



Innovations in Ingredient Delivery Systems



SPECNOVA[®]

With more than 25 years in the natural products industry and a Master's of Science in Medicinal Chemistry, Sebastian Balcombe leads the development of nutraceutical ingredients, advanced delivery systems, and groundbreaking research focused on enhancing nutrient bioavailability and stability.



Sebastian Balcombe MS
Medicinal Chemist

CEO & Founder
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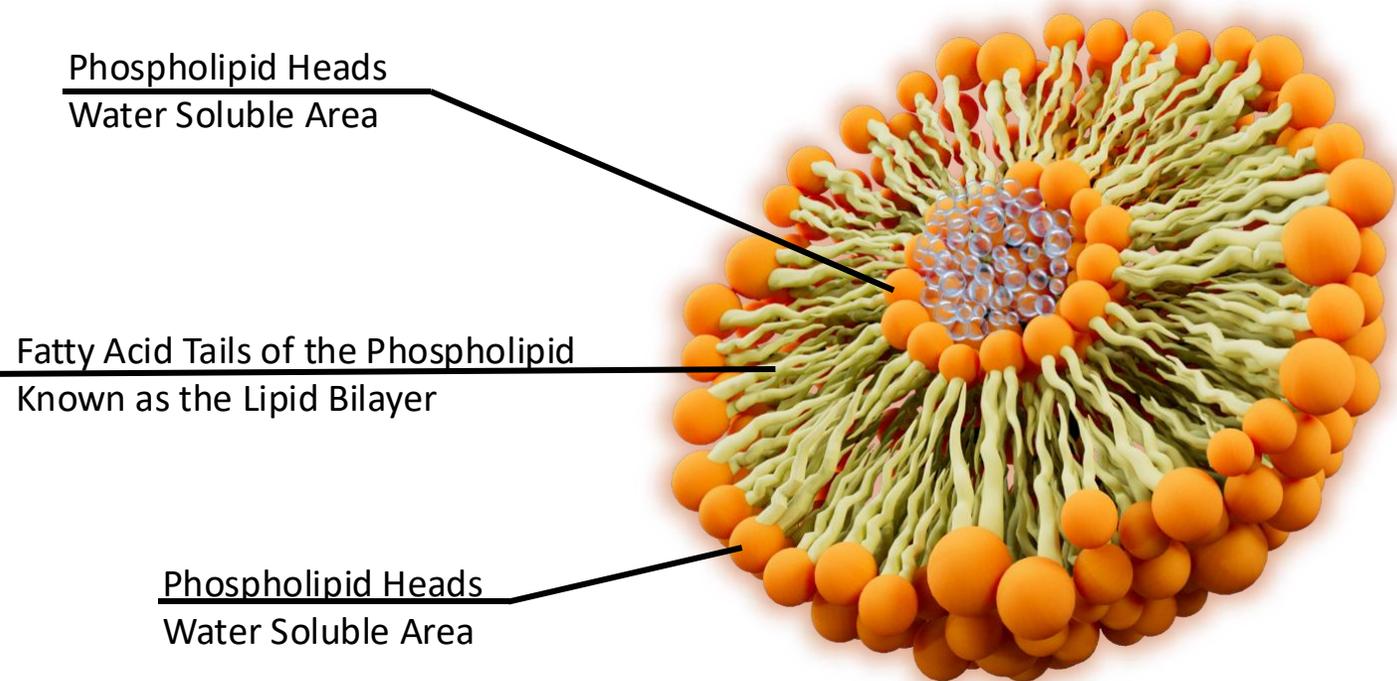
Layered Liposomal Beadlet Technology

