

# An Introduction to Nanosomes™

from

## Elsom Research Innovative Biotechnologies



**Nanosomes™** are the key technology implemented in **Nanosomin™**, **Equisomin™**, and other **Elsom Research** cosmeceuticals. In this document, we provide an illustrated basic explanation of the structure and function of **Nanosomes™**, using **Nanosomin™** to illustrate the concepts discussed.

This document is only an introduction; much more information is available on our website:

- Information about purchasing **Nanosomin™** is available at <http://www.elsomresearch.com/shopping/products/antiaging-001.htm>.
- Information about **Nanosomes™** as an option in custom formulation or private label manufacturing projects is available at <http://www.elsomresearch.com/businesses/nanotechnology.htm>.

To learn more about these ideas, you are invited to contact us:

- by email at [innovation@elsomresearch.com](mailto:innovation@elsomresearch.com).
- by telephone at **210.493.5225**.



## **INTRODUCTION:** **About Nanosomin™ Serum**

**Nanosomin™ Serum**, from **Elsom Research Co., Inc.**, is a novel and complex topical skin treatment based on anti-aging research. It is the only product of its kind. With double emulsion technology at the core of its operating mechanism, the **Nanosomin™ Serum** is comprised of interactive **Nanosomes™** carrying and delivering anabolic factors, vitamins, anti-oxidants, and moisturizers to the skin.

### **What is Nanosomin™ Serum?**

- Why is it so potent?**
- Why is it so different?**
- Why is it so special?**
- What are Nanosomes™?**

**Nanosomin™ Serum** is based on sound science, designed to provide skin with the best possible support for good health which leads to a good appearance.

To explain how **Nanosomin™ Serum** works, we will have to subject you to a four part scientific crash Course in the biochemistry of your body. Specifically, to understand why **Nanosomin™ Serum** is so important for your skin, you will have to know a little about the properties of some lipids and their connection with liposomes and cell membranes. Our course of study on the biochemistry of **Nanosomin™ Serum**, contained in this document, is arranged as follows:

- Part I            Introduction to Phospholipids, Liposomes, and Cell Membranes**  
(begins on page 3)
- Part II           Liposome Function Depends on Size, or, “Smaller is Better”**  
(begins on page 7)
- Part III          The Process of Cellular Aging**  
(begins on page 9)
- Part IV          The Process of Cellular Rejuvenation**  
(begins on page 11)

## PART I: Introduction to Phospholipids, Liposomes, and Cell Membranes

### What are lipids?

**Lipids** are a group of chemical compounds (such as oils and waxes) which occur in living organisms and are only sparingly soluble in water.

### What are phospholipids?

**Phospholipids** are a special group of lipids containing phosphate. Phospholipids are the building blocks of liposomes and cell membranes. Your skin, like the rest of your body, is composed of cells whose membranes must be healthy and strong in order for it to function properly.

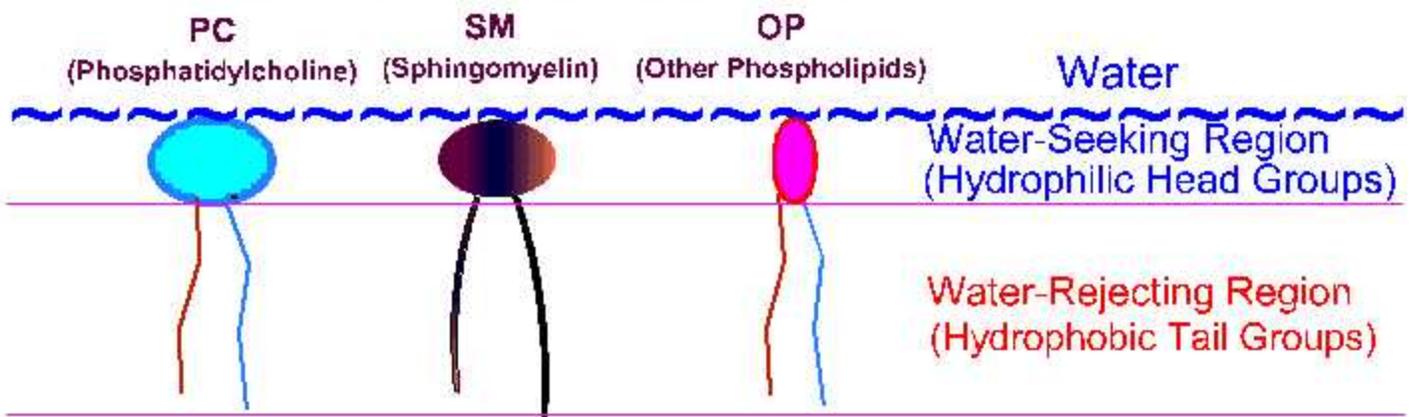
### More details?

