyful Nutritional Supply Co., Ltd. is established in Shenzhen, a hub of biotech innovation. The company's focus on "Liposomal" ingredients (including Vitamin C, Iron, and Glutathione) indicates a specialized manufacturing capability rather than a generic trading house. This specialization translates to deeper technical support and more consistent product quality for buyers.[5]

13.2 Supply Stability

With a retest date of 2 years and robust packaging (HDPE drums), LiposoMore™ supports a stable supply chain. Manufacturers can order in bulk (e.g., 500kg lots) with confidence that the product will remain within specification during warehousing and distribution.[7]

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14. Expanded Technical Sections (Addendum for Comprehensive Report)

14.1 Physiochemical Stability Under Stress Conditions

- **Thermal Stability:** Liposomes are generally sensitive to heat. LiposoMore™ powder should not be exposed to temperatures exceeding 40°C for extended periods. In formulation processing (e.g., gummy manufacturing), the ingredient should be added at the end of the cooling phase to prevent vesicle rupture.
- **pH Stability:** The calcium citrate core buffers the internal pH, but the external phospholipid shell is most stable at neutral pH. In acidic beverages (pH < 3.5), shelf-life studies should be conducted to ensure the liposomes do not aggregate over time.

14.2 Organoleptic Profile

- **Taste Masking:** One of the unsung benefits of liposomal encapsulation is taste masking. Calcium salts can have a metallic or chalky aftertaste. The lipid coating provides a neutral barrier, preventing the tongue's taste receptors from directly interacting with the mineral salt. This property is invaluable for pediatric powders and chewables.

14.3 Sustainability Statement

Joyful Nutritional Supply Co., Ltd. is committed to sustainable sourcing. The phospholipids used in LiposoMore™ are derived from renewable plant sources (Sunflower/Soy). The manufacturing process emphasizes energy efficiency in the homogenization and drying steps, and the packaging materials are recyclable where local facilities exist.

14.4 Global Regulatory Compliance Table

Region	Status	Notes
USA	Compliant	DSHEA / FDA (GRAS Ingredients)
EU	Compliant	Food Supplement Directive 2002/46/EC
Canada	Compliant	NHP (Natural Health Product) Regulations
Australia	Compliant	TGA Listed Ingredients (Calcium Citrate / Lecithin)

Japan	Compliant	FFC (Foods with Function Claims) Potential

This table serves as a quick reference for regulatory affairs managers assessing the export potential of finished goods containing LiposoMore™.

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15. Final Recommendations for Buyers

For procurement officers and product developers reviewing this TDS, LiposoMore™ Calcium Citrate stands out as a "Solution Ingredient." It is not merely a commodity mineral; it is a functional technology that solves specific consumer pain points.

- **For the Marketing Team:** It provides powerful claims ("Liposomal," "High Absorption," "Gentle on Stomach").
- **For the Quality Team:** It offers purity (low heavy metals) and safety (microbial compliance).
- **For the Formulation Team:** It offers versatility (water dispersible, taste masked).

By integrating LiposoMore™ into your product line, you are leveraging the latest in nutritional science to deliver superior health outcomes to your customers.