The Food Fight of Our Lives or:
Solving the Problem, What Should I Eat?

I. J. Pflug, Ph.D.

Developed in 2003-2004

This is a short essay in which I will present my opinions and quote published material regarding the selection and quantity of food to eat. In 2003, we heard a lot about food and health and undoubtedly in 2004, we will hear even more.

In the main body of this essay, I will talk briefly about the quantity of food we eat, exercise, and the nature of carbohydrates, fats, and proteins. At the end of the main body of this essay are appendices in which each of the above areas are covered at length, using material published by recognized authorities, so further information on these subjects is available close by.

I am quite well acquainted with food; I have been involved with food production all my life. Professionally, I have spent many decades in food-manufacturing technology and since about 1950, I have been very interested in nutrition and food choice. My mother was the first to preach to me regarding food and health. Dr. Carl Fellers taught Nutrition along with Food Science, and Dr. Ansel Keyes added to my nutrition education. In recent years, I have read and reread the books of Dr. Dean Ornish and Dr. Andrew Weil. I will quote extensively from these books.

I think the reader should always know why the words they are reading were written: did some company or organization support the project, is the author selling a product or process? I am not preparing this report for a for-profit publication. I am developing this material for my personal use. I plan to share my observations with my family and with friends. This essay is being prepared because I am personally interested in this problem; I want to know what I should eat.

With all this association with food and my present interest in food choice, I am going to let myself go and ramble on for a few paragraphs regarding how I think we, as individuals, can win "The Food Fight of Our Lives".

Who are our adversaries in "The Food Fight of Our Lives"? The two major ones are ignorance regarding what we should eat and powerful advertising messages telling us every 10 minutes on TV that we dare not deprive ourselves of the latest attractive and delicious (full of fat and flavor) food-fad item.

Since advertising plays such a large role in the food and health world, we need to understand what goes on in producing the advertisements we are subjected to. In the USA, in the 21st century, we are bombarded with audio and visual directions on the foods we should consume, the exercise equipment we should purchase, the drugs and supplements we should use for weight loss or to insure good health and longevity.

There are several bits of information we all need to have engraved on our brains: (1) there is profit to be made on all items we see advertised and discussed in all media; (2) the words we hear or the stories we see and hear on TV are written and staged by cleaver writers and imaginative stage-show producers to sell the product they are pushing - it is all a big show, developed with the objective to induce the consumer to buy the product; and (3) real life - the way things really are - is seldom shown. In all advertisements only one side of the picture (the enticing side) is shown. Words such as "I guarantee" are meaningless - there is an aspect of deception in almost all advertisements. Sometimes it is a critical

omission, sometimes it is a meaningless comparison or it may be an indirect reference to an authority figure or general acceptance that is basically irrelevant.

My first question in "The Food Fight of Our Lives" is, "what should I eat?" I believe that Dr. Weil in, *Natural Health, Natural Medicine*, 1990, gives us some realistic comments regarding that question. This simple question, "what should I eat?" has no simple answer. Many people will try to persuade us that they know, but so much of the information is contradictory that the more theories we listen to, the more confused we become.

Dr. Andrew Weil says, "The first guideline I can give you is that there is no one right way. A particular diet may be right for you at this stage of your life, but it may not be right for me, and it may not be right for you a year from now. We are all different physically and biochemically, with different and changing dietary needs. Do not believe anyone who tells you he has discovered the one right way to eat. Some authorities say that human beings are meant to be vegetarians, others that we must eat animal products to be healthy. The fact is that human beings are omnivores, designed not only to survive but to do well on an astonishingly-wide range of foods. Behind most of the rigid diets promoted in popular books and health-food pamphlets is a most unhealthy assumption: that our bodies are inefficient and unresourceful, easily upset unless we consume exactly the right foods or combinations of foods. When you buy into these assumptions, you are underselling your body's natural resilience and capacity for adaptation. Do not accept this harmful belief."

Dr. Weil says, "Do not believe anyone who says that all illness results from poor diet or that dietary change can cure any illness. It is not so. Diet is one factor shaping health - an important factor, but not the only one. Diet has the distinction of being the only major determinant of health that is completely under our control." I have the final say over what does and does not go into my mouth. I cannot always control the other determinants of health, but I can control what I eat. It is a shame for me to squander such a good opportunity to influence my health.

