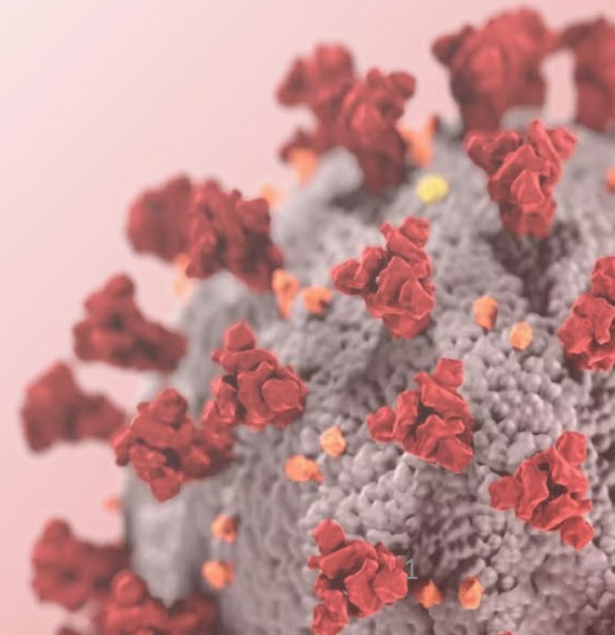


What do we know about mitochondria and aging?

Presented By:

Meryl Nass, M.D.



Desperate times call for desperate measures

So I have replaced my staid talk on mitochondria with something I think is more relevant

Spike protein/ PEG/ LNP with 2 novel lipids never before injected into humans/ visible junk/ ~50% "degraded" RNA JUST A THOUGHT:

"Double-stranded RNA-mediated interference (RNAi) is a simple and rapid method of silencing gene expression in a range of organisms. The silencing of a gene is a consequence of degradation of RNA into short RNAs that activate ribonucleases to target homologous mRNA...."

"Recent studies indicate that in the context of RNAi, the genome also undergoes alterations in the form of DNA methylation, heterochromatin formation, and programmed DNA elimination. As a result of these changes, the silencing effect of gene functions is exercised as tightly as possible. Because of its exquisite specificity and efficiency, RNAi is being considered as an important tool not only for functional genomics, but also for gene-specific therapeutic activities that target the mRNAs of disease-related genes.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC309050/>

July 28, 1993

'Outbreak' of Optic and Peripheral Neuropathy in Cuba?

Norah S. Lincoff, MD; Jeffrey G. Odel, MD; Michio Hirano, MD

» Author Affiliations

JAMA. 1993;270(4):511-518. doi:10.1001/jama.1993.03510040115049

During 1992 and 1993 a new syndrome developed in Cuba. This followed the end of the Soviet bloc and a tightening of the US embargo to try to starve Cuba into submission—because Cuba no longer could trade sugar for food and oil under favorable conditions. I heard heard allegations that the US had unleashed pests on Cuba's crops, and the US had used African SwineFever

All parts of the nervous system were affected, especially vision and hearing.

I investigated the epidemic in mid '93 and discovered, at the same time as several others, that it was due to low doses of cyanide in the setting of impaired nutrition: low B12, other B vitamins and mild protein-calorie malnutrition. Cubans had lost on average 30 lbs. in 1.5 years

B12 (cobalamin) is a cyanide scavenger (cyanocobalamin) which normally helps remove small amounts of cyanide from smoke and certain foods, especially cassava and fruit pits.

My other contribution was identifying this condition as pathologically identical to:

- a) alcohol-tobacco amblyopia—smoking, poor po intake
- b) a syndrome identified in Nigerians who, during times of famine, ate mainly cassava
- c) **Leber's Hereditary Optic Neuropathy – due to mutations in mitochondrial DNA, who**

Castro on the Attack Again with Hints of U.S. Biological Warfare

By **Christopher Dickey**
July 29, 1981

—
Most Read **Politics**

Washington Post. July 29, 1981 — "African swine fever, sugar cane rust, blue mold on tobacco have damaged the economy and now dengue fever has killed 113 people and infected more than 270,000 others in the last seven weeks.

Castro did not claim to be certain of the source of these diseases but he noted that "many citizens are deeply convinced that these sicknesses, especially dengue, were produced in this country by Yankee imperialism."

Castro shared the suspicion. He said that the plagues "could have been introduced . . . by the CIA."

1977: First Ever Outbreak of African Swine Fever in the Western Hemisphere occurred in Cuba

"CIA Link to Cuban Pig Virus Reported,"
reprinted from *Newsday* in *San Francisco Chronicle*, Jan. 10, 1977.

San Francisco Chronicle

January 10, 1977 Front page

1971 Mystery

CIA Link to Cuban Pig Virus Reported

New York

With at least the tacit backing of U.S. Central Intelligence Agency officials, operatives linked to anti-Castro terrorists introduced African swine fever virus into Cuba in 1971.

Six weeks later an outbreak of the disease forced the slaughter of 500,000 pigs to prevent a nationwide animal epidemic.

A U.S. intelligence source told *Newsday* last week he was given the virus in a sealed, unmarked container at a U.S. Army base and CIA training ground in the Panama Canal Zone, with instructions to turn it over to the anti-Castro group.

The 1971 outbreak, the first and only time the disease has hit the Western Hemisphere, was labeled the "most shocking event" of 1971 by the United

THE DOCTOR'S WORLD

Experts Ponder Cuban Epidemic

By LAWRENCE K. ALTMAN, M.D.

