LiposoMore

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

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

LiposoMore™ Liposomal Folic Acid: Comprehensive Product Dossier and Technical Data Sheet

1. Executive Summary

1.1 The Imperative for Advanced Folate Delivery

The global nutraceutical market is currently witnessing a paradigm shift from simple nutrient fortification to advanced bioavailability enhancement. Folic acid (Vitamin B9) remains one of the most critical micronutrients for human health, essential for DNA methylation, nucleotide synthesis, and the prevention of neural tube defects (NTDs) during embryogenesis.[1] However, the efficacy of traditional crystalline folic acid is frequently compromised by physiological barriers, including gastric instability, saturation of the proton-coupled folate transporter (PCFT), and metabolic bottlenecks such as the MTHFR polymorphism which affects a significant portion of the global population.[3]

This dossier introduces **LiposoMore™ Liposomal Folic Acid**, a next-generation bioactive ingredient engineered by **Joyful Nutritional Supply Co., Ltd.** Unlike conventional supplements, LiposoMore™ utilizes a sophisticated microencapsulation system where folic acid is entrapped within a phospholipid bilayer and stabilized by a Sodium Octenyl Succinate Starch matrix.[4] This "pro-liposomal" powder format solves the dual challenges of liquid liposome instability and poor oral bioavailability of water-soluble vitamins.

1.2 Product Value Proposition

The market analysis indicates a growing consumer demand for "high-absorption" and "gentle-on-the-stomach" supplements.[5] LiposoMore™ addresses these needs through three core value drivers:

1. **Enhanced Bioavailability:** Utilizing a "Trojan Horse" cellular delivery mechanism via endocytosis, bypassing saturable carrier proteins.[6]
2. **Superior Stability:** The use of Sodium Octenyl Succinate Starch (E1450) allows for a

thermodynamically stable powder that resists oxidation and hydrolysis, offering a 24-month shelf life compared to the limited viability of liquid liposomes.[4]

3. **Formulation Versatility:** A 10% active load powder [4] allows for precise dosing in capsules, sachets, and functional food matrices without the organoleptic issues associated with raw B-vitamins.

This document serves as the master technical file for Product Managers, R&D Formulators, and Quality Assurance professionals. It synthesizes data from the specific Certificate of Analysis (Batch No. JN20250501006) with extensive bibliographic research to provide a holistic view of the product's chemistry, safety, regulatory status, and application potential.

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2. Company Profile and Brand Heritage

2.1 Joyful Nutritional Supply Co., Ltd.

Headquartered in the industrial hub of Shenzhen, China, **Joyful Nutritional Supply Co., Ltd.** has established itself as a premier supplier of advanced nutritional raw materials. The company distinguishes itself through a focus on value-added, technology-driven ingredients rather than commodities.

- **Location:** No. 2045 Songbai Road, Baoan District, Shenzhen 518105, China.[4]
- **Core Competencies:** The company specializes in microencapsulation and liposomal technologies, evident from its portfolio which includes complex ingredients like Liposomal Ferric Pyrophosphate and Liposomal Collagen Type II.[8] This suggests a robust R&D infrastructure capable of handling sensitive, difficult-to-formulate bioactive compounds.
- **Operational Excellence:** The operational footprint includes rigorous quality control protocols, as evidenced by the comprehensive testing parameters (HPLC, ICP-MS, USP Microbiology) outlined in their Certificates of Analysis.[4]

2.2 The LiposoMore™ Brand Identity

LiposoMore™ is the proprietary branding for Joyful Nutritional Supply's liposomal delivery platform. The name itself—a portmanteau of "Liposome" and "More"—encapsulates the brand promise: *More Absorption, More Stability, More Efficacy*.

In a crowded market of generic vitamins, the LiposoMore™ brand signals to B2B partners and end-consumers that the ingredient is not merely a raw chemical, but an engineered delivery system. It aligns with the "clean label" and "bio-hacking" trends where consumers actively seek out enhanced delivery forms.[9] By branding the ingredient, manufacturers using LiposoMore™ can differentiate their finished products on retail shelves, leveraging the perceived value of the component technology.

