Essential Fats (EFs)

Fat Secrets to Living Long and Well

This website is Under Construction. Many links are not working or are under revision.

Objectives

The unifying concepts are math models, data analysis and optimization. I focus on a systems approach to the body. See https://en.wikipedia.org/wiki/Systems_medicine

https://nam.edu/perspectives-2013-bringing-a-systems-approach-to-health/

https://qualitysafety.bmj.com/content/24/1/7

https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-017-2688-z/tables/3

I see the body as the interaction of about 10^25 to 10^27 molecules. (See https://socratic.org/questions/how-many-molecules-are-in-the-human-body).

The molecules interact among themselves. They group themselves into organs or biochemical pathways. With a systems approach, I look at the interaction of these molecules and what makes their interaction optimal for desirable outcomes.

I define the following desirable goals or outcomes for health (which are not necessarily compatible with each other, optimizing one may interfere with optimizing another)

Increasing the probability of living longer = maximizing life expectancy for individuals and for populations.

Increasing mobility, the ability to move around and use our body well.

Increasing well-being, decreasing pain. Related to mobility, but different.

Improving our brain function and mental health.

I redefine the concepts of sets of diseases for a person {Di}. Each person may have several diseases, each one with different probability P(Di)

Do is a theoretical optimum with no disease, a theoretical healthy state.

Via diagnosis, evaluation, blood tests, etc., we reduce the number of alternative diagnosis to one or a few most likely. Then we implement the best treatment to reduce the probability of disease and shift the body to a healthy state.

It is not useful to do diagnostic tests that do not increase the probability of ONE diagnosis and reduce the probability of alternative diagnosis.

Example. Long ago physicians used to order **ESR** (Erythrocyte Sedimentation Rate). This biomarker goes up when a person feels sick. Modern research showed that one can usually tell if a person is sick. ESR is NOT specific enough to help with diagnosis. It is no longer needed (with few rare exceptions). When I started training in lab medicine as a medical resident, I learned to teach physicians NOT to order ESR. They ordered it too frequently, and was useless practically all the time.

Many diagnostic tests provide interesting information but do not help improve treatment. If the diagnostic test does not lead to better treatment, it is clinically unnecessary.

A priori, to start, we have P(Di), the probability that a person has diseases {Di}. With **diagnostic tests, Rj**, we change those probabilities. Optimal diagnosis narrows the P(Di). It makes some probabilities very small, and one (or a few) very large. The goal is to

find the Diseases that harm a person, and their causes. Examples: a flu infection, a heart attack, loss of brain function. And eliminate unlikely diseases.

The purpose of diagnostic testing is to both narrow the range and shift it towards an extreme (much higher or much lower). If testing does not substantially change **Probabilities**, then it is not worthwhile. Even if it improves P, in clinical practice (as opposed to research), we must consider treatment. Treatment implies that **P(improved mortality or morbidity, given treatment) = UP. If treatment does not lead to desirable outcomes, then improved diagnosis is clinically irrelevant.**

If a diagnostic test helps with diagnosis but not with treatment, then it is redundant or irrelevant. Instead, we must use a diagnostic test that helps with treatment.

Physicians often measure Calcium in blood. But calcium is blood is very rarely abnormal. It has substantial normal variability. The body takes calcium from bones to keep calcium within reference ranges. A far better test (except in complex, rare cases) is calcium in urine. If the body does not have enough calcium, it secretes less calcium in urine (these matters are reviewed in professional textbooks and articles about lab medicine).

My research focuses on biochemical disorders, abnormalities of biochemical reactions due to genes or environmental factors. It substantially excludes events such as accidents, intentional behaviors like shooting or suicide, but includes studying the biochemical consequences of intentional behaviors such as eating too much food or eating too many desserts.

A state of Health means that the P(Di) are small, and P(Do) is close to 1. Seeking a state of health means to reduce the P(Di) and increase P(Do). Means small probability of disease, high probability of good health.