Higher Bioavailability | Enhanced Stability
Improved Efficacy

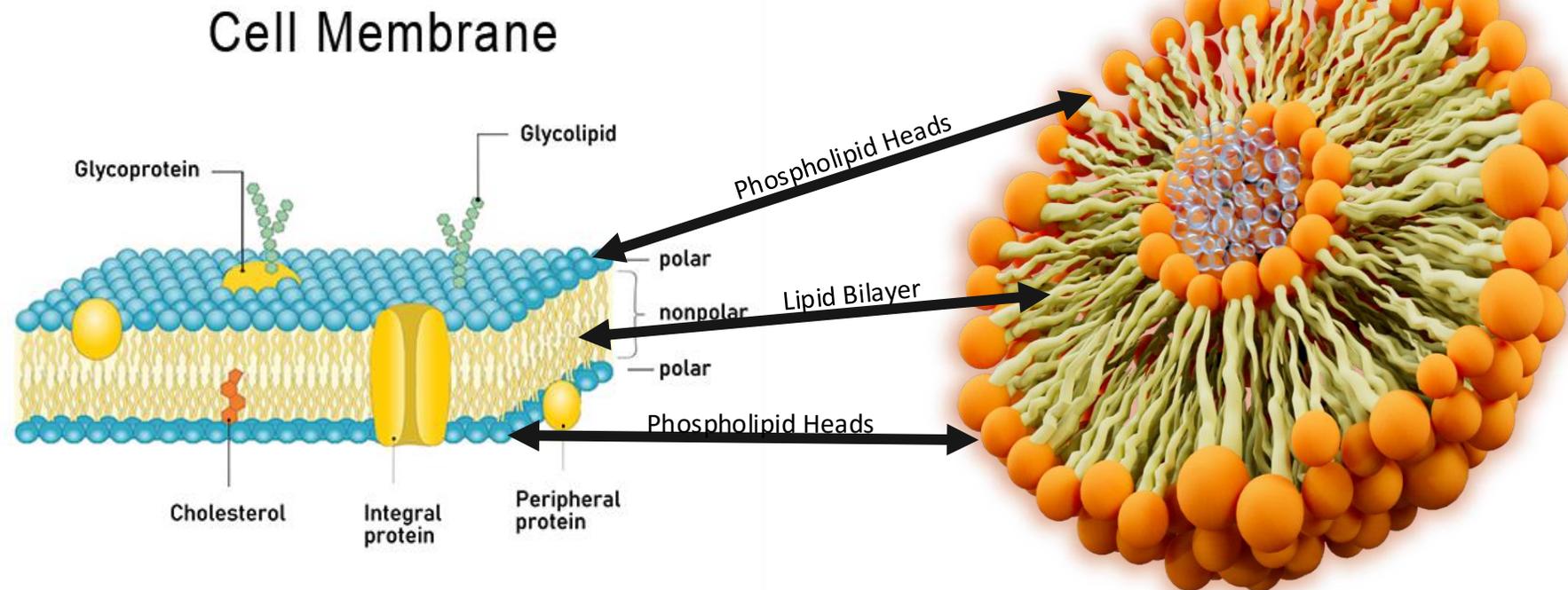


Liposomes - Mimicking Our Cell Membranes

- Liposomes are sphere-shaped structures made up of one or more lipid bilayers (typically phospholipids). Our own cell membranes are made of lipid bilayers and are largely composed of the same phospholipids that make up liposomes. Phospholipids are amphiphilic (both fat and water soluble).



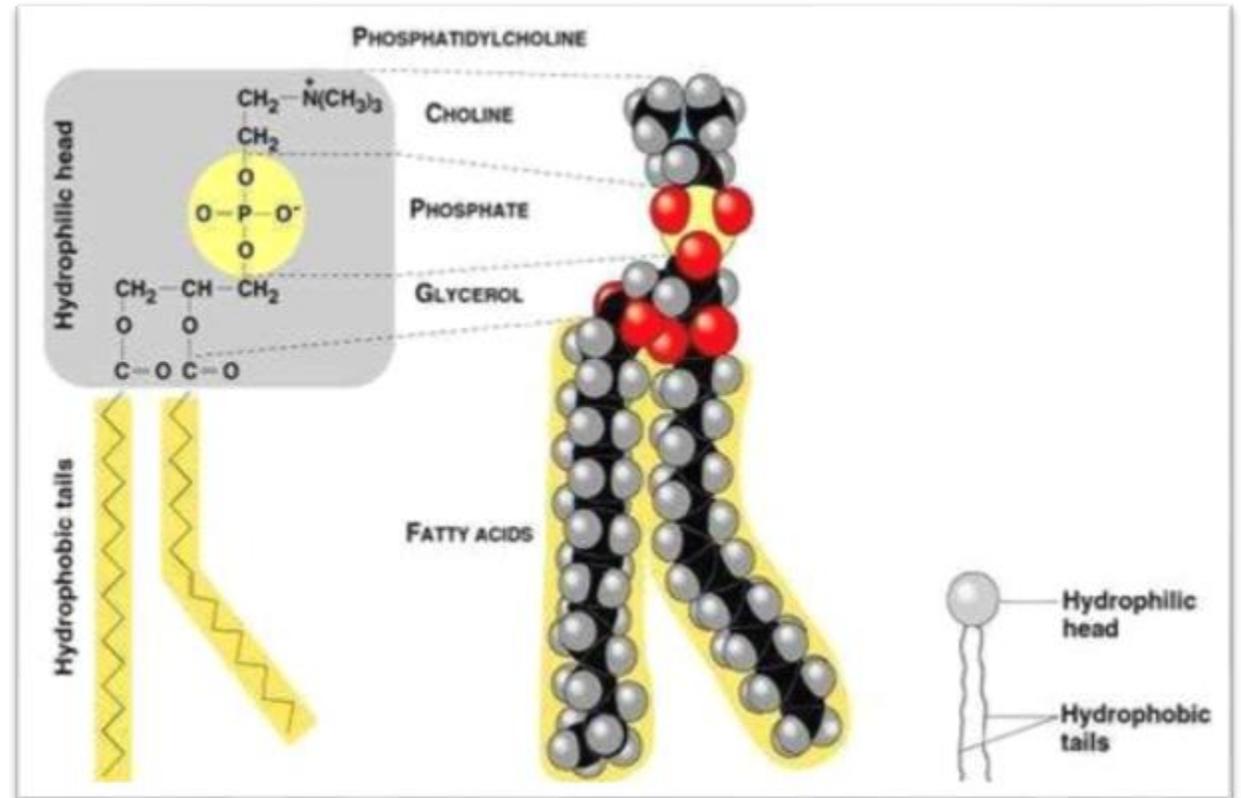
Our Body's Cell Membrane Compared to a Liposome