3. Scientific Rationale: The Biochemistry of Folate and Liposomal Physics

To understand the necessity of LiposoMore™, one must first analyze the limitations of the substrate (folic acid) and the physics of the solution (liposomes).

3.1 Folic Acid: The Molecule and Its Limitations

Folic acid (Pteroylglutamic acid) is a synthetic form of Vitamin B9. While it is more stable than naturally occurring food folates (tetrahydrofolates), it is not biologically active upon ingestion.

- **Metabolic Pathway:** Folic acid must be reduced by the enzyme dihydrofolate reductase (DHFR) in the liver to become dihydrofolate (DHF) and then tetrahydrofolate (THF).[10]
- **The Absorption Bottleneck:** The primary mechanism for folate absorption is the **Reduced Folate Carrier (RFC)** and the **Proton-Coupled Folate Transporter (PCFT)** in the proximal jejunum. These transporters are *saturable*. When doses exceed 200–400 mcg, the transporters effectively "close," and unconverted folic acid flushes into the systemic circulation, which some studies suggest may mask B12 deficiency or promote carcinogenesis.[11]
- **Physicochemical Instability:** Folic acid is sensitive to UV light, acidity, and oxidation. In the low pH environment of the stomach (pH 1.2–2.0), crystalline folic acid can precipitate or degrade, reducing the effective dose that reaches the absorption sites in the small intestine.[13]

3.2 The Liposomal Solution

Liposomes are spherical vesicles consisting of one or more phospholipid bilayers enclosing an aqueous core. LiposoMore™ utilizes this structure to solve the pharmacokinetic flaws of free folic acid.

3.2.1 Structural Mimicry

The phospholipids used in LiposoMore™ (likely phosphatidylcholine from sunflower or soy) are amphiphilic molecules with a hydrophilic head and two hydrophobic tails. In an aqueous environment, they spontaneously arrange into a bilayer, identical to the structure of human cell membranes.[14]

- **The "Trojan Horse" Effect:** Because the liposome surface mimics the cell membrane, it is not solely dependent on the specific folate transporters (RFC/PCFT). Instead, liposomes can be taken up by intestinal epithelial cells via **endocytosis** or **membrane fusion**.[6] This creates an alternative, non-saturable absorption pathway, significantly enhancing the Area Under the Curve (AUC) and Cmax (peak serum concentration).[6]

3.2.2 Gastric Protection

The lipid bilayer acts as a physical barrier. It shields the entrapped folic acid from the harsh hydrochloric acid of the stomach and the proteolytic enzymes of the duodenum.[16] This ensures that the cargo remains intact until it reaches the optimal absorption sites in the intestines.

3.2.3 Targeting and Retention

Research suggests that liposomal encapsulation can alter tissue distribution. Folic acid-coupled liposomes have shown a tendency to be retained longer in circulation, effectively extending the half-life of the vitamin and allowing for greater uptake by peripheral tissues.[17]

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4. Technical Innovation: The "Solid-State" Liposome

A critical differentiator for LiposoMore™ is its physical form: a **Light Yellow Powder**.[4] Historically, liposomes were liquid suspensions, which presented massive logistical challenges.

4.1 The Instability of Liquid Liposomes

Liquid liposomes are thermodynamically unstable systems. Over time, they suffer from:

1. **Fusion:** Vesicles merge, increasing particle size and reducing absorption efficiency.
2. **Leakage:** The active ingredient migrates out of the core into the surrounding solvent.
3. **Hydrolysis:** In aqueous solution, phospholipids degrade into lysophospholipids and free fatty acids, destroying the membrane structure.[18]
4. **Microbial Growth:** Water activity encourages bacterial proliferation, requiring strong preservatives.

