
Exercise for the Mind

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Heart Disease Theories

by *Stanford Field*

TOWARD CLARIFICATION

Much of this article takes place at the confluence of biochemistry, cardiology and physiology where the complexity of interactions induces a great deal of uncertainty.

The complications of the various theories and the perplexity of multiple variables has led to the use of the "risk factor" or "cookbook" approach to manage heart disease.

The main objective of this analysis is to go beyond the "risk factor" approach by clarifying heart disease theories, elucidating important biochemical mechanisms and offering an orthomolecular protocol for a healthy heart.

WHAT'S AHEAD

- Cholesterol Theory
- Homocysteine Theory
- Collagen Theory
- Inflammation Underlies All These Theories, But What Causes Inflammation?
- The Effect of Food on Heart Disease Mortality

CHOLESTEROL THEORY

In the early 1920s, pathologists found that a blockage of the heart artery by atherosclerosis resulted in a dead tissue area in the heart muscle (myocardial infarction). Furthermore, coronary arteries were blocked by platelets, fibrin and cholesterol-rich plaque, giving rise to the assumption that cholesterol was an important cause of the blockage. Patients

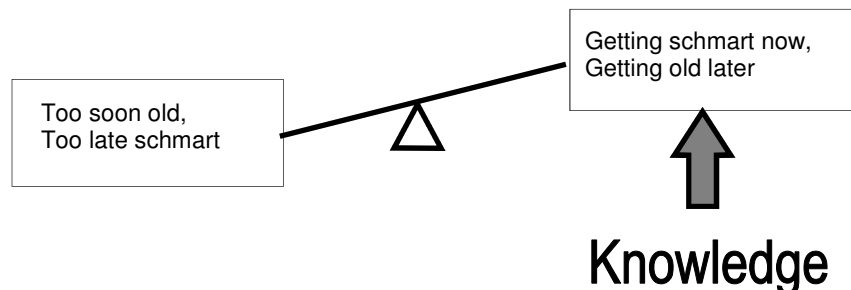
were put to bed in an oxygen tent where they could enhance their oxygen-deficient blood.

By the 1940-50s, patients were treated with the newly discovered coumarins which were obtained from spoiled sweet clover. Cattle or sheep consuming the spoiled clover eventually died of internal hemorrhaging. It was also fatal to rodents. Subsequently, it was used to treat heart disease patients because it could stop the formation of the fibrin clot that was part of the obstructive thrombus. However, the use of coumarins was limited because the therapeutic window was so narrow it could expose any patient to abnormal bleeding.

Beyond the 1950s, epidemiologists found more cardiovascular disease in countries where blood cholesterol levels were higher. About 50% of heart disease deaths occurred because of blocked arteries which were presumed to be mainly caused by cholesterol. The other 50% was attributed to acute stress incidents which resulted from emotional upset, uncontrolled anger that causes high adrenalin release and a speeding heart, and the intake of speed-inducing drugs such as amphetamines and ephedra. These acute stress incidents can cause vise-like pinching of the coronary arteries that produce angina (chest pain), muscle spasms and a good chance of sudden cardiac death.

In the 1960-1980s, the "Prudent Diet" came into being when it was learned that replacing saturated fats with polyunsaturated fats in the diet would reduce serum cholesterol and lower blood pressure. It was recommended that the intake of polyunsaturated vegetable fats be at least double that of saturated fats, and that margarine (hydrogenated vegetable oils [trans fats]) be substituted for butter, and that cholesterol intake should be minimized.

Exercise for the Mind is written by Stanford Field (BS chemical engineering [Penn State], 1951; MS meteorology [US Naval Postgraduate School], 1955). His chemical engineering career was in the oil and petrochemical industries. In 1993, he retired from Stanford Research Institute where he had been Director of Energy Programs. Since that time, he has been avidly studying biochemistry and physiology with the aim of staying healthy. This document is written to add to the general knowledge of interested readers. The publication has neither profit nor political motives.



The UCLA Prudent Diet Trial on men lasted eight years with the following results:

	<u>Prudent Diet</u>	<u>Controls</u>
Fatal Heart Attacks (%)	48	70
Cancer Deaths (%)	31	17
	<u>79</u>	<u>87</u>

It was concluded that the Prudent Diet was trading heart disease for cancer, and for some unknown reason, polyunsaturated vegetable oils were causing cancer. By the end of the 20th century, the Japanese discovered why vegetable oils cause cancer.

