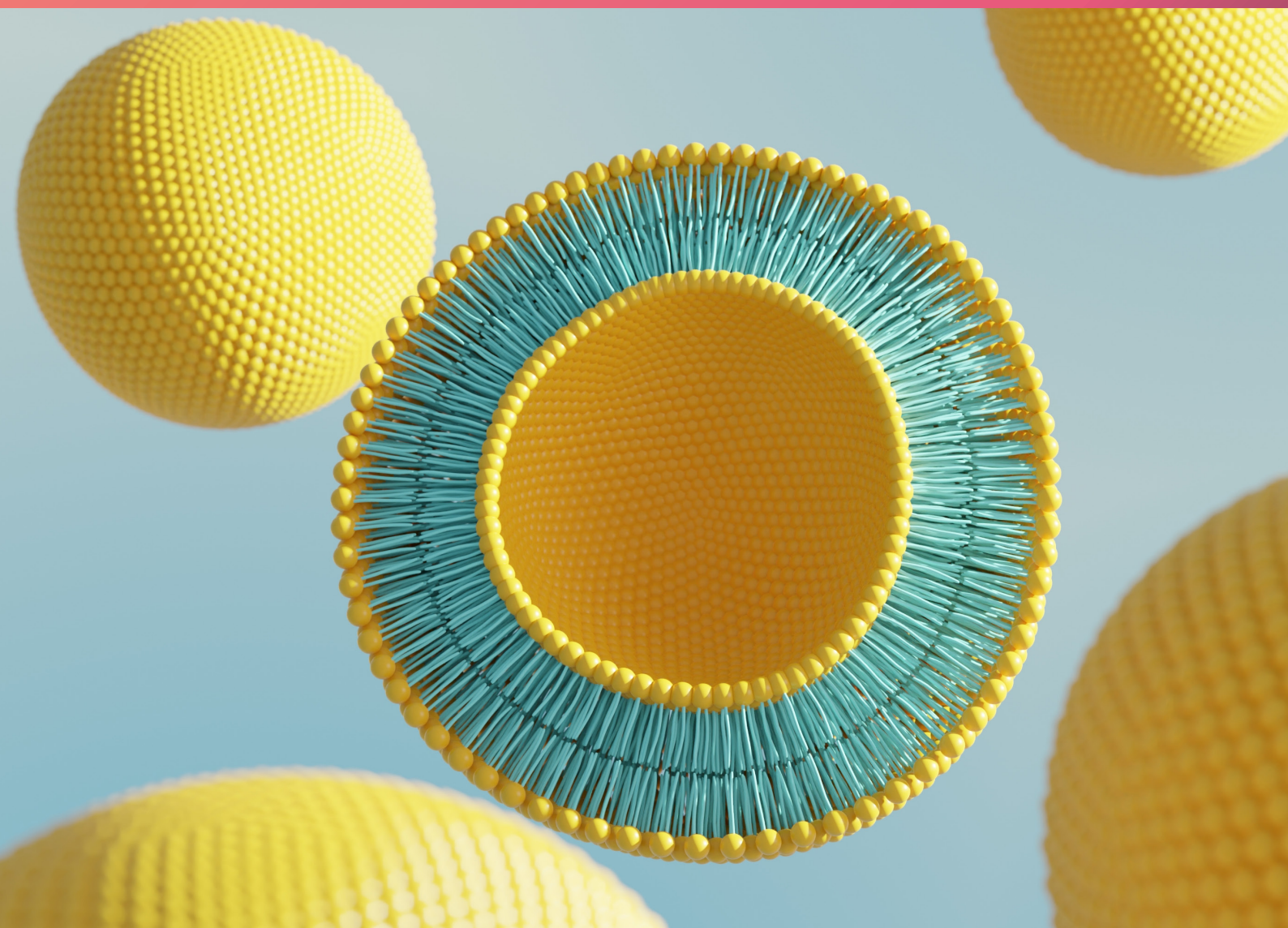




LipoQuest™

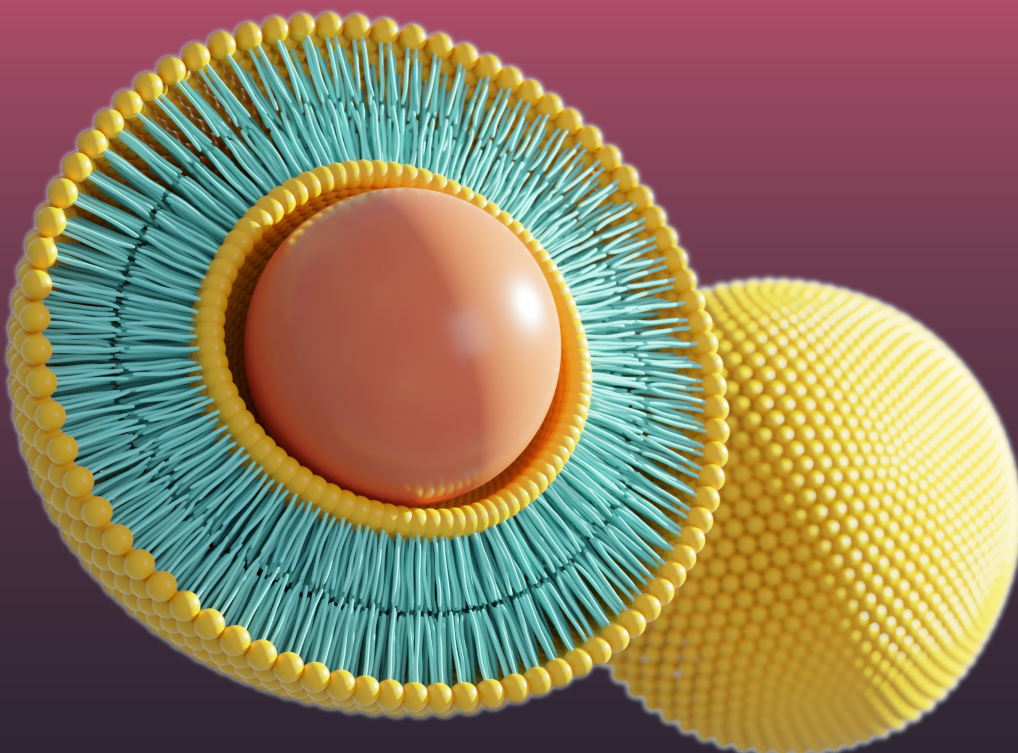


Technical Documents and
Related Research

-White Paper

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Introduction

Vesta Ingredients LipoQuest™ is a proprietary liposome delivery technology. Liposomal supplements are a revolutionary way to deliver nutrients and compounds directly to the cells in your body. These small, spherical shapes are composed of a phospholipid bilayer that encloses your nutrient or active ingredient of interest. The unique lipid structure allows the liposomes to be an effective carrier of vital nutrients, enhancing the bioavailability of supplements and allowing nutrients to pass through the digestive system to be easily absorbed.

Using liposomal technology in your products can provide several benefits. Here are just a few:

1. **Enhanced absorption:** Liposomes are able to efficiently deliver nutrients directly to cells and are absorbed more effectively than traditional supplements, leading to higher levels of nutrient absorption and increased effectiveness. This means that your products will have a stronger impact on the health and wellness of your customers.
2. **Increased bioavailability:** Liposomal supplements have a much higher bioavailability than traditional supplements, meaning that a smaller dose can have a stronger impact. This can allow you to offer more potent products with fewer ingredients, which may be more attractive to customers looking for simple and effective solutions.
3. **Improved stability:** Liposomes can protect sensitive nutrients and compounds from degradation, making them more stable and effective. This can help to extend the shelf life of your products and improve their overall reliability.
4. **Broad range of nutrient delivery:** Liposomal supplements can contain either fat-soluble or water-soluble nutrients and are available in various forms. The lipid carrier allows enhanced intracellular delivery of nutrient payloads, giving you more flexibility in the types of products you can offer.

Overall, liposomal supplements are an innovative and effective way to improve your products geared toward health and wellness. Whether you are looking to support a specific technical concern with your nutraceuticals or improve the efficacy of your ingredients, this cutting-edge technology offers a natural and reliable solution.