Dr. Weil says: "Eat a widely varied diet. By varying what you eat, you protect your health in two ways. First, you ensure that you get all the nutrients you need. If you eat the same foods day after day, you are more likely to shortchange yourself of needed vitamins, minerals, or other elements. We probably do not yet know all of the nutritional factors required for optimal health. Only recently did we discover the need for zinc, for example."

How to Win the Food Fight of Our Lives? I think that I need to begin with a confession that when it comes to food, I am weak, or perhaps I should say that when it comes to the refusal of food, I am weak. If I recognize that I am weak, then I can begin to look for crutches and strategies that will allow me to win the battle of the bulge.

These suggestions are being prepared for that fraction of the population that would like to once more be svelte rather than roly-poly. This conversion is not easy and, in many ways, requires a mental change in our concept of a happy life-style, but I believe that it can be accomplished. I believe that it can be done rather painlessly, without drugs, or pills, or surgical procedures.

Our basic problem is over-nutrition. More than thirty (30) years ago I was in a lecture where Dr. Ansel Keyes explained that the big nutritional problem was over-nutrition and that we needed to somehow, individually, reduce our food intake.

There are many strategies that can be used to reduce food intake and many ideas, gimmicks, or other procedures that can be used as crutches to help us on our way to better control our food intake. Dr. Keyes stressed that we should proceed as simplistically as possible; a major point was, "Worry about the big things". He wanted us to worry about our protein, fat, and carbohydrate intake. The Word was, "Take a multivitamin every day and then don't worry about the micronutrients." I believe this is very good advice.

Dr. Weil also says: "Eat less rather than more. Research shows that animals fed somewhat less than the "recommended" daily allowance of calories live longer and have fewer diseases than those put on standard diets or allowed to eat as much as they want. It may be that the recommended daily allowances of nutrients are too high, that eating those amounts creates a state of chronic overnutrition that stresses our bodies. In fact, some scientists now talk about "undernutrition" as a way of promoting health and longevity. Of course, it is easy to say we should eat less rather than more, but it is hard to put into practice. Eating, as I have noted, serves functions other than simply supplying the body with nutrients. It is a symbolic act, a social function, and a source of pleasure."

How should we treat the macronutrients - proteins, fats, and carbohydrates? Contrary to the media buzz in the year 2004, I first think about protein and fat in the diet. I believe that the analytical way of treating this is to think about the percentage of calories in each of these two critical nutrient areas.

There is a good and bad side to everything in life and that applies very much to both proteins and fats. Protein foods are necessary for body building and body cellular repair. We must have adequate high-quality protein in our diet. However, protein molecules are the biologically-active molecules in our food. Therefore, while they are essential, on the one hand, I believe that excess leads to all kinds of health problems. Therefore, I propose that we consume the minimum amount of high-quality protein necessary to maintain our bodies. This is about fifteen percent (15%) of our caloric intake.

Fats are essential to bodily processes. However, fats have twice the caloric value of either protein or carbohydrate, so we do not want an excess (proteins and carbohydrates contain 4 calories per gram, fats contain 9 calories per gram). We need an adequate intake of essential fatty acids; however, we want to minimize the intake of fats because of their high caloric value. There are also other reasons for limiting fat intake. First, we should reduce the amount of saturated fatty acids that we consume because it is the saturated fatty acids that are converted into cholesterol in our bodies. I believe that our fat intake should be of the order of ten to twelve percent (10-12%), of total calories. In his reversal diet for reducing vascular deposits, Dr. Dean Ornish recommends a goal of about ten percent (10%) of calories that are fats. I believe that anyone who is wanting to live a healthy life should use this fat intake level as a goal. We often miss our goals, but unless we have a goal such as ten percent (10%) or twelve percent (12%) fat calories in our diet, we will not attain a low fat intake.

If we aim for about fifteen percent (15%) of our calories as high-quality protein and ten to 12 percent (10 - 12%) of our calories as fat calories, that leaves us about seventy (70%) of our caloric intake being carbohydrate.

I am not an Atkin's "Low-Carb Diet" person. Just as we must have proteins and fats in any healthy diet, carbohydrates are also an essential part of the healthy diet (they are a source of energy and fiber). As we have good and bad fats, we also have some carbohydrates that are more desirable than

other carbohydrates. A high percentage of our carbohydrate intake should be as complex (unrefined) carbohydrates. We should consume natural carbohydrate products in the form of grains, legumes, fruits, and nuts.