1. **Lipids** in general are hydrophobic, also called non-polar (not able to be mixed in water). However, the phosphate group in **phospholipids** is hydrophilic, also called polar (able to be mixed in water).

The following picture illustrates some of the special structural, chemical, and physical characteristics of phospholipids.

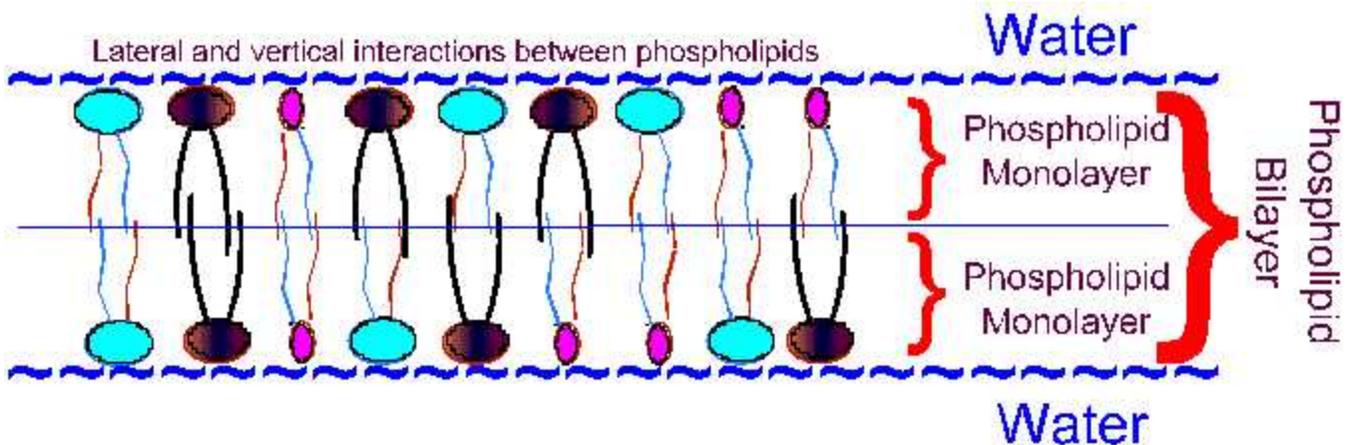
Phospholipids are the building blocks of cell membranes and liposomes.

The major groups of phospholipids are:



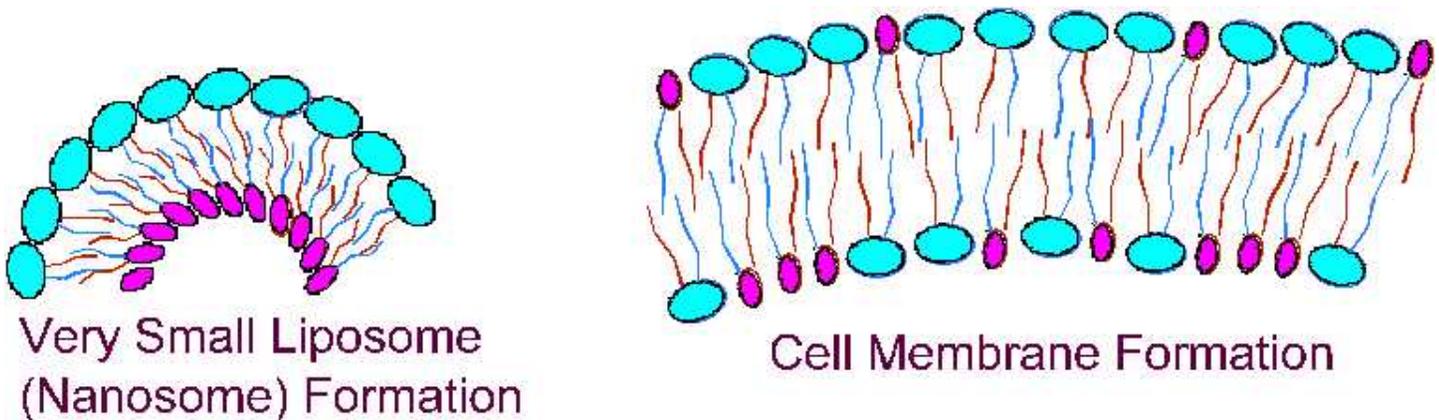
2. When **phospholipids** are immersed in water, they arrange themselves so that their hydrophilic regions point toward the water and their hydrophobic regions point away from the water. This unique simultaneously hydrophilic and hydrophobic structure of **phospholipids** is the key to their ability to organize as a double layer (bilayer formation) when immersed in water. The interaction and rejection forces between **phospholipids** and water cause **phospholipids** to organize themselves as bilayers.

