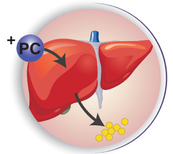
The History of **Phospholipids in Medicine**

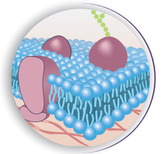
1847

Theodore Gobley, a French pharmacist studying the composition of egg yolks, isolates phospholipids and calls this new substance *lecithine*, which he named after the Greek word *lekithos* meaning "egg yolk"



1930s

At the University of Toronto, Charles Best discovers the liver-protective benefits of phosphatidylcholine in animals with fatty liver challenges



1972

Dr. Garth Nicolson discovers the phospholipid bilayer and creates a new model of cell membrane structure, which he names the "Fluid Mosaic Model"

2003

Dr. Garth Nicholson publishes a paper on oral membrane lipid replacement (MLR) with phosphatidylcholine to improve fatue scores

2008

Dr. Robert Naviaux describes the cell danger response (CDR) cycle and maps each stage of mitochondrial shifts in membrane composition

2022

Ortho Molecular Products brings BioPC Pro to the market providing a full-spectrum, high-potency phospholipid complex

BioPC Pro

- ✓ High-dose phospholipid complex for powerful immune and mitochondrial support
- ✓ Rich in phosphatidylcholine (PC), phosphatidylethanolamine (PE), phosphatidylinositol (PI), and phosphatidylserine (PS), which are vital for healthy cellular and mitochondrial membrane function
- ✓ Provides a key source of choline to support healthy brain function, mental focus and memory
- ✓ Improves gut-barrier function by increasing mucosal protection
- ✓ Non-GMO, vegan, soy-free, gluten-free

Restores Mitochondrial Energy Production

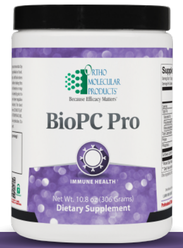
Replaces Damaged and Oxidized Lipids

Enhances Gut-Barrier Immunity

Supports Neurotransmitters and Cognition

Typical naturally occuring phospholipid profile (per 10 g serving)[1]:

Phosphatidylcholine 2.5 g (2,500 mg)
Phosphatidylinositol 2 g (2,000 mg)
Phosphatidylethanolamine 1 g (1,000 mg)
Phosphatidic acid 0.4 g (400 mg)
[1]subject to natural variability



BioPC Pro Powder
ID# 173030 30 SVG
SUGGESTED USE: 1 scoop (10.2 grams) per day with a meal or as recommended by your health care professional. May be mixed in juice or shakes, or sprinkled on food.

Supplement Facts

V1

Serving Size 1 Scoop (10.2 Grams)
Servings Per Container About 30

	Amount Per Serving	% Daily Value
Calories	60	
Total Fat	5 g	6% *
Saturated Fat	1 g	5% *
Polyunsaturated Fat	3 g	
Monounsaturated Fat	1 g	
Total Carbohydrate	3 g	1% *
Protein	<1 g	
Phosphorus	130 mg	10%
Sunflower Lecithin Powder	10 g	**

* Percent Daily Values are based on a 2,000 calorie diet.
** Daily Value not established.

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ORTHO MOLECULAR PRODUCTS®
Because Efficacy Matters®

Ortho Molecular Products

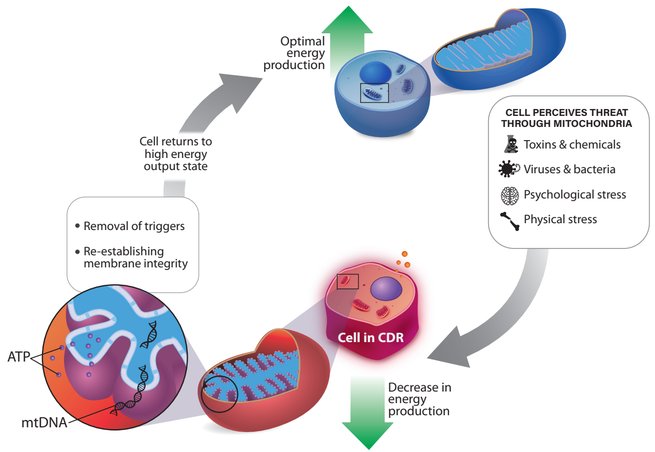
BioPC Pro

Full-Spectrum, High-Potency Phospholipid Complex

Membrane Lipids and the Cell Danger Response

Phospholipids are the major structural lipids of biological membranes, critical to cellular and mitochondrial membrane shape, growth and repair. The balance of these membrane phospholipids is essential to membrane fluidity and proper mitochondrial signaling and function. These membrane phospholipids tend to decrease as we age, and are also damaged and oxidized by free radicals, toxins, viruses, mold and bacteria.

The cell danger response (CDR) is a new understanding of immune system activation in which cells go into a "lock-down" mode to protect themselves from exposure to oxidative stress, toxins and microbes. The hallmark of CDR activation is a shift in mitochondrial membrane composition, shape and function from a fluid, energy-producing membrane to a rigid, swollen and hyper-permeable membrane leaking out ATP, oxidized lipids, fragmented mtDNA and other compounds that activate the immune system.



