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

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

Technical Data Sheet: LiposoMore® Liposomal L-Leucine Powder

Product Overview and Brand Philosophy

LiposoMore® Liposomal L-Leucine Powder is an advanced, supplement-grade dietary ingredient developed by Joyful Nutritional Supply Co., Ltd..[1] It represents a significant advancement in amino acid delivery, utilizing state-of-the-art liposomal microencapsulation technology to convert a traditionally challenging hydrophobic amino acid into a highly functional, bioavailable, and user-friendly ingredient.[1] Guided by the brand slogan, "Delivering Premium Nutrition Through Science & Innovation," LiposoMore® bridges the gap between raw nutrient potential and real-world physiological efficacy.[1]

L-Leucine, classified as an essential branched-chain amino acid (BCAA), has the molecular formula $\mathrm{C_6H_{13}NO}$, a molecular weight of $131.18\ \mathrm{g/mol}$, and is registered under CAS Number 61-90-5.[3] In its conventional free-form state, L-Leucine exhibits several technical and sensory limitations:

- **Low Aqueous Solubility:** It has a baseline water solubility of only $22.4\ \mathrm{g/L}$ at $20^\circ\mathrm{C}$, leading to poor wetability and surface clumping in functional beverages.[5]
- **Unpalatability:** It possesses an intensely bitter taste and a distinct off-odor, making flavoring difficult without substantial quantities of artificial sweeteners.[7]
- **Limited Absorption:** It depends on saturable, carrier-mediated transport systems in the gut, which restricts its absorption rate and peak plasma concentration ($C_{\max}$).[10]

The LiposoMore® platform addresses these issues by coating high-purity L-Leucine within a protective phospholipid bilayer membrane.[1] This lipid envelope acts as a physical barrier that isolates the active compound from environmental degradation and oral taste receptors, while also serving as a transport vehicle that improves absorption through the intestinal wall.[2]

Technical Specifications

LiposoMore® Liposomal L-Leucine Powder is manufactured in strict accordance with rigorous in-house standards, utilizing validated United States Pharmacopeia (USP) testing methods to guarantee uniform quality, safety, and purity.[1]

Testing Parameter	In-House Specification Standard	Typical Analytical Profile	Reference Test Method
Active Ingredient	L-Leucine ($C_6H_{13}NO)_3$	Conforms	In-house verification [1]
Purity (L-Leucine)	**>68%** [1]	**70%**	USP Chromatography (HPLC)
Appearance	White to almost white particles and powders [1]	Passed [1]	USP Color and Achromicity
Odor	Odorless [1]	Passed [1]	USP Odor
Solubility	Dispersible in water [1]	Passed [1]	USP Solubility
Loss on Drying	**≤2.0%**	1.2% [1]	USP Loss on Drying
Bulk Density	Report as it is [1]	$0.38\ \mathrm{g/mL}$ [1]	USP Bulk & Tapped Density
Particle Size Distribution	$> 90\%$ pass $80\ \mathrm{mesh}$ [1]	Passed [1]	USP Particle Size Distribution
Total Heavy Metals	**≤10.0%** [1]	Pass	USP Elemental Impurities (ICP-MS)

Lead (Pb)	**≤3.0 ppm**	Pass	USP Elemental Impurities (ICP-MS)
Mercury (Hg)	**≤0.1 ppm** [1]	Pass	USP Elemental Impurities (ICP-MS)
Cadmium (Cd)	**≤1.0 ppm** [1]	Pass	USP Elemental Impurities (ICP-MS)
Arsenic (As)	**≤1.0 ppm** [1]	Pass	USP Elemental Impurities (ICP-MS)
Total Plate Count	**≤1000cfu/g**	＜100cfu/g	USP Microbiological Examination
Molds & Yeasts	**≤100cfu/g**	＜10cfu/g	USP Microbiological Examination
E. coli	Negative/g [1]	Negative [1]	USP Microbiological Examination
Salmonella	Negative in 25 g [1]	Negative [1]	USP Microbiological Examination
Staphylococcus aureus	Negative in 25 g [1]	Negative [1]	USP Microbiological Examination