The following picture illustrates the formation of a phospholipid bilayer structure.



3. **Phospholipid bilayers** are the core structure of **liposome** and cell membrane formations.

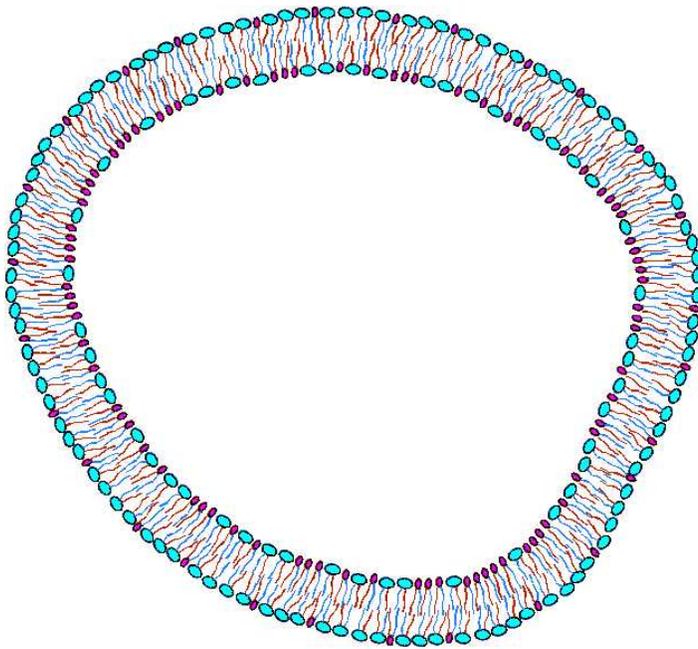
Phospholipid Bilayers forming into a cell membrane or a liposome can be seen in the next pictures.



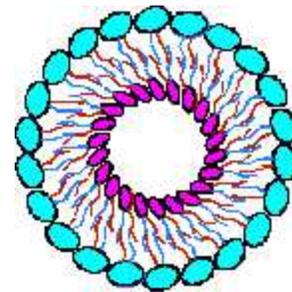
4. The structure of **liposomes** is similar to the structure of cell membranes. We called our very small **liposomes** “**Nanosomes™**”.

A comparison of the two-dimensional structure of a cell membrane and a **liposome** is shown in the following pictures.