As the CDR continues, the mitochondria sense an increase in damaging free radicals and slow down energy production to protect the cell from increasing free radical burden. The result is persistent low energy that can impact patient health in five key areas (MINDD):

Metabolic **I**mmunologic **N**eurologic **D**igestive **D**evelopmental

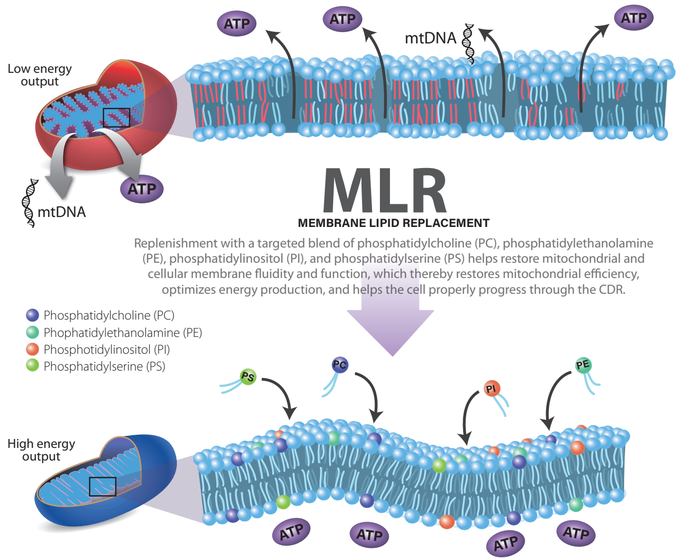
Naviaux, R. K. (2019). Metabolic features and regulation of the healing cycle—A new model for chronic disease pathogenesis and treatment. In Mitochondrion (Vol. 46, pp. 278–297). Elsevier BV. https://doi.org/10.1016/j.mito.2018.08.001

Membrane Lipid Replacement

The Path to Mitochondrial Recovery and Resilience

Many MINDD health challenges are characterized by mitochondrial and cellular membrane damage due to free radicals, with damaged phospholipids resulting in a loss of cellular function. This is readily apparent in mitochondrial inner membranes, where oxidative damage to phospholipids results in reduced ATP production and leads to fatigue and brain fog.

Membrane lipid replacement (MLR) is the use of oral phospholipids to replace oxidized, damaged membrane phospholipids that accumulate during aging and various health challenges.



Nicolson, G. L., & Ash, M. E. (2014). Lipid Replacement Therapy: A natural medicine approach to replacing damaged lipids in cellular membranes and organelles and restoring function. In Biochimica et Biophysica Acta (BBA) - Biomembranes (Vol. 1838, Issue 6, pp. 1657–1679). Elsevier BV. https://doi.org/10.1016/j.bbamem.2013.11.010

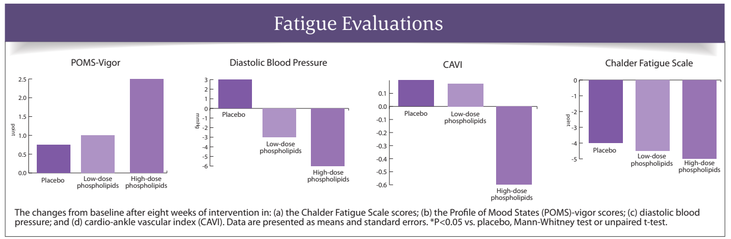
Improving Patient Resilience and Mitochondrial Function

When managing treatments for patients dealing with these complex immune health challenges, the focus should be on supporting mitochondrial membrane health with a root-cause approach focused first on proper lifestyle and nutritional interventions.

- **Lifestyle:** Exercise, fasting and caloric restriction for improved mitophagy
- **Nutrients:** Acetyl L-carnitine, alpha lipoic acid, N-acetyl cysteine and CoQ10 for mitochondrial antioxidant support
- **Membrane Lipid Replacement (MLR):** Targeted phospholipids to replace damaged phospholipids and restore membrane fluidity

Oral Phospholipid Replacement Study in Menopausal Women

One study examined the health promoting effects of oral phospholipid supplementation to support mitochondrial function. An eight-week, double-blind, placebo-controlled study was done on middle-aged female patients with fatigue using membrane lipid replacement (MLR) with oral phospholipids, evaluating at four and eight weeks after supplementation. In examining the use of MLR in these patients, there were significant improvements in the high-dose (1,200 mg/day) phospholipid group compared with the placebo group, showing increased vigor scores on the POMS-vigor scale, lowered diastolic blood pressure within the normal range, and decreased cardio-ankle vascular index after eight weeks of treatment.



The changes from baseline after eight weeks of intervention in: (a) the Chalder Fatigue Scale scores; (b) the Profile of Mood States (POMS)-vigor scores; (c) diastolic blood pressure; and (d) cardio-ankle vascular index (CAVI). Data are presented as means and standard errors. *P<0.05 vs. placebo, Mann-Whitney test or unpaired t-test.

Hirose, A., Terauchi, M., Osaka, Y., Akiyoshi, M., Kato, K., & Miyasaka, N. (2018). Effect of soy lecithin on fatigue and menopausal symptoms in middle-aged women: a randomized, double-blind, placebo-controlled study. In Nutrition Journal (Vol. 17, Issue 1). Springer Science and Business Media LLC. https://doi.org/10.1186/s12937-018-0314-5