

Nutrition and Ingestion: The Good, Bad and the Ugly

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The food that we consume today differs markedly from that which our ancestors subsisted on in earlier times. 14,000 years ago, the hunter-gatherer's diet consisted of an almost limitless variety of fruits, vegetables, nuts, berries and occasional meat and fish as they foraged for food. The Agricultural Revolution began approximately 10,000 years ago. The hunter-gatherer nomadic lifestyle was swept aside in favor of permanent settlements that promoted the domestication of plants and animals. This ensured a reliable food supply but significantly reduced the variety of available food. Over the last 200 years the Industrial Revolution has profoundly revolutionized food production and further transformed our diet. This presentation discusses how the impact of these relatively recent changes have affected the health of the American public.

For the past 60 years the concept of eating healthy in America has become synonymous with restricting dietary fat. Following World War II an epidemic of coronary artery disease appeared to sweep the nation. "Middle-aged men, seemingly healthy, were dropping dead," commented one observer. Heart disease was the number one cause of death claiming more than 500,000 lives annually. This alarming statistic prompted the government to commission the seminal Framingham Heart Study. The study was designed to identify common characteristics that contributed to cardiovascular disease by closely observing a large group of healthy adults over an extended period. The original Framingham study was conducted over twenty years beginning in 1948 but later expanded to include the offspring and grandchildren of the

original participants. 5,209 men and women from Framingham, MA were originally selected for the investigation based on their overall good health and having no prior history of a stroke or heart disease. One important observation from the Framingham study was that total cholesterol levels increased following the ingestion of saturated fat. It was believed that elevated cholesterol was a reliable predictor of heart disease, and this relationship soon became the central focus of nutritionists and epidemiologists.

Cholesterol is essential for life. It is a waxy substance that is a major structural component of all cell membranes and a precursor of Vitamin D and several hormones such as cortisone, estrogen, and testosterone. Cholesterol is primarily produced by the liver, but exogenous sources also exist in animal products such as meat, egg yolks, and dairy. There are two main subtypes of cholesterol – the ‘bad’ LDL that accumulates in the walls of arteries causing atherosclerosis and ‘good’ HDL that returns excess cholesterol back to the liver.

Ancel Benjamin Keys was a nutritionist who became the central figure investigating the connection between dietary fat, cholesterol, and heart disease during the latter half of the 20th century. Keys was largely responsible for promoting the low-fat diet that has existed in America for the past 60 years. He launched the historic Seven Countries Study in 1956 - a 25-year investigation that analyzed the diets of 12,700 men in Yugoslavia, Italy, Greece, Finland, the Netherlands, Japan, and the United States. The Seven Countries Study was the first multicounty epidemiological undertaking in human history. The investigation identified a strong correlation between the consumption of saturated fat and death from heart disease in these seven countries. Finland, having a diet high in saturated fat from dairy

products and meat, experienced a strikingly high death rate from heart disease. Crete and Corfu, with plenty of olive oil and with very little meat, experienced an incidence of heart disease that was quite low. The Seven Countries Study was the first to suggest that heart attacks were not a natural aging phenomenon and might be prevented by reducing dietary fat. Keys introduced the **lipid-heart hypothesis** that outlined a sequence of relationships in which a diet containing saturated fat elevates serum cholesterol. Cholesterol is subsequently deposited in the arteries throughout the body causing atherosclerosis and reduced blood flow. Diminished blood flow in the coronary arteries is the major factor that is responsible for causing heart attacks. The lipid-heart hypothesis also suggested that replacing saturated fats with unsaturated fatty acids from vegetable oils that do not contain cholesterol was likely to improve cardiac health.

Over the ensuing decades there has been near unanimity among nutritionists that the ingestion of fat was unhealthy and should be reduced in our diets. From time to time, a small minority of nutritionists questioned the validity of the lipid-heart hypothesis. As a result, they were routinely ostracized and marginalized by Keys who was combative and intolerant of anyone who disagreed with his hypothesis. These critics paid a heavy price for expressing their opinions and were no longer invited to major national meetings and often their research funding dried up as a result. Essentially, they were sidelined and silenced. Keys and his fellow nutritionists, along with the full support of governmental agencies such as the Food and Drug Administration (FDA) and United States Department of Agriculture (USDA) embarked on a national program to promote the reduction of fat in the American diet.

Crisco was a product originally derived from cottonseed oil that was soon introduced as

a healthier alternative to cooking the traditional way using lard which is high in saturated animal fat. [Crisco-the name is derived from **cr**ystallized **c**ottonseed **o**il] Crisco was originally produced by a process called hydrogenation that transforms vegetable oil into a semi-solid substance suitable for cooking and baking. Another similar product was hydrogenated soybean oil, better known as margarine, that was introduced as a healthier replacement for butter.

