Smart Life Forum

presents

Douglas Husbands, DC, CCN, ABAAHP

Optimizing Cellular Energetics: Healthy Cells = Healthy Aging

Thursday, March 15, 2007 at 7:00 PM
Cubberly Center, 4000 Middlefield Road, Room H1, Palo Alto

Future Speakers:
May 17: Raymond Francis, PhD, on his new book, "Never Be Fat Again"
June 21: James Wilson, ND, on "Adrenal Glands"

FMBR *Friday, March 23, 8pm, Savely Savva, Editor of a new book, Life and Mind: In Search of the Physical Basis, will be addressing an important mystery in biology. Although the genes control the production of various organs and parts of the fetus, how is the assembly of parts over nine months regulated? Savva will describe the biofield control system. See fmbr.org for more information.*

Meet Dr. Douglas Husbands

Dr. Douglas K. Husbands has been in clinical practice for about 16 years. He recently moved to Northern California after practicing in Southern California for almost 15 years. He presently practices Functional Health Care at Athens Chiropractic Clinic in San Carlos, California.

Originally a San Francisco native, Dr. Husbands obtained his Bachelor of Science (B.Sc.) degree in Biology with a specialization in Human Physiology, from San Francisco State University in 1983. Between 1983 and 1987, while working in sports medicine and acute care physical therapy rehabilitation centers and taking additional classes in chemistry and biochemistry, he also owned and operated a personal exercise training business. With a passion to apply and learn more about holistic health care, after experience in both conventional and holistic settings, he entered Cleveland Chiropractic College of Los Angeles in January 1988. In an accelerated program, he graduated in May of 1991 with a Doctor of Chiropractic (D.C.) degree, and has been licensed in the state of California since 1991.

With a holistic clinical focus, he pursued and earned his postgraduate board certification of Certified Clinical Nutritionist (C.C.N.) with the Clinical Nutrition Certification Board of the International and American Associations of Clinical Nutritionists (IAACN) in 1996. Additionally, in 2000, he earned board certification as an Anti-Aging Health Practitioner (ABAAHP) with the American Board of Anti Aging Health Practitioners of the American Academy of Anti-Aging Medicine. Desiring excellence in clinical care, he completed an intense continuing education curriculum with the Institute for Function Medicine in 2003. Throughout this time he has attended many continuing education classes for expertise in dealing with chronic disease conditions using a Functional Health Care perspective.

Dr. Husbands has lectured extensively on holistic methods for various health conditions over the last 10 years to many audiences, and over the last 5 years has written, contributed to, or been sought for his opinion, in numerous chronic health related articles. He recently appeared in a short segment on "breast cancer prevention" which appeared on CNN. While practicing full time in San Carlos, he is submitting various articles for publication in peer-reviewed journals, focusing on functional health care options for chronic disease conditions. Dr. Husbands may be contacted at Athens Chiropractic Clinic by phone at 650-593-4447, or through his website at www.drhusbands.com.

Main Presentation

Chronic clinical syndromes are appearing in the United States with seemingly increased frequency and at younger ages. Common symptoms are: extreme fatigue, sleep disturbances, lack of mental clarity, emotional instability, poor concentration, increased adipose tissue,

joint/muscle/structural pain. These syndromes, in which patients present with one or more of the previously noted symptom complexes have been designated by various names, such as: Metabolic Syndrome, Chronic Fatigue Syndrome, Post-traumatic Stress Disorder, Fibromyalgia, etc. These may have differing origins and clinical presentations while sharing similar underlying processes. At a cellular level, impaired mitochondrial function is often the prominent physiologic process of these underlying processes.

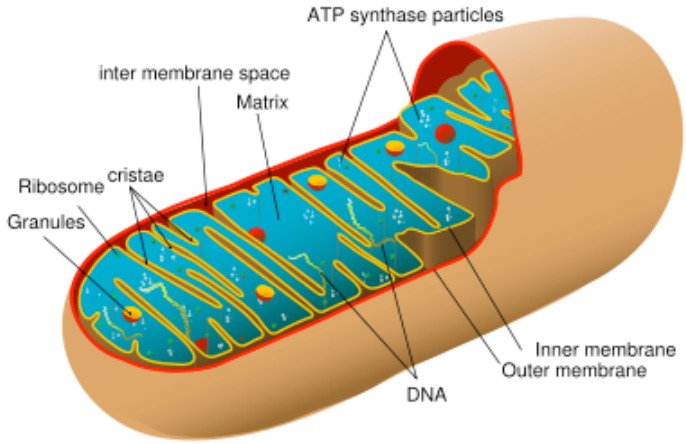
The Prominence of Proper Mitochondrial Function in Healthy Aging

