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"Vitamin F"

The history of the discovery of vitamins and other nutritional factors is not only fascinating, but it is also very dramatic. For example, the story of vitamin B_1 goes back to 1897 when Dr. Christiaan Eijkman, a Dutch physician working in Java, observed pigeons hobbling around the hospital courtyard. These birds demonstrated a crippled gait similar to that of the sick inmates. Dr. Eijkman knew that the pigeons were eating the hospital table scraps, and he surmised that it was the polished rice that was causing the terrible disease called beriberi, in both the patients and the pigeons. When unrefined rice was fed to the pigeons, they became well again. Eventually the experiment resulted in the discovery of vitamin B_1, a starting point in the science of nutrition.

From the 14th to the 19th century scurvy took the lives of millions annually in Europe and Asia. From 1600 to 1800 it is estimated that fully a million English sailors succumbed to this disease. In 1747 James Lind, a medical officer of the British navy aboard H.M.S. Salisbury, made a trial of a half dozen popularly recommended treatments. One of them consisted of two oranges and one lemon per day. Of the various treatments tried, only the citrus fruits worked, and some of the sailors eating them recovered in as little as six days.

Dr. Lind, like many other researchers, did not live to see his discovery given general acceptance. He died in 1794, and in the following year the British Admiralty made provisions for a daily ration of lime or lemon juice to be given all sailors in the navy, and in consequence, even to this day, the sailors of the British navy are dubbed "limies". During the time between Dr. Lind's discovery and its practical application in 1795, nearly 200,000 British sailors died needlessly of scurvy. (Vitamin C was discovered and isolated in 1928.)

Essential unsaturated fatty acids have never been recognized as a vitamin although some in the health field have referred to them as "vitamin F". An essential fatty acid may be defined as a fatty acid that is required for normal health and growth, is manufactured in the body in insufficient quantities or not at all, and must therefore be supplied by food sources. There has been some controversy about the number of essential fatty acids, with a maximum of three being mentioned: linoleic acid (LA), linolenic acid (LNA), and arachidonic acid (AA). Linoleic acid cannot be produced by the body at all. Linolenic and arachidonic acids can be manufactured under certain conditions, for example with sufficient availability of linoleic acid and the presence of certain vitamins and minerals. Most researchers today consider only linoleic and linolenic acids to be essential fatty acids.

It must be noted that there are numerous fatty acids found in food that are of varying degrees of biological importance. Traces of no less than 500 have been identified in butter. There are two main classes of fatty acids: saturated and unsaturated. Hard fats contain mostly saturated fatty acids, while liquid oils are made up predominantly of unsaturated fatty acids. The unsaturated molecule has an "opening" into which an oxygen atom may enter. When this happens, the fat or oil becomes rancid. This "opening" may be "closed" artificially by forcing in an atom of hydrogen in a process called hydrogenation. This helps to prevent rancidity and also causes the oil to become "hardened".

Unsaturated fatty acids are often categorized as Omega-3, 6, and 9 fatty acids. Table 2 on the next page summarizes this information and also