Unfortunately, products such as Crisco and margarine were eventually recognized to contain unhealthy trans fatty acids (trans- fats) that are a product of hydrogenation. Trans-fats were observed to elevate the so-called 'bad' LDL cholesterol, lower the 'good' HDL cholesterol, and increase the risk of heart disease. The hydrogenation process alters the molecular structure of vegetable oils and creates trans-fats that the body is unable to effectively metabolize. Autopsy studies revealed that trans-fats accumulate in the cell membranes and tissues throughout the body causing inflammation and calcification in the arterial walls that often lead to heart disease and stroke. In 1994, it was estimated that trans-fats were responsible for 30,000 deaths annually in the U.S. from heart disease. The food industry was slow to respond when mounting evidence emerged suggesting that trans-fats posed a serious health risk. They were reluctant to bring this to the attention of the American public because hydrogenated products were in widespread use in thousands of food products. To eliminate these products would come at an enormous cost to them. The watchdog agencies in the federal government were also slow to take decisive action in this matter. Fortunately, today trans-fats have now been largely eliminated from our food. In 2006, the FDA began requiring that the trans-fat content be prominently displayed on all food labels (see Nutrition

Facts). The labelling is slightly misleading, however. Zero trans-fats do not necessarily mean zero. One of the lasting problems with the rule is that it allows food packages to list “zero grams” for any serving size that contains up to 0.5 gram of trans-fat. Many food companies cleverly reduced the serving size of their products to slide in just under the 0.5-gram limit. [Crisco and margarine products are still on the market today but employ a different process that does not generate trans-fats.]

(The irony is that hydrogenated vegetable oils were originally promoted to be beneficial to health but later proven to be the unhealthiest of all fats!)

The low-fat diet was officially adopted by the highly influential American Heart Association (AHA) in 1961 and formally introduced to the American public. Initially the focus was primarily on reducing the consumption of saturated fat, but their recommendation was later modified to include the reduction of total dietary fat.

The food industry promptly responded to the American Heart Association’s low-fat recommendation by creating thousands of products that replaced the fat content with other substances. Foods that are advertised as ‘low-fat’ are, in large part, high in sugar. For example, your morning low fat yogurt contains as much sugar as a can of soda pop.

Over the past 60 years the reduction of dietary fat has continued to be the prime focus of most nutritionists but the link between fat consumption and the risk of cardiovascular disease has been among the most vexed issues in public health. Are dietary fats really the “villains” we once believed? Are they benign, or are they even “heroes” that might promote better overall health? Medical literature is full of articles arguing opposing positions. For

example, in 2017, the American Heart Association Presidential Advisory strongly promoted the concept that “lowering the intake of saturated fat and replacing it with unsaturated fat (i.e. vegetable oil), will lower the incidence of cardiovascular disease.” Three months later, the 18- country Prospective Rural Urban Epidemiology (PURE) Study, comprised of 140,000 subjects, concluded much the opposite and claimed that “Total fat and types of fat were not associated with cardiovascular disease, myocardial infarction, or cardiovascular mortality.” Numerous other published studies have also produced contradictory conclusions regarding the low-fat diet.

These three cover stories in Time Magazine spanning more than 50 years from 1961 to 2014 illustrate the dramatic changes that have occurred regarding our understanding of the role of dietary fat and health. The 1961 and 1984 issues strongly promoted the lipid-heart hypothesis and the benefits of the low-fat diet as espoused by Ansel Keys. A decidedly different message was expressed in the June 23, 2014, edition. The magazine cover boldly proclaims, ‘Eat Butter’ -Scientists labelled fat the enemy. Why were they wrong? The lead article is entitled “Ending the War on Fat.” So, what happened to completely upend the lipid-heart hypothesis? The changing attitude regarding dietary fat occurred for a variety of reasons. The science of fat and cholesterol had evolved from a simple story into a very complicated one. A much clearer understanding of the complex relationship between dietary fat and cholesterol emerged as more scientific information became available. Also, the early nutritional studies that were frequently cited in support of the lipid- heart hypothesis were carefully reexamined, and it was determined that many were seriously flawed due to being poorly designed and executed. For example, some studies incorrectly combined saturated fats with

harmful trans-fats producing results that were clearly impossible to interpret. This was a major error.

