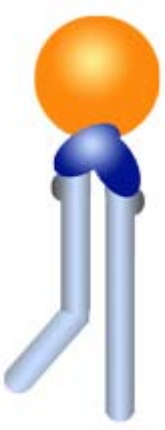
So what are liposomes, exactly?



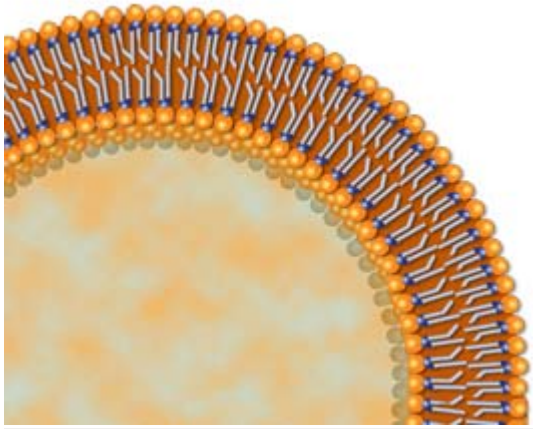
Representation of a phospholipid molecule showing phosphate head (orange), the glycerol sholders (blue) and the fatty acid tails (silver)

Liposomes are bilayer (double-layer), liquid-filled bubbles made from phospholipids. Over 50 years ago, researchers discovered that these spheres could be filled with therapeutic agents and used to protect and deliver these agents into the body and even into specific cells of the body.

The bilayer structure of liposomes is nearly identical to the bilayer construction of the cell membranes that surround each of the cells in the human body. This occurs because of the unique composition of phospholipids. The phosphate (source of "phospho" in phospholipid) head of phospholipids is hydrophilic — it loves water — whereas the fatty-acid tails (lipids) are hydrophobic — they hate water.

Liposome containing vitamin C. Currently liposome-encapsulation is the best oral way to deliver vitamin C known to man.

When phospholipids find themselves in a water-based solution, the hydrophobic tails quickly move to distance themselves from the liquid just like oil separates from vinegar. So, as all the tails turn inward and all the heads turn toward the liquid, they form a double-layered membrane with all the tails pointing toward one another and the heads facing the outside or the inside of the sphere that they have formed.

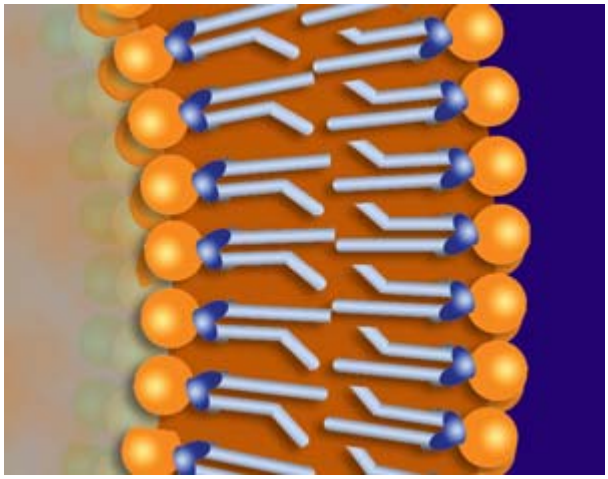


This diagram of a liposome cutaway shows how the tails of phospholipids turn inward to form a bilayer membrane, and in so doing encapsulate a therapeutic agent.

Although research has not clearly shown how the therapeutic agents in a liposome are actually released, there are a couple of theories. One theory suggests that the phospholipids are processed in the liver as fats and that this process releases the vitamin C. Another theory proposes that cells all over the body, hungry for phospholipid materials to repair cell membranes and other cellular structures, "steal" these materials from the liposome allowing their contents to leak out.

Quite possibly both processes occur. In any case, the therapeutic value and greatly increased delivery of liposome-encapsulated drugs and nutrients has been scientifically confirmed countless times. At present, liposomes are the most effective oral way to deliver nutrients.

Essential phospholipids: what are they?