POISONING BY VEGETABLE OILS

After margarine was endorsed by the American Heart Association and their little red heart was placed on margarine containers, it was rapidly swept off grocery store shelves and fed into the bodies of everyone in America! Margarine contains partially hydrogenated fat called “trans fatty acids” which were later found to be linked to the following detrimental health effects:

- Tumor growth and metastasis
- Inhibition of key metabolic enzyme reactions
- Low birth weight in infants
- Decreased testosterone in men
- Prostate enlargement
- Heart disease
- Higher LDL and lower HDL
- Excess glutamate-induced neuronal death

Even so, now in the 21st century, trans-fats are found in bread, cake, candies, canned soup, cereals, cookies, crackers, doughnuts, cheese, grocery store oils and margarine.

A side trip to Japan: In the 1950s, a chemical plant in Minimata continuously discharged large amounts of waste mercury compounds into Minamata Bay. The passage of mercury through the aquatic food chain led to human deaths following the consumption of fish that lived in the bay. Infants were born with severe mental retardation and the absence of limbs.

Concerns about sea foods contaminated with mercury and polychlorinated biphenyls, caused a sharp increase in the use of vegetable oils. The subsequent steadily rising cancer rates provided the incentive for animal research and epidemiological studies to uncover the causes. That research culminated in a report, issued in 1997, that contained electrifying evidence that **linoleic acid** and its metabolite, **arachidonic acid**, were prominent causes of a variety of cancers, cardiovascular and cerebrovascular diseases and allergic hyper-reactivity in Japan.

The linoleic acid content of various common oils is shown in the following table:

Oils	Linoleic Acid (%)
Medium Chain Triglycerides	0
Cod Liver	2
Olive	8
Flax Seed	16
Corn	59
Safflower	80

This table strongly indicates that the most healthy oils are olive oil (for general use), cod liver oil (one tbs per day for eicosapentaenoic acid [EPA] docosahexaenoic acid [DHA]) and medium chain triglycerides [MCT oil] for fat burning and weight loss. It is imperative to take fat-soluble antioxidants when taking cod liver oil to prevent the oxidation of the numerous delicate double-bonds in the oil.

The least healthy oils (the highest sales volume in the U.S.) are safflower and corn oils (extremely high in linoleic acid). Furthermore, the grocery store oils are hydrogenated to increase shelf life. That hydrogenation generates transfats that preferentially displace the omega-3 oils (EPA and DHA) that give cell membranes their flexibility. The transfats are disruptive and contribute to dysfunction. It has been estimated that the use of linoleic acid-containing oils in the U.S. is more than 20 times higher than it should be. **How does linoleic acid (an essential fat) do so much damage?**

There are two excesses that synergistically combine to wreak havoc. The extremely high sugar consumption in the U.S. causes high insulin levels as the body desperately tries to lower glucose in the bloodstream. For example, a soft drink that contains about 30-40 grams of sugar easily overwhelms the body's equilibrium glucose level of about 5 grams. Insulin levels soar as the body tries to return to equilibrium. Insulin converts the glucose to triglycerides which are stored as fat.

The high insulin levels promote the conversion of the large excess of linoleic acid to a concomitantly large excess of arachidonic acid which is the mediator of not only inflammation (a cause of atherosclerosis), but also of prostaglandins-2, and more specifically, PGE-2. The PGE-2 causes the expression of the aromatase enzyme which causes the formation of excess estradiol which causes endometriosis, prostate enlargement and carcinogenic growth.

TRANSMUTING CHOLESTEROL INTO GOLD

In the 1960-70s, the pharmaceutical industry responded to the perceived cholesterol threat by developing a variety of drugs to lower cholesterol in

the body. The most prominent drug was the “statin” which successfully lowered cholesterol by blocking an enzyme involved in the conversion of the 2-carbon acetate fragment into the 27-carbon cholesterol molecule. The drug also prevented the desired formation of coenzyme Q-10 which is a powerful lipid antioxidant and is **essential** for the energy system of every one of the 60-100 trillion cells in the body. The loss of Co-Q-10 caused muscle weakness and compensating enlargement of the heart muscle (muscular dystrophy). The corollary dangers of the intentional reduction of Co-Q-10 output has proven to be an affliction for all statin users.

Health problems are compounded because statins also inhibit the production of 7-dehydrocholesterol, the molecule that is converted by ultraviolet light to vitamin D, which is super-essential for health.

Furthermore, doctors are unknowingly prescribing statins to lower high cholesterol caused by the unprecedented consumption of sugar which is converted to fat and cholesterol if it is not immediately used for energy.