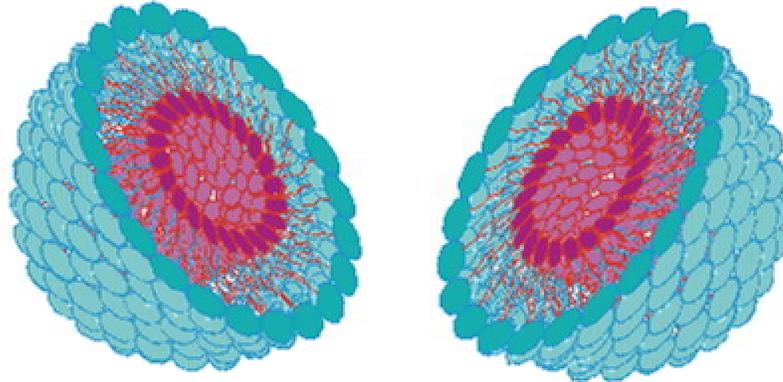
**Cell Membrane**



**Very Small Liposome (Nanosome™)**

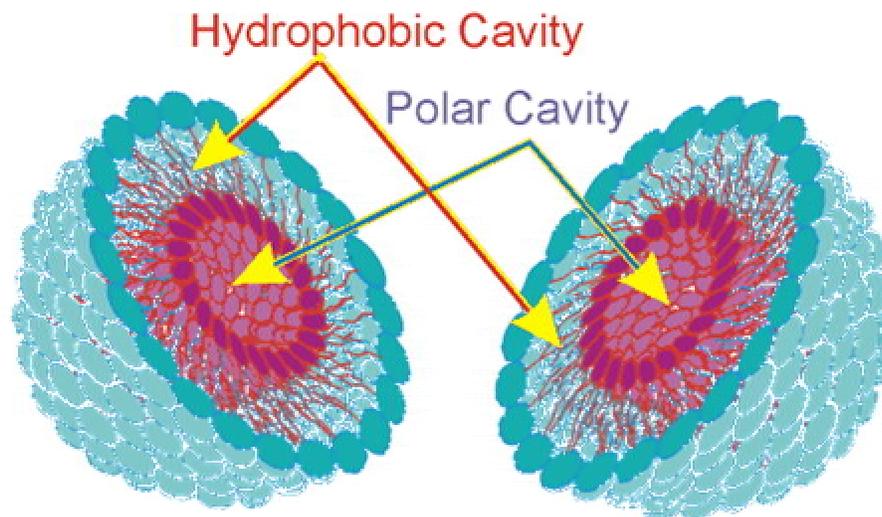


5. A complete three-dimensional Nanosome™ structure as a ball within a ball is shown in the next picture. The ball is split in half to show its internal structure.



6. **Liposomes** can contain and mobilize water-soluble materials as well as oil-soluble materials in specific cavities inside themselves.

Liposomes can encapsulate and transport water-soluble ingredients in their polar cavity and oil-soluble ingredients in their hydrophobic cavity.





## **Part II: Liposome Function Depends on Size, or, “Smaller is Better”**

### **What is the difference between small liposomes and large liposomes, and which are better?**

Large, multiple-layer **liposomes** are actually **liposomes-within-liposomes**. They have a limited ability to penetrate narrow blood vessels or into the skin. The materials that are entrapped in the inner layers of these liposomes are practically neither accessible nor releasable.

Large **liposomes** are easy to make. All that is required is shaking **phospholipids** in water. These **liposomes** have very limited functions and are usually made of commercial lecithin, commonly found in food products. Commercial lecithin’s main function is as an emulsifying agent, improving the ability of oil and water to remain mixed.

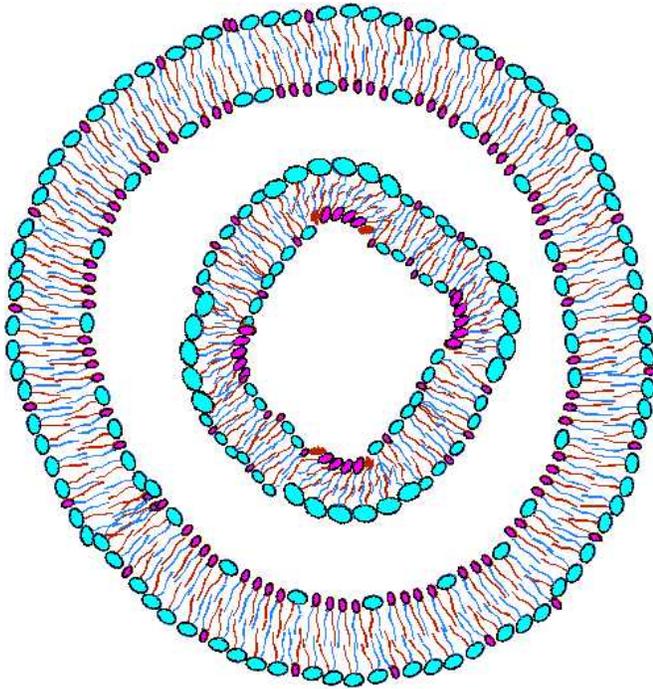
Our very small, single-bilayer **liposomes** (**Nanosomes™**) differ from large **liposomes** in some major ways. They are constructed from the highest possible quality of ingredients, and they are created using a special technique.

Our **Nanosomes™** are created of higher-quality material than commercial lecithin. The material we use to create our **Nanosomes™** has an extremely high percentage of phosphatidylcholine (PC), one of the essential components of cell membranes.

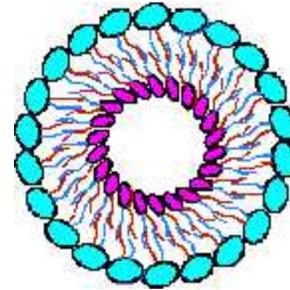
Very small, single-bilayer liposomes (**Nanosomes™**) are very difficult to make, so our **Nanosomes™** are created in a special way. The process of creating **Nanosomes™** involves subjecting large, multiple-layer **liposomes** to ultrasonic energy. This process is very long, extremely delicate, and is done in small batches. **Nanosomes™** can easily penetrate into small blood vessels by intravenous injection; they can also penetrate into the skin by topical application. Their content, material intentionally entrapped inside them, is efficiently transported and can be delivered to desired targets such as cells.

