NO. 14

# the FELIX Letter

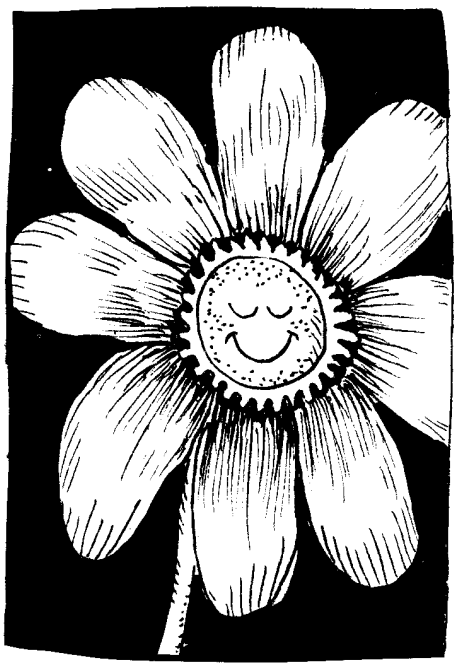
A COMMENTARY ON NUTRITION

## THE PRIMROSE PATH

***My head is buzzing with essential fatty acids, prostaglandins, and optimism. I think we're on to something big. It began when I started chasing down primrose oil a few months ago. Oil from the seeds of the evening primrose has become a hot item in healthfood sales and literature, and my reaction to this was my usual two-sided one: clearly, it's a commercial ploy and there are profits involved; on the other hand, as has sometimes happened with other highly touted food supplements, the theoretical basis behind it may be sound and emanating from conservative research efforts, so let's see what we can find.***

What I found was that it was necessary for me to plunge with both feet into the world of prostaglandins and their precursors, the essential fatty acids — a deep pool of lipid biochemistry over whose surface I had only skimmed in the past. My professors at UC Berkeley's nutrition department had just touched on prostaglandins in 1975-77, noting that a newer understanding of why essential fatty acids *were* essential arose from the discovery in the previous decade that, from them, the body could make the hormonelike prostaglandins. Work on isolating and defining these vital substances and their complex actions was still in the beginning stages. By now, the amount of worldwide scientific literature on prostaglandins is astonishing, including many U.S. and international journals devoted exclusively to research on these singular substances.

The reason they are remarkable is that they seem to modulate biological activities in every organ system. Their name was derived from their early discovery in seminal fluid and prostate glands, but they are now known to be made in most human and animal tissues. Medical interest stems from the awareness that prostaglandins mediate or control such diverse and fundamental processes as inflammation of tissues in immune reactions; the clumping of blood platelets to form clots; the squeezing or dilating of small arteries, with effects on blood pressure; the induction of labor at the end of pregnancy — to name a few.



***Prostaglandins as Healers***

The work on prostaglandins is new enough so that many medical and biochemical texts published as late as 1976 contain only passing references to them. Accelerating research, however, has determined that certain prostaglandins are key modulators which by dilating arteries and reducing abnormal blood clotting, may afford a natural defense against heart attacks. They have been shown to relieve bronchial asthma by dilating the tiny airways which squeeze down in this ailment; and the same prostalgandins administered intravenously have healed painful ulcers in legs of patients with such severe loss of circulation to their limbs because of arteriosclerosis that the spread of necrotizing ischaemic tissues (tissues that die because of lack of oxygen and other nutrients from the blood — often related to many years of smoking) could otherwise only be halted by amputation.

Using prostaglandins in medical treatment, however, is still in the pioneering phase. They are not only unstable, extremely potent substances, but because the same prostaglandin can have different effects in different tissues, intravenous treatment for ischaemic ulcers in limbs, for example, may cause upsetting reactions in the digestive system such as vomiting, severe cramps, and diarrhea. Even if accumulating research eventually permits medical science to sort out the diverse effects of the dozens of different prostaglandins on different organs and tissues, "delivering" the appropriate dosage to the target tissue will still present a major therapeutic challenge.

### *The Nutrition Connection*

The prostaglandins became a logical research area for *nutrition scientists* when it was learned the body makes them directly from molecules found in food — the essential fatty acids. Now, we are learning that *the amount and kind of fatty acids we eat can alter the amount and kind of prostaglandins we make* and, in turn, affect a wide array of our bodily functions.

