LiposoMore

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

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

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# TECHNICAL DATA SHEET: LiposoMore™-Ca (Liposomal Tricalcium Phosphate Powder)

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## 1. Product Description & Brand Overview

**LiposoMore™-Ca** is a premium, highly bioavailable solid-state liposomal calcium powder designed for elite dietary supplements and functional food applications.[3] Developed by Joyful Nutritional Supply Co., Ltd., a global leader in advanced microencapsulation and target nutrient delivery systems, this product features micronized Tricalcium Phosphate—chemical formula Ca3(PO4)2—expertly coated with high-purity phospholipids.

Traditional calcium salts are notorious for poor absorption, chemical instability, and adverse gastrointestinal side effects.[4] LiposoMore™-Ca solves these bottlenecks by utilizing a proprietary, biomimetic liposomal bilayer technology. This nanostructured "core-shell" system shields the mineral cargo from gastric acid, prevents undesirable interactions with other dietary compounds, and routes absorption through non-competitive lipid transport pathways.

Unlike conventional liquid liposomes, which suffer from short shelf-lives, rapid phase separation, and phospholipid hydrolysis, our dry liposomal powder locks the lipid bilayers in a stable, solid-state matrix.[6] This guarantees superior stability, easy dispersibility, and long-term retention of the encapsulated active mineral throughout its shelf-life.[9]

## 2. Technical Specifications

The following table outlines the standardized physicochemical, regulatory, and microbiological

specifications for LiposoMore™-Ca, established under our strict corporate In-house Quality Standards.[1]

| Technical Parameter | Specification Standard | Analytical Method |
|---|---|---|
| **Appearance** | White, fine, free-flowing powder | Visual observation [1] |
| **Odor** | Odorless | Sensory evaluation [1] |
| **Active Ingredient** | Tricalcium Phosphate [Ca3(PO4)2] | Gravimetric / Identification [11] |
| **Total Calcium Assay** | NLT 27.0% | ICP-MS / ICP-OES [12] |
| **Tricalcium Phosphate Content** | NLT 80.0% | Gravimetric analysis [1] |
| **Loss on Drying** | NMT 10.0% | 105 °C, constant weight [11] |
| **Average Particle Size (D50)** | 100 to 220 nm | Dynamic Light Scattering (DLS) [13] |
| **Polydispersity Index (PDI)** | NMT 0.3 | DLS [13] |
| **Zeta Potential** | -30 to -45 mV | Electrophoretic Light Scattering (ELS) [13] |
| **Encapsulation Efficiency** | NLT 70.0% (Typically NLT 94.0%) | Ultrafiltration + LC-MS/MS [13] |
| **Total Heavy Metals** | NMT 10 ppm | ICP-MS [1] |
| **Lead (Pb)** | NMT 3 ppm | ICP-MS [1] |
| **Mercury (Hg)** | NMT 0.1 ppm | ICP-MS [1] |
| **Cadmium (Cd)** | NMT 1.0 ppm | ICP-MS [1] |

| | | |
|---|---|---|
| **Arsenic (As)** | NMT 1.0 ppm | ICP-MS [1] |
| **Total Plate Count** | NMT 1000 cfu/g | USP [1] |
| **Molds & Yeasts** | NMT 100 cfu/g | USP [1] |
| **E. coli** | Negative/g | USP [1] |
| **Salmonella** | Negative/25g | USP [1] |
| **Staphylococcus aureus** | Negative/25g | USP [1] |

*Note: All analytical data are verified using state-of-the-art instruments in our CNAS-validated and GMP-compliant testing facilities.*

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# 3. Product Advantages & Physiological Mechanisms

Traditional calcium supplements (e.g., calcium carbonate and citrate) have low bioavailability (20% to 40%) because they rely on gastric acid-dependent ionization and saturable, active intestinal transporters (TRPV6).[14] Unabsorbed calcium reacts with dietary oxalates and phytates in the gut, forming insoluble precipitates that irritate the intestinal mucosa, leading to bloating, severe gas, and constipation.[5]

LiposoMore™-Ca completely overcomes these biological barriers through three primary delivery mechanisms:

1. **Biomimetic Cellular Fusion & Endocytosis:** Because the outer liposomal membrane is composed of a phospholipid bilayer structurally identical to human cell membranes, the enterocytes recognize the liposome as naturally compatible. Instead of fighting for transport proteins, LiposoMore™-Ca fuses directly with the intestinal cell walls or is absorbed whole via endocytosis, releasing its calcium payload directly into systemic circulation.
2. **Gastric Acid Protection & Mucosal Shielding:** The robust phospholipid shell acts as a physical barrier, protecting the encapsulated Tricalcium Phosphate from reacting prematurely with gastric acid. Energy Dispersive X-ray Spectroscopy (EDAX) surface analysis confirms that calcium is fully enclosed inside the lipid bilayers with no surface exposure.[9] This eliminates direct contact between calcium ions and the sensitive stomach lining, completely preventing heartburn, acid reflux, and constipation.
3. **Hepatic First-Pass Bypass via Lymphatic Pathway:** The lipid-based nanocarriers enter the systemic circulation partially through the intestinal lymphatic system (via Peyer's Patches). By bypassing hepatic first-pass metabolism, a significantly higher portion of

calcium is directed to bone tissues.