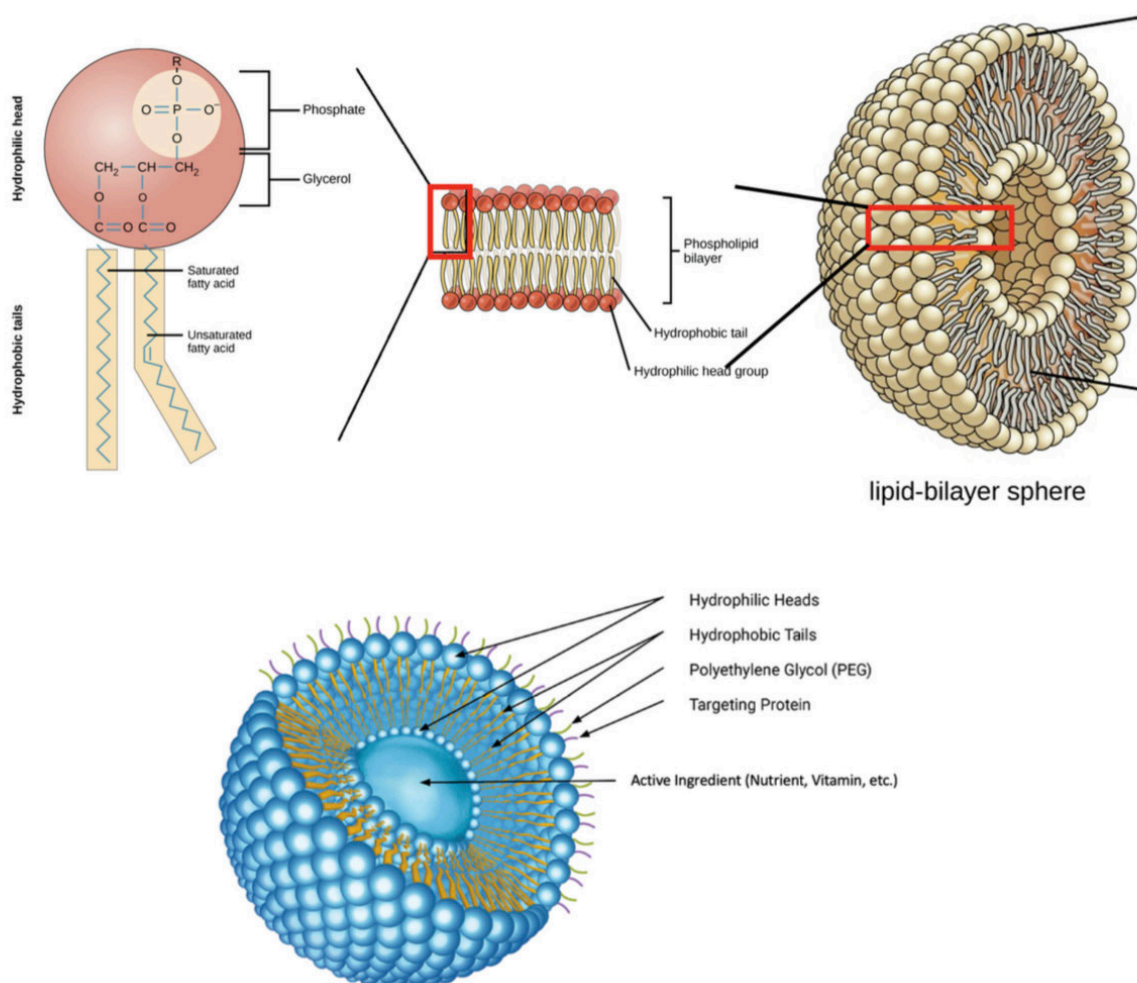
Scientific Background

Lipids are a diverse group of biomolecules that include fats, oils, waxes, and related substances. They are an important component of cell membranes and serve a variety of functions in the body, including energy storage, insulation, and mediates absorption of nutrients.

Liposome Composition:

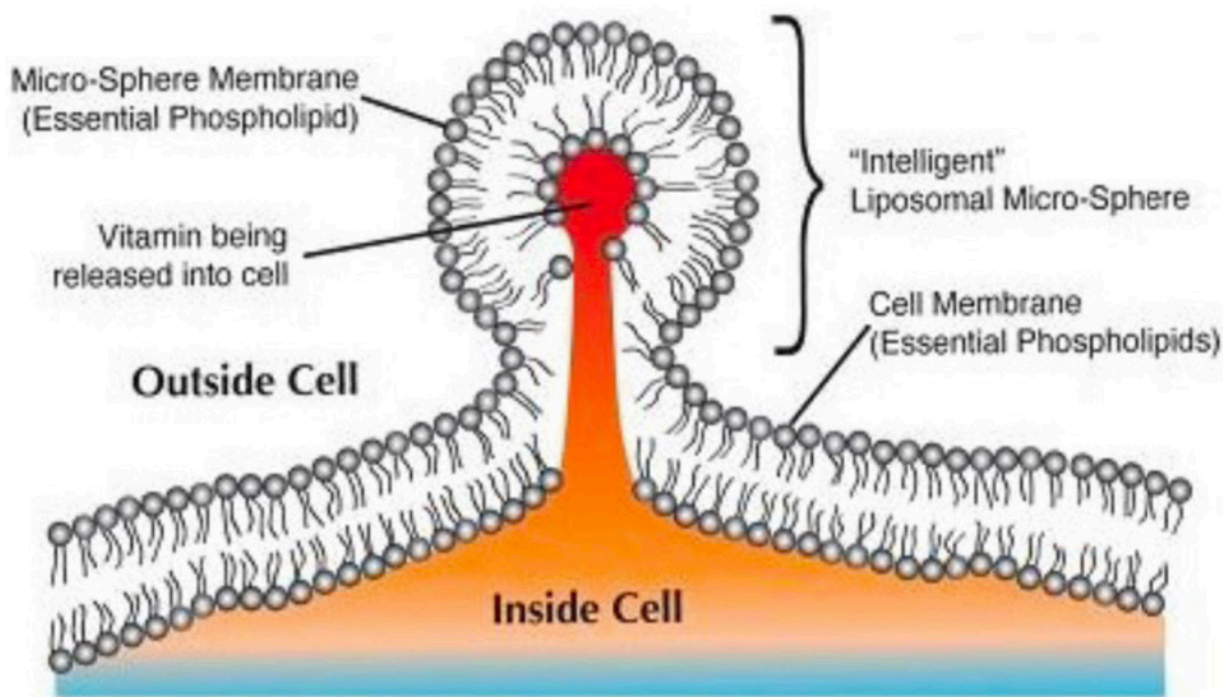
Lipids are composed of fatty acids (water insoluble) and glycerol (water soluble), and when lipids are dissolved in water, they can