OXYCHOLESTEROLS

Also in the 1960-70s, important knowledge about the biochemistry of heart disease was obtained from examination of the bodies of *young* men killed in the Korean (1950s) and Vietnam (1960s) wars. Autopsies showed they had atherosclerosis (blockage of coronary arteries with cholesterol plaques). It was found that oxidized cholesterols caused the blockages.

The **oxycholesterols** were fed to the soldiers in the form of powdered eggs and powdered milk that had come from the oxidation induced by the spray drying (done at 400-700 degrees Fahrenheit) of eggs and milk to avoid the inconvenience of shipping the associated water to distant battlefields. This is probably still the situation with the soldiers that are embattled in Iraq today (2006).

Even today, most whey protein is spray-dried and contains oxycholesterols. It dominates the market and is promoted as a protein health food for athletes to mix in their morning shake. However, there are whey proteins available that are made by low-temperature filtration and ion exchange that do not contain oxidized cholesterols. They are more expensive and people generally do not know why they should buy the higher-priced product.

DAMAGE, REPAIR AND OBSTRUCTION

Plaque deposits are not formed randomly in the circulatory system. Plaque always forms nearest the heart where blood vessels are constantly under mechanical stress by being vibrated and stretched as the heart pulsates. Plaque deposits always occur in regions of the highest blood pressure such as the aorta which receives blood that is forcefully pumped from the heart.

By the 1990s, **it was clear that oxycholesterols and other oxidants cause inflammation in the lining of the arteries.** The damaged area is immediately clotted with an aggregate of platelets and a mesh of fibrin molecules. That first line of defense is followed with a buildup of cholesterol and calcium that repair and strengthen the damage. As the buildup of repair molecules takes place, they form an

obstruction that hinders the flow of blood. The arteries become tough and inflexible which makes it difficult for red blood cells to deliver oxygen to the cells.

Homocysteine Theory

In the mid-1800s, European pathologists discovered that blood clots formed layers on the internal lining of arteries. These layers became calcified into tough, hardened arteries that couldn't be cut with a scalpel. The disease became known as “arteriosclerosis.”

In the 1920-30s, the amino acid methionine was discovered, and it was subsequently found to be essential for human life. Afterward, the amino acid homocysteine was discovered, but its importance was not known for many years. In 1933, at the Massachusetts General Hospital, an eight year old boy with a rare inborn error of metabolism, died of a stroke. This highly unusual occurrence resulted in an autopsy which showed he had advanced arteriosclerosis throughout his body, especially in the arteries of the heart, neck and legs. This provocative case could not be explained and was buried in the archives and forgotten.

In the 1950s, a methionine derivative, **S**-adenosylmethionine (SAM) was discovered at the National Institutes of Health in the United States. SAM was made from methionine and adenosine triphosphate (ATP) using liver enzymes. **Subsequently, it was found that SAM mediated nearly all methylation reactions. Methylation is vital for humans. Incidentally, alcohol consumption delivers a one-two punch to the liver by consuming the liver's glutathione for detoxification and by inhibiting the enzyme that converts methionine to SAM.**

In the 1960s, in Ireland, a metabolic disease called “homocystinuria” was discovered. In homocystinuria, the liver is unable to dispose of homocysteine via the cystathionine route. Homocystinuria is characterized by the dislocation of lenses of the eyes, chronic fatigue, mental retardation, psychiatric disturbances and thromboembolic (blood clots to repair damage) episodes. Thromboembolism occurs when a blood vessel is blocked by an embolus (clot) carried in the bloodstream from the site of formation of the clot to another location. A clot that obstructs the carotid arteries leading to the brain, for example, is likely to cause a stroke and death in parts of the brain.

HOMOCYSTEINE: WHY IS IT DANGEROUS?

Homocysteine is a powerful oxidant that attacks the lipid membranes of endothelial cells that line the arteries and veins of the circulatory system. Inflammatory mediators are released by the immune system that induce blood clotting factors at the site of damage. Platelets and fibrin form a mesh that is followed by **cholesterol which is promptly oxidized by homocysteine and thiolactone.** The thiolactone is derived from excess methionine in the diet. **Lysine, a common amino acid, can defuse the situation by forming an adduct with the thiolactone and by reducing homocysteine from its oxidative state.**

If lysine or antioxidants are not available, a dangerous chain reaction of oxidation ensues, but that's not the end of it. **Homocysteine blocks the production of nitric oxide in**

cells that line the blood vessels. The loss of nitric oxide causes the endothelial cells to lose their pliability and to become stiff and thickened with calcium deposits. The oxidized endothelial cells are repaired by an aggregate which forms a brittle, tough and hardened patch to seal the damage, but at the same time, the patch blocks the blood flow. This phenomenon is labeled "arteriosclerosis."