**The following picture illustrates some of the common structural differences between large and small liposomes.**

**Large, Multiple layer Liposome**



**Very Small, Single Bilayer Liposome (Nanosome™)**



### **High PC-Content Liposomes are Better**

Since very small **liposomes** (**Nanosomes™**) made with various **phospholipid** types can contain, encapsulate, and mobilize water-soluble materials as well as oil-soluble materials, what is so special about **liposomes** made with high purity PC rather than those made with the inexpensive alternative, commercial lecithin?

High purity PC **Nanosomes™** not only deliver encapsulated ingredients to cells but also deliver phosphatidylcholine (PC), *cells' own building block*. This unique ability of high purity PC **Nanosomes™** renders them the most powerful available tool in combating cellular aging.

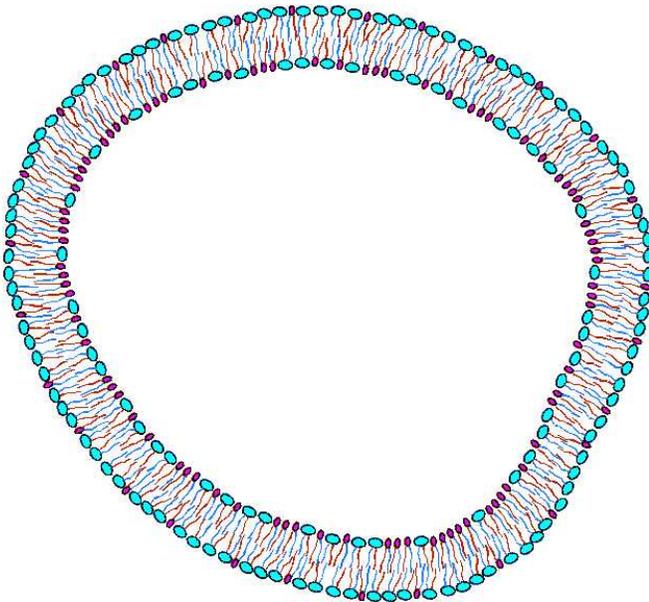
**To understand the importance of Nanosomes™ containing high purity PC, please continue reading.**

- Part III will introduce you to some of the major events occurring during the aging process of cells.**
- Part IV will explain how high purity PC Nanosomes™ reverse the aging process in old cells.**

## Part III: The Process of Cellular Aging

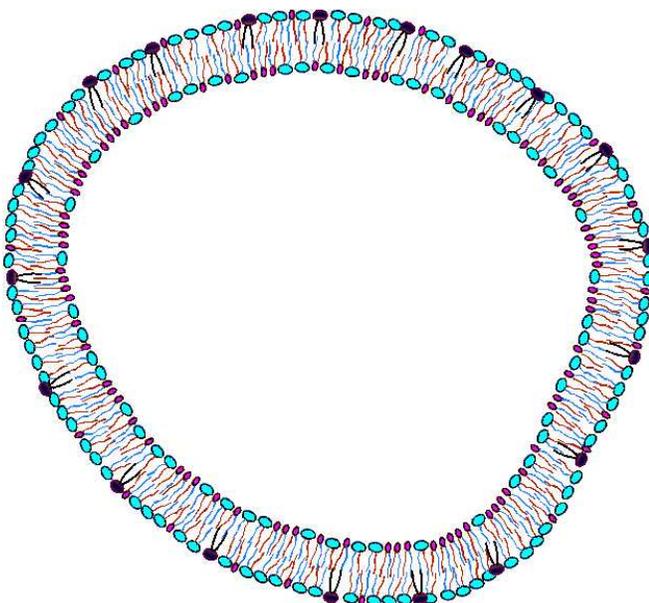
During the aging process, the level of phosphatidylcholine (PC) in cell membranes is diminished and the level of sphingomyelin (SM) increases.

In the images below, PC is represented by blue-headed phospholipids and SM is represented by black-headed phospholipids.

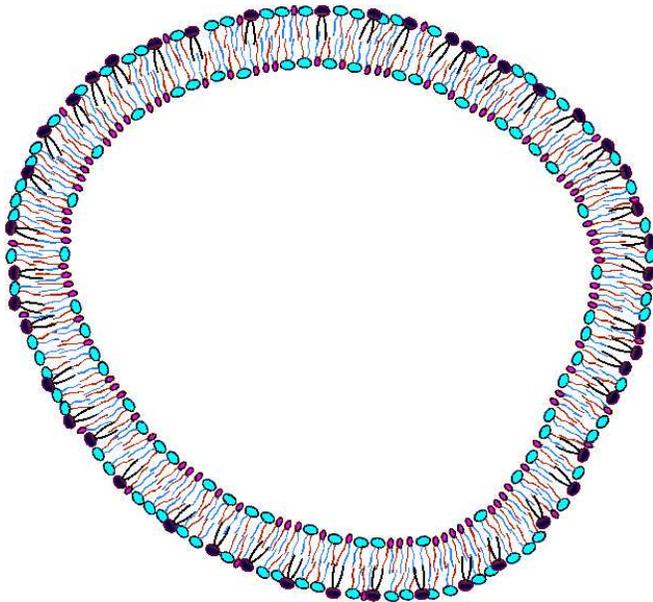


This figure represents a very young cell membrane. The level of PC in this cell membrane is very high, as shown by the predominance of blue-headed phospholipids.