spontaneously organize into bi-lipid layers, which are thin sheets composed of two layers of phospholipid molecules. These bi-lipid layers can spontaneously fold and form closed structures called liposomes, which are spherical vesicles with a phospholipid bilayer enclosing a hollow interior where your nutrients of interest are ensconced. Liposomes can be used to deliver nutrients and other substances to the body, and they are a key component of liposomal supplements.



The bilayer of the sphere is made up of phospholipids, which are essential components of cell membranes. This allows the liposomes to be easily absorbed by the body, as they are similar in structure to the cell membranes and can pass through them. Liposomes are taken up by the cells of the body by fusing with the cell membrane and emptying the nutritional content within the lumen of the liposome into the cell.

Taken together, the unique structure allows the liposomes to be an effective carrier of vital nutrients, enhancing the bioavailability of supplements and allowing nutrients to pass through the digestive system to be easily absorbed. Liposome technology is a powerful tool for nutraceutical product developers looking to create high-quality, effective, and reliable products that support the health and wellness of their customers.



Research on Bioavailability and Benefits

History, Usage, and Safety

Liposome technology was first discovered in the 60's and has since been diligently studied as well as improved to deliver nutrients directly to the cells in the body for maximal efficacy.^{1,2} They have been widely used in a variety of products for decades and have a long history of safe use. Accordingly, there have been extensive safety studies on liposomes through the years.³⁻⁵ Liposomes are considered safe and have virtually no known side effects. They are an effective and efficient way to deliver nutrients and other substances to the body and have the added benefit of being easy to take and well-tolerated by most individuals.

Enhancing Bioavailability, Absorption and Efficacy

Liposomal technology is a specialized and extensively researched method of delivering nutrients to the body in a way that increases their absorption and effectiveness.⁶ These microscopic, hollow spheres have a unique structure that allows them to carry both water-based and oil-based molecules and easily cross cell membranes to deliver ingredients to specific cells in the body.^{7,8} A further benefit of lipid-based formulations can enhance the oral bioavailability of highly potent, poorly water-soluble molecules.⁹ The absorption of liposomes is enhanced by the fact that they are able to efficiently deliver nutrients directly into the cells, bypassing the barriers of the digestive system and other organs to enhance their bioavailability.¹⁰ This allows the nutrients to be absorbed and utilized more effectively than traditional supplements, resulting in higher levels of nutrient absorption and increased effectiveness.¹¹

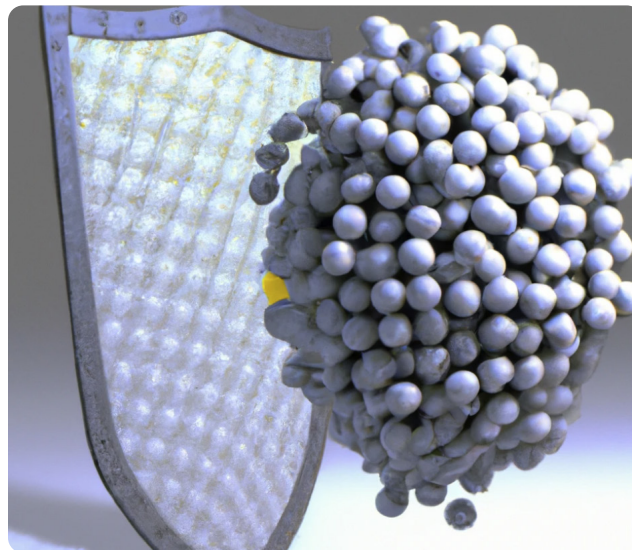


Improving Stability - Biomolecular Shields

Liposomes act as shields that can encapsulate nutrient payload molecules in their aqueous core and hydrophobic molecules in their bilayers. They can also be modulated and designed for targeting specific cell sites or avoiding them, resulting in long circulation, increased biodistribution, and favorable pharmacodynamics. For example, liposomes also protect certain nutrients, such as Vitamin C, from degrading in the stomach and improve their stability in order to increase their absorption through the gut wall and into the bloodstream.^{12,13} Liposomes can also provide better stabilization of the nutrient they embed by protecting it from oxidants that may degrade the active ingredient within the body.¹⁴ The combination of liposomal technology and lipid metabolites creates a proprietary formula that has a unique mechanism of action in the body.