As those in this forum know, mitochondrial function has predominant importance in not only the production of energy, but also in energy distribution throughout the cell. Each cell contains about 200 to 4000 mitochondria, with the wide variation in the potential number based on the cell type, environmental exposures, and the lifestyle of the person. The cells that have the most mitochondrial activity are those that have the greatest aerobic energy utilization; namely those of the heart, brain, and muscles. Age is also a factor in the number of mitochondria per cell, but mitochondrial changes seen with age are often the *result of* poor lifestyle habits, i.e. lack of exercise, poor dietary habits, etc., not necessarily a *consequence of* aging itself.

Additionally, basic cell biology for many years has taught[i], and research has verified that there is plasticity in the number of mitochondria per cell[ii], dependant upon exercise training, environmental exposures and personal health habits. For instance, in the typical healthy cardiocyte, 75 percent of the volume is occupied by mitochondria. Mitochondrial cardiocyte function can change with exposures to certain drugs, lifestyle habits and dietary factors.

The mitochondria are the cellular organelle essential for adequate production of the high-energy compound Adenosine 5'-triphosphate, or ATP which is essential for cellular energy, and therefore proper function. The physical structure of the mitochondria consists of an outer membrane that is permeable to most small molecules and in inner membrane that does not easily allow molecules to pass through. The inner membrane forms invaginations, or christae, for increased surface area to allow for the large number of enzymes present.

Mitochondria have their own DNA. Mitochondrial DNA mutations can occur in the absence of those that occur in the nuclear DNA. Mitochondrial DNA is inherited predominantly from the mother[iii], which is logical since the ovum is large and contains many mitochondria. The sperm have mitochondria in the section near the tail, but that section falls off after fertilization. Therefore mitochondrial function and mitochondrial-associated diseases are largely maternally-inherited characteristics. From a clinical basis, this is even more of a reason that women in pre-childbearing and childbearing years should optimize their health with healthy lifestyle habits, organic foods, and use of non-toxic orthomolecular health care and medical therapies.



A Brief Review of the Mechanisms of Mitochondrial Energy Production

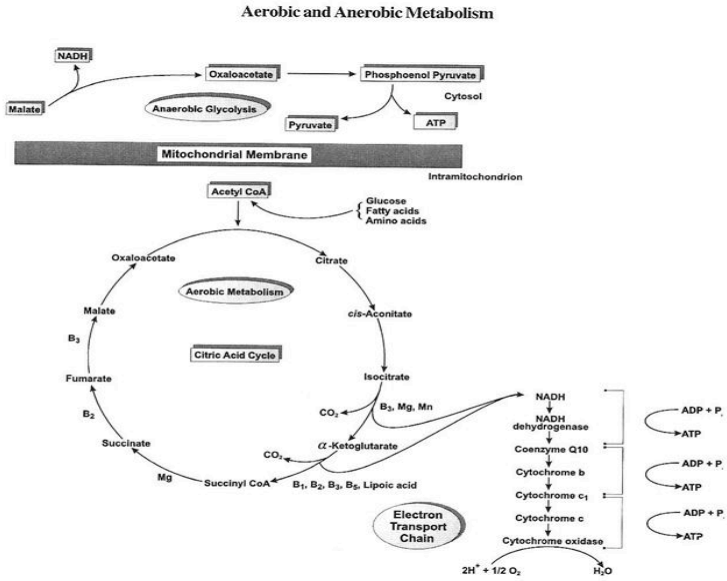
Since many in this forum are familiar with the cellular mechanisms of anaerobic glycolysis, pyruvate decarboxylation, the citric acid cycle (also called Krebs cycle or Tricarboxylic Acid cycle = TCA cycle), the electron transport chain, and oxidative phosphorylation, only a brief review of theses mechanisms will be mentioned.

In anaerobic metabolism, through the process of glycolysis occurring in the cytoplasm of the cell, a molecule of glucose is separated into 2 molecules of pyruvate. Only 2 molecules of the high energy compound ATP are derived from glucose in glycolysis.