Physicochemical Parameters and Quality Control

Maintaining strict physical parameters is necessary to ensure consistent flowability, storage stability, and standard reconstituted vesicle sizes.[14] A bulk density of $0.38\ \mathrm{g/mL}$ allows for efficient powder handling, reducing issues like powder separation during dry-blending and ensuring uniform filling during high-speed encapsulation.[1]

The particle size distribution ($> 90\%$ pass $80\ \mathrm{mesh}$) supports high-speed manufacturing

by minimizing dust generation while allowing for rapid, uniform wetting when dispersed in liquids.[1] Heavy metals and microbiological parameters are verified using inductively coupled plasma mass spectrometry (ICP-MS) and USP-compliant cultivation methods.[1] These steps confirm that the ingredient meets strict contaminants standards required for clean-label supplements globally.[1]

Physiological Mechanisms and Bioavailability Enhancements

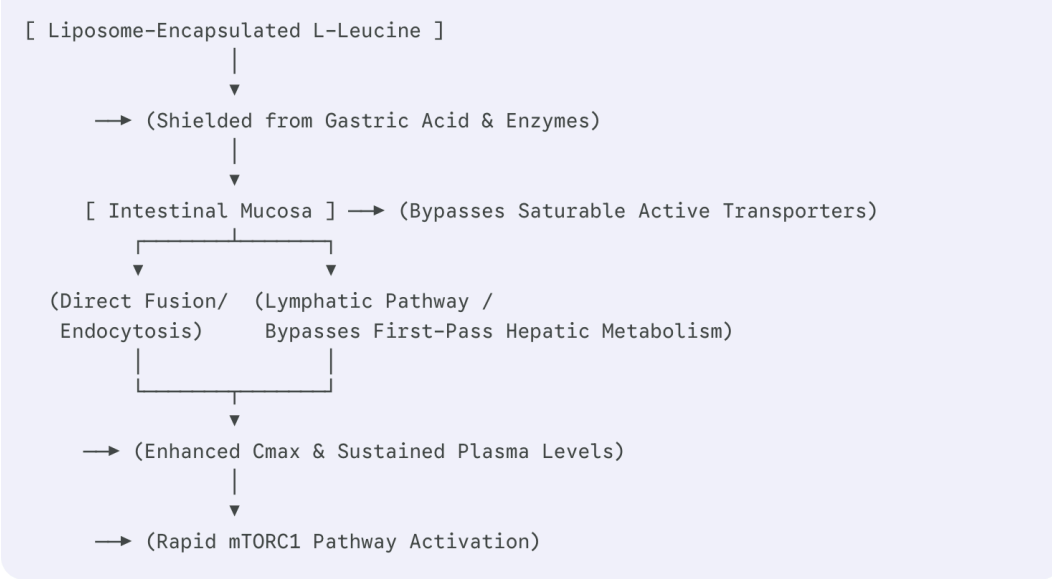
To fully understand the performance of LiposoMore® Liposomal L-Leucine, it is helpful to distinguish between three concepts: *bioaccessibility* (the fraction released from the food matrix that is ready for absorption), *bioavailability* (the fraction that enters systemic circulation intact), and *efficacy* (the ultimate physiological response triggered at the cellular level).[10]

Bypassing Intestinal Barriers

Standard L-Leucine absorption is restricted by the speed and capacity of mucosal amino acid transporters in the small intestine.[10] Large doses of free-form amino acids can saturate these active transport sites, leaving unabsorbed amino acids in the digestive tract.[19] This accumulation can create an osmotic imbalance, drawing water into the lumen and potentially causing gastrointestinal discomfort.[12]

LiposoMore® encapsulates L-Leucine in microscopic phospholipid bilayers, bypassing standard amino acid transporters.[1] Because these liposomes are structurally similar to enterocyte membranes, they can transport their amino acid cargo through alternative pathways [2]:

- **Membrane Fusion and Endocytosis:** Liposomal vesicles can fuse directly with mucosal cells or be taken up through endocytic processes.[2] This bypasses standard transport proteins and delivers L-Leucine straight into the cytoplasm.[11]
- **Lymphatic Pathway Absorption:** These lipid-based vesicles can enter the lymphatic system via chylomicron pathways in the intestinal villi, bypassing first-pass portal vein metabolism in the liver.[19] This direct route into the systemic bloodstream helps preserve the active ingredient and increases overall bioavailability.[19]