Summary of the Technical Benefits of Liposomes:

- **Increased Bioavailability:** Liposomal supplements have substantially better bioavailability than conventional supplements, allowing for a bigger effect with a lesser amount.
- **Boost Efficacy:** Increased effectiveness and higher levels of nutritional absorption are the results of liposomes' superior ability to transport nutrients directly to cells and their superior absorption compared to conventional supplements.
- **Protective Effects:** Prevent the deterioration of delicate nutrients and chemicals, increasing their effectiveness and stability. By doing so, you may be able to increase the items' general reliability and shelf life.



- **Safe and Proven:** Liposomes are generally considered safe when used as directed and have been widely used in a variety of products for several decades.
- **Versatile Usage:** Variety of formulations and applications, including liquids, sprays, and capsules, and can contain either fat-soluble or water-soluble nutrients.

Vesta's proprietary LipoQuest™ technology is exclusive and uniquely developed and optimized for efficacy and maximizing bioavailability. Our liposome technology is uniquely developed to produce the best quality liposomes for maximum absorption and effectiveness. We are dedicated to providing our customers with the highest quality products and delivering superior results that they can trust.

Overall, incorporating liposomal technology into your nutraceutical products can provide numerous benefits, including enhanced absorption, increased bioavailability, improved stability, and a broad range of nutrient delivery options. This can help to differentiate your products in the marketplace and provide your customers with high-quality, effective solutions for their health and wellness needs.

Features of LipoQuest™

Sourcing:

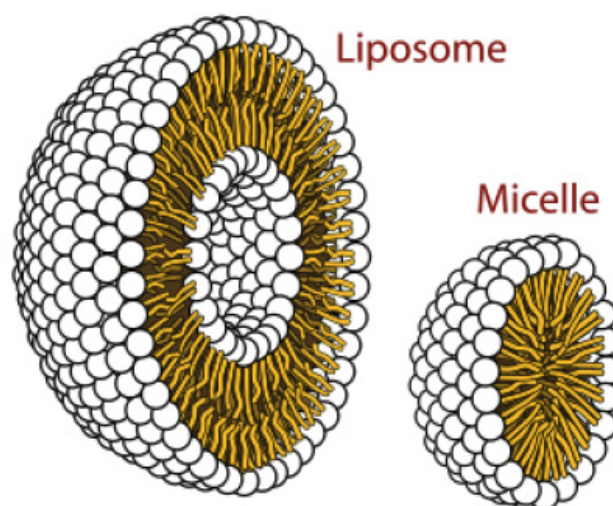
The source and manufacturing of liposomes is extremely important for several reasons. One reason is that the source can impact the safety of the liposomes. For example, some sources of lipids, such as soy, can cause allergen issues for certain individuals. Using non-allergenic sources of lipids, such as sunflower oil, can help to make the liposomes more suitable for a wider range of users. LipoQuest™ is also 100% soy-free, making them safe for those with dietary sensitivities. Many other liposomal products on the market are derived from soy and can cause allergen issues, but our non-hydrogenated phospholipids provide a safe and allergen-free alternative. Furthermore, some liposomes can be derived from both synthetic and natural sources. Often synthetic forms can contain impurities or modifications of lipids that may have undesirable effects. We here at Vesta strongly believe in the philosophy of all-natural products, and our LipoQuest™ is derived from all-natural, non-GMO sunflower oil. Thus our liposomes serve as a safe and reliable option for nutraceutical delivery for broad consumer base, including vegetarians.

Background on Structural Integrity and Quality:

The source of lipids can also impact the quality and effectiveness of the liposomes. Some sources may be more suitable for producing high-quality liposomes with a high level of structural integrity and bioavailability, while others may not be as effective. Using high-quality sources of lipids can help to ensure that the liposomes are able to deliver nutrients and other substances effectively and efficiently. More specifically, liposomes by definition are formed by a bilipid layer and its by creating this internal cavity that allows it to provide all the active ingredient delivery benefits that we discussed previously. Unfortunately, during improper extraction and purification methods