As we know in pyruvate decarboxylation, under aerobic cellular conditions pyruvate crosses the outer mitochondrial membrane, and is actively transported across the inner mitochondrial membrane into the mitochondrial matrix by the pyruvate dehydrogenase enzyme complex. Pyruvate is oxidized (gives up electrons) and combined with coenzyme A to form acetyl CoA, for entry into the citric acid cycle within the mitochondrial matrix.

In aerobic metabolism occurring within the mitochondrial matrix, two sequential processes can produce 36 molecules of ATP: the Krebs cycle, followed by oxidative phosphorylation. During the Krebs cycle

where electrons are removed from the di- and tricarboxylic acids in the cycle, electrons are captured by the protons of the electron transport chain and transferred to molecular oxygen. With everything working smoothly, mitochondria produce about 36 ATP, H2O and CO2 from this process.



All the steps in the mechanism of mitochondrial energy production are greatly dependent on nutrients and nutrient cofactors and will not work properly without these nutrients. In summary, they are greatly dependent on adequate intake of B-vitamins, and optimal small-molecule antioxidant protection, which includes lipoic acid, coenzyme Q10, and carnitine.

If mitochondrial oxidative phosphorylation is inhibited or blocked, then energy production in the cells are limited to anaerobic glycolysis in the cell cytoplasm. When limited to energy production in the cytoplasm, pyruvate is reduced (takes electrons) to form lactate. As previously mentioned this process only gives about two ATP...greatly decreased energy production compared to energy production in the mitochondria.

Bottom line: If you have impaired mitochondrial energy production, you will eventually have impaired system wide energy. Left unresolved, with chronically impaired cellular energy production (in all cells), and then tissues, then organs, and then impaired organ systems, then systemically impaired mitochondrial energy production, aberrant cellular processes will occur. These aberrant processes will produce fatigue, sleep disturbances, lack of mental clarity, emotional instability and poor concentration, increased adipose tissue accumulation, muscular weakness, increased susceptibility to infection, autoimmunity, joint/muscle/structural pain, and in the worst case lead to cancer and many of the problems commonly associated with aging.

Clinical Conditions Associated with Impaired Mitochondrial Function

At this point, it can now be clearly understood that impaired mitochondrial function influences multiple systems and organs, and therefore is a component in many different diagnosable diseases. If mitochondrial function is impaired in certain organs or tissues, those organs and tissues begin shifting into a degenerative mode, because they no longer have sufficient energy to function adequately. In the lecture, Dr. Husbands will be covering some of the clinical manifestations, and diagnostic methods for detection, of impaired mitochondrial function.

Nutrients for Mitochondrial Function Restoration

Dr. Husbands will also discuss various nutrients and nutrient cofactors, with mechanisms of action and dosages recommended for various clinical conditions, supported by the scientific literature. In particular some of the therapeutic agents (and others) for mitochondrial resuscitation which will be covered are:

- dietary phyto-nutrient factors
- coenzyme Q10
- lipoic acid
- N-acetylcarnitine
- N-acetylcysteine
- vitamin E
- omega-3 fatty acids

Lifestyle & Environmental Factors and Mitochondrial Function Restoration

The extreme importance of an individually-suited, exercise program, at the appropriate frequency and intensity is essential in mitochondrial resuscitation. Decreased stress and stress management methods are also essential with the “busy-ness” of our society. Adequate rest, discipline and organization to accomplish all the lifestyle modifications are also essential and he will briefly discuss these issues in relation to mitochondrial resuscitation. Lastly, environmental factors with measures for decreasing exposure to xenobiotics will be briefly presented.

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1 Dyson, RD. Essentials of Cell Biology. Boston, MA: Allyn and Bacon, 1975, p. 181.

2 Hood, D. Plasticity in Skeletal, Cardiac, and Smooth Muscle Invited Review: Contractile activity-induced mitochondrial biogenesis in skeletal muscle. J Appl Physiol 2001;90:1137-1157.

3 Chan, K, Levin, S. Leaky prezygotic isolation and porous genomes: rapid introgression of maternally inherited DNA. Evolution Int J Org Evolution 2005;59:720-29.

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SmartLifeForum.org,
See additional notes and links now and after this month's meeting here (and add your own!):
http://SmartLifeForum.org/2007/03

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