In 1930, researchers George O. and Mildred Burr proved beyond a shadow of doubt that certain fats were not only pleasant to eat but were "essential." "Essentiality" in nutrition parlance means a minuscule dietary subparticle needed for growth and health, such as vitamins and minerals, which our bodies can't synthesize from other substances but must obtain from the diet. The Burrs began their work (on laboratory rats) at UC Berkeley in the 1920's, where they met and were married. In May of 1980, at the

"Golden Jubilee" International Congress on Essential Fatty Acids and Prostaglandins held at the University of Minnesota, scientists from all over the world commemorated the 50th anniversary of the Burrs' discovery. Now in his 80's, Professor Burr described how as a young couple he and his wife moved their research efforts to the U. of Minnesota in 1927: "With deep sorrow and high hopes, the Burrs left Berkeley in their Model 'T' Ford roadster with two cages of Long-Evans rats . . . On the cold fall nights, our pets were smuggled into hotel rooms under long overcoats."

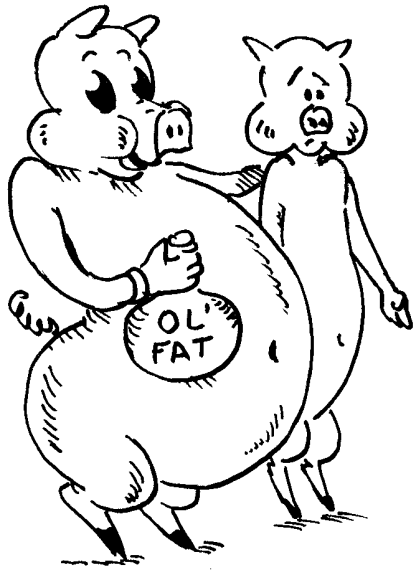
The fatty acid in fats and oils that they found to be essential was *linoleic acid.* The Burrs' work in 1930 on the devastating symptoms in animals deficient in essential fatty acids was so encompassing and definitive that it still stands as a classic guide. Since then, *arachidonic acid,* which can be made from linoleic, has also been termed "essential." Both linoleic and arachidonic acids are known as members of the "Omega 6" family. The third essential fatty acid is *alpha-linolenic* of the "Omega 3" family.

Essential fatty acids and other major fatty acids are the components of fats and oils in the plants and animals that we eat. We know, of course, they can be 'burned' by the body to produce energy (one gram can produce 9 calories), whether the fat is from food we eat or from fat stored in our own tissues. Fat in adipose tissue serves as cushioning, shock absorption, protection against cold, and stored energy to be called upon when needed. (If only our ability to convert it to energy was as boundless as our capacity to store it!)

### *Lively Lipid Membranes*

It's less commonly known that fatty acids perform intrinsic structural and functional roles. Because they transport lipids and cholesterol out of the liver, a deficiency can cause unhealthy fatty livers. In the form of phospholipids, they are *the major component of all cellular and subcellular membranes;* that is, each cell of the billions in our bodies has a membrane surrounding it made up largely of molecules of fatty acids, each attached to a phosphate group — hence "phospholipd." Within the cells, the nucleus and discrete cellular units ("organelles" such as mitochondria) also have surrounding membranes composed mainly of phospholipids.

Just as solid matter is made up of atoms and electrons in constant seething motion, so are our stolid selves in reality the products of several billion cells and their fatty-acid membranes, in continual dynamic flux! Pig farmers learned some time ago they could harden or soften the fat in the flesh of their livestock by feeding different amounts of either hard (saturated) or soft (unsaturated) fats, i.e., coconut fat vs. soy oil. It is now totally confirmed that in humans, too, the fatty acid composition of membranes and blood plasma will change in direct relationship to the kinds and amounts of fatty acids we eat.