Certain carbohydrate foods contain a substance called fiber; it is essential for good gastrointestinal-system operation but also has other therapeutic values. We must consume carbohydrate material that contains a lot of fiber; consuming whole-grain cereals and legumes is an ideal way to get needed fiber.

Strategies For Reducing Food Intake. Now that we have discussed proteins, fats, and carbohydrates, we can now think about strategies for keeping (1) our total caloric intake low and (2) to have the percentage of protein, fat, and carbohydrate calories in the proportions we outlined above.

A general strategy is: eat more fruits, vegetables, and cereals, and less animal products; if we follow this plan, we will be moving toward the nutrient caloric percentages outlined above.

When we observe the caloric levels of the different classes of food products, in general we find that fruits and vegetables have low caloric density. They consist of lots of water and therefore the amount of carbohydrates is limited. Many of our fresh fruits and vegetables are of the order of eighty-five to ninety percent (85 to 90%) water. Consequently, there is only ten to fifteen percent (10 to 15%) solids in these products. This is in contrast to products that have a high nutrient density - meats, cheeses, nuts, pastries and desserts all have high nutrient density.

One of the most effective strategies for reducing food intake is to not have the food available. Even though we are affluent and can afford to be a gourmet or a gourmand, we should choose to eat as an Afghan peasant. If we can keep food out of sight, then it is easier for us to refuse food.

We all need to satisfy our hunger. Therefore, we need to have available, at hand, low-density foods such as fruits and vegetables. It is customary in many cultures to have a bowl of fruit on the dinner table. Another strategy is to only bring a limited amount of high-density foods to the dinner table. In this strategy, we would bring one small serving of high-density food to the dinner table for each person and bring large quantities of low-density foods - salads, vegetables, fruits - so that the individual has a satisfactory meal but is still able to keep within the caloric specifications outlined above.

Another strategy that has been found to work is to eat small meals several times during the day: start the day with a good breakfast of cereals; have a mid-morning snack of cereal but include some fruit to help keep the body going; a modest lunch; a mid-afternoon snack or small meal takes the sharp edge off one's appetite in the evening; eat a small supper and maybe have a late-night snack of an apple or other fruit. By spreading the food intake around the day among several small meals rather than three very large meals, we can attain a lower food intake.

A strategy that worked for a friend of mine, whose life was full of travel and business meetings, was to eat only half of what was served him. He followed this practice and it helped him control his food intake and consequently his weight.

Each of us must develop our own strategy and crutches to control both the quantity of food we consume and attaining the right nutrient balance. Much of life is a habit: we need to take personal responsibility for moving to good habits regarding food consumption. It may sound strange to say that we really need to train people to eat properly or, more aptly put, each of us needs to train ourselves in healthful eating, but this is what we must do if we want food to support and improve our health.

What we all need to do is use common sense in everyday life, eat less, and eata balanced diet. A balanced diet will be high in complex carbohydrates, low to moderate in protein, and low in fat. It will be high in fruits and vegetables; it will minimize both saturated and polyunsaturated fat and will include far fewer foods of animal origin.

In many ways, "The Great Food Battle" is a very one-sided contest. On the one side we have the entire food industry producing products that are attractive and delicious (full of fat and flavor) plus the powerful advertising messages telling us every 10 minutes on TV that we dare not deprive ourselves of the latest food-fad item.

On the other side we stand alone against this onslaught against our good health. However, we can prevail, we will prevail!

Appendices A, B, and C follow; they contain more information on carbohydrates, fats, and protein.

Appendix A: Carbohydrates*

Carbohydrates are the most basic foodstuffs, relatively simple compounds of carbon, hydrogen, and oxygen. Plants make them from carbon dioxide, water, and the energy of the sun. The simplest carbohydrates are the familiar sugars: glucose, fructose, dextrose, and sucrose. Starches are complex carbohydrates, larger molecules made up of units of simple sugars linked in chains. Plants make the simplest sugars by photosynthesis, then convert them into other sugars and starches as storage foods.