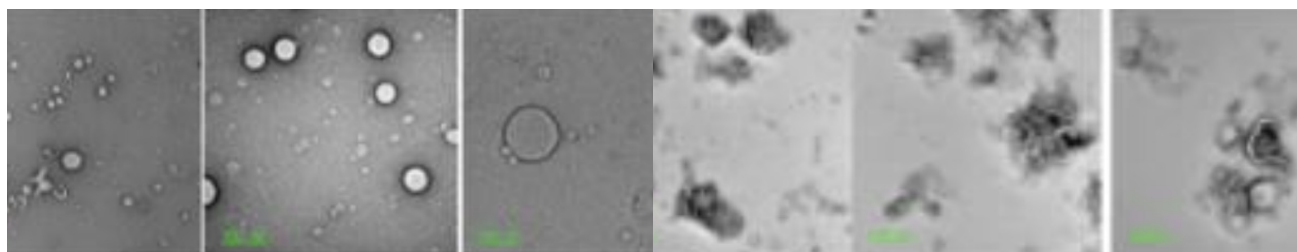
can result in the formation of unproductive micelles or unstructured lipid globules. These lipids, although they may contain similar biomolecular content of lipids, they are not effective nutrient carriers because they are unable to house the active molecules.



Proprietary Liposome Technology and State-of-the-art Quality Testing:

Our cutting-edge manufacturing process is carefully designed to produce the highest quality liposomes, with a focus on maintaining their structural integrity and effectiveness over time. Again, this is important, as the quality of the liposomes determine the efficacy of the final product. We are diligent in our quality assurance efforts and are committed to producing the highest quality liposomes.

To ensure that our liposomes maintain their structural integrity and effectiveness over time, we run extensive testing to validate their performance. This includes using advanced techniques such as transmission electron microscopy, which allows us to visualize the liposomes at a microscopic level and confirm their size, shape, and overall quality. We take pride in our commitment to quality and are confident in the performance of our liposomes. By running thorough testing and using advanced techniques like transmission electron microscopy, we are able to ensure that our products meet the highest standards and deliver superior results that our customers can trust.



In summary, the source of liposomes matters because it can impact the safety, quality, and effectiveness of the liposomes. Using high-quality, non-allergenic sources of lipids can help to ensure that the liposomes are safe, reliable, and effective for supporting the health and wellness of the user. LipoQuest™ have a high level of quality/uniformity and are made from all-natural, allergen-free ingredients,

making them safe and suitable for a wide range of users. They are also designed to be highly stable and bioavailable, ensuring that they are absorbed efficiently and effectively by the body. We are confident that our liposomes are the best choice for anyone looking for a high-quality and reliable way to support their health and wellness.

Our LipoQuest™ Liposome Products

Liposomes are versatile carriers that can be used to deliver a wide variety of molecules, including nutrients, drugs, and other bioactive compounds. The type of molecule that can be delivered using liposomes is dependent on the nature of the molecule itself, as well as the specific type of liposome being used. For example, liposomes can be used to deliver water-soluble molecules, such as vitamins, minerals, and other nutrients, by encapsulating them in the aqueous core of the liposome. Liposomes can also be used to deliver hydrophobic molecules, such as drugs and other bioactive compounds, by dissolving them in the bilayers of the liposome. In addition to these basic types of molecules, liposomes can also be used to deliver

complex or multi-component mixtures, such as proteins, enzymes, and other biological agents. Liposomes can enable the delivery of more challenging molecules and the unique properties of liposomes can help to protect and deliver them effectively over traditional methods.

Accordingly, we offer a wide range of different liposome vitamins and other nutrients that manufacturers can use to enhance your nutraceutical products. Our LipoQuest™ liposomes are carefully formulated using high-quality, all-natural ingredients and are designed to deliver superior results:

LipoVita™ Vitamin Series:



Vitamin C - water-soluble nutrient that plays a vital role in supporting a healthy immune system and promoting collagen production



Vitamin B12 - essential nutrient that plays a vital role in the proper functioning of the brain and nervous system, the formation of red blood cells, and metabolism



Vitamin D3 - fat-soluble nutrient that is essential for maintaining healthy bones, supporting a healthy immune system, and regulating calcium/phosphorus levels



Additional Vitamin custom formulations available upon request

LipoQuest™ Nutritional Product series:



Hyaluronic acid - for maintaining youthful skin, eye hydration, and joint health



CoQ10 - natural antioxidant that can help to support cardiovascular health, improve energy levels, and protect cells from oxidative stress