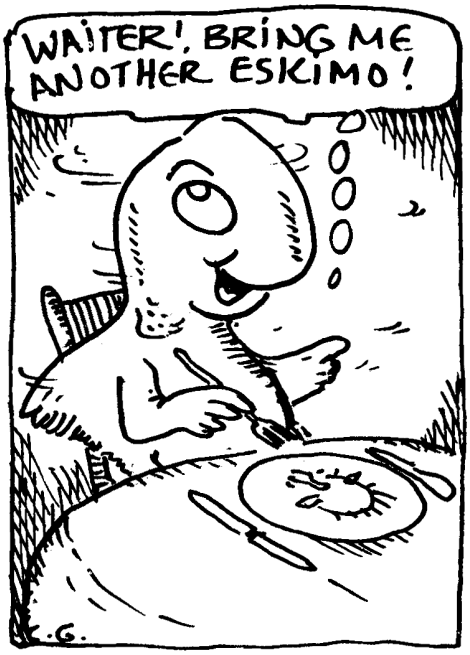

The 1980 U. of Minnesota congress also honored the Swedish scientist, Ulf von Euler, and other pioneers for their discoveries and early work on the prostaglandins. The inevitable intertwining between prostaglandin and essential fatty acid research efforts was a recurrent theme in the approximately 170 papers presented at the conference.[1] Of the many fatty acids in foods or body tissues, it is *only* the essential fatty acids of the Omega 3 and Omega 6 families or their longer-chain derivatives which evolve into the prostaglandins. This, their last-discovered and possibly most important role, *singles out the essential fatty acids as having the unique capacity to affect perhaps every aspect of human functioning.*

### *Oily Fish and Eskimos*

One of the reasons I love my work is that I am trained to sniff out good news even when it's obscured by the studied, cautious objectivity of scientific papers! There is no question in my mind that a number of researchers have become very optimistic indeed, just within the last few years, about the potential for using simple dietary manipulation to bring about major health benefits.

Because native Eskimos of Greenland, eating a traditional diet of seal, walrus, and fish, have excellent cardiovascular health and no heart attacks, they attracted the attention a few years ago of a group of Danish and English scientists, who found that essential fatty acids in Eskimo blood and membranes were in reverse proportions to those in the average Danish person. In the Eskimos, the Omega 3 fatty acids (very high in marine plants and animals) dominated over the Omega 6 family. Danes eat a typically Western diet and suffer from heart attacks, strokes, and other cardiovascular ailments. The studies attracted worldwide attention, and soon German, Dutch, and Japanese researchers were reporting that the differences were not inborn racial characteristics but a direct result of diet, because by substituting large amounts of fish or fish oils for dairy and meat products, persons of altogether different racial strains could develop Omega 3/Omega 6 patterns in their blood and membranes resembling the Eskimos'.

[1]*Progress in Lipid Research, Volume 20,* Ralph T. Holman, Editor. Pergamon Press, N.Y., 1982.




### *You Are What You Eat???*

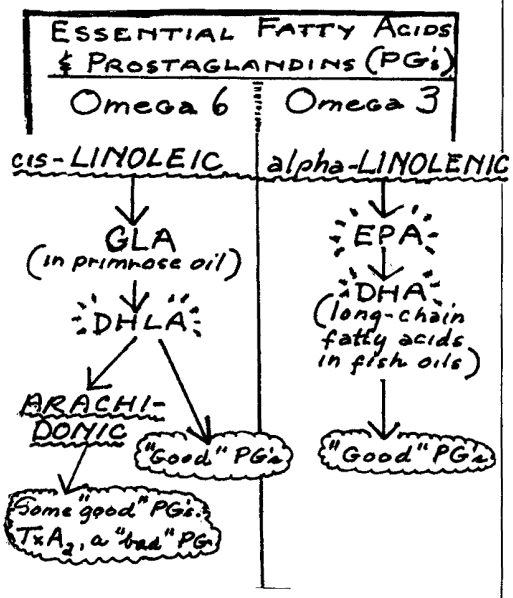
An important study by a Munich group came up with the extraordinary evidence that when seven healthy men were placed on a diet consisting of stewed or smoked mackerel, a very oily fish, as the only fat and protein source (but permitting unrestricted carbohydrate and fluid intake), WITHIN ONE WEEK the "total phospholipid fatty acid composition in [blood] platelets became similar to that of mackerel lipid composition." That may be carrying a good thing too far! — but the men's blood also showed a decrease in a tendency for platelets to aggregate — a good sign.

The reduced tendency of platelets to clump is attributed, in a number of similar studies, to *a change in prostaglandin production, brought about by the increase of Omega 3 fatty acids and the decrease of the Omega 6 fatty acids, particularly arachidonic.* Arachidonic acid can become a prostaglandin known as Thromboxane $A_2$ (abbreviated $TxA_2$) which is produced in large amounts in person who have abnormal platelet clumping and a tendency to form clots in arteries. Eskimos make so little $TxA_2$ that their blood clots abnormally slowly.