AERICAN medical experts returning from Cuba have different theories about the nature of the epidemic that has struck there in recent months, affecting some 25,000 people.

The disease impairs vision and can damage peripheral nerves, causing symptoms like burning sensations in the legs. The underlying cause of the disease, all agree, is a nutritional deficiency, most probably resulting from changes in the diet caused by worsening economic problems in Cuba.

During their weeklong stay, the experts say, they met often with Fidel Castro, the Cuban leader, to discuss their findings. President Castro is taking a deep interest in the mysterious epidemic.

But opinion is divided over the precise type of nutritional deficiency that is causing the disease. One group pinpoints a lack of thiamine, or vitamin B1. Another attributes the disease to a deficiency of folic acid combined with the drinking of methanol and natural cyanide in home-brewed rum.

The experts who have made themselves available for interviews on their return from Cuba are from Columbia University's medical school in New York and the University of Southern California in Los Angeles. The Columbia doctors went under the auspices of Peace for Cuba, a non-profit organization that has lobbied against the American trade embargo against Cuba. The California group went for Orbis International, a non-profit organization that fights blindness throughout the world.

The Cuban Government also asked the Pan American Health Organiza-

Fidel Castro's eyes lit up, he slapped his hand and said, 'I knew it.'

tion to send a team. One of the nine members of the Paho team, Dr. D. Carleton Gajdusek, left Cuba last weekend but was not available for comment and his office referred all calls to Paho. A spokesman for Paho said members of the team would discuss the epidemic and provide a more definitive assessment at a news conference later this week.

Last week Dr. Michio Hirano, one of the Columbia doctors, said the evidence pointed to a vitamin B1 deficiency known as Strachan syndrome as the cause of the Cuban epidemic. But Dr. Hirano, a neurologist, said yesterday that he had overstated the case for vitamin B1 deficiency. He and Dr. Norah Lincoff, a colleague who is training to be a neuro-ophthalmologist, said they believed the disease was more likely a result of a deficiency of a combination of 3 vitamins.

But Dr. Alfredo Sadun, an expert in optic nerve disease at the University of Southern California, said the cause was a lack of dietary folate combined with the ingestion of two toxins, methanol in home-brewed rum and cyanide in sugar cane. He said the disease was a variation of a rare but well described condition known mitochondrial optic neuropathy, or M.O.N., that had reached epidemic proportions because of recent changes in nutritional and drinking habits.

M.O.N. is usually a genetic dis-

order, and ordinarily does not damage both eyes at the same time. Dr. Sadun said he was speaking of a nongenetic variation caused by toxins like methanol and cyanide.

Dr. Lincoff disagreed, saying that Dr. Sadun lacked proof for such a diagnosis and that there was no evidence that the disease could result in loss of vision in both eyes simultaneously, as is happening in Cuba.

Not only the name of the disease but the number of those affected is in dispute. Cuban health officials have said that almost 26,000 people are afflicted. Dr. Sadun said he and other experts from Orbis and Paho told Mr. Castro in their daily meetings last week that the number was inflated because many cases had been misdiagnosed. Many of these individuals had other serious visual and neurological disorders.

Initially, predominantly adult men were afflicted. But in recent weeks, Cuban doctors diagnosed the condition in many women. Dr. Sadun said his team had determined that many recent cases could be attributed to malingering or hysteria. The group used tests that are standard in the United States for determining whether a person can see, he said, in order to diagnose the cases of malingering or hysteria.

On being told about the misdiagnoses, Dr. Sadun said, Mr. Castro "was extremely receptive to what should have been a very threatening comment."

"His eyes lit up," Dr. Sadun went on, "he slapped his hand and said, 'I knew it. That explains why the characteristics of the disease have shifted so much.'"

Mr. Castro's views toward the cause of the epidemic seem to have changed between the meeting that Dr. Hirano had on May 6 and the ones Dr. Sadun's team had last week. Ear-

[nature](#) > [nature food](#) > [articles](#) > articleArticle | [Published: 27 September 2021](#)

African swine fever outbreaks in China led to gross domestic product and economic losses

[Shibing You](#) ✉, [Tingyi Liu](#), [Miao Zhang](#), [Xue Zhao](#), [Yizhe Dong](#) ✉, [Bi Wu](#), [Yanzhen](#)[Wang](#), [Juan Li](#), [Xinjie Wei](#) & [Baofeng Shi](#) ✉[Nature Food](#) **2**, 802–808 (2021) | [Cite this article](#)[Download PDF](#)

Associated Content

The \$100-billion toll of a pig epidemic in China

Nature | **Research Highlight** | 01 Oct 2021[Sections](#)[Figures](#)[References](#)[Abstract](#)

And so I became fascinated with impaired ox-phos/ mitochondria as the basis of fatiguing illnesses

- and in the intervening 29 years, a huge amount of detail regarding the many roles of mitochondria have been discovered
- it remains a fertile field for the basic scientist, and a huge area for drug discovery
- But people are both complex and unique
- Studying humans is a bit different than studying genetically identical mice
- Unfortunately, we are forced to rely on empiric/experiential evidence in humans