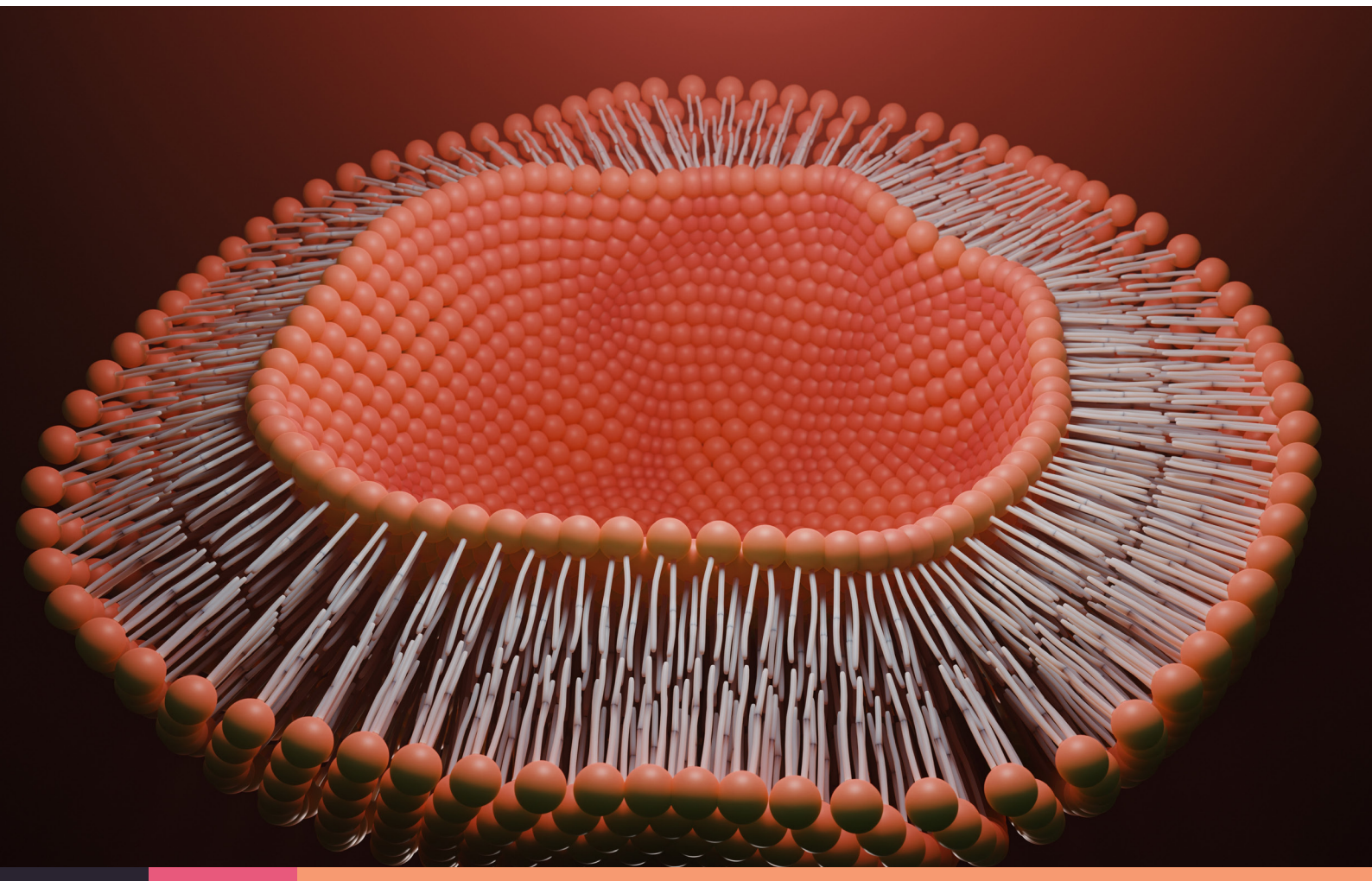


Glutathione - support a healthy immune system, protect cells from oxidative stress, and improve overall health and wellness



Pearl Tomato

A proprietary tomato extract powder, uniquely rich in multi-functional colorless carotenoids, sourced from specially selected non-GMO tomato fruit. Brightening & lightening Skin, Firming, and moisturizing. This ingredient can be used in the food and beauty industry.