Through these dual pathways, liposomal delivery systems can achieve absorption rates of 80% to 90%, compared to just 20% to 30% for traditional oral supplements.[12]

The Leucine Trigger and Muscle Protein Synthesis

Muscle hypertrophy, cellular recovery, and tissue repair are regulated by the mammalian target of rapamycin complex 1 ($\mathrm{mTORC1}$) signaling pathway.[5] Intracellular L-Leucine acts as an obligatory metabolic trigger that activates this pathway.[10] However, this activation depends on a threshold effect known as the "leucine trigger".[10] To maximize muscle protein synthesis, plasma and intracellular leucine concentrations must rise rapidly within a narrow postprandial window.[10]

By accelerating absorption and avoiding the rate limits of typical mucosal transporters, LiposoMore® Liposomal L-Leucine Powder produces a sharp, robust spike in plasma concentration.[10] This rapid delivery triggers stronger, more sustained $\mathrm{mTORC1}$ signaling, which supports muscle growth and helps reduce muscle wasting, particularly during intense training or aging-related muscle loss.[5]

Application and Formulation Guidelines

LiposoMore® Liposomal L-Leucine Powder's physical properties make it highly versatile for developers of advanced sports nutrition and clinical dietary supplements.[2]

Key Formulation Advantages

- **Superior Taste and Odor Masking:** The physical phospholipid bilayer completely isolates

the active L-Leucine, preventing it from binding to bitter taste receptors (T2Rs) on the tongue.[7] This masking helps developers create unflavored or clean-tasting powder formulations without needing high levels of artificial masking agents, chemical taste blockers, or intense sweeteners.[8]

- **Excellent Water Dispersibility:** While standard L-Leucine is hydrophobic and tends to float or clump on water, the outer hydrophilic phosphate groups of the LiposoMore® bilayer interact readily with water molecules.[1] This surface modification allows the powder to disperse quickly and evenly in aqueous solutions, forming a stable, homogeneous suspension without grittiness.[1]
- **Reduced Dependency on Excipients:** Because the natural phospholipid shell provides protective and structural benefits, developers can formulate cleaner, simpler products with fewer synthetic binders, flowing agents, or texturizers.[11]

Dosage and Processing Recommendations

To preserve the delicate microencapsulated liposomal structures during manufacturing, several guidelines should be followed [14]:

Parameter	Guideline	Technical Justification
Active Target Calculation	Adjust input based on the 71.00% assay.[1]	Ensures accurate dosing of elemental L-Leucine per serving.[1]
Mixing Shear Limits	Use low-shear blending; avoid high-shear homogenization.[26]	High mechanical shear can rupture the lipid bilayers, releasing free amino acids.[26]
Thermal Processing Limits	Keep temperatures below 40°C to 45°C.[14]	High heat can fluidize or melt the phospholipid membranes.[14]
Incompatible Ingredients	Avoid strong surfactants or highly acidic compounds ($\text{pH} <$).[26]	Chemical destabilizers can compromise membrane integrity.[26]

Formulation Compatibility

LiposoMore® Liposomal L-Leucine is suitable for a wide range of product formats [2]:

- **Hard Shell VegCaps and Tablets:** The powder's consistent bulk density and particle size

support high-speed capsule filling and direct-compression tableting.[2]

- **Dry Powder Drink Mixes:** It blends easily with other BCAAs, creatine, proteins, and electrolytes to create high-dispersion, unflavored, or lightly flavored sports nutrition mixes.[2]
- **Functional Foods and Gelled Delivery Systems:** It can be incorporated into protein bars, meal replacement shakes, and functional gummies without affecting the final product's texture or flavor profile.[2]