Questions were raised about Key's landmark Seven Countries Study. It was noted that Keys had actually analyzed the diets of less than 4% of the 12,763 subjects. He was accused of selecting only countries that fit with his lipid-heart hypothesis and excluding others that did not. Critics noted that Keys did not include a European country such as Germany, France, or Switzerland to challenge his hypothesis. The French, for example, experience a low incidence of coronary death rates despite their high intake of dietary cholesterol and fat. The lipid-heart hypothesis appeared to be inconsistent with the so-called 'French paradox' and therefore Keys simply excluded France from the investigation.

Nutritional studies have repeatedly demonstrated that reducing dietary fat consistently lowers serum cholesterol. However, this fact does not translate into any demonstrable reduction in mortality or coronary artery disease. Since the 1970s, the average fat intake in America has decreased from 40% to 34% of total caloric intake and cholesterol levels have declined as well. However, critics of the low-fat diet argue that there is no compelling evidence to suggest that these decreases have produced any health benefits.

It is widely understood that ingesting saturated fat will raise 'bad' LDL cholesterol levels, which are associated with higher rates of heart disease. That's the most damning biological evidence against saturated fat. Cholesterol is more complicated than that. Saturated fat also raises levels of the so-called 'good' HDL cholesterol which returns cholesterol to the liver preventing it from accumulating in arterial walls. Raising both the LDL and HDL makes the ingestion of saturated fat a virtual wash. In addition,

scientists have now identified two kinds of LDL particles, small dense ones and large fluffy ones. The large ones appear to be mostly harmless-and it's the levels of those large particles that fat intake raises. Carbohydrate intake, meanwhile, seems to increase the number of small, sticky particles that now appear to be linked to heart disease.

There are many additional factors that can influence health outcomes besides eliminating or adding a single item to our diet such as the effects of smoking, exercise, stress, hypertension and genetics. Nutritional studies are inherently complex and difficult to conduct as they require monitoring the diets of individuals over a long period of time, often relying on questionnaires which are inherently inaccurate. Often the length of study is far too brief to draw any meaningful conclusions. To produce public health guidelines about which foods to eat or avoid is complicated. For example, dietary fats are typically mixtures of different types of fatty acids. Hence, conclusions about the effects of dietary saturated fat, monounsaturated, and polyunsaturated fatty acids are unlikely to consistently translate to their effect on health.

Let us examine the popular Western diet which is the prevalent diet today in North America. The Western diet consists of a notably high content of red and processed meat, sweetened drinks, refined grains, and ultra-processed foods.

Processed and ultra-processed foods pack the shelves of every grocery isle in America. Processed foods have been altered in some way from their natural state for taste, preservation or storage. Examples include canned vegetables, frozen fruit, white bread and breakfast cereal such as corn flakes. Processed foods often contain unhealthy ingredients such as sweeteners or

sodium that lack nutritional value. Ultra-processed foods go through several additional steps of processing and add substances such as artificial colors and flavors, preservatives and other unhealthy ingredients. They often lack essential nutrients such as dietary fiber and key vitamins and minerals. Some examples include ice cream, packaged baked goods, and sweet and salty snacks. Ultra-processed foods now comprise about 60% of the American diet according to a recent government study.

Processed meats are another unhealthy example of the Western diet. These include bacon, ham, sausage, hot dogs, pepperoni and deli meats. Processed meats often contain a high content of salt, high fructose corn syrup, wheat, grains, and other additives that can have multiple adverse health effects.

Grain fed cows have a big impact on the health effects of the meat. Beef from grain fed cows often contain antibiotics, pesticides and hormones. and a high content of undesirable omega-6 fatty acids (due to being corn fed in overcrowded feed lots for an average of six months). Grass fed beef is a much healthier option than beef raised on grain in feed lots. Grass fed cows are largely devoid of these substances and have a higher content of vitamins and minerals. Grass fed cows have a healthier fat profile including a greater content of desirable omega-3 fatty acids and lower omega-6 content. Keep in mind, when it comes to beef- you are not what you eat- you are what your food eats. Grass fed beef is far more nutritious -yet 99% of the beef consumed in America is grain fed.

In 1992 the USDA introduced the Food Guide Pyramid that recommended the consumption of up to 11 servings of grains per day, compared with just two or three servings of meat, eggs, nuts,

beans, and fish combined. The pyramid was flawed in several ways placing an emphasis on high carbohydrate consumption that has contributed to negative health outcomes. The Food Pyramid did not recommend whole grains specifically. Whole grains are the source of numerous, healthy and biologically active micronutrients and provide fiber which acts by slowing down digestion. This, in turn, aids in regulating blood glucose levels following a meal [the so-called glycemic effect.] Whole grains also help us to feel full longer, reducing the likelihood of weight gain. The reality today is that most grains that are available in the Western diet are the less-healthy refined variety.