WHAT CAUSES HOMOCYSTEINE TO RISE TO UNSAFE LEVELS?

The homocysteine theory is based on the fact that a dietary imbalance between too much methionine (an essential amino acid) and a deficiency of methylating nutrients (B6, B12, folic acid and methyl donors such as trimethylglycine [TMG] and trimethylaminoethanol [choline]) is an underlying cause of death and disability from vascular diseases. That imbalance causes a buildup of homocysteine and thiolactone which initiate an inflammatory cascade. Antioxidants and lysine (forms an adduct with thiolactone), will decrease the harmful effects of those oxidants.

The estimated risk for coronary artery disease based on homocysteine in the blood is shown in the following table:

Estimated Risk for Coronary Artery Disease	Homocysteine (micromols/liter)
Low	6-10
Moderate	10-15
High	15+

KILMER S. McCULLY, MD

Dr. McCully summarized his 35 years of pioneering research on homocysteine in a book "The Homocysteine Revolution" published in 1997. Dr. McCully deserves a great deal of appreciation for his assiduous pursuit of disparate facts despite impediments put in his path. His effort resulted in defining the importance of homocysteine.

Collagen Theory

SCURVY = BODY FALLING APART

The first recorded symptoms of scurvy were made by the Egyptians about 1500 BC. Scurvy did not emerge as a problem for maritime explorers until voyages were long enough to penetrate the Indian and Pacific oceans from Europe. In 1520, Magellan lost more than 80% of his crew to scurvy on the voyage around the southern tip of South America and across the Pacific in the first global circumnavigation.

Written accounts during these early voyages describe scurvy: **skin black as ink, ulcers, difficult respiration, loosening of the limbs, teeth falling out, the rotting of gum tissue which fell out of the mouth and gave the victim's breath an abominable odor.**

Physicians speculated that scurvy was caused by a salt diet, lack of oxygen (the men slept in the foul and dank hold below decks), fat skimmed from boiling pans in the ship's galley, bad air, thickening of blood, sugar and melancholy. Thus, the causes of scurvy presented a great challenge for medicine.

A person who is dying of scurvy stops making collagen, and his body literally falls apart. His joints fail because he can no longer keep the ligaments, tendons and cartilage strong enough to hold things together. His blood vessels break open; his gums ulcerate and his teeth fall out; his immune system deteriorates and, ultimately, he dies. Early signs of scurvy are bleeding gums and poor wound healing.

People were aware that once victims were ashore, they could recover by eating grass, wild celery, nasturtiums, cabbage and fruit. In the mid-1700s, Dr. James Lind, a British naval surgeon, established the fact (by trial and error) that oranges and lemons had a rapid beneficial effect on scurvy. By the end of the 1700s, oranges, lemons and limes became standard rations in the Royal Navy. The British sailors ("limeys") were getting just enough ascorbic acid from fruits and vegetables to prevent scurvy. However, one hundred fifty years later, the knowledge had not spread to the California gold fields where, in the 1850s, miners were plagued with scurvy.

The Collagen Theory holds that human cardiovascular disease is a pre-scurvy condition.

COLLAGEN NOT ONLY HOLDS THE BODY TOGETHER, BUT ALSO ALLOWS TRILLIONS OF CELLS TO COMMUNICATE INSTANTLY

Collagen is the main protein of the extracellular matrix which literally holds the trillions of cells of the body together. It is basic to the structure and function of blood vessels, bones, skin, cartilage, joints, ligaments, tendons and interstitial tissues in all organs.

Collagen is made from a linear chain of amino acids that consists mainly of glycine, proline and lysine that are biochemically linked in the presence of ascorbic acid, bioflavonoids, ferrous iron and copper Three of the linear amino acid chains spiral around each other to form a long helical protein rope-like structure which is the main part of collagen. Bone collagen is extensively cross-linked to maximize rigidity.

Recent research indicates that collagen has the ability to conduct electromagnetic energy (at the speed of light) which allows instantaneous transmission of electromagnetic signals among all cells. This biological internet provides the means for the communications necessary to coordinate the activities of the trillions of cells that make up the body. This is analogous to the fiberoptic cables that make up the world's communications network.