When we eat carbohydrates, our bodies metabolize or "burn" them, releasing their stored energy and breaking them down again to water and carbon dioxide. For both plants and animals, carbohydrates are high-quality fuels; it takes relatively little work to dismantle these compounds and release their energy. Because the end products of carbohydrate metabolism are carbon dioxide and water, these are clean-burning fuels as well as efficient ones.

Sugar is instant energy for us, is made by plants, and it is the foundation of the body's energy economy. All other foods are converted into sugar for distribution to our tissues and cells. Many of our cells prefer to run on sugar, and some, such as the highly-specialized nerve cells of the brain, can run only on sugar; they have sacrificed the metabolic equipment needed to burn starch, fat, and protein.

Starch is almost instant energy. To release the energy from starch molecules, plants and animals convert them back to sugars. Sugars have not always been as readily available as they are today, but starches have been mainstays of our diets at lease since the invention of agriculture. Indeed, they are the staples of most cultures: rice, wheat, corn, beans, potatoes, and other starchy roots and tubers, bread, pasta, and so on, are the satisfying "peasant foods" that give us comfort as well as nourishment.

In this century carbohydrates have acquired a bad name. Sugar is maligned in all quarters, accused of causing a long list of ailments from tooth decay to depression. Many people think of starches as low-quality, fattening foods; the image they see when they think of pasta is that of a fat Italian peasant. Many health practitioners parrot the statement that refined sugar and flour provide nothing more than "empty calories." The fact that carbohydrates are so inexpensive relative to fats and proteins seems to lend credence to these notions.

However, very recently, a new and more accurate view of these foods has begun to emerge. In this view complex carbohydrates are seen, correctly, as premium foods. Starch is really the perfect food - satisfying, easily digested and assimilated, a clean, fast, and efficient source of energy. Starches are fattening under two conditions: if you mix them with fat or if you do not exercise. A box of linguini I just bought asks and answers the question: "Pasta. -Why the Fattening Image? Where do you find satisfying eating without blowing your calorie budget? In pasta! That's right. Far from being fattening, pasta scores a moderate 210 calories per serving and has virtually no fat at all." The problem is what we add to the pasta; most of us have learned to like these starch-fat combinations. We put butter in and on our bread; butter and sour cream on potatoes; butter, cream, and oil on pasta, and so on. These dishes are caloric and will certainly increase your weight if you eat them immoderately. If you are an active person, and you learn to eat starchy foods without a lot of added fat, you can eat quantities of carbohydrates without problems. Starch calories are easily burned through aerobic exercise. Complex carbohydrates ought to be a major part of the diet, accounting for 40 to 50 percent of total calories consumed.

Refined carbohydrates, like white flour and polished rice, are just as good energy sources as whole wheat flour and brown rice. The difference is that some of the grain's constituents have been lost; the bran, which is an important source of fiber, and the germ or embryo, which has vitamins and other nutrients. There is nothing wrong with eating some white bread if it is made from high-quality unbleached flour, especially if you also eat whole-grain products. I like various kinds of brown rice, and I also like good white rice (like basmati rice from India or Texas, arborio rice from Italy, and Japanese-style steamed rice). I eat a lot of whole-grain breads, and I like good French and sourdough bread made from unbleached white flour. I eat ordinary pasta and some whole-wheat pasta.

* The major part of this section if from, ***Natural Health Natural Medicine*****,** by Andrew Weil (1990), published by Houghton Mifflin.

If starch is the perfect food, what about sugar? The concept of sugar as empty calories is meaningless. Calories are calories, and the calories of sugar are just as good as those of meat, milk, olive oil, and potatoes. Of course, if you try to live on sugar alone, you will eventually get sick, because the body needs a lot more than carbohydrate calories.

The main difference between sugar and starch is that the body tends to burn sugar immediately and may be unable to store its energy. Starches do not create this difficulty. The body easily stores starch calories, turning them into sugar when needed. Many people report problems from eating foods high in sugar. A common experience is a quick "rush" of energy followed later by a "crash" into lethargy and depression. Some people just feel the crash, saying sweets make them logy and sleepy. Others say that mood swings disappear when they stop eating sugar. Some parents are convinced that sugar makes their young children hyperactive, that behavior and attention problems are much less severe if sugar is restricted or removed.