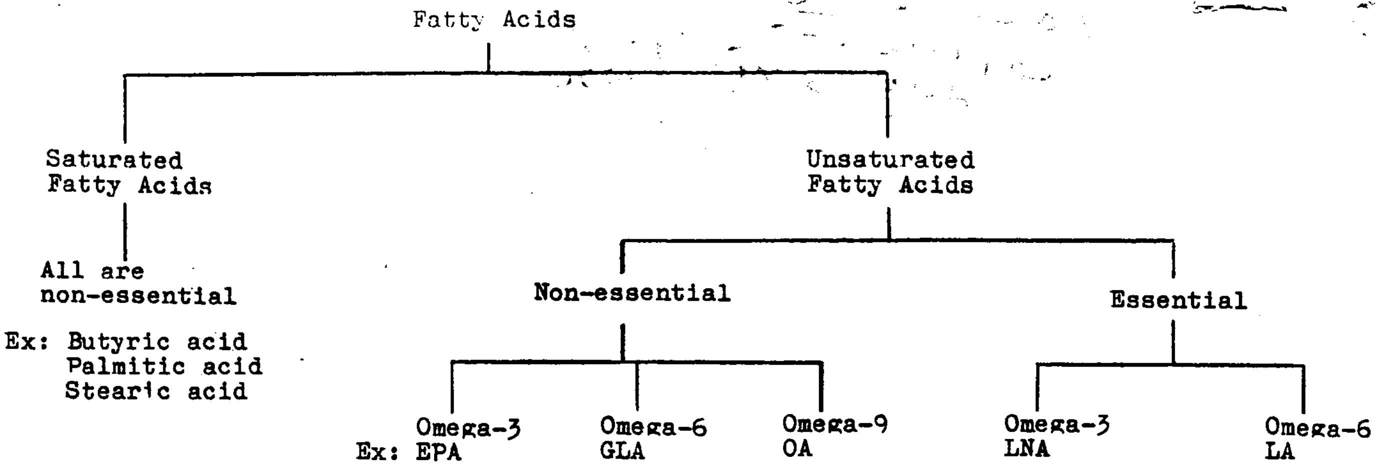

TABLE 1

Unsaturated Fatty Acids

Fatty Acid	No. of Times Unsaturated	Food Sources
Omega-3		
LNA[a] (linolenic acid)[b]	3	Flax Seeds, Pumpkin Seeds, Walnuts, Soy Beans, Dark Green Leaves
SDA (stearidonic acid)	4	Seeds of certain members of the Borage family
EPA (eicosapentaenoic acid)	5	Cold-water Fish (Salmon, Sardine, Mackerel, Trout)
DHA (docosahexaenoic acid)	6	
Omega-6		
LA[a] (linoleic acid)	2	Safflower, Sunflower & Sesame Seeds, Wheat & Corn Germ Oils, Walnut
GLA (gamma-linolenic acid)	3	Evening Primrose Seed, Black Currant & Borage Oil, Mother's Milk
AA (arachidonic acid)	4	Liver, Brain, Meats
DPA (docosapentaenoic acid)	5	Oils of certain fish
Omega-9		
OA (oleic acid)	1[c]	Olive & Almond Oil, Pecan, Cashew, Filbert, Avocado

TABLE 2

Fatty Acid Composition of Different Seed Oils (Percent)

Name	LNA	LA	OA	Sat'd
Flax	58	14	19	9
Pumpkin	15	42	34	9
Soy Bean	9	50	26	15
Walnut	5	51	28	16
Evening Primrose		81[d]	11	8
Safflower		75	13	12
Sunflower		65	23	12
Corn		59	24	17
Wheat Germ		54	28	18
Sesame		45	42	13
Almond		17	78	5
Olive		8	76	16

TABLE 3

(a) Essential Fatty Acid (b) Sometimes called "alpha-linolenic acid"

(c) 1x unsaturated = monounsaturated (d) Includes 9% GLA lists some of the principal food sources for each. Table 1 lists examples of saturated fatty acids (all non-essential, i.e., they can be made by the body if required), non-essential unsaturated fatty acids, and essential unsaturated fatty acids (there are only two - LA and LNA).

The essential fatty acids are involved with the production of life energy in the body from food substances. They govern growth, vitality and mental state. They form a structural part of all cell membranes, and they have a part in maintaining the fluidity of membranes, and in creating the electrical potentials across the membranes, which when stimulated, can generate bioelectric currents which travel along the cells to other cells, transmitting messages. Essential fatty acids are the precursors of the prostaglandins, hormone-like substances which regulate many functions of all tissues on a moment to moment basis, including blood pressure, platelet stickiness, and smooth muscle contraction. Essential fatty acids are involved in the transport of excess cholesterol, and they help keep the body depot fats fluid. They are involved in generating the electrical currents that make the heart beat in orderly sequence. They appear to regulate chromosome stability, and may have functions in the starting and stopping of gene expression. They help govern the movement of chromosomes during cell division and they are required in the formation of the new cell membranes which separate the two daughter cells after a cell has divided. Essential fatty acids are involved in the function of the immune system, which acts to fight infections and confers resistance to disease and allergies. In short, life without essential fatty acids is impossible and when essential fatty acids are deficient, we can expect a diversity of health problems.

As shown in Table 2, the best sources of linolenic acid are flax seeds, pumpkin seeds, walnuts, soy beans, and dark green leaves. The best sources of linoleic acid are safflower, sunflower and sesame seeds, wheat germ and corn germ oil, and walnuts. Since the essential fatty acids are easily destroyed by light, air, and heat, great care is required in processing, packaging, and storing of the oils containing them. Unfortunately, the processes used commercially are designed to produce oils that are light, clear, tasteless and everlasting. The seeds are crushed and then cooked for up to two hours at varying temperatures. When they are pressed, the pressure that is created causes the seed mass to be heated further. The higher the temperature and pressure, the better is the oil yield. Some oils are extracted, using a solvent such as hexane. The next step is degumming which removes phospholipids, including lecithin. Next, free fatty acids are removed, using caustic soda (Draino). Bleaching then removes the pigments chlorophyll and beta-carotene. Deodorization removes aromatic oils and more free fatty acids, as well as pungent odors and unpleasant tastes, which were not present in the natural oil in the seeds before the processing began. Deodorization takes place at between 460 and 520 degrees Fahrenheit. The next step may be hydrogenation or partial hydrogenation.