Vitamins are crucial for every major cellular process

B1. Thiamine

B2. Riboflavin / FAD.
Complex 2 cofactor,
regulates ROS

B3. Niacin / NAD /
NADP, regulates ROS,
Complex 1 cofactor

B5. Pantothenic acid/ CoA

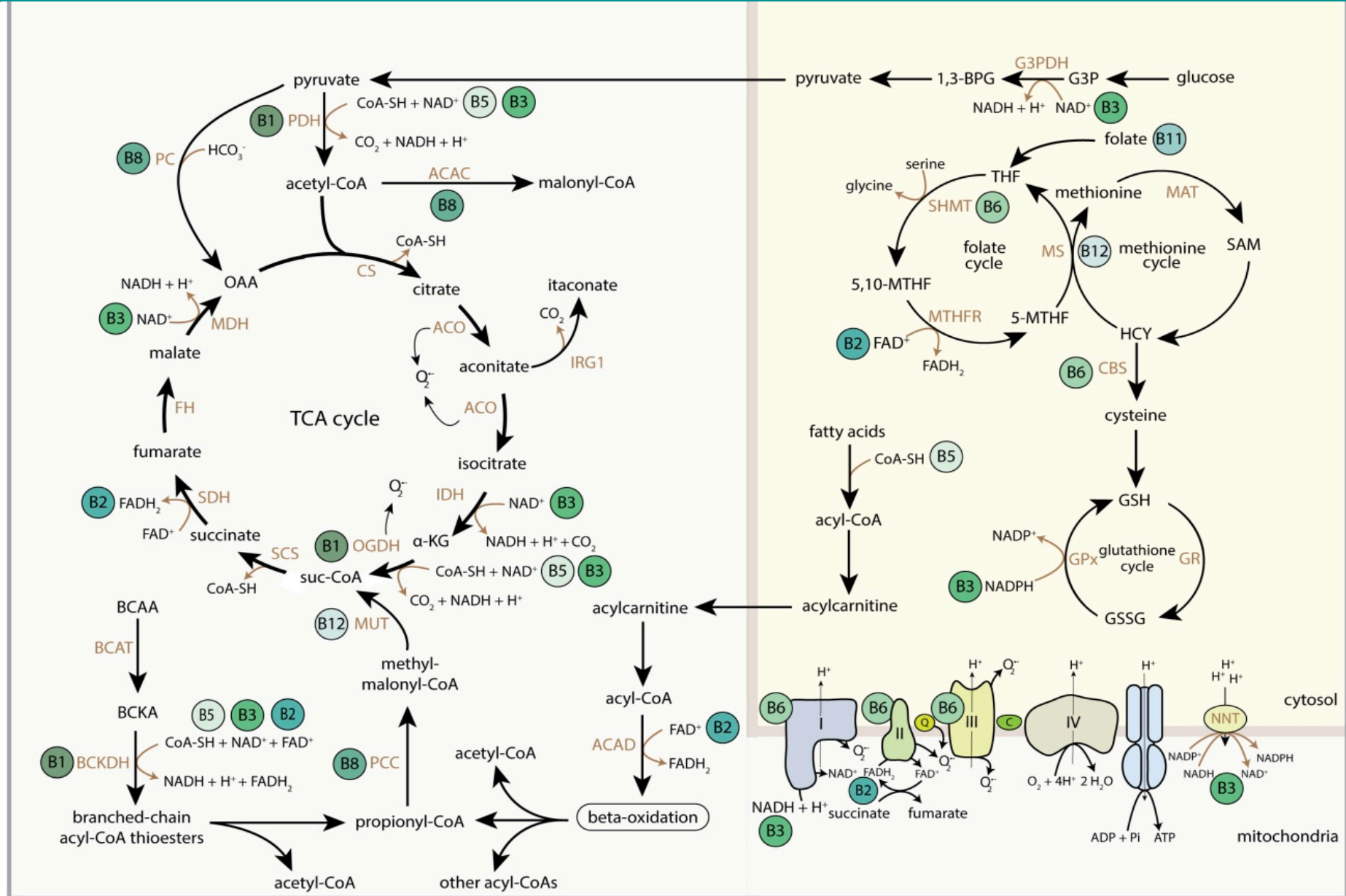
B6. Pyridoxine <50 mg/d

B8. Biotin

B11. Folate <5mg/day*

B12. Cobalamin (also
HCN scavenger if hydroxo
or methyl cobalamin)

* Don't overdose



ROS/Oxidative stress = unpaired electrons

There is no proof supplemental antioxidants improve health or longevity, though **control** of ROS/RNS is important
(The free radical theory of aging remains a theory)

Exogenous Causes

- pollutants
- solvents
- pesticides
- [heavy metals](#)
- **trans fats, microwaved lipids**
- [tobacco](#) smoke, alcohol
- drugs (NSAIDS for example)
- microplastics
- radiation, UV, chemotherapy
- vaccine injury

Beneficial effects

- Platelet and WBC recruitment
- Programmed cell death
- Host defense
- Signalling

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4044300/>

Many different kinds of molecules can act to counter oxidative stress as electron donors



antioxidants



Review The Role of Antioxidants in the Interplay between Oxidative Stress and Senescence

Angelica Varesi ^{1,2,*}, Salvatore Chirumbolo ³, Lucrezia Irene Maria Campagnoli ⁴, Elisa Pierella ⁵, Gaia Bavestrello Piccini ⁶, Adelaide Carrara ⁷, Giovanni Ricevuti ⁸, Catia Scassellati ⁹, Cristian Bonvicini ^{10,†} and Alessia Pascale ^{4,*,†}