NORMAL DISSOLUTION OF COLLAGEN

The main immune system cells (monocytes, macrophages and neutrophils) use the dissolution of collagen for their migration through body compartments. They secrete plasminogen activators which induce plasmin which, in turn, causes the formation of collagenase which dissolves collagen.

During ovulation, leutenizing hormone and follicle stimulating hormone also stimulate the secretion of plasminogen activators that cause the degradation of ovarian connective tissue to allow for ovulation.

Similarly, trophoblast cells use plasmin-induced proteolysis to enter the wall of the uterus to implant the embryo just after conception. Under hormonal stimulation, mammary and uterine cells secrete plasminogen activators to initiate morphological changes in the mother during pregnancy and lactation.

As part of the fertilization process, a sperm cell will secrete hyaluronidases to dissolve the outer shell that protects the ovum, thus allowing the sperm and ovum cells to meet.

MORE DISSOLUTION OF COLLAGEN

All types of cancer cells continuously secrete plasminogen activators that dissolve the surrounding extracellular matrix and pave the way for metastasis into other parts of the body.

Virally transformed cells (e.g. Herpes virus) secrete plasminogen activators to promote the systemic spread of infection.

In the vascular wall that has become injured by oxidation (as in the case of cardiovascular disease), as part of the repair process, inflammatory cytokines alert the immune system. The damaged area is immediately clotted with an aggregate of platelets and a mesh of fibrin molecules that is catalyzed by calcium. Blood monocytes detect the presence of oxidized lipoproteins and enter the vascular wall to become macrophages which secrete plasminogen activators to produce plasmin which activates procollagenases to produce collagenase which dissolves the damaged connective tissue in the vascular wall in preparation for replacement. **If the nutrients that build collagen are available, repair of the damage will take place. Glucocorticoids, other anti-inflammatory agents and pain killers (e.g. morphine, Vicodin, aspirin) inhibit the induction of plasmin and the repair process.**

PATHOGENIC DISSOLUTION OF COLLAGEN

Hyaluronic acid (composed of N-acetylglucosamine and glucuronic acid) is a central component of the extracellular matrix. Malignant tumors and some bacteria secrete the enzyme hyaluronidase that disintegrates the hyaluronic acid "backbone" of collagen that surrounds the cells. The collagen is weakened to such an extent as to permit invasion of the cells by bacteria and cancer (metastasis). **The addition of hyaluronic acid to intravenous ascorbate has had positive clinical effects in treating cancer.** However, the mechanisms are not yet known.

As a speculation, the nutritional supplementation with **calcium-D-glucarate and glucosamine sulfate**, combined with the body's acetyl groups and its innate wisdom, could provide the ingredients to make hyaluronic acid.

WHAT IF REPAIR NUTRIENTS ARE NOT AVAILABLE?: APO(a): BIOADHESIVE TAPE

The fracture in the arterial wall usually occurs in the area of high mechanical stress around the heart. The emergency response team releases cytokines that initiate the arachidonic acid cascade via eicosanoids that induce inflammation to warn of danger and initiate the healing process. **The cytokines also cause the release of C-reactive protein which activates apo(a) and other adhesion molecules to quickly mobilize a repair process.**

Apo(a) is attached to the outside of low density lipoprotein to form a repair complex. The aggregate of low density lipoprotein and apoprotein(a) is called "lipoprotein(a)" or abbreviated to "Lp(a)." **The Lp(a) aggregate slowly dissolves the fibrin/platelet clot before being attracted ("glued") to lysine and proline binding sites of collagen. Then, Lp(a) creates binding sites for cholesterol and calcium to strengthen the patch.** Thus, Lp(a) becomes the main patch for the stress fracture (the 1987 Nobel Prize in Medicine was awarded for that discovery). **Thus, apo(a) is a surrogate for ascorbate and other nutrients that build collagen and elastin that were not available.**

Lp(a): PREMIER HEART DISEASE INDICATOR

Pioneering research with lipids related to heart disease was done by Linus Pauling and Matthias Rath in the 1970s-1980s. **They estimated that lipoprotein (a) was a 10-times greater "risk factor" for heart disease than total cholesterol or LDL cholesterol.**

Today, we know that if Lp(a) is elevated, it means that heart disease exists and that the body is already trying to repair blood vessel stress fractures. Linus Pauling thought that plaques began to develop when Lp(a) was > 20 mg/dl in the plasma. In 2005, that limit was set at > 32 mg/dl. In 2003, at age 74, my first and only test came in at a satisfying 18 mg/dl. My partner-in-life, Judy (age 61) was at 4.5 mg/dl. That was phenomenal! **It is certain that Lp(a) is a prime indicator, and it should be a routine test for heart disease.**

Cholesterol-lowering drugs have no effect on Lp(a) because the biochemical pathway is different for Lp(a) compared to that for cholesterol. If a drug is developed to inhibit Lp(a), it will be like most others that "shoot the messenger" while not addressing the fundamental causes. If you shut down the Lp(a) alarm, the disease will escalate to get your attention. The alarm is an early attempt to heal and keep you alive.