****Take Note of the Phospholipid Bilayer in Both****

What Makes a Liposome - An Inside Look

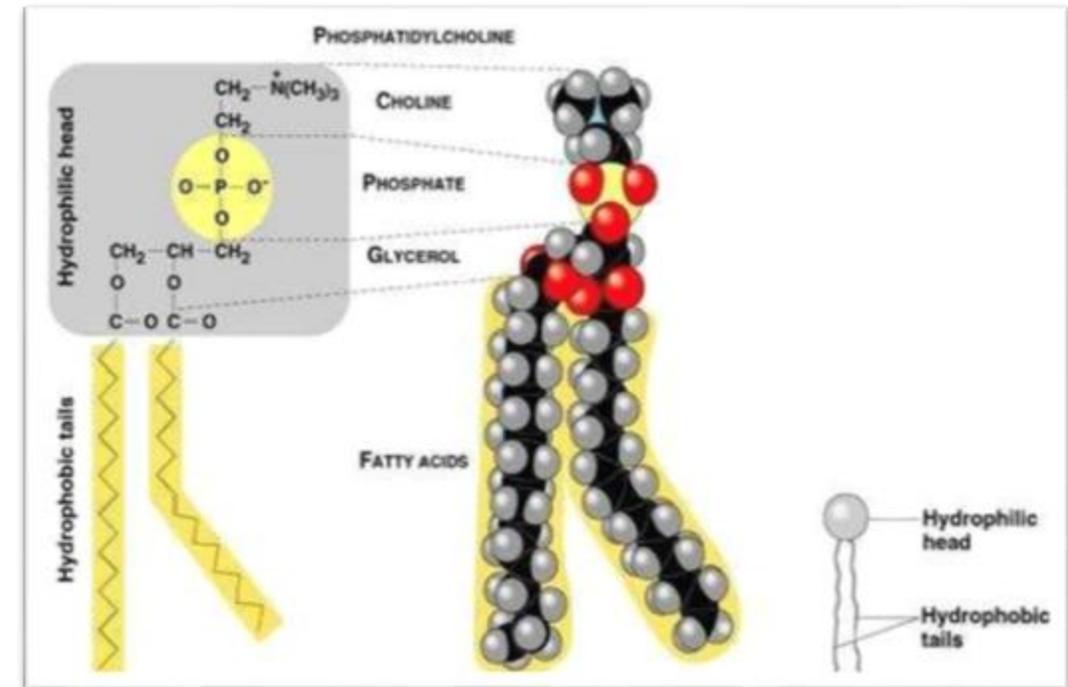
- Specnova phospholipids are derived from Non-GMO Sunflower Lecithin (with a high concentration of phospholipids)
- Main types of Phospholipids used in Specnova liposomes
 - Phosphatidylcholine(PC)
 - Phosphatidylinositol(PI)
 - Phosphatidylethanolamine (PE)
 - Phosphatidic Acid (PA)
 - Phosphatidylserine (PS)



Phospholipids - A Closer Look

Phospholipids all have the same basic structure and composition, with the major differences being varied head groups and varied fatty acid tails.