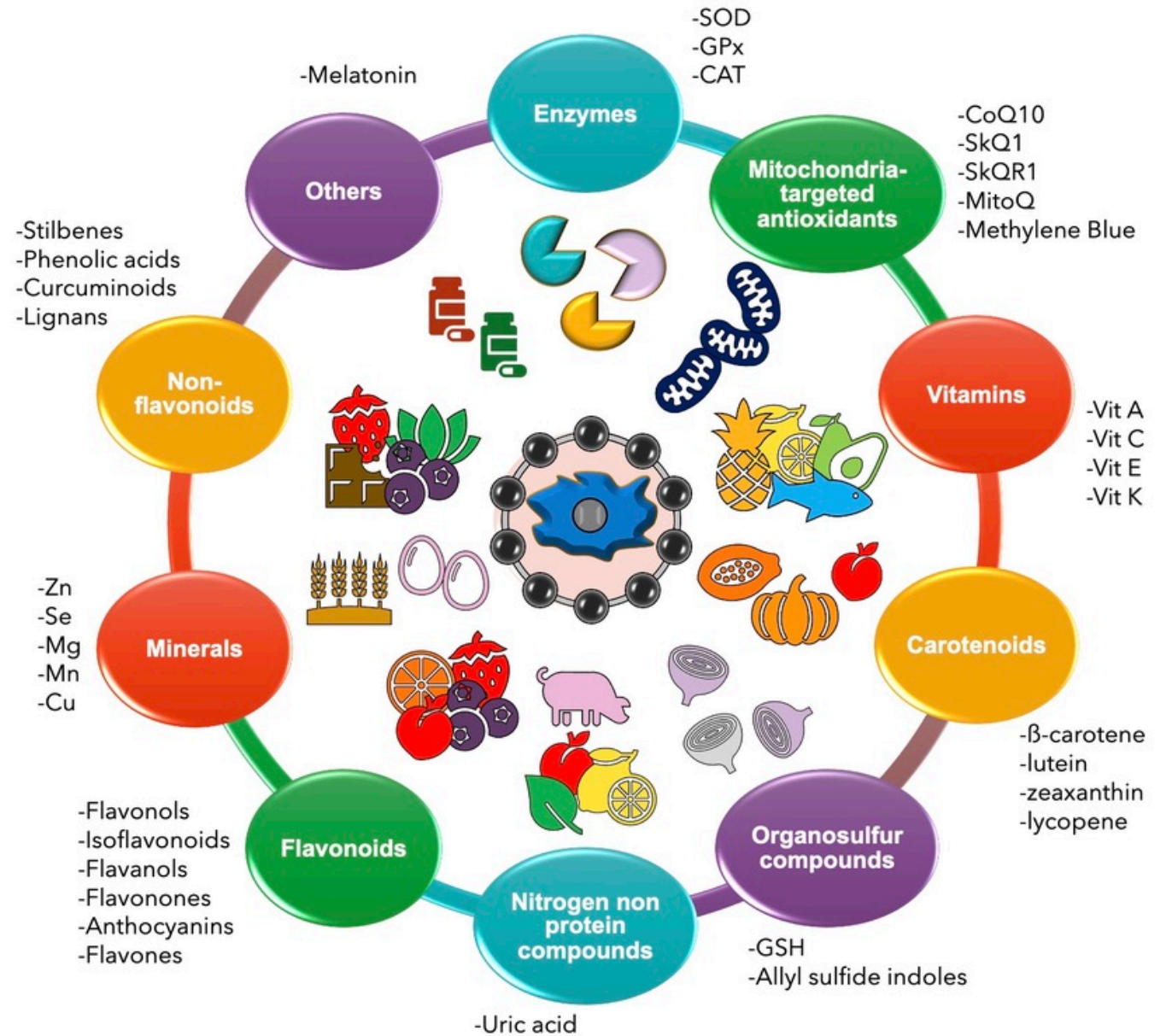


Figure 2. Antioxidants: classification. The figure illustrates the main classes of antioxidants capable of counteracting oxidative stress-induced senescence: enzymes, mitochondria-targeted antioxidants, vitamins, carotenoids, organosulfur compounds, nitrogen non protein compounds, flavonoids, minerals, non-flavonoids, and others.