Biomarkers are molecules (like Glucose or Cholesterol) or processes (like Blood pressure or Pulse or Temperature) that we measure and are indicators of health, disease, improvements, etc. Modern medicine today can measure tens of thousands of biomarkers. About 50 years ago medicine measured less than a few hundred.

With **treatments Tk**, the P(Di) change so that they all are very small, and P(Do) is close to 1. Treatment involves finding the optimal set of Tk (given constraints of time, money, resources such as physicians, lab space, technicians) to substantially increase P(Do) as close as possible to 1. Find the treatments that make the patient healthy.

Competent informed consent means that patient is explained the probability of each likely disease (only the likely ones, not those highly unlikely), during the visit (based on the medical history, physical exam, etc.). The patient is explained the purpose of EACH diagnostic test, the risks, benefits, harms, cost. The purpose of diagnostic tests is to select the most likely disease and eliminate (rule out) other alternatives. Optimal selection of diagnostic tests identifies the critical disease.

In clinical medicine, diagnosis is needed to implement better treatments. Diagnosis for the sake of knowing are important in Research, but not in clinical medicine.

With a diagnosis, the physician explains the available alternatives, the probability of success, risk, harm, costs.

P(Di), the effect of Rj and Tk on P(Di). The physician explains the effect of each diagnostic tests on probability of disease and alternative treatments. This includes the risks, benefits, costs.

Example. Some Rj may reduce the probability of D3 (disease #3) but increase the probability of D7 (disease#7). It is a balance of risks and benefits that must be explained. Sometimes there are better alternatives.

Example. Instead of measuring vitamin B12 in blood, physicians can measure a derivative, MMA in urine. When the body does not have enough B12, the body makes more MMA, which is secreted in urine. This test is often more accurate than B12 in blood, and has no harm (but some people, mistakenly, may prefer blood drawing that saving urine, which takes time and refrigerator space; this happens to children who do not understand and parents who do not want the effort to save urine and go back to the lab).

Even simple diagnostic tests, such as blood drawing, increase the probability of damage to veins, changes in blood flow to the brain, death of some brain cells, etc. **Competent informed consent is difficult** because some patients have poor understanding of probability, conditional probabilities, Bayes' theorem, Algebra, calculus, math models. Further, a health provider may decide what is the best choice for a patient, and present data or evidence to support that view, and omit other evidence. Because we know so little about the effect of Rj and Tk on P(Di), and the data are not publicly and easily available, it is relatively easy for a health provider to consider his/her subjective views on these probabilities as facts to present to patients. Profits or ignorance or lack of time to explain may influence these decisions and evidence.

Medical necessity means the diagnosis or treatment is necessary and useful to improve desirable outcomes, to benefit the patient. It is not just to know or for research.

Mathematically, I define it as the concept that Rj (set of diagnosis Rj) or Tk (set of treatments Tk) are needed because they substantially change P(Di) (probability of diagnosis Di) in a desirable way, and shift P(Do) closer to 1. A Rj or Tj that does not improve "health" is not medically necessary (and thus may not be covered by insurance).

There are usually several diagnoses with different probabilities. Ideally, one is far more probable than others. Sometimes we know it seems like a bacterial infection, but do not know which specific bacteria are involved (similarly for virus). There are usually a set of treatments. For a bacterial infection with fever, they could be an antibiotic (among several), lowering a very high fever, drinking fluids, rest, etc.

https://www.bmj.com/content/350/bmj.h3311/rr
Informed consent includes a description of:

- The likely diagnosis and their probability ranges (using the word "may" is not enough);
- The available diagnostic options (e.g., tests) that will narrow the probability ranges;

• The available treatment options (for each relevant diagnosis) that will substantially reduce the probability of continuing with an undesirable diagnosis (e.g., improve the health condition);

• Each treatment option, the probability ranges of undesirable outcomes (adverse consequences);

• Patients ought to have enough time to think and consider.