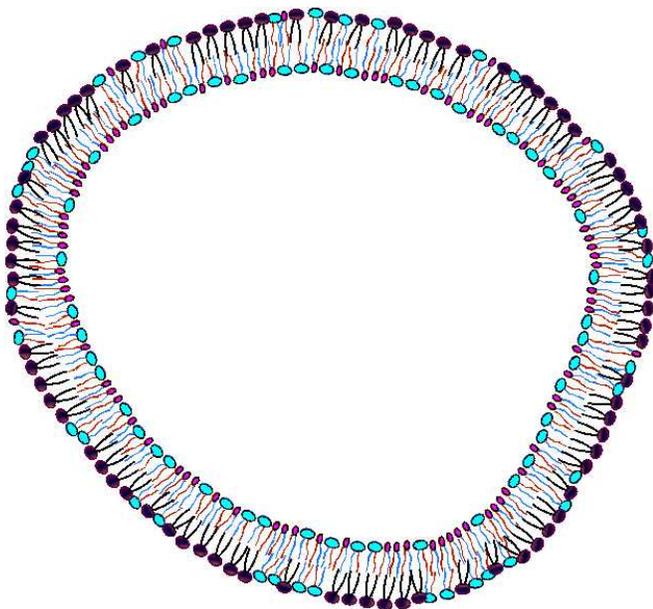
Please note that the picture is designed to illustrate a point and thus oversimplifies a complex situation by not showing any SM molecules. In actual live cells, even very young cells contain a few SM molecules.



This figure represents a middle-aged cell membrane. The level of PC in this cell membrane is still very high, but SM molecules are already present in significant quantities, as shown by the appearance of a few black-headed phospholipids.



This figure represents an old cell membrane. The level of PC in this cell membrane is low and the SM molecules have become a significant portion of the total phospholipid content. This can be seen by the relative numbers of black-headed and blue-headed phospholipids.

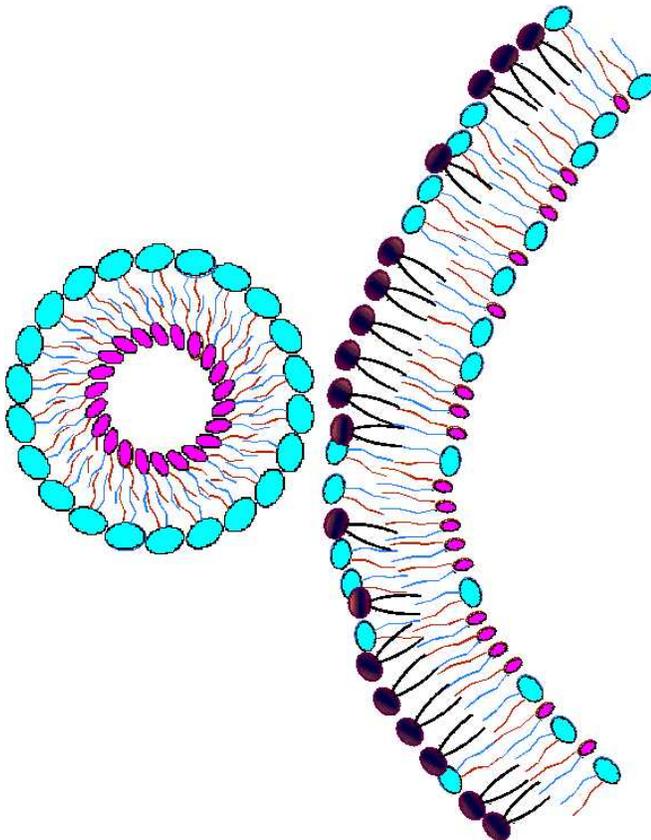


This figure represents an extremely aged cell membrane. The level of PC in this cell membrane is very low and the level of SM is very high. In addition, the distribution of phospholipids throughout the membrane surface is significantly altered.