COLLAGEN THEORY SUMMARY

The basis of the collagen theory of heart disease is that the main cause of atherosclerotic plaques is the weakness of artery walls caused by a chronic deficiency of nutrients that are required to strengthen and repair the arteries.

Atherosclerotic deposits develop to strengthen weakened blood vessels. The need for ascorbic acid, for example, is illustrated by the well-established fact that atherosclerotic disease does not occur in animals because they can synthesize ascorbic acid from glucose, whereas humans cannot. Healthy animals produce about 30 mg/d of ascorbic acid per pound of body weight. This would be equivalent to 5000 mg/d of ascorbic acid for a 167 lb person. In sickness, animals produce 10-30 times that amount.

In humans, it is known that high-dose vitamin C (as neutralized ascorbic acid), lysine, proline and other orthomolecular nutrients can repair and resolve advanced cardiovascular diseases.

ARE "RISK FACTORS" FADING AWAY?

After oxidation has overwhelmed the antioxidant defense system and has damaged arteries, what can happen?

(1) Emergency repairs appear in the form of an aggregate of platelets and a mesh of fibrin to form an immediate plug to stop bleeding.

(2) When there is a chronic deficiency of collagen-forming nutrients that are preferred to repair and strengthen arteries, the body uses a second line of defense by bringing Lp(a) consisting of apoprotein (a) attached to the outside of LDL to act as the "bioadhesive tape." The subsequent action of cholesterol and calcium in addition to the platelet/fibrin mesh/Lp(a) aggregate, forms a brittle, tough inflexible and hardened patch which strengthens arteries, but also blocks them.

(3) When there is a sustained surplus of collagen-forming nutrients, the body preferentially uses them instead of the Lp(a) complex to repair the damaged artery. The collagen-forming nutrients slowly dissolve the fibrin/platelet clot and replace it with collagen, elastin and other molecules that give natural strength to the intricate network (extracellular matrix) that surrounds, supports and regulates the behavior of cells and tissues.

(4) Using drugs to lower repair molecules such as cholesterol (by statins), LDL and Apo(a) is counterproductive. **The above-normal readings for cholesterol and LDL indicates that anti-oxidants and collagen-forming nutrients are required.** Drugs can reduce inflammation by shutting down the body's alarm system. However, drugs poison essential biological pathways and inhibit the healing process.

WHAT IS INFLAMMATION AND WHY DOES IT OCCUR?

Inflammation is an integrated body response to factors which threaten the organism's integrity. The inflammatory response and its attendant pain can be initiated by any

form of cell and tissue injury. Inflammation serves as an alarm system to guard against more extensive injury, and it stimulates repair of the damaged area. Leukocytes, phagocytes and other debris-removing cells clean the area of foreign substances, necrotic debris and invading organisms. Thus, a complex chain of events is initiated to repair the damaged tissue.

The successful inflammatory response depends on the cessation of the source of injury. Prolonged inflammation can lead to autoimmune pathology and accompanying degeneration.

Pain-killers reduce pain and inflammation, and at the same time, they stop the healing process. This means there is a balance somewhere between pain relief and healing that should be sought. This brings to mind a personal experience: In 10-01-01 (that's not binary code; it's a date), I had hip replacement surgery. It's a major operation. The incision is about 10-12 inches long. I lost about two pints of blood which were subsequently replaced by blood I had drawn before the surgery. During the five-day recovery period in the hospital, the nurses had attached a morphine pump to the back of my hand. You could click it and get as much morphine as you wanted. After a couple of days, one of the nurses came in and scolded me for not using the morphine. After four months of physical therapy and lots of healing nutrients, I was back on the tennis court. This convinced me of the fact that not using pain-killers speeded my recovery. Every individual must assess their own situation.