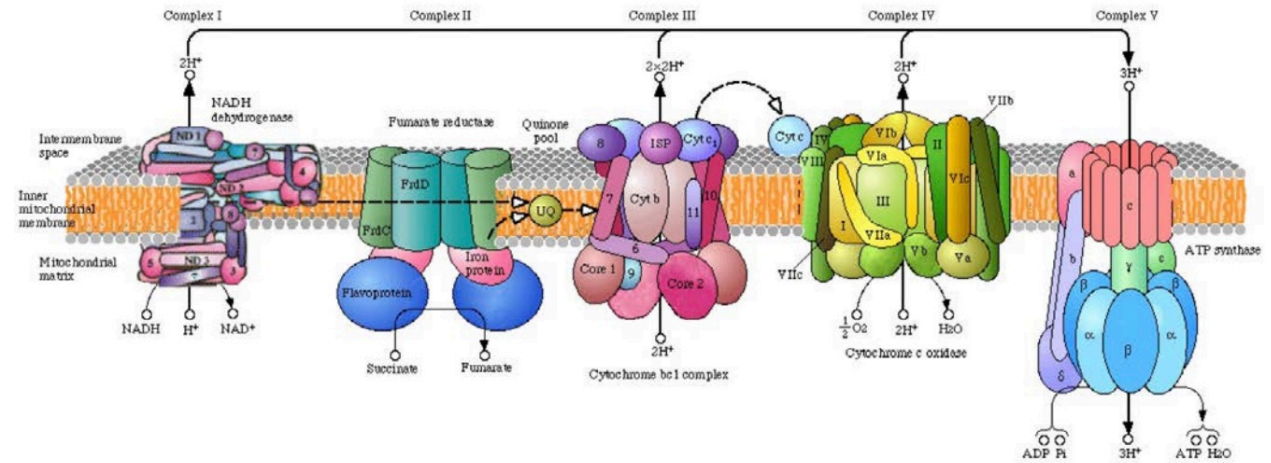
'The Science' Takes Us Back to Diet...

- **Vitamin C**: Broccoli, [Brussels sprouts](#), cantaloupe, cauliflower, grapefruit, leafy greens (turnip, mustard, beet, collards), honeydew, [kale](#), kiwi, lemon, orange, papaya, snow peas, strawberries, [sweet potato](#), tomatoes, and bell peppers (all colors)
- **Vitamin E**: [Almonds](#), avocado, Swiss chard, leafy greens (beet, mustard, turnip), peanuts, red peppers, spinach (boiled), and sunflower seeds
- ***Carotenoids including beta-carotene and lycopene***: Apricots, asparagus, beets, broccoli, cantaloupe, carrots, bell peppers, [kale](#), mangos, turnip and collard greens, oranges, peaches, pink grapefruit, pumpkin, [winter squash](#), spinach, [sweet potato](#), tangerines, tomatoes, and watermelon
- ***Selenium***: Brazil nuts, fish, shellfish, beef, poultry, barley, [brown rice](#)
- **Zinc**: Beef, poultry, oysters, shrimp, sesame seeds, pumpkin seeds, [chickpeas](#), [lentils](#), cashews, fortified cereals
- ***Phenolic compounds***: Quercetin ([apples](#), red wine, onions), catechins ([tea](#), [cocoa](#), berries), resveratrol ([red and white wine](#), grapes, peanuts, berries), coumaric acid (spices, berries), anthocyanins (blueberries, strawberries)

- Various common medications poison the 5 Complexes of the electron transport chain

- You need to remove these drugs in fatigued patients

Graphic from Kendall Wallace,
University of Minnesota



<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>
Amytal	Cyclophosphamide	Acetaminophen	Cephaloridine	Oligomycin
Haloperidol	Ketoconazole	Isoflurane	Cefazolin	Propofol
Chlorpromazine	Hydrazine	Sevoflurane	Cefalotin	
Fluphenazine	Isoniazid	Propofol	Tamoxifen	
Risperidone				
Clozapine				
Nefazodone				
Clofibrate, Fenofibrate,				
Ciprofibrate				
Troglitazone,				
Rosiglitazone,				
Pioglitazone				
Metformin,				
Phenformin, Buformin,				
Metformin				
Bupivacaine,				
Lidocaine, Halothane,				
Flutamide, Dantrolene				
Phenytoin				

Pharmaceutical Uncouplers of Mitochondrial Respiration:

Amphetamines, doxorubicin, Flufenamic acid, Diflunisal,
Tolfenamic acid, Mefenamic acid, Diclofenac,
Indomethacin, Naproxen, Nimmesulide

Mitochondrial toxicity database with 1400 entries

Lin, YT., Lin, KH., Huang, CJ. *et al.* MitoTox: a comprehensive mitochondrial toxicity database. *BMC Bioinformatics* **22** (Suppl 10), 369 (2021).