### *Manipulating the Prostaglandins*

Ideally, we need enough $TxA_2$ to keep us from bleeding to death, but not so much that our arteries are filled with clots! I've been examining different research approaches on how to accomplish this. A major strategy is based on supplementing the diet with fish oils, which contain large amounts of the longer-chain, more unsaturated members of the same family as alpha-linolenic — the Omega 3 fatty acids. Most scientists believe they "crowd" arachidonic out in competition for the enzymes needed to make the transformation from fatty acid to prostaglandin. Hence, little $TxA_2$ can be formed.

A number of researchers think that, in addition to beating arachidonic acid in competition for these enzymes, the long-chain fatty acids of the Omega 3 group themselves form valuable prostaglandins which decrease platelet aggregation.




### *Primrose Oil and DHLA*

The primrose-oil theoreticians have a different approach. It, too, is based on the understanding that overproduction of certain prostaglandins from arachidonic acid is harmful and undesirable. However, another member of the same Omega 6 family as arachidonic happens to be the precursor of a particularly benevolent group of prostaglandins — as a matter of fact, the ones I described as being effective in reducing blood pressure, healing leg ulcers, relieving asthma, as well as reducing abnormal clotting.

This Omega 6 fatty acid, mercifully abbreviated to "DHLA," is quite scarce in foods other than breast milk. Normally, it's made in our tissues from the original essential fatty acid (of the Omega 6 family), linoleic acid. There is reason to believe, however, that the conversion to DHLA is hampered by a number of factors. One of these may be a deficiency of the trace minerals and vitamins required for the enzymatic conversion. Other factors are thought to be illness and aging.

### *A Well-Hidden Danger*

Another possibility receiving growing recognition in the research literature is the presence of manmade fatty acids which compete with and crowd out the natural ones. By "manmade," I really mean machine-made! It may be a long time before it becomes common knowledge — the food industry lobbies are very influential in the media — but margarine is bad news fo arteries and health in general, no matter how "unsaturated" its oils are, and so are all the other hydrogenated (solidified) oils used as shortening. Natural unsaturated fatty acids are shaped somewhat like a hairpin (although submicroscopic in size), and are named "*cis*-fatty acids." Through processing, about half of the unsaturated fatty acids in margarine become "*trans*-fatty acid isomers" — stretched out like a straightened hairpin. It's now been discovered that when we eat them, they are able to be incorporated into our membranes, where they compete with the natural *cis*-fatty acids and interefere with normal metabolism. They may comprise as much as 15% of the fatty acids in our tissues! There is no question that the scientists whose papers I've read are disturbed by these findings and pessimistic about the chances for dissemination of this information outside of research circles.

Primrose oil is one of the few foods that contains the direct precursor to DHLA, thus bypassing most of the stumbling blocks to its formation and assuring a ready supply of DHLA that can be transformed into the benevolent prostaglandins. There have been studies suggesting that its use brings about improvement in a very wide spectrum of ailments. A lot more research is needed, but the implications are truly encouraging.

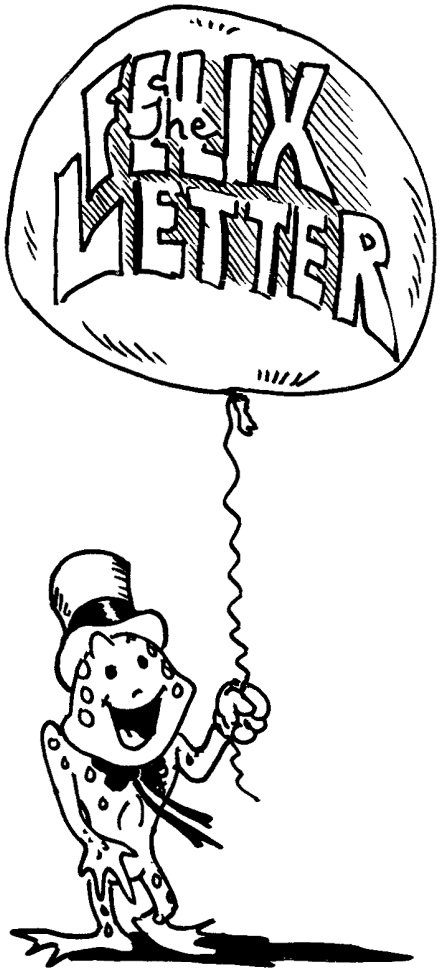
### *Linseed Oil as Therapy*

Still another treatment strategy is one using linseed oil from flaxseed, a very rich source of alpha-linolenic acid (an Omega 3). Alpha-linolenic may be converted by enzymes in our tissues to the longer-chain, more highly unsaturated Omega 3 fatty acids that I described as being plentiful in fish oils. These in turn may possibly be converted to prostaglandins that inhibit platelet aggregation.