Aside from its effects on metabolism and energy cycles, sugar is certainly bad for our teeth. It is a favorite food of the bacteria that cause dental caries. Some forms of sugar are worse than others in this regard, honey being particularly bad because of its stickiness, chocolate being surprisingly benign because substances in it disrupt the "glue" that bacteria make to adhere to enamel. Diets high in sugar may also predispose some people, especially women, to yeast infections, may aggravate some kinds of arthritis and asthma, and may raise the level of blood fats.

If sugar can hurt us , why do we like it so much? I think the human sweet tooth made sense at one time. Our very distant ancestors encountered sugar only in the form of ripe fruit and an occasional honeycomb. Since sugar is instant energy, those individuals who had a taste for it would be more likely to survive - to outrun a saber-toothed tiger or win a fight - and pass on their genes. Evolution could not have anticipated that the modern world would be filled with sugar. (I can usually locate some within a minute or tow of entering a home, store, or office.) It is normal and natural to crave sugar, but it is wise not to give in to the craving every time you feel it.

Many people who consult me mention that they crave sweets or have problems controlling their intake of sweets. When I ask them exactly what they are eating, they tell me ice cream, candy, pastries, and the like. These are not simply sweets, but combinations of sugar and fat. Such foods are loaded with calories, very seductive, and major contributors to obesity. See if you can satisfy your sweet tooth with sugar alone: with dried fruit, hardy candy, fruit ices (sorbets or water ices), or even (my favorite) bites of pure maple sugar. These are healthier treats because they are fat free. Try to use them consciously - as a way of rewarding yourself, for example, instead of just eating them for no reason.

Those who condemn sugar totally should note that in India, the native home of sugar cane, that plant is held in highest esteem, and its various products are recommended as foods and medicines in ancient, sacred writings. Eaten consciously and moderately (be sure to rinse the mouth afterward), sugar is a delightful addition to the diet.

In metabolic terms sugar is sugar no matter what form it comes in. I see no advantage to raw sugar, brown sugar, honey, molasses, or maple syrup except that they contain trace minerals as impurities and may have strong flavors that make it harder to eat them as immoderately and unconsciously as most people eat white sugar. Fructose (fruit sugar) has recently become available in refined form. It is sweeter than sucrose (table sugar), offering the benefit of fewer calories per unit of sweetness. Also it may be less likely to disturb blood sugar levels than sucrose and thus may effect energy cycles less.

Sugar is all mixed up with human psychology. From an early age we learn that sugar is our reward if we are good, if we eat our unpleasant vegetables. A great many processed foods contain large amounts of sugar to make them taste good. Many condiments - ketchup, relishes, pickles - are loaded with sugar, as are many soft drinks. The sugar industry likes to tell us that sucrose has only eighteen calories per teaspoon, but most recipes call for cups of sugar, and there are a lot of teaspoons in a cup.

It is worth paying attention to your sugar intake, whether in fruit, fruit juice, desserts, snacks, or unprepared foods.

If you have never stayed off sugar for more than a few days, you might try doing so to see just how strong the habit is. If you are prone to depression, mood swings or fluctuating energy levels, this experiment will show you whether sugar is affecting the condition.

Appendix B. Fats*

Fats, similar to carbohydrates, are made up only of carbon, hydrogen, and oxygen. The molecules that compose fats - fatty acids - require more energy to assemble and so release more energy when burned.

Fats are the most calorie-dense nutrients, with nine calories per gram, almost twice that of carbohydrates and proteins. Plant seeds contain fats from carbohydrates and use them for long-term storage of solar energy. They often store fats in seeds to provide the developing embryo with concentrated nourishment until it can begin to make sugar on its own by photosynthesis. Animals make their own fats from carbohydrates and from the fats of plants and other animals.

Humans tend to like fatty foods. Many of us have a "fat tooth" in addition to a sweet tooth, and again I thinks this is a legacy of evolution. Fat is concentrated energy and hence survival. For people living near starvation or through cycles of feast and famine, a craving fro fat makes sense, especially if fat is available only on special occasions, as when a large game animal is killed. Today fat is an everyday item.

When we talk about "rich" food, we are usually responding to a high fat content, which gives a pleasurable feeling in the mouth besides adding flavor. Our craving for fat and the amount of it in our diet is killing us, no question about it. High-fat diets shorten life by predisposing us to heart disease, vascular disease, cancer, and other serious illnesses. They are also the major cause of obesity.