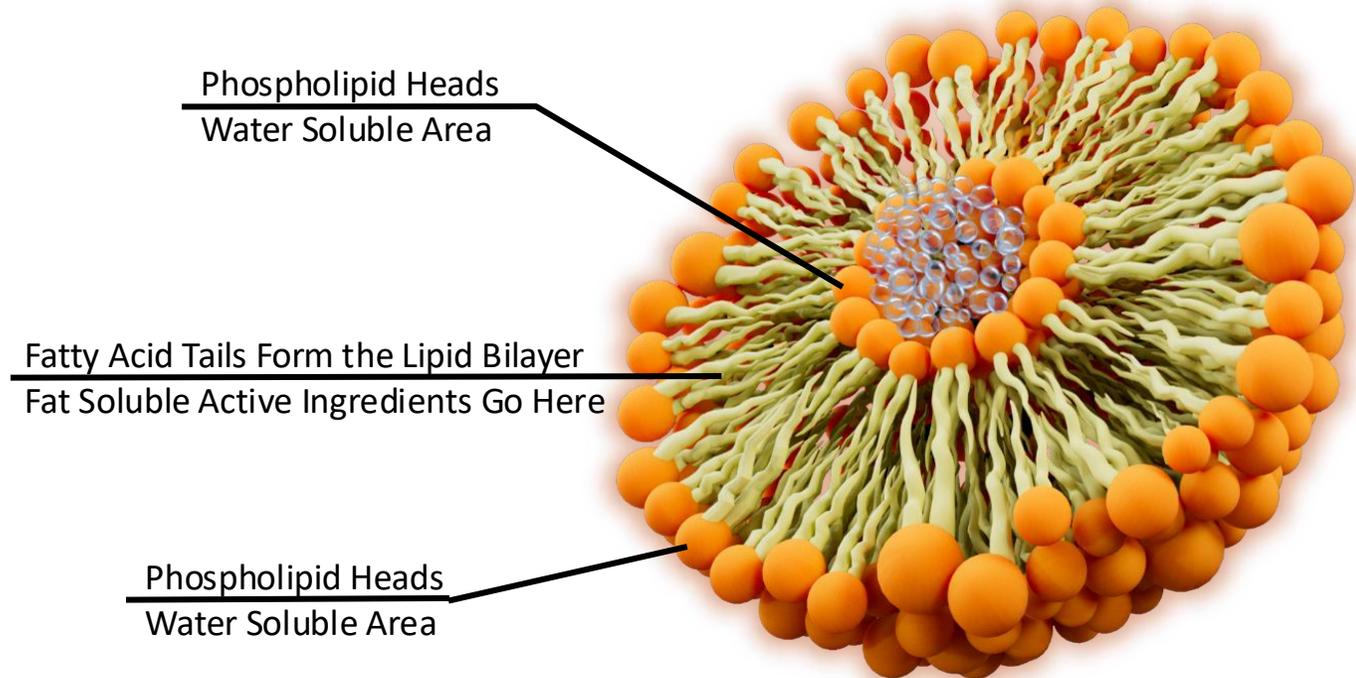
- Head (water-loving) section is comprised of:
 - A phosphate group
 - Glycerol
 - In the case of phosphatidylcholine (PE), choline, which can be replaced by inositol, ethanolamine, serine, or phosphatidic acid
- Tails (fat-loving) section is comprised of:
 - Two fatty acid chains/tails that are linked to the glycerol in the head section
 - The fatty acids, vary in length (typically between 14-24 carbons)
 - One fatty acid is typically unsaturated fat, and the other is typically a saturated fat. It is the unsaturated tail with its cis double bond that gives it the small kink in its shape.



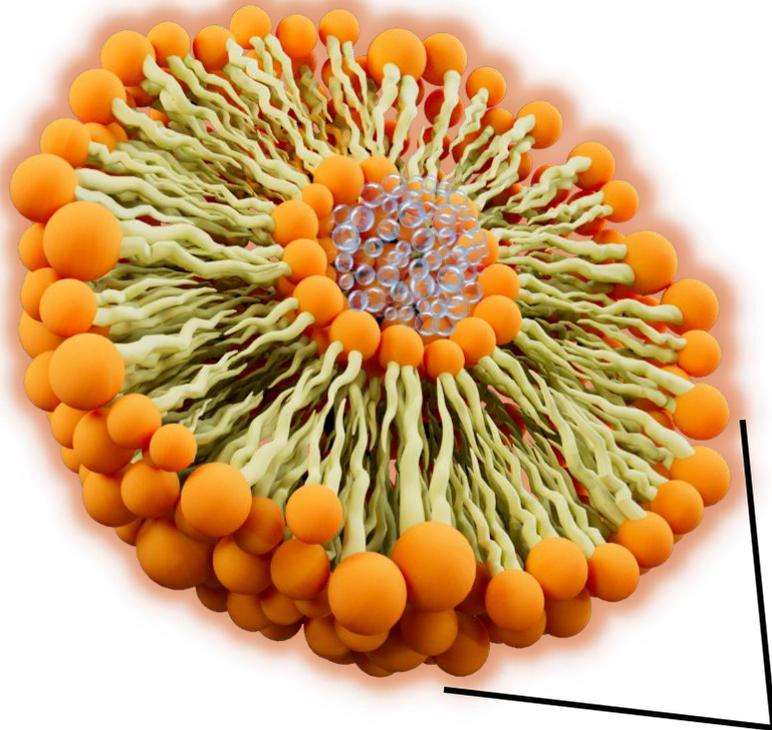
Why do Phospholipids Form Liposomes

Two Key Reasons

- The shape (cylindrical) and amphiphilic qualities of phospholipids, when added to water, cause them to organize themselves in an energetically favorable, closed and sealed, spherical bilayer which forms a liposome.
- Think of the lipid tail portions as protecting themselves by facing inward and away from the water, making the interior of a liposome. While the water-loving heads are attracted and face the water both in the core of the liposome and the outside of the liposome interacting with the water environment of the GI tract.



More Than Just Phospholipids



- Liposomes can have major stability issues as they go through the harsh environment of the GI Tract.
- A large number of liposomes can be torn apart, disrupted, damaged, or leak out the active ingredient.
- A simple phospholipid formulation is not enough!

DualHydrogel[®] Technology acts as a shield, increasing stability by protecting against the harsh environment of the GI tract.

Polysaccharide & Peptide Matrix for Improved Stability in the GI Tract

A unique combination of polysaccharides and at times plant peptides is the foundation of the protective matrix. This technology was developed to improve the stability of liposomes in THREE key areas:

- Adds a surface coating using a polysaccharide and plant peptide matrix
- Creates structural stability in the lipid bilayer
- Polysaccharides are formulated within the core of the liposomes

Benefits of the protective matrix (DualHydrogel® Technology)

- Prevents liposomal leakage
- Protects the liposome
- Increases stability in the body
- Improves the bioavailability of active components
- Allows liposome to be a free-flowing powder which increases manufacturing performance
- Increases shelf life



SPECNOVA®

Key Liposome Features

True liposomes should meet four requirements in order to provide maximum effectiveness.