Refined grains are subject to a milling process that removes the outer husk and inner germ layers from the grains, leaving only the middle endosperm. As a result of milling, refined grains have lost much of their fiber and nutritional elements leaving a nutrient poor and high carbohydrate (read sugar) content. A diet heavy on refined carbohydrates can promote obesity and diabetes.

Simple carbohydrates like those found in white bread may not look like sugar on your plate, but in your body, that's what they're converted into when digested. "A bagel is no different than a bag of skittles to your body."

It is estimated that today the average American consumes about one pound/day of sugar and carbohydrates. The rise in sugar consumption has soared over the past 50 years following the introduction of the low-fat diet and has resulted in exceedingly unhealthy consequences. Adding to the large sugar consumption is another product that is in widespread use today - high fructose corn syrup. It is relatively inexpensive to produce and is now a common additive and sweetener in thousands of processed foods and soft drinks. High fructose corn syrup is highly addictive and

results in a rapid spike in insulin release that promotes both inflammation and fat storage.

The increased sugar consumption in the American diet is largely responsible for the obesity and type-2 diabetes epidemic in our country today. Besides the high content of sugar in so-called healthy low-fat foods, approximately 20% of dietary calories result from the ingestion of sugar sweetened beverages such as soda pop and sports drinks. Ingestion of these products have little nutritional value and are far worse than ingesting foods containing complex carbohydrates because they are rapidly absorbed and go straight into fat production. They are biologically addictive, increasing one's craving for more sugar and since your body does not recognize these beverages as food, one ends up consuming more calories than you would from solid food.

A critical review of the low-fat American diet over the past few decades highlights some disturbing health problems that have emerged. We have steadily reduced the total fat content in our diet since 1961, yet we are sicker than ever. Type-2 diabetes and obesity rates are skyrocketing. In 1960 1 out of 100 people in America had type 2 diabetes, today that ratio has changed to 1 in 10, a tenfold increase. In 1960 only 1 in 7 Americans was obese; now it is 1 in 3. A recent study found that fewer than 7 percent of American adults are metabolically healthy, in other words, have normal blood pressure, blood sugar, cholesterol and weight, and have not had a heart attack or stroke. Deaths from heart disease have fallen-a fact that many experts attribute to better emergency care, less smoking and widespread use of cholesterol lowering drugs like statins-but cardiovascular disease remains the country's number one killer.

If you are confused about what constitutes the best diet to promote good health, you are not alone.

The U.S. News and World Report produces an annual ranking of the 30 Best American Diets. For the eighth consecutive year, the Mediterranean diet takes the No. 1 spot for the Best Diet Overall with its focus on diet quality rather than a single nutrient or food group and a daily consumption of fruits, vegetables, whole grains, beans, nuts, legumes, herbs and spices and olive oil.

Ancel Keys created the Mediterranean diet concept in the 1950s. Keys had been drawn to Mediterranean countries because they seemed to be compatible with his hypothesis that saturated fat caused heart disease. He later published a cookbook entitled “Eat Well and Stay Well the Mediterranean Way” but never formally identified a “Mediterranean” cuisine. There was no such thing as a formal Mediterranean diet in these various countries such as Spain, southern Italy and Greece until very recently.

Creation of the Mediterranean diet (MedDiet) was promoted by two nutritionists from Greece and Italy in the 1980s. They collaborated to describe common dietary features that existed in the Mediterranean region and the Mediterranean diet came into being. The traditional Mediterranean diet reflects food patterns typical of Crete, much of the rest of Greece and southern Italy in the early 1960s. Variations of the MedDiet exist but have been less well described elsewhere in the Mediterranean region. The Mediterranean Diet was formally introduced in the United States in 1993 and is one of the most studied and well-known dietary patterns worldwide.

The traditional Mediterranean diet is widely considered a model for healthy living. Daily physical activity combined with an abundance of fruits, vegetables, whole grains, nuts, and legumes

are the major features of the MedDiet. Olive oil is the main source of fat. Fish, poultry and red meat are consumed in low to moderate amounts. Also, moderate consumption of red wine is common and typically served in conjunction with meals. There is compelling evidence that adherence to the MedDiet reduces the incidence of obesity, type-2 diabetes, hypertension, stroke and heart failure. In addition, the MedDiet is associated with a slower progression of age-related cognitive decline and a lower risk of neurodegenerative disorders such as dementia and Alzheimer's disease.