Stability, Storage, and Packaging

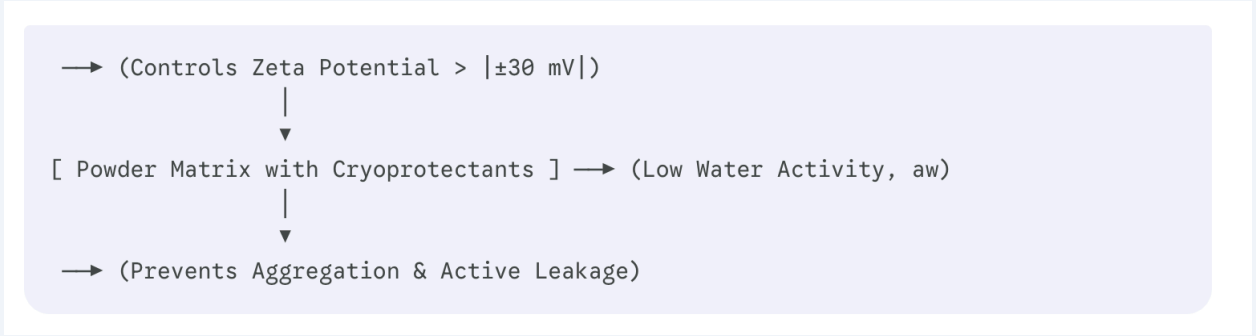
Physical and Chemical Stability

Liquid liposomal formulas are often prone to degradation, including aggregation, precipitation, and lipid oxidation.[14] Over time, water molecules can slowly cleave the ester bonds in phospholipids, generating lysophospholipids that disrupt vesicle membranes.[26]

LiposoMore® addresses these stability concerns by utilizing a dry powder format.[1] Converting the liposomes into a solid powder matrix significantly reduces molecular mobility, preventing membrane fusion and lipid hydrolysis.[2]

During drying, protective excipients like trehalose or maltodextrin can be used as cryoprotectants.[33] These molecules form a glassy state around the vesicles, preserving their size ($170\ \text{nm}$ to $210\ \text{nm}$) and preventing leakage during dehydration and storage.[26]

This dry powder design ensures excellent shelf-life and stability under ambient conditions, allowing the product to be stored at room temperature without the need for refrigeration.



To predict long-term physical stability, formulators often measure the zeta potential of reconstituted liposomes.[14] A zeta potential value greater than $|\pm 30\ \text{mV}|$ indicates strong electrostatic repulsion between vesicles, which helps prevent aggregation and phase separation over time.[14]

Packaging Specifications and Shelf-Life

The bulk powder is packaged in food-grade, dual-layer low-density polyethylene (LDPE) bags sealed within robust fiber drums to provide high protection against moisture and light.[15]

- **Storage Conditions:** Store in a cool, dry place, away from direct sunlight, high heat, and moisture.[1] Keep containers tightly closed when not in use.[27]
- **Nitrogen Flushing:** Flushing containers with nitrogen is highly recommended during packaging and after opening to displace oxygen, helping to prevent phospholipid oxidation and preserve flavor.[34]
- **Shelf Life:** When stored under these recommended conditions, the ingredient has a confirmed shelf life of **24 months** ($2\ \text{years}$) from the date of manufacture.[1]

Regulatory Compliance and Certifications

LiposoMore® Liposomal L-Leucine Powder is produced in a certified manufacturing facility, adhering to strict international standards for safety, traceability, and quality control [1]:

- **BSE/TSE Compliance:** The product is derived entirely from non-animal sources.[37] It contains no materials of animal, bovine, or human origin, eliminating any risk associated with Transmissible Spongiform Encephalopathy (TSE) or Bovine Spongiform Encephalopathy (BSE).[18]
- **Dietary and Allergen Status:** Naturally allergen-free, non-genetically modified (Non-GMO), gluten-free, and 100% vegan, making it suitable for a wide range of dietary preferences and lifestyle requirements.[17]
- **Global Quality Certifications:** Produced in compliance with Current Good Manufacturing Practice (cGMP), Hazard Analysis Critical Control Point (HACCP), ISO 9001, Kosher, and Halal standards.[2]

Technical Support and Supplier Contact

For additional technical documentation, safety data sheets (SDS), application assistance, or purchasing inquiries, please contact the global headquarters of Joyful Nutritional Supply Co., Ltd. [1]:

- **Address:** No. 2045 Songbai Road, Baoan District, Shenzhen, China [1]
- **Website:** www.liposomore.com [1]
- **Global Sales Email:** Sales@liposomore.com [1]