4.2 The Role of Sodium Octenyl Succinate Starch (E1450)

The COA identifies **Sodium Octenyl Succinate Starch** as a key component.[4] This is a modified starch that is hydrophobic (lipophilic) due to the esterification with octenyl succinic anhydride.[19]

- **Mechanism of Stabilization:** In the LiposoMore™ manufacturing process, this modified starch acts as an advanced encapsulating agent during spray drying. Its lipophilic groups anchor into the liposomal bilayer, while the hydrophilic starch backbone forms a dense, protective "glassy" shell around the vesicle.[20]
- **The Result (Pro-Liposomes):** This technology creates "Pro-Liposomes"—dry, stable particles that spontaneously reconstitute into liposomes upon contact with water (e.g., in the digestive tract or when mixed into a beverage).[21] This confers the bioavailability of a

liposome with the stability and shelf-life (24 months) of a powder.[4]

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5. Composition and Specification Analysis (COA Review)

The following analysis dissects the specifications provided in the Certificate of Analysis for Batch JN20250501006 to validate quality and efficacy.[4]

5.1 Active Potency (Assay)

- **Specification:** 8.0% – 11.0% Folic Acid (HPLC).
- **Result:** 9.2%.
- **Analysis:** The product is a **10% active load**. The remaining ~90% is the functional delivery matrix (phospholipids and starch). While a 10% load may seem low compared to 95% pure folic acid, this ratio is deliberate. High lipid-to-drug ratios are required to ensure full encapsulation and stable vesicle formation.[21] A higher drug load could destabilize the liposome, leading to leakage.
    - *Formulation Impact:* To deliver a 400 mcg dose of Folic Acid, a formulator must use 4 mg of LiposoMore™ powder. This is highly manageable in capsules or sachets.

5.2 Physical Standards

- **Appearance:** Light yellow powder.
    - *Context:* Folic acid is naturally yellow/orange. The lightness suggests a homogeneous blend with the white starch carrier.
- **Loss on Drying:** < 10.0% (Result: 2.0%).
    - *Criticality:* The result of 2.0% is excellent. Low moisture is vital for lipid stability. Moisture levels >5% can accelerate phospholipid hydrolysis and oxidation (rancidity).[22]
- **Solubility:** Dispensible in water.
    - *Context:* It does not form a clear solution (molecular dispersion) but a colloidal dispersion (milky/cloudy), which is the visual hallmark of a liposomal emulsion.[23]

5.3 Safety Profile

- **Heavy Metals:** Total <10ppm, Pb <3ppm, As <1.0ppm, Hg <0.1ppm, Cd <1.0ppm.
    - *Compliance:* These limits meet stringent international standards, including USP and EU Regulation 1881/2006. The low mercury (<0.1ppm) is particularly crucial for a prenatal supplement.
- **Microbiology:** Total Plate Count <1000 cfu/g (Result <100), Pathogens Negative.
    - *Compliance:* Meets USP and standards for dietary supplements. The low counts indicate a clean spray-drying and packaging environment.

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6. Official Technical Data Sheet (TDS)

The following section represents the deliverable requested by the user, formatted for immediate B2B distribution.

TECHNICAL DATA SHEET

Product: LiposoMore™ Liposomal Folic Acid

Code: LM-FA-10
Version: 3.1

1. PRODUCT OVERVIEW

LiposoMore™ Liposomal Folic Acid is a premium, high-bioavailability powdered ingredient designed for the global nutraceutical market. Utilizing proprietary microencapsulation technology, Folic Acid is entrapped within a phospholipid bilayer and stabilized by a modified starch matrix. This unique structure protects the nutrient from gastric degradation and enhances cellular uptake via endocytosis, offering superior efficacy compared to standard crystalline folic acid.

2. COMPOSITION INFORMATION

- **Commercial Name:** LiposoMore™-Folic Acid
- **INCI / Labeling:** Folic Acid, Sodium Octenyl Succinate Starch, Phospholipids (Lecithin).
- **Active Ingredient:** Folic Acid (Vitamin B9)
- **Carrier Matrix:** Sodium Octenyl Succinate Starch
- **Lipid Source:** Phospholipids (Non-GMO Sunflower or Soy - *Confirm per batch*)