<https://doi.org/10.1186/s12859-021-04285-3>

From: MitoTox: a comprehensive mitochondrial toxicity database

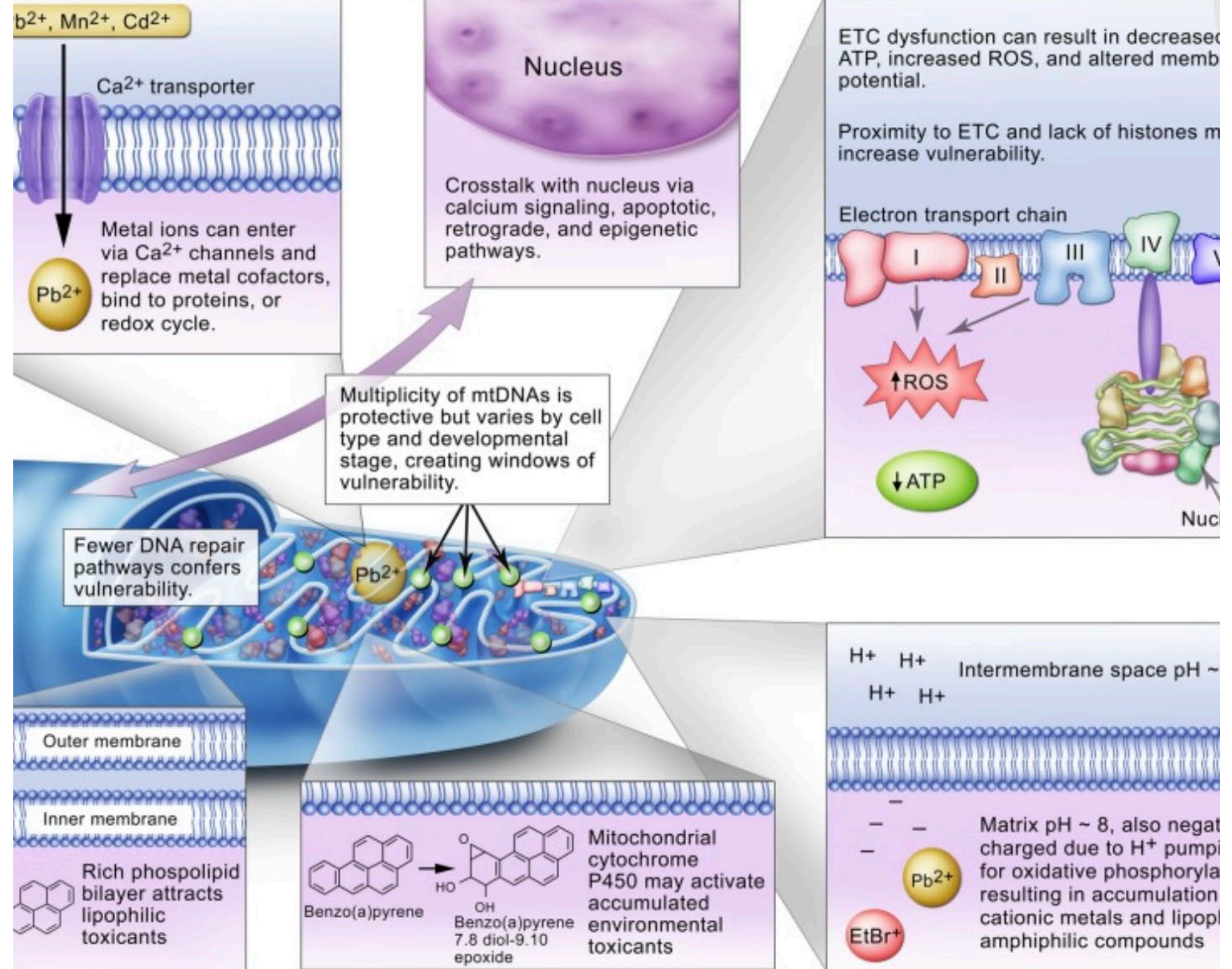
Indication	Drug Name	Mechanism of mitochondrial toxicity	Status	Toxicity
Antidiabetic	Troglitazone ✓	Inhibition of ETC	Withdrawn, 2000	Hepatotoxicity
	Rosiglitazone	Inhibition of ETC	Approved, investigational	Cardiotoxicity
	Pioglitazone	Inhibition of ETC	Approved, investigational	Cardiotoxicity
	Ciglitazone	Inhibition of ETC	Discontinued	NA
	Darglitazone	Inhibition of ETC	Discontinued	NA
	Muraglitazar	Inhibition of ETC	Discontinued	NA
Anticancer	* Metformin ✓	Inhibition of complex I; uncoupling; impaired TCA cycle	Approved	Lactic acidosis
	Doxorubicin	Increased ROS; mtDNA adduct; iron overload	Approved	Cardiotoxicity
Hyperlipidemia	Cisplatin	Inhibition of Complex I	Approved	Nephrotoxicity
	Fenofibrate ✓	Inhibition of complex I	Approved	Hepatotoxicity
	Clofibrate	Inhibition of complex I	Approved	Hepatotoxicity
Psychotropic	Ciprofibrate	Inhibition of complex I	Approved	Hepatotoxicity
	Valproic acid ✓	Inhibition of TCA cycle	Approved	Coma and respiratory depression
	Clozapine ✓	Inhibition of the ETC	Approved	Metabolic syndrome
	Fluoxetine ✓	Uncoupler	Approved	CNS, GI effects
Analgesic	Nefazodone	Inhibition of Complex I and complex IV	Withdrawn	Hepatotoxicity
	* Acetaminophen ✓	Oxidative stress	Approved	Hepatotoxicity
	Aspirin ✓	mPTP potentiation	Approved	Cardiotoxicity, GI effects
Antibacterial	Diclofenac ✓	Inhibition of ETC and ATP synthase	Approved	Nephrotoxicity
	Imipenem ✓	Oxidative stress	Approved	Nephrotoxicity
Antiviral	Chloramphenicol	Depletion of iron	Approved	Aplastic anemia
	Zidovudine ✓	mtDNA replication (inhibit mtDNA polymerase-γ)	Approved	Myopathy

So many ways things can go awry with mitochondria

[Toxicol Sci.](#) 2018 Mar; 162(1): 15–23.

Mitochondrial Toxicity

[Joel N Meyer](#), [Jessica H Hartman](#), and [Danielle F Mello](#)



Mitochondrial mutations affect at least one in 4,300 people Leber's Hereditary Optic Neuropathy (LHON) is most common, and a good model for mitochondrial diseases

- Leber's results from one of several mtDNA mutations. It affects vision primarily, but can cause extensive effects on cardiac conduction, multiple nervous system effects, muscles, endocrine organs, etc.
- Maternal transmission. Heteroplasmy. Male predominance
- Alcohol, tobacco, B12. Mitochondrial drug avoidance
- A much larger number of individuals is affected by diseases associated with, but not necessarily caused directly or entirely by mitochondrial dysfunction, including common diseases of aging such as Parkinson's Disease, Alzheimer's Disease, and cancers ([Wallace, 2005](#)).