BREATHING IS OXIDATIVE

During the evolution of single cell life forms, aerobic (oxygen-using) organisms advanced beyond the more primitive anaerobic (e.g. cancer cells) single-celled organisms in the efficiency of converting nutrients to chemical energy. However, using oxygen incurred the unique liability of the potential toxicity of oxygen because of its high reactivity and the delicacy of the fatty acid cell membranes.

Thus, a potential source of damage that could cause chronic inflammation in humans is the reaction of oxygen with the unsaturated lipids in red blood cells and arterial walls. This is an overwhelming incentive for maintaining a strong antioxidant defense system to prevent a great deal of damaging oxidation and inflammation.

OXIDATIVE STRESS CAUSES INFLAMMATION!

Common sources of inflammation include: physical trauma, infection, lack of sleep, severe emotional distress and chemical toxicity (e.g. pesticides, food additives, monosodium glutamate, aspartame, modern medicines, mercury amalgams, smoking including second hand smoke, excitotoxins, estrogen mimics).

In infection, phagocytic cells produce a respiratory burst which is composed of oxidative chemicals that are toxic to micro-organisms. The oxidative burst creates

holes in the membranes of the micro-organisms and causes the lysis of their cell contents. Some healthy body cells are unavoidable casualties of the war. In chronic infections, one of the mechanisms the microbes use to stop the attack of the immune system is to cause hypercoagulation which covers them with a thick coat of fibrin. Thus, the microbes can evade recognition. This fibrin coat narrows the arteries, and the heart responds by increasing blood pressure. In some cases, such as Lyme Disease, the use of antibiotics can thicken the fibrin coating and raise the blood pressure even more.

In severe emotional distress, including lack of sleep, thoughts and moods can trigger a cascade of inflammatory reactions. Being depressed, hostile, anxious or otherwise stressed is pro-inflammatory. Chronic stress is destructive because pro-inflammatory and pro-aging forces are occurring continuously. This leads to chronic inflammatory degenerative illnesses that include heart disease.

OXIDATIVE DAMAGE AND INITIATION OF THE ARACHIDONIC ACID CASCADE

When oxidative molecular fragments (e.g. from foods, chemical pollutants, drugs) overwhelm the antioxidant defense system, oxidation reactions take place in the unsaturated fatty acids of cell membranes and the amino acid portion of enzymes and structural proteins to peroxidize or alkylate them. Cytokines are generated by the immune system to warn of the danger.

If arachidonic acid is high in cell membranes, an exaggerated response to oxidation occurs that produces excessive inflammation, allergic reactions and cell damage. For example, sudden cardiac death (~ 50% of all heart disease deaths) is accompanied by vise-like contractions of the heart muscle that occur when magnesium (a muscle relaxant) is deficient relative to calcium (a muscle contractor). The vasospasms are mediated by arachidonic acid and its eicosanoid metabolites.

Arachidonic acid is freed from cell membranes to initiate a cascade of eicosanoids that sound alarm systems throughout the body. If the defensive maneuvers are not successful, eventually the body is overpowered and gives way to overt diseases that include inflammatory, immunogenic and carcinogenic states. Brain cells are highly susceptible because their membranes have a higher content of highly unsaturated fatty acids which are particularly vulnerable to peroxidation because of the high oxygen use of the cells.

The main sources of arachidonic acid and its precursors are linoleic acid (the main polyunsaturate in vegetable oils), beef, egg yolk, cheese and other dairy products. The conversion of linoleic acid to arachidonic acid is promoted by high insulin which occurs in reaction to high simple carbohydrate (mainly sugar) intake. Cod liver oil supplies the nutrients (EPA and DHA) that become part of cell membranes and displace arachidonic acid.

ANTIOXIDANTS QUENCH OXIDATION AND ASSOCIATED INFLAMMATION

The antioxidant defense system acts in a downward cascading of redox potential from harmful oxidants toward neutral molecules using the following outstanding array of antioxidants:

- Vitamin E (alpha, beta, gamma, delta tocopherols and related tocotrienols)
- Coenzyme Q10
- Carotenes
- Lycopene
- Lutein
- Alpha Lipoic Acid
- Vitamin C (ascorbate)
- Selenium
- Bilberry
- Glutathione Blend (glutamic acid, cysteine, glycine)
- Green Tea Polyphenols
- Grape seed and skin extract (proanthocyanadins)
- Megahydrin (concentrated source of electrons which are antioxidants)
- Antioxidant Water (an electronegative water (source of electrons))

