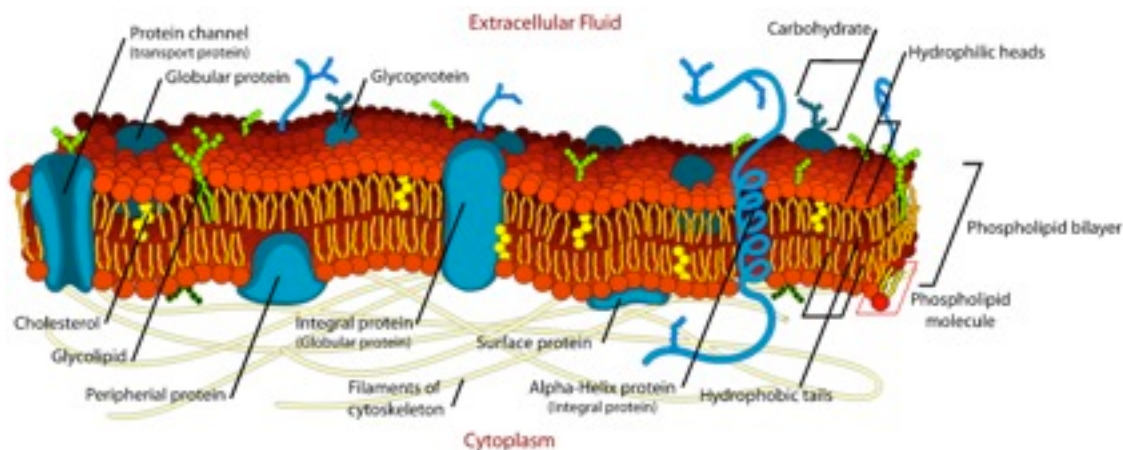


Phosphatidylcholine and Glutathione: Champions of Cell Membranes

by Dan Schwartz and Sheryl Leventhal, MD

with concepts adapted from Patricia Kane, PhD PK Neurolipid Keto Membrane Stabilizing protocol" NRF 2012.

Phosphatidylcholine (PC) plays an integral role in the structure and biology of cell membranes. Containing both hydrophobic (water-hating) and hydrophilic (water-loving) parts, PC endows cell membranes with a lipid bilayer structure that allow the transport of nutrients from the surrounding environment into the cell and vice versa, as well as



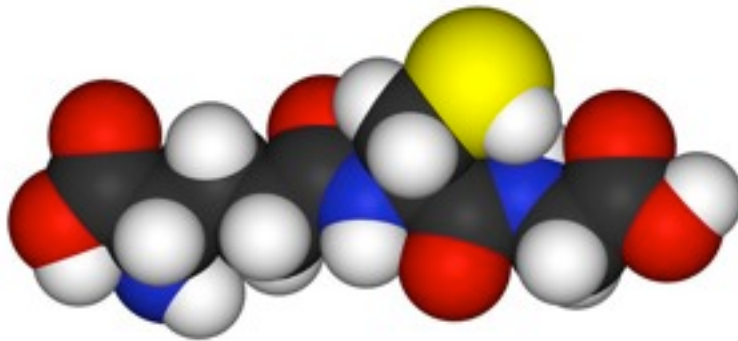
protection from toxic insults to the cell (heavy metals, etc). In the realm of cell signaling and communication, PC occupies another important position, serving as the primary precursor to the molecule acetylcholine, a crucial neurotransmitter involved in memory. Its chemical derivative, phosphatidic acid, is central to several lipid signaling pathways in the cell, and PC itself is known to be involved in the activation of several key enzymes.

IV supplementation of PC has proven effective in reversing the onset of diseases affecting the health of cell membranes, particularly neural membranes. While the precise mechanism is not well understood, the literature suggests a number of routes through which PC can improve the integrity of cell membranes and neuronal function. Administering a mixture of vitamin E, PC and pyruvate to mice, Shea and colleagues demonstrate a powerful neuroprotective effect not seen in mice given vitamin E alone, showing increased cortical neurons in culture and protection of neurons from oxidative processes that hasten DNA damage (Shea et. al., 2002). In treating mouse cortical neurons directly with PC, pyruvate and vitamin E, the same group demonstrates a marked decline in the amount of reactive oxygen species compared to neurons treated with vitamin E alone, suggesting a powerful role for PC in combating neurodegeneration (Shea et. al., 2003).

In the liver, PC plays a prominent role in supporting the membranous network of parenchymal cells that comprise the body's detoxification system. With over 33,000 square meters of phospholipid cell membrane, these cellular systems depend on PC for

membrane stability, ensuring that liver enzymes have a place to carry out the hundreds of intricate chemical reactions involved in processing toxins and other wastes for excretion from the body (Kidd, 1996). Several clinical studies from Europe point to PC as a potent restorer of liver function, particularly in patients suffering from severe liver damage. One such study conducted over 5 years with 650 liver-damaged subjects demonstrates the revitalizing effects of PC, as evidenced by the normalization of liver enzyme function and reversal of fatty liver damage (Wallnoefer & Hanusch, 1973 qtd Kidd, 1996). A later investigation by Sorrentino and colleagues shows a substantial improvement in liver parameters in liver-damaged subjects given large doses of oral PC and B vitamins compared to subjects given B vitamins alone (Sorrentino, 1982 qtd Kidd, 1996).

By shoring up the lipid structures of the body's detoxification system, PC ensures a strong response to the toxic insults of modern life. From environmental exposures (heavy metals and pesticides), to foreign biological invasions (mold and other fungi, viruses, bacteria), the body



A molecular model of glutathione

is confronted with a wide variety of toxic elements that rupture cell membranes, creating structural gaps that prevent the enzymes of the membrane from doing their jobs. Glutathione, a sulfur-based antioxidant that is produced naturally in the body, serves a similar purpose, using its

free electrons from sulfur to "mop up" toxins and purge them from the body. Attacking reactive oxidative species that are persistent in a range of chronic illnesses (cancer, arthritis, neurodegeneration and more), glutathione bolsters membrane integrity by literally carrying dangerous oxidative species through the body's detoxification system, thus preventing damage to membranes (Hayes and McLellan, 1999). With oxidative stress being a major force behind a number of chronic illnesses, glutathione supplementation, along with PC, work synergistically to heal cell membranes by enhancing the body's natural detoxification pathways.

With no known side effects or toxicities, PC and glutathione IV supplementation represent an important flank in the Functional Medicine approach to chronic illness. Along with nutritional and lifestyle counseling, PC and glutathione are a powerful adjunctive therapy, helping the body clear up toxins and restore membrane function in a range of chronic diseases. From chronic lyme disease, to mold and heavy metals exposure, to neurodegenerative diseases (chronic epilepsy, MS, and more), PC and glutathione supplementation provide a biological/non-pharmaceutical way to clear up toxicities and optimize basic cell membrane function.

Hudson Valley Functional Medicine practitioners Sheryl Leventhal, MD and Regina Fasano, RN have been specifically trained by Patricia Kane, PhD in the intravenous administration of phosphatidylcholine and glutathione, along with a companion diet and usually other supplements tailored to the patients specific fatty acid profile and clinical situation. Our dietary work is handled by Betsy Adelman, HHC, PT in small group or individual settings.

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