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5837373/>

Antihypertrophic Effects of Small Molecules that Maintain Mitochondrial ATP Levels Under Hypoxia

Hiroaki Nagai   • Tomoko Satomi • Akiko Abiru • Kazumasa Miyamoto • Koji Nagasawa • Minoru Maruyama • et al. [Show all authors](#)

1. About 4 of my patients told me they felt better than their baseline when taking ivermectin (half life > one month) and wanted more, which I was afraid to prescribe.
2. Geert Vanden Bossche, DVM, noted that many years ago, racehorses were doped with ivermectin because it improved performance and could not be detected.
3. "we identified small-molecule drugs, including the anti-parasitic agent, ivermectin, that maintain mitochondrial ATP levels under hypoxia in cardiomyocytes... ivermectin increased mitochondrial ATP production by inducing Cox6a2, a subunit of the mitochondrial respiratory chain. Furthermore, ivermectin inhibited the hypertrophic response of human induced pluripotent stem cell-derived cardiomyocytes. Pharmacological inhibition of importin β , one of the targets of ivermectin, exhibited protection against mitochondrial ATP decline and cardiomyocyte hypertrophy." *
4. In some studies, ivermectin was found to be an inducer of cancer cell death. It extended life and increase mitochondrial activity in rotifers, tiny aquatic animals. Erythromycin worked too.**

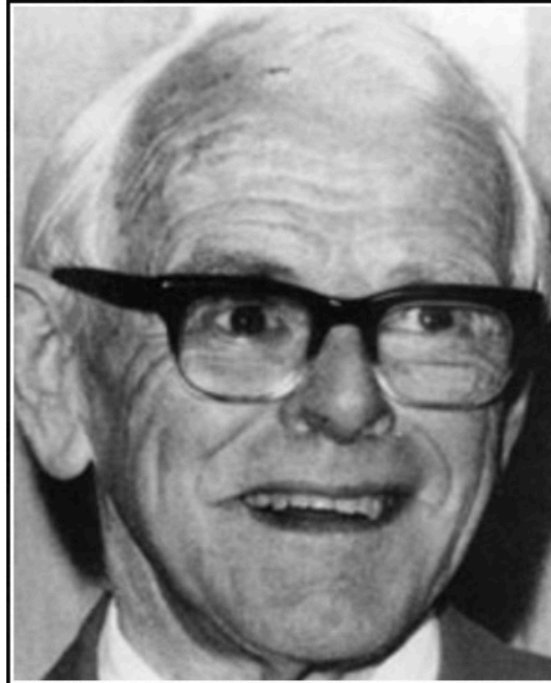
* [https://www.thelancet.com/article/S2352-3964\(17\)30376-6/fulltext](https://www.thelancet.com/article/S2352-3964(17)30376-6/fulltext).

**<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5834582/>

Irish Surgeon Sir Denis Burkitt (1911-93) made amazing discoveries



1. Burkitt's Lymphoma
2. The Fiber hypothesis:
Fiber consumption
reduces colorectal
cancer, constipation,
diabetes and heart
disease



It is better to read a little and
ponder a lot than to read a lot and
ponder a little.

— Denis Parsons Burkitt —

AZ QUOTES

It is better to read a little and ponder a lot than to read a lot and ponder a little.

[Denis Parsons Burkitt](#)

Partial list of mitochondrial supplements

From a 2014 review article by
my friend and colleague Garth
Nicolson:

[Integr Med \(Encinitas\)](#). 2014 Aug;
13(4): 35–43. Nicolson, Garth.

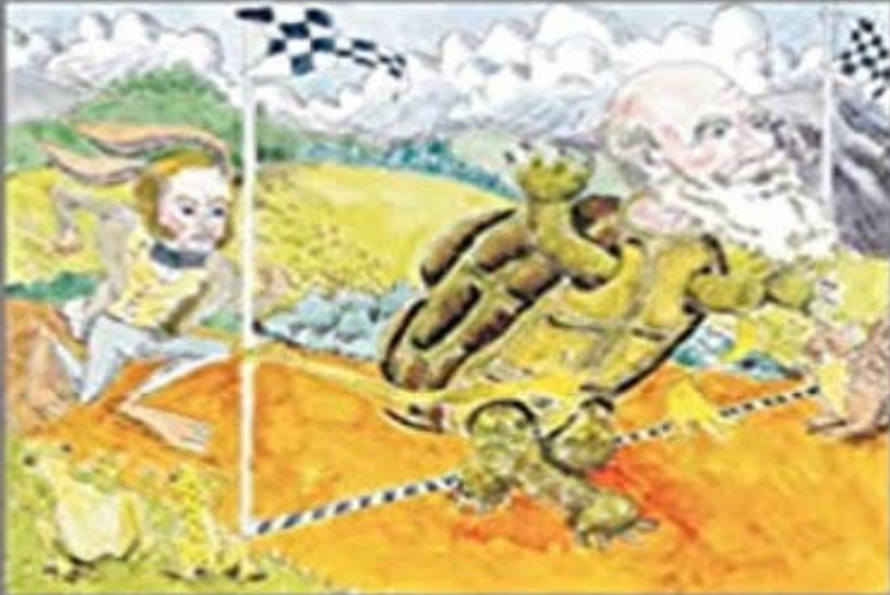
Category	Examples
Vitamins	Vitamins C, D and E, thiamine, riboflavin
Minerals	Magnesium, calcium, phosphate
Lipids	Membrane phospholipids, unsaturated fatty acids
Metabolites	Creatine, pyruvate
Cofactors	CoQ ₁₀ , α-lipoic acid, NADH, nicotinic acid
Transporters	L-Carnitine, membrane phospholipids
Antioxidants	CoQ ₁₀ , α-lipoic acid, NADH, glutathione
Enzyme inhibitors	α-Lipoic acid, dichloroacetate
Herbs	Curcumin, schisandrin