## Part IV: The Process of Cellular Rejuvenation

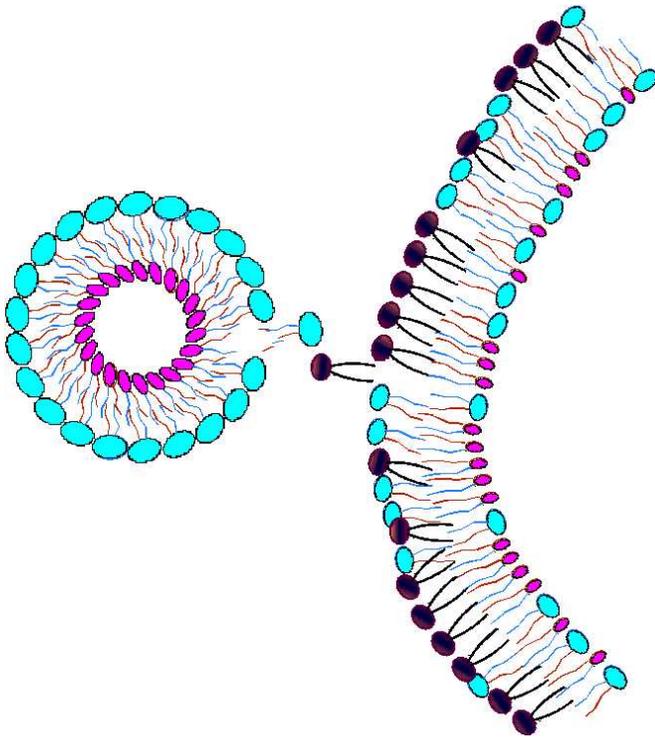
High purity PC **Nanosomes™** can restore the levels and distribution of phospholipids in old cells to the characteristics they had as young cells. They do this by interacting with cell membranes and causing them to reach a **new equilibrium**. For this reason, the **Elsom Research** cosmeceuticals product line which includes **Nanosomin™ Serum** has been named “**New Equilibrium**”.

This process can only be carried out when high purity PC is utilized in constructing the **Nanosomes™**. The effective PC purity should be at least 70% but is extremely potent if it is 90% or higher, as it is in **Nanosomin™ Serum**.



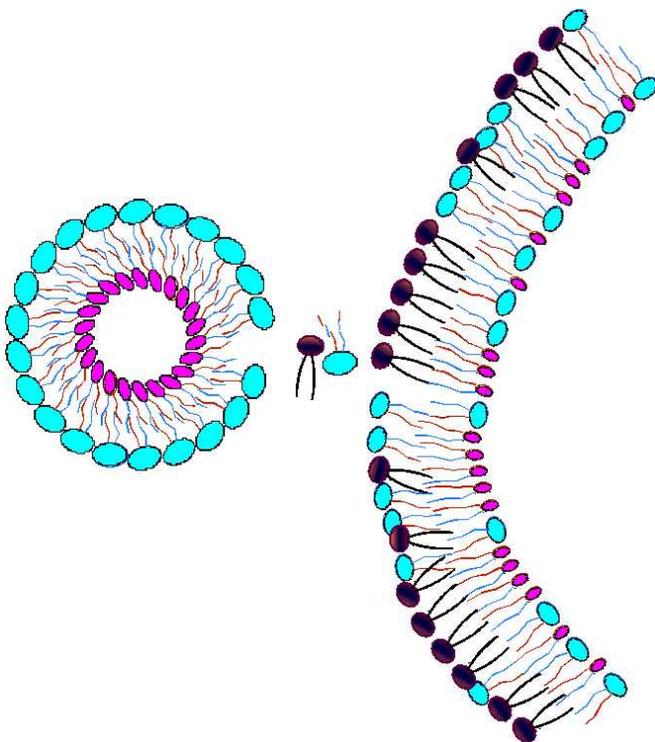
A fresh very small liposome, a “**Nanosome™**” made with very high content (over 90%) of PC is approaching an old cell membrane.

The aging cell membrane has lost many of its “good” PC molecules (represented by the phospholipids with blue head groups) which have been replaced by “bad” SM molecules (represented by the phospholipids with black head groups)