1. They must be spherical in shape
2. The size of the liposome should be between 100-200 nm to be optimally absorbed by the small intestines
3. The liposomes should have strong encapsulation - known as encapsulation efficiency - which tells us how much of the active ingredient is inside the liposome
4. Liposomes must be well dispersed and free of leakage

TEM
Glutathione

Importance of Liposomal Validation

Specnova is the only company to verify its liposomes through six different analytical technologies

- Most liposomes on the market are not true liposomes
- Consumers are not getting the benefits of liposomal ingredients
- Every batch of liposomes should go through six different validation tests
- Validation ensures that liposomes will work as expected - increasing bioavailability and performance
- Validation fosters retailer and consumer confidence

There are six different cutting-edge technologies used to verify the defining characteristics of a true liposome.



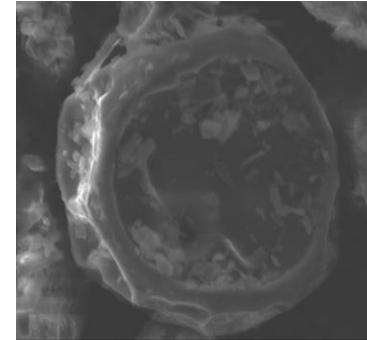
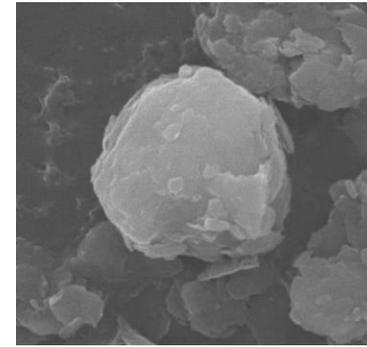
A mark of excellence
and a symbol of trust
for your liposomal
products.



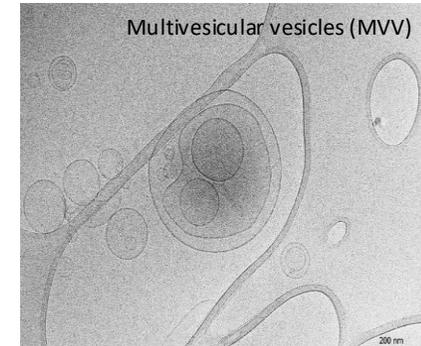
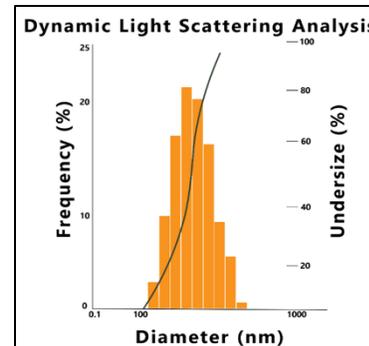
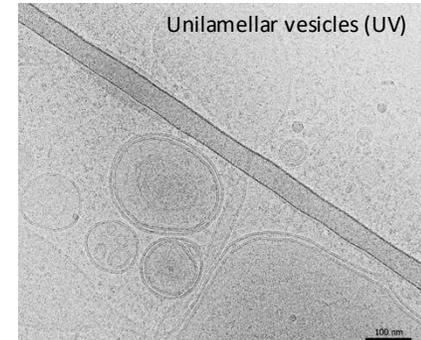
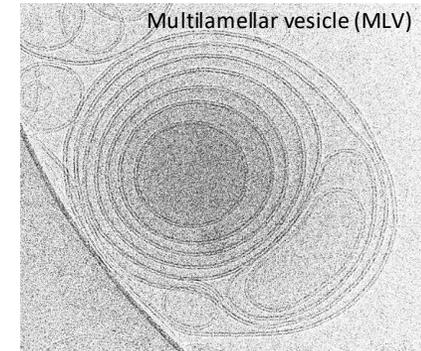
Liposomal Validation Methods

- Cryogenic Transmission electron microscope (CryoTEM) – Backbone of liposomal testing, shows the inside of the liposome
- Scanning electron microscopes (SEM) – Shows the outside of the liposome
- Dynamic light scattering (DLS) – Measures average size of the liposome
- Zeta potential – Measures encapsulation efficiency
- Powder X-ray diffraction (XRD) – Checks for crystallization and components of formulation
- Optical Microscope – Used to check dispersion of formulation