So, FWIW, this is what I take and I believe it gives me considerable energy, based on challenge--rechallenge



Aging is a Group-Selected Adaptation

Theory, Evidence, and Medical Implications



Josh Mitteldorf

Foreword by
Michael Rosenzweig



CRC Press
Taylor & Francis Group

A SCIENCE PUBLISHERS BOOK

Summary for the impatient*

Recommended for everyone

- **Vitamin D**, megadoses, perhaps with vit K to help maintain calcium balance
- **Aspirin or ibuprofen**, perhaps in alternating weeks
- **Melatonin** at bedtime
- **Telomerase activators**: (Milk thistle=Silymarin, Carnosine, **Ashwagandha**)
- **Curcumin**=turmeric

Recommended if it is right for you

- **Metformin** (prescription)
- **Rapamycin** (prescription)
- **Deprenyl=Selegiline** (prescription)
- **Resveratrol**
- **Fish or krill oil**
- **Acetyl L-Carnitine**
- **Creatine**
- **Horny Goat Weed**
- **Rhodiola**

*caution: Impatience is a mortality risk factor. 😊

MitoAction: Rx

<https://www.mitoaction.org/diagnosis/treatment/>

"Physicians specializing in metabolic diseases have found that every child and adult is biochemically different, meaning that no two people will respond to a particular treatment in a specific way, even if they have the same disease."

- **Vitamins and Supplements Prescribed Typically Include:**
- **Coenzyme Q10 – ubiquinol preferred**
- **Alpha lipoic acid**
- **Riboflavin and possibly other B vitamins**
- **Arginine – for stroke-like events**
- **Folinic acid – only routine for documented CSF deficiencies and diseases known to cause deficiency and considered with central nervous system manifestations**
- **L-carnitine – for carnitine deficient patients only**
- **Vitamin C – for intercurrent illness supplement**
- **Diet therapy, as prescribed by your doctor along with a registered dietitian, may be recommended.**
- **Exercise**

Anthrax vaccine--sound familiar?

<https://archives-veterans.house.gov/witness-testimony/dr-meryl-nass-md>

from my 2007 testimony to the House Veterans Affairs Committee

- Raw data from the military's Defense Medical Surveillance System in 2001 [\[28\]](#) revealed statistically significant increased rates of hospitalizations after vaccination, compared to pre-vaccination, for heart attacks, psychosis, depression, breast cancer, thyroid cancer, gallbladder and bile duct cancers, uterine cancer, diabetes, blood clots, asthma, multiple sclerosis and abnormal PAP smears in 300,000 soldiers. Yet no focused studies of these relationships have been conducted or made public since.
- An unpublished Navy study of active-duty women inadvertently vaccinated during the first trimester, revealed a 39% greater rate of birth defects in vaccinated mothers, compared to mothers who received anthrax vaccine at any other time. [\[29\]](#) An Army study found no increased rate of birth defects in vaccinated mothers, but did not examine first trimester vaccinations, and was admittedly not adequately powered to examine the issue. [\[30\]](#)
- Easily verifiable, but non-public, DoD and CDC data suggest that anthrax vaccine is associated with birth defects and long-term adverse effects. Just last month the GAO, citing CDC and Vaccine Healthcare Center officials as sources, reporting that 1-2% of anthrax-vaccinated individuals "may experience severe adverse events, which could result in disability or death." [\[31\]](#)

Anthrax vax illness and COVID vax illness, GWS, Lyme , fibromyalgia and other fatiguing illnesses share the same symptoms

- Gulf War Syndrome does not have an ICD-10 code. It is not described in medical textbooks yet, and it is not taught in medical schools. The massive, confusing body of published research is extremely difficult for the non-specialist, let alone a journalist, to understand. Veterans have so many symptoms they often appear to have psychiatric, rather than physical, illness to uninformed medical practitioners. Therapies recommended by the DVA emphasize the use of psychiatric medications as primary treatment modalities.[\[7\]](#) All these factors have conspired to create a smoke screen that both the ill veteran, the competent medical practitioner and policymakers have trouble penetrating.

On a Parting Note...

- I can tell you the point of departure for everything that 's gone wrong in medicine
- It happened when the sacredness of the bond between doctor and patient was lost
- We can be the plumbers and electricians of the body
- But soon the computers will do that better
- Unless we can make this profession about devotion to patients and not money and power, and we demand the time and tools to properly care for our patients, the practice of medicine will, appropriately, go the way of the dinosaur

Meryl Nass, M.D.



THANK YOU