### Proven Clinical Superiority:

- **1.56-Fold AUC Bioavailability Boost:** In a randomized, double-blind, crossover clinical human absorption trial, subjects consuming solid-state liposomal calcium showed a significantly faster and more sustained blood calcium response.[15] The 8-hour area under the curve ($\mathrm{AUC}_{0-8\mathrm{h}}$) for the liposomal group was **2.94 mg·h/dL** compared to only **1.88 mg·h/dL** for the non-liposomal group.[15]
- **3.2-Fold Biomarker Improvement:** Long-term clinical studies indicate that LiposoMore™-Ca achieves a **3.2 times greater increase** in key bone-mineralization biomarkers compared to equivalent doses of standard calcium carbonate.[14]

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## 4. Synergy & Formulation Guidelines

Due to the superior bioavailability of LiposoMore™-Ca, product formulators do not need to overload tablets or capsules with massive, unabsorbable doses.[14] A smaller, highly efficient dose of **200 to 400 mg** of LiposoMore™-Ca provides superior bone density support with zero gastrointestinal discomfort.[14]

To maximize clinical efficacy, we recommend formulating LiposoMore™-Ca within a synergistic "Bone Mineral Matrix" [14]:

- **Vitamin D3 (1000 to 1200 IU):** Acts as the essential gene-activating cofactor that stimulates the synthesis of calcium-binding proteins (Calbindin) in the intestinal mucosa, complementing the liposome's natural absorption pathways.
- **Vitamin K2 (as MK-7, 75 mcg):** Crucial for activating osteocalcin and matrix Gla protein (MGP).[14] This ensures that the calcium absorbed in the blood is actively bound to the bone matrix, rather than accumulating pathologically in the arteries or kidneys (preventing the "Calcium Paradox").[14]
- **Magnesium Balance (2:1 Ratio):** It is highly recommended to combine LiposoMore™-Ca with Liposomal Magnesium (such as MagShape™) in a 2:1 Calcium-to-Magnesium ratio.[14] The liposomal coating shields both minerals, preventing them from competing for the same absorption channels, thus ensuring maximum co-delivery of both essential macronutrients.

$$\text{Encapsulation Efficiency (EE\%)} = \frac{\text{Total Calcium} - \text{Free Surface Calcium}}{\text{Total Calcium}} \times 100\%$$

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# 5. Regulatory Compliance & Clean Label Declarations

At LiposoMore, we understand that global supplement brands require absolute regulatory transparency.[18] LiposoMore™-Ca is manufactured under the strictest global standards and carries the following safety declarations:

- **Non-GMO:** 100% free from genetically modified organisms. Phospholipids are sourced from non-GMO sunflowers/sustainable palm and comply fully with EC Regulations 1829/2003 and 1830/2003.[19]
- **BSE/TSE-Free:** The Tricalcium Phosphate and phospholipid carriers are of 100% mineral and plant origin.[22] No animal bones or tissues are used at any stage of manufacturing, completely eliminating any risk of Transmissible Spongiform Encephalopathy (TSE) or Bovine Spongiform Encephalopathy (BSE).[22]
- **Gluten-Free & Allergen-Free:** Completely free from gluten, soy, dairy, wheat, peanuts, tree nuts, egg, fish, and shellfish.[22] Safe for highly sensitive individuals.
- **No Nanotechnology / Non-Irradiated:** Our high-pressure homogenization process produces natural, thermodynamically stable liposomes [25] without utilizing synthetic nanoparticles, chemical irradiation, or Ethylene Oxide (ETO) treatment.[22]
- **Vegan & Vegetarian Certified:** Suitable for 100% plant-based, vegan, and vegetarian diets.[22]

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# 6. Storage, Packaging, & Industrial Handling Guidelines

## Storage Conditions:

Phospholipids are inherently hygroscopic and susceptible to heat-induced phase transitions. To maintain optimal powder flowability, liposome structure, and long-term encapsulation efficiency, LiposoMore™-Ca must be stored in a cool, dry place inside tightly closed containers.[26] Keep away from direct sunlight, moisture, and high temperatures.[27]

## Packaging Format:

Standard export packaging is supplied in **25 kg fiber drums** equipped with double food-grade, low-density polyethylene (LDPE) inner bags to block moisture.[29]

## Industrial Handling & Safety Precautions:

- **Humidity Control:** To avoid powder stickiness and machinery clumping during blending, tableting, or capsule filling, we strictly recommend maintaining the relative humidity (RH) of the production facility between **35% and 45%**.
- **Incompatibilities:** Keep the material away from strong acids and strong oxidizing agents.[26] Warning: Do not store or handle in environments containing fluorine gas, as calcium-lipid complexes may react fiercely upon contact.[27]

- **Personal Protective Equipment (PPE):** Excessive inhalation of fine mineral dust may cause physical irritation to the respiratory tract.[26] Operators should wear an N95 dust respirator, safety goggles, anti-static clothing, and protective gloves during bulk handling and weighing.[26]
- **Spill Cleanup:** In the event of a spill, avoid sweeping dry powder which generates airborne dust.[27] Collect the material using a shovel or an industrial explosion-proof vacuum cleaner and transfer it to a designated waste container.[26] Clean the contaminated surface thoroughly with water and dispose of it in accordance with local regulations.[26]