CHRONIC CELL OXIDATION → FIBRIN FORMATION

When cells suffer damage as in the oxidation of arterial cell membranes, within seconds platelets (small circulating cells in the blood) adhere to the sites of damage. They pile up to provide a mechanical plug that effectively stops bleeding. The damaged cells release chemicals into the bloodstream that start a chain of events that causes fibrinogen (a dissolved plasma protein) to be polymerized and cross-linked to form fibrin at the sites of damage. The chronic damage to cells eventually causes the formation of a thrombus which, we know, can get large enough to block arterial blood flow. For example:



Carbon monoxide from smoking, second hand smoke or automobile exhaust reacts with oxygen in the blood to form carbon dioxide and liberate a highly reactive oxygen atom (nascent oxygen) which easily oxidizes unsaturated fatty acids in cell membranes which then induces the inflammatory arachidonic acid cascade and fibrin formation which eventually leads to an arterial blockage.

EFFECT OF FOOD ON HEART DISEASE MORTALITY

A World Health Organization 25-year study of food intake patterns and mortality from coronary heart disease (CHD) across seven countries. was reported in 1999. Its principal conclusions were:

- Major countries with the lowest CHD mortality were Japan, Greece and Italy where diets emphasized **vegetables, fish, oils, and legumes (beans, nuts and seeds)**.

Country and CHD Mortality per 1000 men	Diet Factor Score (summation of food calories weighted by diet factors)
Japan (33)	-1.5
Greece (37)	-0.6
Yugoslavia (78)	0.0
Italy (80)	-0.4
United States (160)	1.3
Netherlands (169)	1.4
Finland (224)	1.5

Food	Diet Factor
Butter	+0.887
Pastries	+0.752
Meat	+0.645
Milk	+0.600
Sugar	+0.600
Potatoes	+0.599
Margarine	+0.507
Cheese	+0.407
Fruit	+0.118
Eggs	+0.001
Bread	-0.001
Vegetables	-0.228
Fish	-0.279
Cereals	-0.305
Oils	-0.571
Wine	-0.609
Legumes	-0.822

- Major countries with the highest CHD mortality were Finland, Netherlands and the United States where diets emphasized **meat, milk, sugar, potatoes and eggs.**

The study quantitatively correlated items in the various diets with coronary heart disease mortality, as shown in the preceding tables.

DIET

The base of the health pyramid is fresh vegetables and fruits. Although they are carbohydrates, the fiber content slows glucose absorption to a healthy rate. Do not “juice” them because the requisite fiber goes into the garbage disposal instead of the intestines. The vegetables and fruits contain fibrinolytic enzymes that healthfully dissolve fibrin clots.

The next layer up the pyramid is to eat low-fat protein. I prefer mostly wild ocean fish that are low in mercury. The internet has many lists of fish and their mercury contents that will enable you to make a safe choice. **Do not eat farmed fish** because they are fed grains that are high in linoleic acid. They also contain polychlorinated biphenyls used as pesticides for the grain storage. Farmed salmon are deceptively advertised as “Atlantic Salmon” at half the price of Wild Alaskan Salmon which is the fish to eat. Mercury is at very low acceptable levels in wild Alaskan salmon, sardines, flounder, sole, herring, whitefish, and cod. Do not eat fish from the Gulf of Mexico because they have been contaminated with mercury and other toxics that are related to the U.S. Gulf Coast petrochemical industry.

In the third layer upward of the pyramid are healthy oils: olive, fish (no vitamin D) and cod liver oils. They are great for building the membranes of your cells. Medium chain triglycerides (MCT oil) are special because they provide energy while moderating insulin cycling.

The top layer of the pyramid is “grains” which are essentially “polyglucose.” Think of them as “sugars” which, if consumed in excess, are converted to triglycerides and stored as fat

PEACE AND HARMONY

The foremost variable in the search for health is ability to achieve a lifestyle filled with peace and harmony. This is increasingly difficult considering the American lifestyle of frantic time schedules, long working hours, sedentary work, fast food and the endless pursuit of pseudo-ego-enhancing material goods. This escalating craziness has created a general state of high chronic stress, associated obesity and silent inflammation. Our world of high-speed information that incessantly bombards us and dazes us to the point of insensibility, is reflected in rising rates of chronic diseases including cancer and heart disease. This anxiety-filled way of living must be overcome to achieve health from all aspects.

Peace and harmony can be attained by sincerely being friendly, compassionate and understanding. To do that it is necessary to be satisfied with who we are despite the fact that life has dealt blows to all of us.

Best wishes for a healthy life,
Stanford Field
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