SEM Images

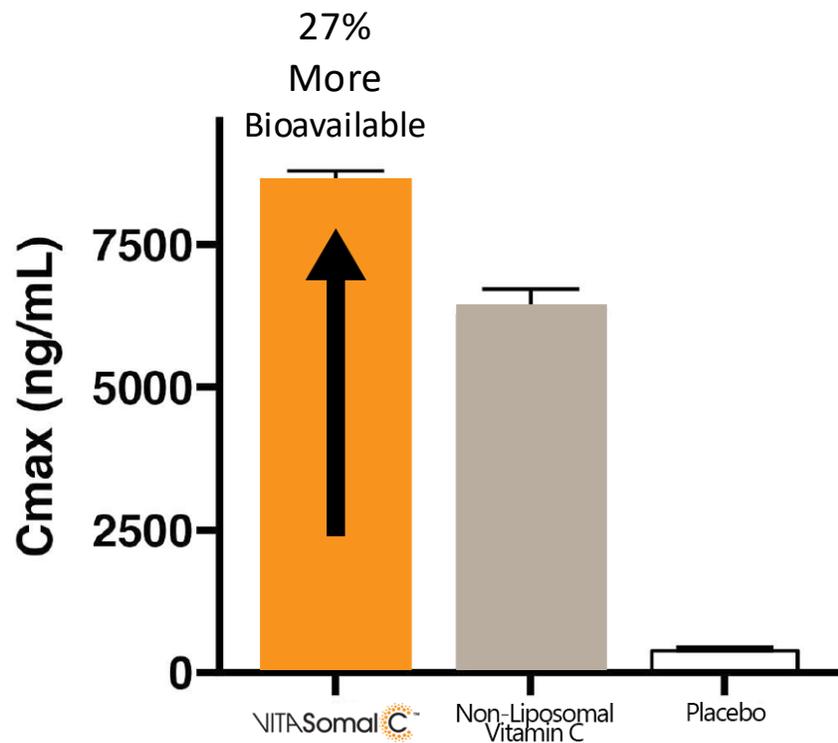


CryoTEM Images



Published Clinical Research - VitaSomal[®] C

A peer-reviewed, published, randomized, double-blind, placebo-controlled study was conducted on 27 healthy adult males and females to examine the bioavailability of VitaSomal C[®] (as ascorbic acid) vs non-liposomal vitamin C (as ascorbic acid).



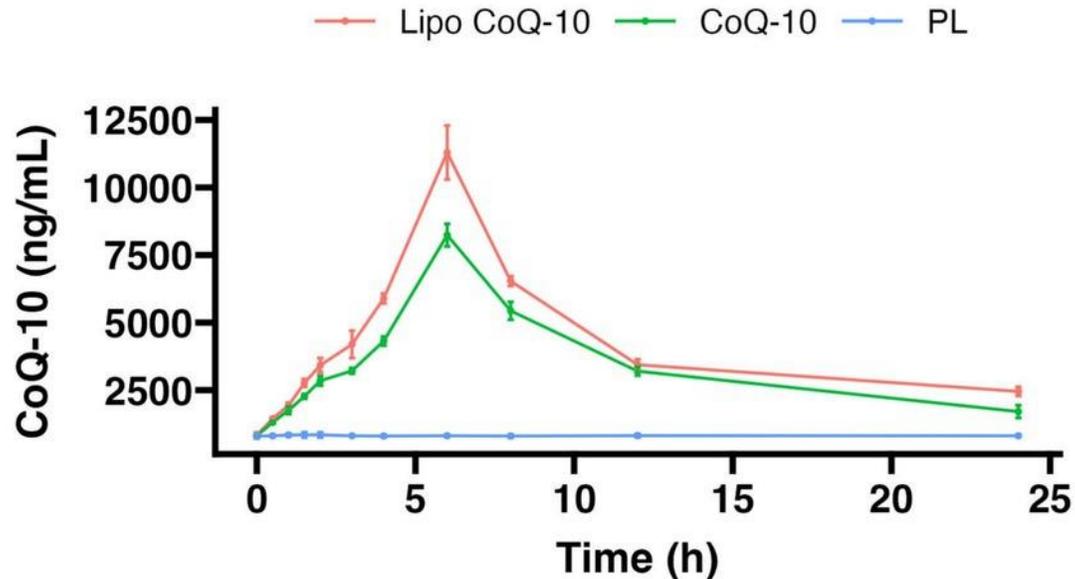
Results:

- VitaSomal C[®] was 27% MORE bioavailable when compared to non-liposomal vitamin C over 24 hours
- 20% more VitaSomal C[®] was found in the white blood cells (leukocytes) as compared to non-liposomal vitamin C over 24 hours, showing the increased bioavailability of liposomal vitamin C



Published Clinical Research - CoQ10

In a peer-reviewed, randomized, double-blind, placebo-controlled, crossover study, 18 men and women ingested a single dose of placebo, 100 mg of non-liposomal CoQ10, or 100 mg of LipoVantage® Liposomal CoQ10.



Effects of liposomal delivery on coenzyme Q-10 absorption.

Results:

- LipoVantage® Liposomal CoQ10 had significantly higher Cmax (+31.3%, $p < 0.001$) values as compared to non-liposomal CoQ10.
- LipoVantage® Liposomal CoQ10 had significantly higher AUC0-24 (+22.6%, $p < 0.001$) values as compared to non-liposomal CoQ10.