One of the best ways to ruin the nutritional value of an oil is to hydrogenate it. In this process the oil is reacted at high temperature and under pressure with hydrogen gas in the presence of a catalyst such as nickel. If the process is brought to completion, the resulting product will contain no essential fatty acid, but it also does not contain trans-fatty acids to interfere with essential fatty acid activity in the body. Partial hydrogenation results in a high proportion of trans-fatty acids and numerous other altered, unnatural substances that interfere with normal biochemical processes.[a]

(a) In Holland the sale of margarines containing trans-fatty acids is prohibited by law.

Natural fatty acids have a molecular structure called cis-configuration in which both hydrogen atoms attached to the carbon atoms of a double bond are on the same side of a molecule. When subjected to high temperatures, the molecule is "twisted" so that the hydrogen atoms appear on opposite sides. The results of this miniscule change are quite drastic: In biological systems, the trans-form "half-fits" into enzyme and membrane structures. It can't complete the functions that the cis-form performs, and at the same time, blocks out the cis form. Thus the trans-forms take up the space, but won't do the work of the cis-essential fatty acids. The trans-molecules are more sticky. For this reason, trans-fatty acids encourage fatty deposits in the arteries, liver, and other organs, and trans-fatty acids also make platelets more sticky, increasing the likelihood of a clot in a small blood vessel, leading to strokes, heart attacks, or circulatory occlusions in other organs. Trans-fatty acids change the permeability of membranes. This means that some molecules, which ordinarily would be kept out of the cell, can now get in, and others which normally should remain in the cell can now get out. Trans-fatty acids disrupt the vital functions of the essential fatty acids, and worsen essential fatty acid deficiency by interfering with the enzyme systems which transform the fatty acids into other important molecules, such as the prostaglandins. Trans-fatty acids interfere with certain enzymes that are needed to detoxify insecticides, and they increase the activity of some enzyme systems that have the ability to potentiate carcinogens.

About 95% of the average intake of trans-fatty acids comes from hydrogenated vegetable oil products, and the rest from animal products, mainly beef and butter fat. The annual consumption of trans-fatty acids is almost twice as much as the total intake of all other unnatural food additives put together. The two main products from which we get trans-fatty acids are margarines and shortenings or shortening oils, both of which are made from partially hydrogenated vegetable oils. These appear literally in thousands of processed foods - bread, rolls, crackers, pies, pretzels, cookies, donuts, breadsticks, muffins, breadcrumbs, stuffing, waffles, pop tarts, hamburger helper, biscuits, wheat thins, pancake mix, quick bread mix, cake mix, pie crust mix, fig newtons, potato chips, candy bars, nondairy creamers, salad dressings, peanut butter, mayonnaise, ad infinitum.

Consumers are being badly misled when it comes to advertising fats and oils. For example "Cold Pressed" only means that no additional heat was used during pressing; no mention is made of the heat generated by the process itself. "No Cholesterol" has no meaning whatsoever when it comes to vegetable oils since no products of plant origin contain any cholesterol. Margarine "for the good of your heart" - there is not a single shred of evidence to back up the claim that margarine is good for the heart, or that it has any health benefits. Heart disease and cancer deaths have increased at a rate parallel to the increase in margarine sales and the sale of other hydrogenated and partially hydrogenated products. But the worst deception relates to the amounts of unsaturated fats listed on margarine labels. The figures given include various unnatural unsaturated fatty acids, including the trans-polyunsaturates. These not only are not health-giving, but are antagonistic to the health-giving essential fatty acids. They compete for enzymes, produce biologically non-functional derivaties, and interfere with the work of the essential fatty acids in the body. Food processors get away with this deception because the chemical structure of these trans fatty acids does indeed qualify as "unsaturated". However, they act as saturated fats, and nutitionists who are aware of the situation sometimes redefine the trans proportion as "saturate equivalent".

Table 2 lists a number of unsaturated fatty acids which are not essential fatty acids but are nevertheless of great value. For example, the omega-3 fatty acids EPA and DHA are associated with clean arteries and absence of fatty degeneration diseases. They can both be manufactured by the healthy human body, albeit slowly, from linolenic acid, but various degenerative conditions impair the body's ability to do so. EPA and DHA are found in cold-water fish such as salmon, sardine, trout and mackerel. However, if the fish are raised on fish farms, the amounts of these omega-3 fatty acids are greatly reduced.