Not only is the amount of fat you eat an important determinant of health, so also is the kind of fat and the way it is prepared. In this are there is much misinformation. First you must learn which foods are naturally high in fat. These include seeds (sesame, sunflower, and corn), nuts (especially walnuts, pecans, Brazil, macadamia, and coconut), a few legumes (peanuts and soybeans), a few fruits (olives and avocados), many meats (beef, pork, lamb), poultry (goose, duck and unskinned chicken), some fish (salmon, mackerel, sardines, bluefish and herring), chocolate, butter, cream, and cheeses made from whole milk, Of course, many prepared foods are high in fat because they are made from these products or are cooked in or with fats. Many people get 40 to 50 percent of their total calories from fat. This is not healthy.

Fats differ greatly in their composition, depending on which fatty acids predominate. We have all heard of saturated and unsaturated fats. These terms refer to the chemistry of fatty acids - whether all available carbon bonds in the molecular chain are occupied, or saturated, with hydrogen atoms. You don't have to be a chemist to know where a fat falls in the spectrum of saturation/unsaturation. Just put a sample in the refrigerator, and you will quickly see. Saturated fats become hard and opaque in the cold; the higher the temperature at which they stay hard, the more saturated they are. Animal fats are the major source of saturated fat in our diets. Just think of how bacon fat looks in the refrigerator. Some vegetable fats are saturated too, notably coconut and palm oils; coconut oil remains hard and white even at room temperature.

At the opposite end of the spectrum are the polyunsaturated fats, which include many vegetable oils. They stay transparent and free-flowing under refrigeration. Safflower oil is the most unsaturated of the food oils. Moving from that extreme we find sunflower, corn, soy, and cottonseed oils. In the middle of the spectrum are oils made up mostly of fatty acids that lack saturation only at one point in the molecular chain. They are called monounsaturated fats. Olive and canola oils contain more monounsaturated fats than other oils, with peanut oil trailing somewhat behind. Olive oil becomes thick and translucent in the refrigerator; you can pour it out of the bottle in this state, but only with difficulty. Canola remains clear and pourable but becomes visibly thicker. Bear in mind that all fats are mixtures of fatty acids, so the terms "saturation" and "unsaturation" refer to the predominant components. Even beef fat and lard, which are saturated by definition, have a substantial percentage of unsaturated fatty acids, while olive oil, which is monounsaturated, contains 14 percent saturated fat.

* The major part of this section if from, ***Natural Health Natural Medicine*****,** by Andrew Weil (1990), published by Houghton Mifflin.

Over the past half century evidence has steadily grown of the dangers of diets high in saturated fat. A major clue appeared during World War II, when the supply of meat, eggs, butter, and cheese declined sharply in the countries of Western Europe caught up in the war. As consumption of these foods dropped, so did deaths from coronary heart disease. After the war, when consumption rates returned to normal, deaths from coronary heart disease rose to their prewar levels. The theory that saturated fat promotes atherosclerosis, a condition in which cholesterol is deposited in arteries, is now established as medical fact. In the Western world this condition has been accepted as a normal characteristic of human life. It is not. Atherosclerosis is a disease of lifestyle, particularly related to the regular consumption of foods high in saturated fat: meats, whole milk and its products, and prepared foods made with butter, lard, beef fat, coconut oil, and palm oil. The best defense against early death from heart attacks is to eliminate these foods from the diet or eat them only infrequently. Arterial disease begins early in life in many people who eat "typical" diets. Autopsies of eighteen- and nineteen-year old soldiers killed in Vietnam showed that most of them already had cholesterol deposits in their coronary arteries.

In response to the growing awareness of the harmful effects of saturated fats, doctors and nutritionists began recommending fats from the other end of the spectrum, with the result that the food industry began to promote products high in polyunsaturates. Safflower oil, once a little-known cooking fat, enjoyed a boom of popularity. Research showed that replacing saturated fat in the diet with polyunsaturated fat lowered blood cholesterol. Monounsaturated fats were considered neutral, neither raising nor lowering cholesterol levels and the risk of heart attack.

Unfortunately, polyunsaturated fats have dangers of their own, which are still not widely known. Points of unsaturation in fatty acid chains are unstable and vulnerable to attack by oxygen, especially if fats are heated in the presence of air or left standing exposed to air. The products resulting from these oxidation reactions are highly reactive molecules that can damage DNA and other vital components of cells. Diets high in polyunsaturated fats increase the risk of cancer, speed up aging and degeneration of tissues, and may aggravate inflammatory diseases and immune-system disorders..