Liposomes and Delivery Formats

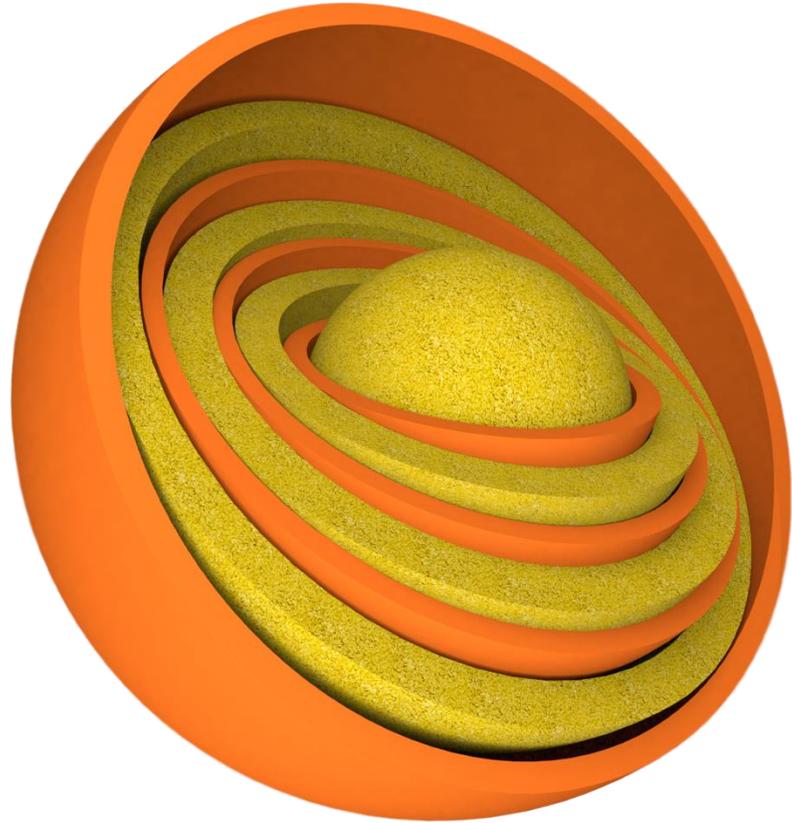
Liposomes can be used in many different delivery formats to meet the needs of the consumer

- Capsules
- Tablets
- Gummies & Chews
- Sachets
- Drink Mixes
- Powder Mixes

Important!

- Not every ingredient should be made liposomal
- Not all liposomal ingredients will work in every format!





Layered Liposomal Beadlet Technology

Disruptive | Precise | Controlled-Release
Beadlet Technology

Nova  **Spheres**[®]


SPECNOVA[®]

Overcoming Ingredient Weaknesses

Beadlets

- Precision-controlled release
- Enhanced stability
- Small, consistent release of the ingredient into the blood over 10-12 hours rather than a large single dose
- Controlled-release profile slows down the absorption of the ingredient into the blood
- More of the ingredient can reach the target tissues
- Less is excreted in urine



Layered Beadlet Technology

How are they made?

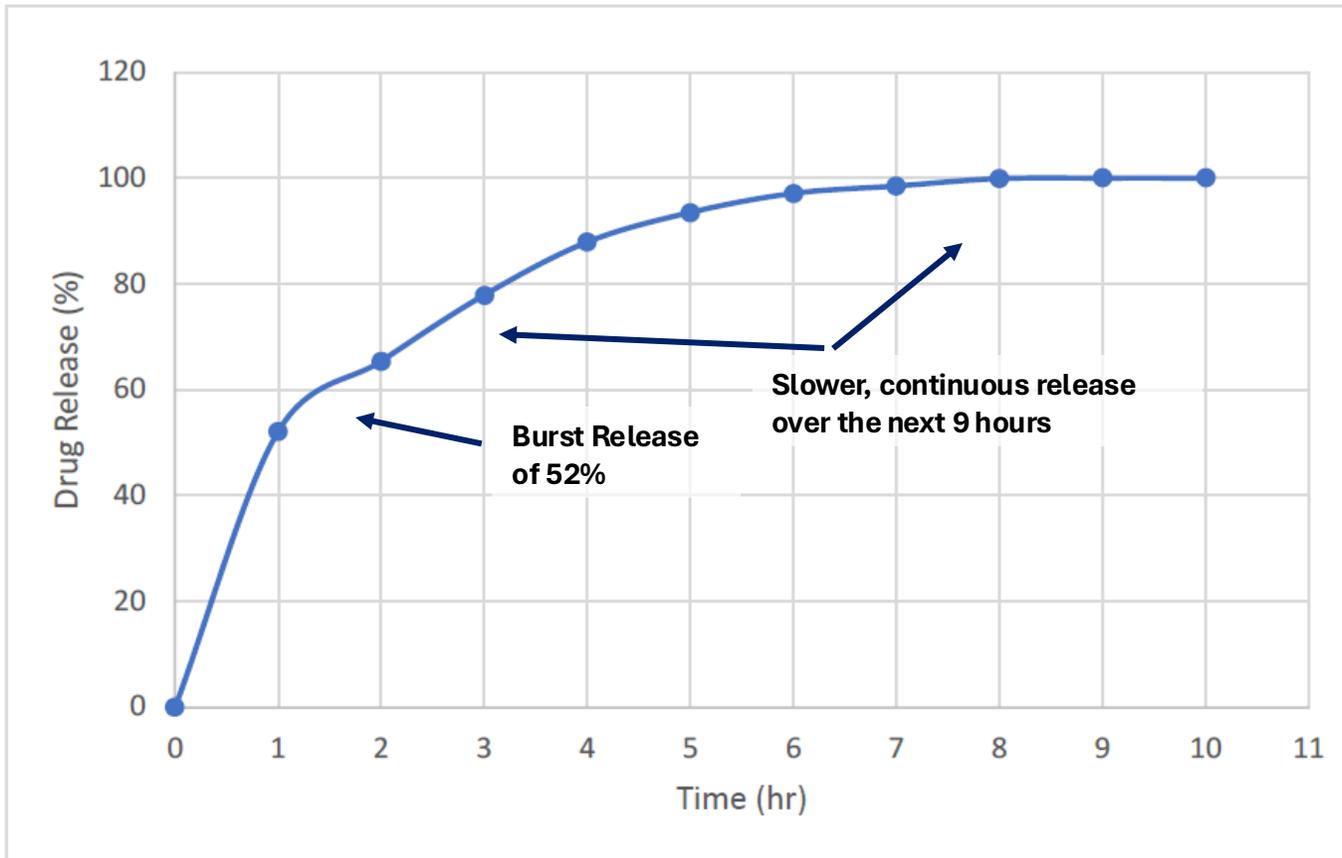
- Consists of at least 4 layers of the key active wrapped in a sphere-shaped membrane
- These layered membranes are made of various polymers and cyclodextrins such as MCC, HPMC
- 100% non-GMO excipients
- **NO ARTIFICIAL COLORS** – natural colors e.g. turmeric, beet, beta-carotene, paprika, blue-green algae