The omega-6 fatty acid GLA is the result of the body's first biochemical step in the transformation of linoleic acid into the PG1 family of prostaglandins. Members of this series perform many important functions in different tissues of the human body, e.g., keeping blood platelets from sticking together, acting as a diuretic, opening up blood vessels, slowing down cholesterol production, preventing inflammations, making insulin work more effectively, improving nerve function, regulating calcium metabolism, improving functioning of the T-cells of the immune system, etc. Certain dietary deficiencies and disease conditions block the enzyme (delta-6-desaturase) that catalyzes this chemical reaction, thus preventing the transformation of LA into GLA from taking place. Also, excess cholesterol, excess saturated fats, trans-fatty acids, and alcohol interfere with this enzyme. Fortunately, GLA is available as a food supplement so that the problem of the blocked enzyme may be bypassed. The immature livers of newborns and infants also do not produce enough of the enzyme, but nature compensates for this by supplying GLA with the mother's milk.

Besides the trans-fatty acids there are a number of other toxic elements contained in oils. Cotton seed oil contains a cyclopropene fatty acid which has toxic effects on the liver and gall bladder and also interferes with the functions of the essential fatty acids. Cotton seed oil has the highest content of pesticide residues. It also contains gossypol, which irritates the digestive tract, causes water retention in the lungs and shortness of breath. Rape (canola) and mustard seed oils contain erucic acid which causes fatty degeneration of heart, kidney, adrenals, and thyroid. Rape seed oils used to contain as much as 40% erucic acid, but geneticists have bred new varieties which now contain less than 1% of erucic acid. Herring and capelin oils contain between 10 and 20% cetoleic acid, which is similar in its effects to erucic acid.

It was mentioned on page 4 that labeling of fats and oils can be very deceptive. To truly inform consumers, the following information should be presented:

- o Amounts of cis-LA and cis-LNA in grams per 100 grams of product.
- o Amounts of trans-fatty acid isomers in grams per 100 grams of product.
- o Maximum temperature reached during processing (should be below 50°C).
- o Whether light and air were excluded during processing.
- o Date of pressing (or expiration date).
- o Whether oil was mechanically pressed or chemically extracted.
- o Whether oil was refined (degummed, bleached, deodorized).
- o Whether oil was hydrogenated or partially hydrogenated.
- o Whether seeds were organically grown.

Sugar is considered by most nutritionists to be the major dietary cause of degenerative diseases. While it does play a major role in degeneratio much of the effect is due to the fats into which the body converts excess sugar, and the fats produced therefrom then create major health problems for the body. Complex carbohydrates are digested and absorbed slowly, because they contain fiber and other materials which slow down digestion, and because the starches they contain are only slowly converted into sugars. For this reason, the energy they provide is burned up in body functions at the rate at which it is produced. They also contain the vitamin and mineral factors that allow the carbohydrates to "burn clean" into carbon dioxide and water. Refined carbohydrates (e.g., white flour), on the other hand, are digested and absorbed much more rapidly. and can overload the blood with glucose. Also, because they lack important minerals and vitamins, the body cannot burn them properly, and therefore has to deal with them another way, for instance by turning them into fat.

Sugars are absorbed even faster than refined carbohydrates, and are therefore much more dangerous. The body has to do something about the high glucose levels because when they go too high, a condition is created which may result in sugar shock, coma, or death. To prevent this, the body has to store the excess glucose. For millions of years this has been the way to prepare for famine in times of feasting. High blood glucose triggers the pancreas to secrete insulin, which stimulates the conversion ~~of sugars~~ into fatty acids which are then stored as triglycerides.

There are fatty acids of high quality and of low quality. The former heal, and the latter kill. Excess sugars and refined carbohydrates produce the kind that kill - the sticky, saturated kind of fatty acid that increases the chance of stroke, heart attack and arteriosclerosis. But just as the wrong fats destroy health, so the right fats can be used to help restore health. This is being done by knowledgeable doctors all over the world. One of the pioneers in the therapeutic use of the essential unsaturated fatty acids is Dr. Johanna Budwig in Freudenstadt, Germany. She has had excellent results treating various degenerative diseases, including cancer, using dietary means that include daily consumption of a mixture of skim milk kwark and fresh, natural, unheated flax seed oil. Her diet also includes plenty of carrots, fresh greens, whole grains, rainbow trout, nuts and some herbs.

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