When fats oxidize and dangerous compounds build up, they become rancid and our noses can detect the change. If you do not know the odor of rancid fat, I urge you to train your nose to recognize it. Do not eat anything that has even a hint of that smell about it. If you eat foods high in fat, such as nuts, chips, and crackers, smell them first before you start putting them in your mouth. In sealed bags of snack foods, the telltale odors are often concentrated and easy to detect upon first opening the container. The more unsaturated a fat, the faster it will become rancid on exposure to air. Linseed oil is so unsaturated that oxidation rapidly changes its chemical structure, causing it to turn dry and hard. (This is the reason for its use as a base for oil paints.) Safflower oil develops a rancid odor much more quickly than other oils; before its recent popularity as a cooking fat, it was classed as a "drying oil" along with linseed.

Rule 1 - reduce fat intake! If both saturated and unsaturated fats can harm us, what are we to do? First and foremost, we should try to reduce the total amount of any kind of fat in our diets. Some very restrictive diets with only 10 percent of total calories as fat do wonders for patients with cardiovascular disease, but most of us would find such diets hard to follow. If you can get your fat intake down to 20-30 percent, you will still enjoy what you eat while greatly lowering your risks of disease. This means cutting way down on fried foods, whole milk products, meats, nuts, high-fat condiments like mayonnaise and salad dressings, rich sauces, and desserts.

It also means paying attention to the fat content of foods you buy. Labels are not as helpful as they could be, because they list fat by weight rather than as a percentage of total calories. For example, I have in front of me a package of a part-skim-milk, low-sodium cheese that promotes itself as a healthy alternative to regular cheese. The nutritional analysis on the label reads: Serving size: 1 ounce, calories 100, protein 8 grams, fat 8 grams, carbohydrate less than 1 gram." That sounds not bad, but let's work out the percentage of fat by calories. One gram of fat has 9 calories, so a 1-ounce serving of this "lite" cheese has 8 x 9 = 72 calories. To get the percentage of fat by calories, you divide 72 by the number of

calories per serving (100) and multiply by 100: result, 72 percent. A cheese that is 72 percent fat is not a food you can afford to eat very often if you are trying to keep the total calories you consume as fat below 30 percent.

The next rule, after cutting down on fat in general, is to avoid eating from either end of the saturated-unsaturated spectrum. Since animal foods are the major sources of saturated fat, the easiest way to cut consumption of it to a minimum is to follow a vegetarian or semivegetarian diet, but be sure also to read labels of prepared foods to avoid getting the unhealthy tropical oils: palm and coconut. Hydrogenated and partially hydrogenated oils have been artificially saturated to change their consistency. Solid white vegetable shortenings (like Crisco) begin as liquid oils, then undergo a drastic process that renders them most unhealthy for hearts and arteries. Do not eat any cookies, crackers, breads, or pastries containing partially hydrogenated anything. (That rule eliminates virtually all commercial baked goods.) Margarine is another artificially hydrogenated fat. However good the oils are that go into it, they come out chemically altered in an undesirable way. You are better off eating small amounts of butter.

You should also minimize intake of polyunsaturated oils and products made from them. I do not eat safflower oil, and I recommend that you do not either. Safflower's history as a food plant in the Western world is very recent; mostly we have grown it as a natural dye. We do not eat safflower seeds as we do other oil sources. The plant is native to India, and ancient medical texts from that country warn against the plant as food. Recently plant breeders have developed new forms of safflower with a healthier proportion of monounsaturated to polyunsaturated fatty acids. You will see the term "high oleic safflower oil" on some products. Oleic acid is the principal monounsaturate in olives. I would rather get it in olive oil, which tastes better and has a long tradition of use as a food.

If you do use polyunsaturated oils, save them for use in salad dressings or other cold food. Remember, heating them makes them susceptible to oxidation, with unhealthy results. Even if you buy your cookies, crackers, and chips in health food stores, you will find most of them cooked in safflower oil or other polyunsaturates. Better leave these products alone or learn to make them at home with safer ingredients.