Beadlets Deliver:

- Total control of release profiles of the active
- Enhanced stability
- Easy to swallow capsules
- Cool factor



Beadlet Release Study: Creatine Monohydrate



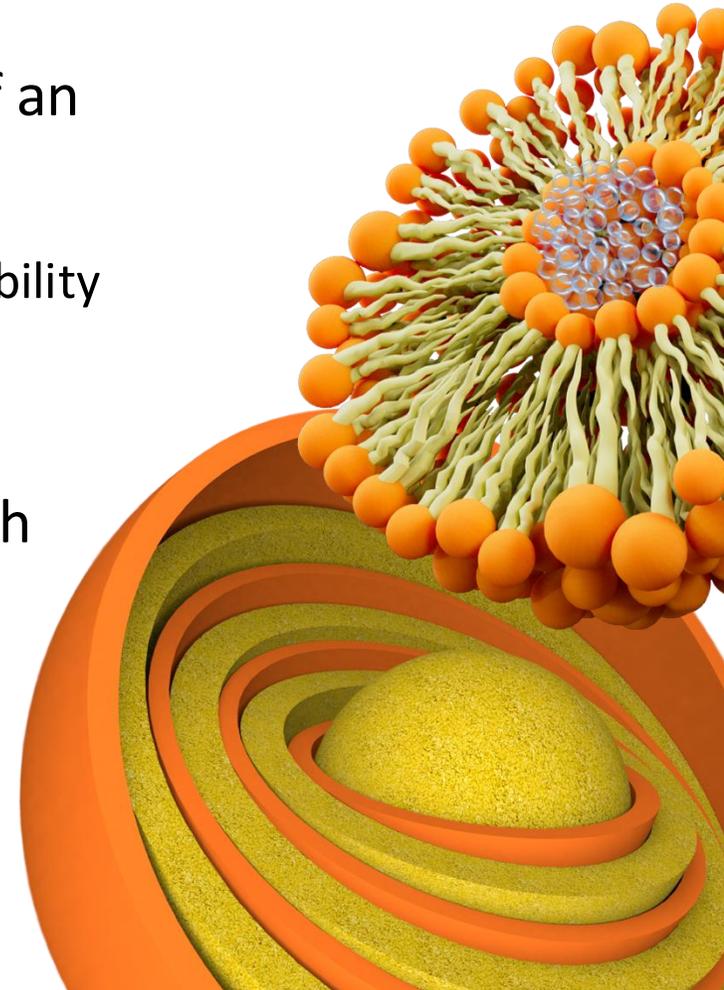
Continuous Release of Creatine Creates:

- Higher cellular creatine concentrations
- A higher total ceiling of cellular creatine levels
- Reduced low and moderate responders to creatine supplementation

Beadlet Technology + Liposomes

Combining TWO technologies for increased effectiveness!

- Liposomes increase the bioavailability and performance of an ingredient
 - They do this by offering increased permeability, solubility and stability in the body
- Using beadlet technology PLUS liposomes combines the bioavailability and performance benefits of a liposome with the precision-controlled release of a beadlet.





Thank You

Sebastian Balcombe



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