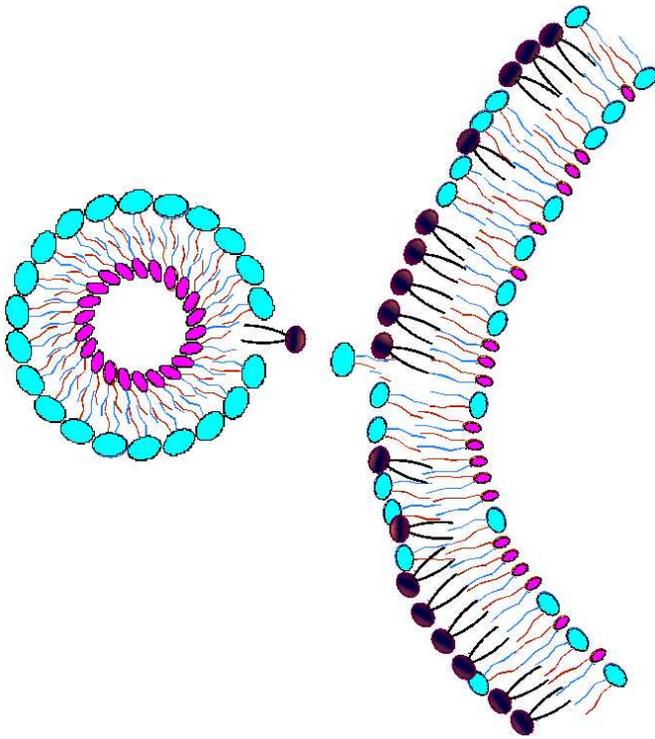


The **Nanosome™** and the aging cell membrane begin moving toward a **New Equilibrium**, a process in which molecules from the cell membrane will be exchanged with molecules from the **Nanosome™**.

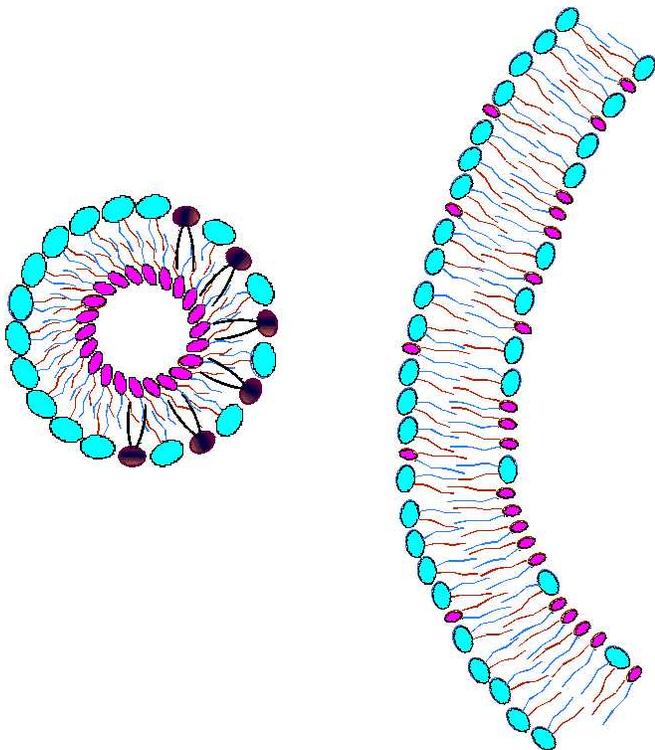
The bad SM molecule from the aging cell is being pulled out from the cell membrane, and the good PC molecule is being pulled out of the **Nanosome™**.



The SM molecule originating in the aging cell attempts to achieve equilibrium by reaching toward the **Nanosome™**. The PC molecule originating in the **Nanosome™** attempts to reach equilibrium by moving toward the aging cell membrane.



The molecules exchanged between the **Nanosome™** and the cell membrane are being repositioned in their respective new destinations.



Application of **Nanosomin Serum™** creates an environment in which many **Nanosomes™** are available. The large number of **Nanosomes™** provides a very large surface area relative to the surface area of the aging cell membranes, ensuring that there is material available for use in achieving a **New Equilibrium**.

The end process provides a cell that has reached a **New Equilibrium** and is thus rejuvenated biologically, chemically, and physically. A rejuvenated cell is replenished with PC molecules and cleaned of SM molecules. The **Nanosomes™** at this stage carry and discard the old chemical and physical image of the cell.



**An Introduction to Nanosomes™**  
For more information, please visit [www.elsomresearch.com](http://www.elsomresearch.com).

We hope this explanation is useful to you in understanding the aging process of skin; we also hope it helps you appreciate the uniqueness and novelty of **Nanosomin™ Serum** and the **New Equilibrium** product line from **Elsom Research Co., Inc.** The sound science behind **Nanosomin™ Serum** and all our products provides you with the state of the art in active skin care.

*A New Equilibrium*

**NANOSOMIN**

**Topical Skin Treatment**

**Endotherapeutic Serum**

With  
Nanosomes,  
Anabolites,  
Vitamins, Anti-  
Oxidants, Moisturizers

**We take great care in making our products; our products will take great care of you.**