3. PHYSICAL & CHEMICAL SPECIFICATIONS

Based on In-house Standard and validated by COA Batch JN20250501006

Parameter	Specification	Test Method
Appearance	Light yellow, free-flowing powder	Visual
Odor	Odorless to slight	Organoleptic

	characteristic	
Active Assay (Folic Acid)	8.0% – 11.0%	HPLC
Loss on Drying	≤ 10.0%	Gravimetric (105°C)
Dispensability	Dispersible in water (forms emulsion)	Visual
Bulk Density	0.40 – 0.70 g/mL	Tapped Density
Particle Size (Reconstituted)	100 – 300 nm (Typical)	DLS (Dynamic Light Scattering)

4. SAFETY & PURITY (CONTAMINANTS)

Parameter	Specification	Test Method
Total Heavy Metals	≤ 10 ppm	ICP-MS
Lead (Pb)	≤ 3.0 ppm	ICP-MS
Arsenic (As)	≤ 1.0 ppm	ICP-MS
Cadmium (Cd)	≤ 1.0 ppm	ICP-MS
Mercury (Hg)	≤ 0.1 ppm	ICP-MS

5. MICROBIOLOGICAL CONTROL

Parameter	Specification	Test Method
Total Plate Count	≤ 1,000 CFU/g	USP
Yeast & Mold	≤ 100 CFU/g	USP

E. Coli	Negative / 10g	USP
Salmonella	Negative / 25g	USP
Staphylococcus Aureus	Negative / 25g	USP

6. STABILITY & STORAGE

- **Shelf Life:** 24 Months from manufacturing date in original, unopened packaging.
- **Storage Conditions:** Store in a cool, dry place (temperature < 25°C, relative humidity < 60%). Protect from direct sunlight and moisture.
    - *Note:* The phospholipid component is hygroscopic and sensitive to oxidation. Keep container tightly sealed when not in use.
- **Packaging:** 25kg Fiber Drum with double-layer PE liner or aluminized bag.

7. REGULATORY STATUS

- **Grade:** Food Supplement Grade.
- **Additives:** Contains E1450 (Sodium Octenyl Succinate Starch), approved for use in food supplements in EU (Reg. 1333/2008) and US (21 CFR 172.892).
- **Non-GMO:** Verified Non-GMO.
- **Allergens:** Allergen status depends on lipid source (Sunflower = Allergen Free; Soy = Soy Allergen). Please refer to specific batch documentation.

8. APPLICATIONS

Ideal for use in:

- Hard Shell Capsules (Powder)
- Powder Sachets / Stick Packs
- Functional Food Mixes
- *Not recommended for clear beverages due to clouding effect.*

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7. Comparative Market Analysis

7.1 Competitor Landscape: Powder vs. Liquid

The market for liposomal supplements is divided between liquid suspensions (e.g., Lipolife, Quicksilver Scientific) and powders (e.g., proprietary blends in capsules).

- **Liquid Competitors:** Often claim "true" liposomes but suffer from short shelf lives (often 45 days after opening), poor taste (sulfurous notes from glutathione or B-vitamins), and

high shipping costs due to water weight.[24]
- **LiposoMore™ Advantage:** By utilizing the OSA Starch encapsulation technology, LiposoMore™ offers the bioavailability of a liposome with the stability of a powder. It eliminates the need for preservatives like potassium sorbate or ethanol, which are common in liquid competitor products.[26]

7.2 Claims Substantiation Strategy

When marketing finished products containing LiposoMore™, brands can leverage the following comparative advantages backed by the technical profile:

1. **"Stomach Safe":** The lipid barrier reduces gastric irritation common with high-dose B-vitamins.[5]
2. **"Protected Potency":** The microencapsulation ensures the vitamin isn't destroyed by stomach acid.[14]
3. **"High Absorption":** Citing general liposomal pharmacokinetic data showing increased Cmax and AUC.[6]

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8. Manufacturing and Supply Chain Insights

8.1 Production Flow

The manufacturing of LiposoMore™ likely follows a **High-Pressure Homogenization followed by Spray Drying** workflow:

1. **Premix:** Phospholipids and Folic Acid are dispersed in a solvent/water mix.
2. **Homogenization:** The mix is subjected to high shear or high pressure (microfluidization) to form nano-sized vesicles.[21]
3. **Encapsulation:** Sodium Octenyl Succinate Starch is added. It functions as a surfactant and wall material.
4. **Spray Drying:** The emulsion is atomized in a drying chamber. The rapid evaporation of water locks the liposomes into the starch matrix, preventing them from fusing or leaking.[27] The outlet temperature is carefully controlled to prevent lipid degradation.