Goals or Purpose

- **Substantial changes to medicine** (diagnosis and treatment), biomedical research, health care delivery and informed consent. Medicine = diagnosis + treatment. Health care = optimal delivery of medicine.
- **Desirable outcomes** = meaningful increase in healthy life expectancy or desirable life expectancy (such as ability to do what one wants to do in life). A meaningful increase is usually substantive, measured in many years, not many months.
- **Clinical Diagnosis** that increases the probability that treatments lead to desirable outcomes. Diagnosis not related to or does not improve treatment is not clinical but research diagnosis. https://www.bmj.com/content/347/bmj.f4843/rr/656334; https://www.bmj.com/content/351/bmj.h4534/rr
- **Treatment** that increases the probability of desirable outcomes.
- **Health care is very different from other products or services**. Provide a different type of analysis. Economic analysis that applies concepts from other fields to health care (e.g., offer, demand, pricing) are likely to be incorrect or misleading.
- **Change nutrition guidelines with regard to fat**. Replace the guidelines and food pyramid to reflect modern knowledge of nutrition and health. Create new types of foods.
- **Improve nutrition guidelines for all nutrients**. Create and implement better biomarkers for nutrition and disease. Focus on biomarkers using disposable tissues such as urine, fecal matter, breath, saliva.
- **Focus on behavioral changes**. Healthy eating. Slim. No substance abuse. Respect for other people. Enforcement of proper boundaries in life.
- **Require biophysical predictive models, not just descriptive models, to analyze and interpret data**. Medicine is a change in biochemical reactions based on models that predict the effect of those reactions on the whole body and desirable outcomes.
- "**Thought experiments**" that predict likely outcomes of diagnosis or treatment or clinical trials, and substantially reduce trial and error or potential options. Considers a hypothesis, theory, model, principle, to think, analyze, predict its consequences. Do before physical (real) experiments. See https://en.wikipedia.org/wiki/Thought_experiment.

  Medicine should use "**Thought Experiments**" (like Einstein did) BEFORE clinical trials and empirical research. Researchers must have a MODEL, consider the consequences of alternatives, make predictions, compare with reality.
- **Clinical trials are not the golden standard**. Mandate biophysical predictor models before trials start.
- **Substantial revisions of clinical trials** that have a substantial nutrition component (e.g., trials where foods may affect outcomes). Identify flaws in clinical trials.

- **Implement better Competent Informed consent**, better education for patients and doctors. Better data and analysis for informed consent. See https://www.bmj.com/content/350/bmj.h3311/rr
- **Revise medical education and CME** to incorporate modern science of nutrition, biophysics, biochemistry.
- **Revise Medical necessity use by providers and payors**. Create uniform standards.
- **Change priorities to focus on maximizing desirable outcomes to patients, not profits to providers**. Better outcomes for patients can produce better profits for providers.
- **Shift in biotechnology to focus on "cures", treating the underlying condition to improve healthy life expectancy** for 5+ years instead of treating biomarkers or consequences of the condition to improve survival a short time. It means focusing on the major cause of the condition instead of a consequence (like lowering cholesterol of hemoglobin A1c) or a rare genetic abnormality.
- **Precision medicine must focus on biomarkers** and biochemical reactions instead of mostly genes.
- **Biomarkers should be part of a biophysics model** and measure thousands, not hundreds. Create multivariate models of health and disease. Identify the biomarkers most responsible for desirable or undesirable outcomes, and how to modify them.

Our methods use multivariate analysis, thought experiments, to analyze data and identify best policies and undesirable consequences of alternative policies.

We focus on fats; make this a porthole to fats. Discover options and strategies to prevent, diagnose, and treat health problems by correcting low levels and imbalances of essential fats. These are opinions, speculations about Fats that heal and fats that kill. Think how to unlock the secrets to optimal cell and body function.

Commentary and opinions about scientific nutrition, healthy foods, diagnosis of fatty acid abnormalities, treatment using fat mixtures, and more! We emphasize balanced nutrition aimed to achieve ideal weight and optimal levels of EFs.