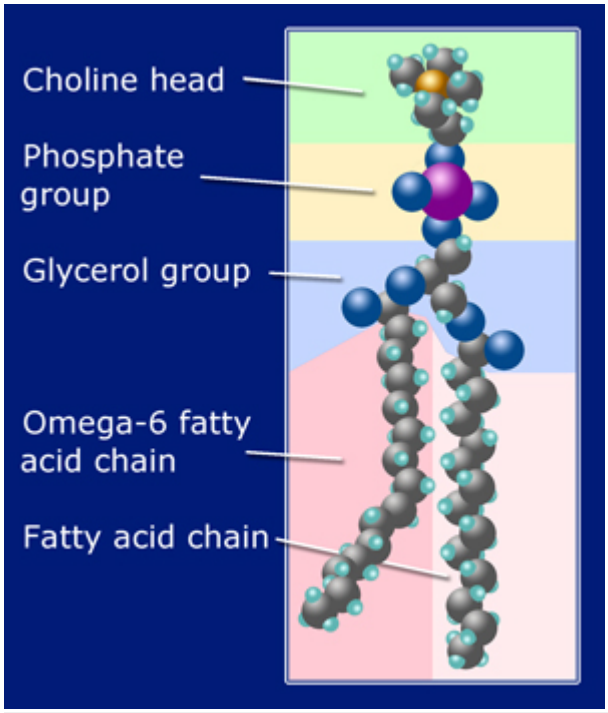


Phosholipids align themselves in a tail-to-tail formation with their heads facing outward which creates a double layer membrane. This bilayer structure is used by cells throughout the body for outer membranes as well as for structures inside each cell.

Phospholipids are the primary building blocks of cellular membranes. These membranes are the "containers" that hold the living matter within each cell. They also give definition, shape, and protection to many of the substructures (organelles within the cell like the nucleus and mitochondria) within our cells.

In addition to functioning as a skin for each cell — keeping the insides in and the outsides out — phospholipid membranes provide protection from chemicals and pathogens that can derail and/or destroy the necessary life functions that take place within each cell. While performing this function, phospholipid membranes are subject to constant attack from free radicals (oxidants), pathogens, and toxins.

In order to repair the structural damage caused by the continual barrage of toxic substances and pathogens, your body requires a constant supply of phospholipids. The body can synthesize some phospholipid compounds but others must be supplied by the diet. Phospholipids that can only be obtained through dietary intake are called "essential phospholipids."



Anatomy of a phosphatidylcholine molecule. All phospholipids have a phosphate group and fatty acid chains connected by a glycerol group. Phosphatidylcholine, a class of essential phospholipids, has two distinguishing characteristics: 1) a choline head and 2) one of the fatty acid chains is an omega-6 fatty acid. (KEY — Gray: carbon atoms; Teal: hydrogen atoms; Blue: oxygen atoms; Violet: phosphorus atom; Gold: nitrogen atom.)

At the basic level, phospholipids are a phosphate group (phospho) attached to fatty acids (lipids) by means of a glycerol group.

Unlike phosphates, which are attracted to water (hydrophilic), fatty acids are repelled by water (hydrophobic). It is this very love/hate relationship with water that allows phospholipids to form cellular membranes — and liposomes as well.

As phospholipids are exposed to water-based solutions, they automatically align themselves in a double-layer (bilayer) configuration — phosphates toward the water and fatty acids away from the water.

One of the most important and prominent phospholipids in cell membranes is called phosphatidylcholine (PC) *[pronounced FOSS-fah-tide-al-KOH-lean]*. At birth up to 90% of cellular membranes are made up of PC. As humans age, the percentage of PC in their cellular membranes can decrease to about 10%. This fact leads many to recommend consistent supplementation with this essential phospholipid.

Intact PC — as well as its essential fatty acid and choline components — is required for many vital functions in the cardiovascular, reproductive, immune, and nervous systems. PC and its components are needed for the synthesis of important messenger molecules called prostaglandins which, among other functions, regulate the contraction and relaxation of muscles. Choline is required for the synthesis of intracellular messenger molecules including the neurotransmitters that allow nerve cells to communicate with muscles and each other, and are essential for proper heart and brain function.

The liposomes used for Lypo-Spheric™ Vitamin C, AGE Blocker™, and Lypo-Spheric™ GSH are made from essential phospholipids including a rich blend of phosphatidylcholine. These liposomes not only provide optimum protection and superior transport for these supplements, they also help satisfy the body's need for PC, omega-6 fatty acids, and choline.