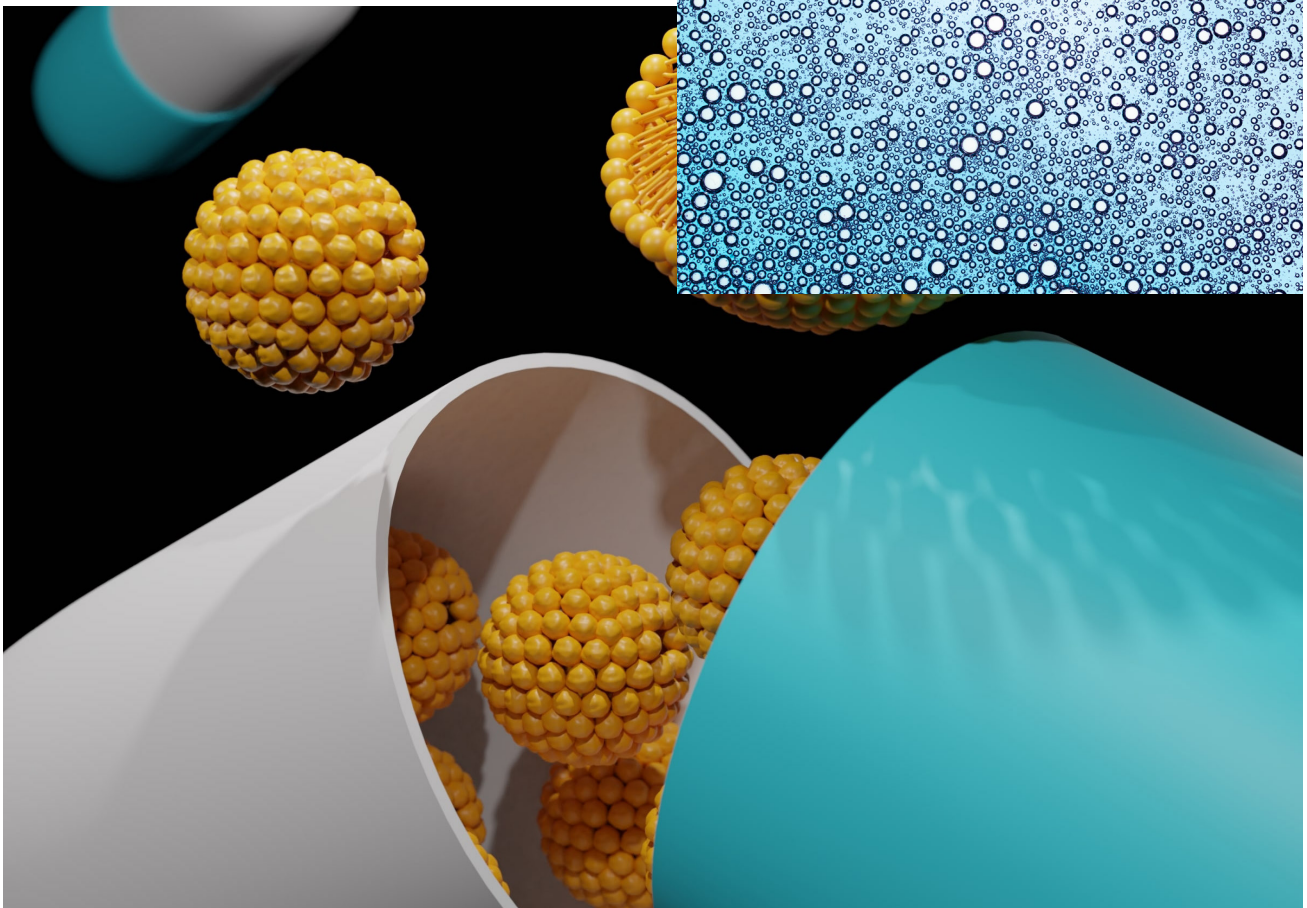
LipoQuest™ Summary

In summary, liposomes are tiny, spherical structures made of phospholipids that can effectively deliver ingredients to the desired cells in the body. They have a unique structure that allows them to easily cross cell membranes and protect ingredients from degradation in the stomach, leading to improved absorption and bioavailability.

Vesta LipoQuest™ can improve stability of sensitive nutrients, offering a broad range of delivery options and the ability to hold both hydrophilic and hydrophobic compounds. Our groundbreaking liposomal technology offers the highest quality liposomes that maximizes active ingredient efficacy, allowing for lower doses to be taken for the same effect.

Furthermore, Vesta LipoQuest™ are made

using all-natural, non-GMO ingredients, making them a safe and natural choice for consumers. In addition, they are allergen-free, meaning they do not contain any common allergens such as soy, nuts, or gluten. This makes them suitable for people with dietary sensitivities or allergies. Our liposomes are also vegetarian-friendly, as they are made using non-hydrogenated phospholipids derived from GMO-free sunflower oil. Utilize LipoQuest™ to enhance the delivery and effectiveness of your products.



About Us:

A leader in the nutraceutical industry since 1996, Vesta Ingredients is a manufacturer and distributor of superior quality ingredients. We are known for providing high quality ingredients at competitive prices. We also strive to provide impeccable customer service and superior quality ingredients. By offering a broad range of cutting-edge raw nutraceutical materials, our customers are enabled to develop innovative products. Vesta is built on the philosophy that the quality of our ingredients is our highest priority.



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INNOVATIVE PRODUCTS AT COMPETITIVE PRICE

SPECIALTY INGREDIENTS CONTRACT MANUFACTURING PRIVATE LABEL

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