The Mediterranean food pyramid illustrates an emphasis on nutrient rich fruits, vegetables, and whole grains. Seafood and poultry may be eaten several times a week along with moderate amounts of yogurt, nuts, eggs, and cheese while red meat is allowed only rarely. Olive oil consumption is a hallmark of the traditional Mediterranean diet. Research has established that the benefits of the Mediterranean diet are largely due to the ingestion of polyphenols. Polyphenols are abundant in the Mediterranean diet and appear to be responsible for their cardioprotective, metabolic and longevity effect. Polyphenols are natural compounds that exist in fruits, vegetables, nuts and seeds, roots, bark, leaves of different plants, whole grain products, red wine and, of course, olive oil. These compounds are diverse in structure and function and play a critical role in neutralizing free radicals, lowering blood pressure and slowing atherosclerosis. The health benefits of olive oil are also believed to be due, in part, to its being a monounsaturated fat that is largely composed of oleic acid. Monounsaturated fats are heart healthy and raise the 'good' HDL and lower the 'bad' LDL cholesterol.

The process of extracting olive oil entails initially mechanically crushing the olives and then separating the oil from the fruit pulp under elevated pressure without the use of heat or chemicals. This produces what is termed 'extra virgin' olive oil that contains a high content of beneficial nutrients and over 30 polyphenols. Olive oil production then goes through additional processing to extract more of the oil. Further processing removes many of the essential nutritional elements. Extra virgin olive oil is much more beneficial to health than processed olive oil so one should always insist on extra virgin olive oil.

Dan Buettner has identified several regions around the globe called Blue Zones where people live unusually long and healthy lives. The Blue Zones are all diverse geographically and culturally but share many common dietary features with the Mediterranean diet. People residing in Blue Zones subsist predominately on fresh plant-based ingredients. There is low consumption of fish, eggs and dairy products. Meat and sweets are consumed, but mostly as celebratory foods. People in Blue Zones also tend to be physically active on a regular basis. Largely because of their lifestyle and diet, Blue Zone inhabitants live long, healthy, and energetic lives.

The low-fat diet has been promoted by the highly regarded American Heart Association since 1961 in response to a perceived epidemic of coronary deaths, mainly in middle-aged men. Since then, the heart disease epidemic has been replaced by a much larger epidemic of metabolic disorders affecting all ages and genders accompanied by staggering increases in obesity and type-2 diabetes. The increased carbohydrate consumption that has occurred following the adoption of the low-

fat diet is largely responsible. Carbohydrate ingestion stimulates the release of insulin that directly promotes fat storage. Persistently elevated insulin levels due to carbohydrates can result in insulin resistance and type-2 diabetes. Evidence now suggests that insulin resistance is responsible for elevating triglycerides that are more closely associated with cardiovascular disease than cholesterol. It appears that we may have had it all wrong! The high intake of carbohydrates, rather than fats, appears to be responsible for the health crisis in America today. The ongoing debate regarding the health effects of fat vs carbohydrate has persisted for decades, often generating more heat than light. The low-fat diet became institutionalized long ago as the only diet that could prevent heart disease. It is still being promoted by most nutritionists and governmental agencies today. The American Heart Association currently recommends limiting dietary saturated fat to less than 6% of total daily caloric intake. The emerging evidence, however, now suggests that a well-balanced diet should allow for a reasonable intake of fat. This approach is echoed by Walter Willett, a highly respected nutritionist and former chair of the Department of Nutrition at the Harvard School of Public Health. Willett asserts that there exists no specific fat to carbohydrate ratio that is best for everyone and that an overall high-quality diet that is low in carbohydrate and refined grain will help most people maintain a healthy weight and a low chronic disease risk.

In conclusion, bear in mind that a healthy diet entails much more than reducing the consumption of dietary fat. We should limit our intake of processed and ultra-processed foods, refined grains, and sweetened soft drinks and promote diets that are nutrient rich that include an abundance of fresh fruit, vegetables and whole grains. In addition to dietary changes, we should embrace a

healthy lifestyle that incorporates daily physical activity. Combining these changes in diet and lifestyle can make a significant difference in the quality of one's health, longevity, and well-being. Adopting a Mediterranean type of diet appears to be one effective approach that can promote overall better health, lessen the chance of cognitive decline, and increase longevity. Thank You.

“Eat food. Mostly plants. Not too much.” That is the short answer to the supposedly, incredibly complicated and confusing question of what we humans should eat in order to be maximally healthy. (Michael Pollan, ‘In Defense of Food’)