Several researchers, however, have proposed that the Omega 3 fatty acids in linseed oil (which, unlike the fish oils, also contains ample Omega 6 linoleic acid) may also serve to *reduce the amount of arachidonic acid* by grabbing the enzyme needed for its formation. The end result *would be an increase in DHLA formation and the useful prostaglandins made from it.*

This may be one explanation for the extraordinary results reported by Donald O. Rudin, M.D. in a pilot study with two groups of patients, 32 suffering from a number of different physical ailments of chronic duration and 12 with severe mental illness along with a variety of physical ailments as well. The treatment consisted of linseed oil (food grade, not the paint store variety!), one to six tablespoons per day with meals. To this, a low dosage multivitamin/mineral tablet, selenium, and vitamins C and E were added. Oils for cooking or salads were walnut, soy, wheat germ, or linseed only. Fatty fish (tuna, salmon, mackerel, herring) and chicken were recommended — with beef eaten only occasionally. Whole grains, beans, vegetables, fruits, yogurt, and bran or psyllium seed husks (for ease of bowel movements) were eaten regularly.

"In this pilot study, our goal is to determine only if a more extensive double-blind statistical study is warranted," Dr. Rudin states. I found his results to be very impressive. Long-term bursitis, tinnitus (head noises), depression, dry skin, spastic colon, glaucoma, angina, osteoarthritis — the list goes on — showed clear improvement on the linseed oil regimen. In the mentally ill patients, a large proportion not only showed improvement in their psychoses or incapacitating phobias, but also amelioration of physical disorders common to many of them: food allergies, irregular sleep patterns, dandruff, tinnitus, dry skin, and fatigue.




Two years ago, Dr. Rudin took a leave from his work as director since 1956 of the Dept. of Molecular Biology, Eastern Pennsylvania Psychiatric Institute, to write a book, now completed, on the Omega 3 fatty acids. In the *Felix Letter* #15, I'll describe Dr. Rudin's hypothesis on the comprehensive cause of modernized society's dominant diseases. It's a blockbuster of a theory, with unusual, original insights. Meanwhile, I've started taking linseed oil!

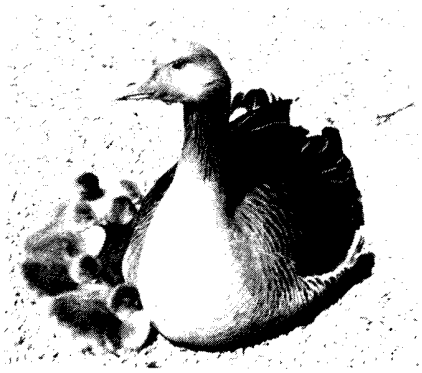
### *Much to Ponder*

Dear readers, these are concepts heavy with biochemical jargonese that I've been throwing about, and I apologize if I've confused you. I'll be continuing this discussion for the next few *Letters* and, I hope, clarifying matters more and more. The big question is, how does one deal with scientific information so fraught with promise but still in the experimental stage? Is it wise to increase our consumption of fish oils? Are there dangers involved? How about linseed oil? Primrose oil?

In the next few issues, I'll be presenting as much useful information as I can to make reasonable choices possible. I'll also be discussing fatty acids and prostaglandins in pregnancy and the developing infant.

Generally speaking, for adequate consumption of essential fatty acids, a tablespoon or two of oil daily is a pretty safe recommendation. For the time being, I'm personally experimenting with a tablespoon of codliver oil and two of linseed oil: the codliver oil shaken with a little milk at bedtime, and the linseed oil in salads, grains, or soups. Primrose oil sounds promising, but it's expensive, and the others are not. I'll report on any results!

To be continued . . . ■



*Illustrations are by Clay Geerdes.*



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