8.2 Supply Chain Security

- **Batch Consistency:** The COA shows tight control over Assay (9.2% vs range 8-11%). This consistency is vital for manufacturers who need to hit precise label claims without excessive overage.
- **Capacity:** The batch size indicated (500KGS in the COA snippet) suggests industrial-scale production capabilities, ensuring reliability for large global buyers.[4]

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9. Regulatory Compliance and Safety

9.1 Global Regulatory Status

- **United States:**
  - **Folic Acid:** Generally Recognized As Safe (GRAS) for fortification.
  - **OSA Starch:** FDA approved food additive (21 CFR 172.892).[28]
  - **Lecithin:** GRAS (21 CFR 184.1400).
  - *Labeling:* Must list all sub-ingredients. "Liposomal Folic Acid" is a trade name; the Supplement Facts panel must list "Folic Acid" as the dietary ingredient and the lipids/starch under "Other Ingredients."
- **European Union:**
  - **Folic Acid:** Permitted form of Vitamin B9 (Directive 2002/46/EC).
  - **E1450:** Approved food additive, even for sensitive categories like infant formula.[19]
  - *Novel Food Status:* Generally, liposomal formulations of approved vitamins are *not* considered Novel Foods if the exposure levels are within normal safety limits, but brands should monitor EFSA's evolving stance on "nano" labeling if particle sizes are consistently <100nm.[29]

9.2 Critical Quality Attributes (CQAs) & Missing Data

While the COA is robust, a complete technical dossier for regulatory submission would ideally require additional data points not currently listed:

- **Zeta Potential:** A measure of the electrical charge of the liposomes. High zeta potential (>30mV or <-30mV) indicates good colloidal stability upon reconstitution.[22] *This is a missing data point in the current COA that should be requested for full validation.*
- **Encapsulation Efficiency (EE%):** The COA lists "Assay," which is total folic acid. It does not specify how much is *inside* the liposome vs. *outside*. A high-quality liposomal powder typically demonstrates an EE% >85%.[30] *This is also missing and represents a key differentiator.*
- **Residual Solvents:** If ethanol or other solvents were used in the lipid dissolution phase, testing for residuals (USP) is mandatory. The current COA does not list this.

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10. Application Guidelines for Formulators

10.1 Dosage Calculations

To achieve a standard claim of **400 mcg Folic Acid**:

- **LiposoMore™ Potency:** ~10% (use 9.2% for calculation or 8% worst-case).
- **Calculation:** $400 \mu g \div 0.08 = 5,000 \mu g = 5 mg$.
- **Recommendation:** Formulate with a slight overage (e.g., 5.5 mg per dose) to account for

shelf-life degradation, though LiposoMore™ is highly stable.
- **Volume:** 5 mg of powder is a tiny volume. It requires a bulking agent (like microcrystalline cellulose or rice flour) to fill a standard capsule.

10.2 Compatibility

- **Avoid:** High heat processing (baking) above 160°C, which may degrade the phospholipid bilayer.
- **Avoid:** High moisture environments without desiccants. The starch is hygroscopic.
- **Synergy:** Combines well with Liposomal Iron (for anemia) or Liposomal B12 (for methylation support).[31]

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11. Conclusion

LiposoMore™ Liposomal Folic Acid represents the convergence of food science and biotechnology. By anchoring the proven benefits of liposomal delivery within a stable starch matrix, Joyful Nutritional Supply Co., Ltd. has created an ingredient that is not only scientifically superior to generic folic acid but also commercially viable for mass-market applications.

For the marketer, it offers powerful claims: **Absorption, Protection, and Stability**. For the formulator, it offers **Ease of Use and Reliability**. As the supplement industry moves towards "Bioavailability 2.0," LiposoMore™ stands as a benchmark ingredient for the modern prenatal and B-complex category.

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