We propose that abnormal levels of EFs disturb cell and hormone function, and thus aggravate many diseases of western societies. We explain how to use our findings to prolong life. We try to educate doctors and nutritionists with our research and inventions. We provide results that others may use to write about fat and design new foods. We introduce key concepts about fats.

Dr. Siguel created new methods to diagnose and correct fat abnormalities, discovered a missing link between heart disease and EFAs, identified similarities and differences between disorders due to fat malabsorption and those due to excessive fat intake. He coined the words Essential Fats, Essential Fatty Acid Insufficiency, Relative EFA Deficiency, Relative EFA Insufficiency, and parents, daughters or derivatives of EFAs (DEFAs).

Dr. Siguel created a highly sensitive test to measure EFA deficiency and found that w6 and w3 deficiencies, rather than being rare conditions, are some of the most prevalent nutrition abnormalities in the USA (based on our blood analysis of subjects from the Framingham Heart Study and other data).

Dr. Siguel explained why low-fat diets can be harmful. Who is likely to be hurt (e.g., slim people, pregnant women, people who are not losing weight). Some of these issues are now discussed in many websites, but Dr. Siguel disagrees with some.

Dr. Siguel explained how /trans/ fatty acids are harmful. Now researchers warn about dangers of hydrogenated oils, and foods like margarine are being redesigned. Some nutritionists recommend oil supplements (flax, etc.).

We report news from an insider's perspective, based on our biochemical research and private conversations with leading scientists. We describe differences between what others say and what recent (sometimes unpublished) research has shown. We explain how to select and use vegetable and fish oils and other foods.

This site is for health professionals, doctors, nutritionists, researchers, reporters, individuals who use PUFA-rich foods or supplements (fish oils, GLA, DHA, etc.), patients with genetic lipid disorders (special diets + drugs), IBD and SBS (elemental foods, therapies), cardiovascular disease, diabetes, Alzheimer's, neurological or neuromuscular disorders, epilepsy, prostate or breast cancer, pregnant women and nursing mothers who want to have smart and healthy babies, individuals who want to lose weight, athletes, people wishing to look, feel and be physiologically younger, and anyone wanting to eat close to an optimal diet. We suggest new options. You must be prepared to invest time & money in yourself to decide. We give you suggestions for opportunities; you take the responsibility to use them under supervision by expert professionals.

There are several types of FAs in humans. The most important and common types are:

- SFA = Saturated FAs
- MUFA = MONO = Monounsaturated FA
- PUFA = polyunsaturated FA.

They all usually have an even number of carbon chains. In addition, there are odd FAs (odd number of carbon chains), branch FAs, Trans FAs, and others. See other links.

The Essential Fats (EFs) are a group of fatty acids (FAs) that are essential to human health. There are two types, which form two families, the omega-3 (w3) and omega-6 (w6) families. The distinction is caused by the nature and location of the double bonds in the molecules. It means they have different biophysical properties, different distribution in the body.

Example. The w6s play a major role in skin, the w3s in brain function. But they are distributed everywhere.

The EFs are critical for human life.

The essential fats are made from the essential fatty acids (EFAs) linoleic (w6 = EFA6) and linolenic acid (w3 = EFA3). The human body makes FAs derivatives, which I named Derivative Fatty Acids (DFAs), DFA3, DFA6.

There are two other common families of FAs, the omega-7 (w7) and omega-9 (w9).

Historically, physicians and nutritionists used the word polyunsaturated FAs (**PUFAs**) usually to refer to PUFAs of the w3 and w6 families. My research and research from others found that there are PUFAs of the w7 and w9 families. I created the term EFs

EFs = PUFAw3 + PUFAw6 = EFA3+DFA3+EFA6+DFA6 (or = EFAw3+DFAw3+EFAw6+DFAw6).

Usually, most of the w7 and w9 FAs are monounsaturated fatty acids (MUFA = MONO).

