



Improving The Health of Your Cell Membranes



Dr. Kate Thomsen and Silky

There was a lot of information about cell membranes in the last article. To review, these cell membranes are the outer "skins" of your cells. Your body is made of about 50 trillion cells. Cells have specific functions depending on the organs they comprise – the thyroid is made of thyroid cells and the liver is made of liver cells. These cells are little factories, making their own energy to fuel the job they are doing, e.g., making thyroid hormone, or detoxifying toxins. Inside each cell is a nucleus containing the DNA – the identical DNA is inside every cell. Only certain portions of the DNA are needed to perform the particular functions of each organ and that specificity is facilitated by the cell membranes. These membranes are made of fats that separate the watery inside of cells from the watery outside of cells. Other membranes "partition off" the nucleus and the mitochondria that are within the cell. Cell membranes also surround and insulate nerves as well as provide structure and function in photoreceptors of the eye. They are so thin that 10,000 of these membranes stacked on top of each other would only equal the thickness of a piece of paper. What fascinates me about these membranes is that they are the dynamic interface between your lifestyle and your DNA. I have written about this interaction called, "epigenetics" in prior articles. Basically, the foods you eat (or don't eat) and the toxins you are exposed to (viruses, bacteria, fungus, molds, pesticides, chemicals, heavy metals, oxidized sugars and fats...) greatly influence the structure and function of the cell membrane. These functions include: being a me-

chanical barrier surrounding and protecting the DNA, being a fluid mosaic of fats and proteins that form receptors and channels for entry and exit of particles (including those that "turn on" DNA replication), being a "footing" for flag-like proteins that show immune cells that this cell is not foreign – it is "self", and forming an electrical gradient that supports the formation of ATP for energy and allows the transmission of nerve impulses.

The cell membrane is a phospholipid bilayer. Imagine lining up 2 rows of clothespins with the rounded heads towards the top in the first row and the rounded heads facing the bottom in the lower row. The 2 pronged tails of these 2 rows of clothespins point towards and touch each other in the middle. This is a phospholipid bilayer with the clothespin heads touching water in each row but the clothespin prongs in the center are various fatty acids forming a barrier to water. Now – reflect upon the food you eat. The MUFAs (monounsaturated fatty acids, primarily olive oil) and PUFAs (polyunsaturated fatty acids, primarily vegetable and seed oils) as well as some saturated fats (from animal products) form the tails of the phospholipid bilayer. The MUFAs and the PUFAs give the membrane fluidity – allowing it to change shape, creating protein passageways. Mineral salts create the charges that allow movement in this membrane. Small proteins form ion channels and receptors for receiving messages. Saturated fats and cholesterol are needed to attain the rigidity and mechanical barrier function of the cell membranes.

The essential fats (as in Essential Fatty Acids) must come from your diet. Omega 3s come from cold water fish and flax. The shortest Omega 3 oil, Alpha-linolenic Acid, elongates and eventually makes EPA and DHA (many of us take these directly in the form of "fish oil"). The Omega 6 family, derived primarily from plant oils like sunflower and safflower, also contains Arachidonic Acid.

This Omega 6 oil is found in animal fats (egg yolks, butter, meat). Omega 6 Fatty Acids comprise about 30% of the fats in the cell membrane, Omega 3s comprise only 7%. These Omega 3 and 6 Essential Fatty Acids form tails in the lipid membranes but they evolved another function. An enzyme can cut them loose from the membrane and they become Eicosanoids, hormone-like messengers to other cells in the body. These enzyme snippers only function in the presence of several minerals and B vitamins. Once "freed", the eicosanoids have various signals including those for inflammation, fever, regulation of blood pressure, blood clotting, immune system modulation, control of reproductive processes and tissue growth, and regulation of the sleep/wake cycle. There is speculation that the eicosanoid messengers, freed from primitive cell membranes, are what made it possible for one-celled organisms to evolve into coordinated many-celled organisms.

The human brain is 60% lipids (fats). The majority of these brain cell membrane fats are Arachidonic Acid and DHA. The human eye protein rhodopsin is also highly dependent on Arachidonic Acid and DHA. There are 100 million photoreceptor cells in the retina of each eye and the entire lipid membrane for each of these cells needs to be replaced every 2 weeks. The high energy fatty acid DHA, comprises a large percentage of these membranes

The mitochondria in each cell are primarily membranes that facilitate energy production. There are 200 – 500 mitochondria in each cell – 1000 or more in a heart muscle cell. The mitochondria can use glucose or fatty acids (in the presence of Vit. B2 and carnitine) to make ATP. The process involves an electrical gradient set up as the membrane separates electrons from hydrogen atoms.

The membrane covering around nerves not only insulates to facilitate impulse transmission but also provides an electrical gradient for the production of energy. Nerve membranes

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Your Cell Membranes can be evaluated by:

- Checking your Phase Angle on a Body Composition Analysis
- A Blood test evaluating the Fatty Acid composition of your Red Blood Cells

Your Cell Membranes can be nourished by:

- Essential Fatty Acids found in seeds and nuts, olives, avocados, vegetables and/or Supplements with:
- A 4:1 Organic Omega 6: Omega 3 Oil Blend
- High quality PhosphatidylCholine
- Arachidonic Acid in egg yolk, butter, and meat
- An Omega 6 GLA, e.g., Evening Primrose Oil
- Fish Oil with Molecularly distilled EPA and DHA
- Wheat Germ Oil
- High quality complete Proteins
- Liquid Minerals and Electrolytes
- Low refined Carbohydrate (low glycemic) diet
- Detoxification Foods and Supplements

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are actually large mitochondria. They require saturated, MUFAs and PUFA fats.

The most predominant phospholipid in the outer leaflet of the cell membranes is Phosphatidylcholine. It's "clothespin tails" incorporate mostly HUFAs (highly unsaturated fatty acids) like Arachidonic Acid and DHA. The phosphatidylcholine content of the cell membrane tends to decrease with aging and the cholesterol content increases. This makes the cell membranes more rigid and less metabolically active with age.

Ever wonder how exposure to toxins affect you? One way is by interfering with the functioning of the cell membrane. Toxins from viruses, chemicals, heavy metals, high blood sugar, etc will create free radical damage, and prevent the beta oxidation (burning up) of long chain fats. This creates loss of integrity and malfunctioning of the cell membranes. Disruption

of the intricate architecture of these membranes from poor dietary choices or toxin exposure: prevents messages from being able to turn on or turn off your DNA, slows nerve impulse transmission, prevents optimum eyesight and brain function, allows immune confusion, etc.

Since the cell membranes reflect the overall health of the cells – hence the overall health of your body and brain – nourish and regenerate them and protect them well.

Dr Kate Thomsen's office for holistic health care is located in Pennington, NJ. She is board certified in Family Medicine and in Integrative/Holistic Medicine. She has been practicing Functional Medicine for over 15 years. For more information see www.drkatethomsen.com or call the office at 609-818-9700.