Topics

How Essential Fats link nutrition and heart disease (Siguel E, Lerman, RH. Fatty Acid Patterns in Patients with Angiographically Documented CAD. /Metabolism/ 1994; 43:982-993.)

Why EFs are likely the greatest nutritional factor affecting Total/HDL cholesterol, and how people can optimize their diet to reduce their risk for heart disease (Siguel, E. A New Relationship between PUFAs and TC/HDLC. Lipids, 1996; 31, S51-S56).

How EF abnormalities contribute to the complications of Crohn's disease, Ulcerative Colitis, Cystic Fibrosis, and other chronic intestinal diseases; using nutritional supplements to correct these conditions (Siguel E, Lerman, RH. Fatty Acid Patterns in Patients with Chronic Intestinal Disease. Metabolism, 1996; 45(1):12-23).

The role of EFs, vegetarian diets, and antioxidants in breast and prostate cancers. (Siguel EN. Cancerostatic Effect of Vegetable Diets. Nutrition and Cancer, 4:285-289, 1983).

Changing the USDA Food pyramid to incorporate a new nutritional strategy that reflects the diet of our ancestors and prevents many of the modern diseases that reduce life expectancy. (Siguel EN, Schaefer EJ. Aging and Nutritional Requirements of EFAs. In: Beare J, ed. Dietary Fats, American Oil Chemists Society (AOCS), Chapter 13. (1989). Siguel E, Lerman RH. The Role of EFAs: Dangers in the USDA Dietary Recommendations ("Pyramid") and in Low Fat Diets. Am. J. Clin. Nutrition, 1994; 60:973-9).

How low-fat diets can cause EF abnormalities and lead to premature heart disease, behavioral and learning difficulties, and many other problems. (Siguel E, Lerman RH. The Effects of Low-Fat Diet on Lipid Levels. JAMA, 1996; 275:759. Siguel E, Lerman RH, MacBeath, B. Very Low-Fat Diets for CHD: Perhaps, But Which One? /JAMA/, 1996:275: 1402-1403.)

The role of functional foods in preventing and treating disease (Siguel, E. Issues and Problems in the Design of Foods Rich in EFAs. Lipid Technology/, 8(4):81-86, 1996).

Optimized drug and nutrition therapies for people who have abnormal lipids and increased risk of premature death due to cardiovascular disease.

Warning signs that one may be headed for heart trouble, in time to stop and reverse the damage already done. Why having "normal" cholesterol values is not good enough. Ideal levels of cholesterol, HDL, triglycerides. How to reach those levels and remain there.

How to strengthen immune system with foods and EFs. Understanding the balance of "eicosanoid" hormones, derived from EFs. Optimizing immune function.

How to identify and understand the concepts in food and medicine, advertisements. Which could make sense, which ones I would avoid. Is advice from the previous centuries good enough? Why, which one? Which "diet foods" deceive because they replace fat with sugar. Foods which are " all natural" and "sugar free" but high in calories (because they contain sugar-like ingredients such as fructose or corn syrup).

Other topics. Which low fat diets work and why. Comments on news media articles. Pros and cons of low-fat vegetarian programs similar to those of Dr. Ornish (see letters published in JAMA); discussion of The Zone and other diets.

Philosophy goals

We aspire to Menschkeit. From https://www.peterswank.com/menschkeit

"A person having admirable, noble, or dignified characteristics, such as fortitude, responsibility, and firmness of purpose"; fundamental decency.

"A person who is admired, respected, and trusted because of a sense of ethics, fairness, and nobility"

References

Siguel, E. Deficiencies and Abnormalities of Essential Fats in Gastrointestinal and Coronary Artery Disease. Journal of Clinical Ligand Assay 2000; 23:104–11.

Siguel, E. Clinical Impact of Methodological Issues in the Diagnosis of Deficiencies and Abnormalities of Essential Fats. Journal of Clinical Ligand Assay 2000; 23:112–21.

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