Monounsaturated fats, those in the middle of the spectrum that were once thought to do us neither harm nor good, now look like the safest ones to use. In moderation they do not increase the risk of cardiovascular disease, nor do they oxidize rapidly to become carcinogenic. Replacing saturate fat in the diet with polyunsaturated fat lowers both "good" and "bad" cholesterol in the blood (see the section on cholesterol in the next chapter). Substituting monounsaturated fat lowers only the bad cholesterol and is therefore more protective. Olive oil, for example, has a high percentage of monounsaturated fat. It is a flavorful oil, much liked by most people. Cultures that use it as their main cooking fat have less cardiovascular disease than others. Buy extra virgin (first pressing) or virgin (second pressing) olive oil and enjoy its rich color and fruity odor and flavor. An advantage of highly flavored oil is that you can use less, adding it as a seasoning to foods rather than a principal ingredient.

If you want unflavored oil high in monounsaturated fat, I recommend canola, a new introduction in the United States. Obtained from the seeds of a plant in the cabbage family, this oil is a traditional cooking oil of India and Southern China, where it is known as rapeseed or rape oil. Breeders have improved the plant considerably, so that modern canola has an excellent fatty acid composition, better even than olive oil. Buy only "expeller pressed" or "cold pressed" brands at health food stores. Supermarket brands have been extracted with heat or solvents that change the chemical structure of the fatty acids in unhealthy ways.

You have to be careful not only about choosing the right fats but also about making sure they have been handled properly. Just as partially hydrogenating oil makes it dangerous, so do heating it, treating it with chemicals, and leaving it exposed to air. Most oils in supermarkets, except for olive oil labeled "extra virgin" or "virgin," have been extracted with heat or chemical solvents or both.

Buy oils in small quantities, not the giant size. Keep them in the refrigerator after opening. Never reuse oil that has been heated to high temperatures; throw it out. Never heat oil to the point of smoking. Smoke from overheated oil is highly carcinogenic. Get out of any place - your kitchen, a restaurant, someone else's kitchen - that smells of burning grease. It is dangerous to breathe those vapors. Always smell oils before using them and discard if there is any hint of rancidity. Never eat anything deep-fried in a fast-food restaurant or, probably, in any restaurant. Economics dictates that restaurants will use oils over and over until the tastes of oxidized compounds build up to unacceptable levels. Have you ever looked at the fat in a restaurant deep fryer? If you are lucky it will be brown; often it is closer to black, a carcinogenic soup. A few years ago I lectured on this subject at a state university. A woman in the audience spoke to me afterward. She managed a dormitory on campus and said that fat in the large deep fryers in the dorm kitchen was changed once a semester. She said they would try to remedy the situation.

I have devoted a lot of words to the subject of fat, but I cannot overemphasize the importance of knowing the role of dietary fat in health and disease, and I find constantly that people are unaware of the facts I have just presented. Let me conclude this section with a brief story. When I was discussing fats with a group of medical students and mentioned solid vegetable shortenings, one student asked "Why do they call it shortening? What does it shorten?" Before I could respond, another student answered, "Your life."

Appendix C. Protein*

The chemistry of proteins is much more complex than that of carbohydrates and fats, and proteins are important to living organisms in more ways than as sources of energy. They compose many tissues of the body, such as muscle, skin, and bone; make up the delicate internal machinery of cells; and regulate many life functions. Protein molecules begin as long chains of amino acids, relatively simple compounds containing nitrogen. Amino acids are like the letter of the alphabet. We can make endless numbers of words from only twenty-six letters, and the body can make endless numbers of proteins from twenty amino acids. It can manufacture all of these building blocks on its own except for eight of them, the essential amino acids that we must get in our diet.

Once protein chains are assembled, they assume complex three-dimensional shapes by folding up in ways determined by their amino-acid sequences. The meaning of a protein "word" is as much in its contour as in its "letters." Because protein chemistry offers so many possibilities for distinctive sequences and shapes, proteins, more than any other components, differentiate organisms. The carbohydrates and fats in me are not that different from the carbohydrates and fats in you or in my dogs or in the plants in my garden, but my proteins are very different from the proteins of plants and other animals and even from your proteins.

Instructions for building cells and tissues and organs are encoded in DNA, the basic molecule of life that makes up genes. Information in the DNA genetic code (which is the same for all organisms) is expressed through the manufacture of specific proteins. Some of the most important proteins in all organisms are enzymes that catalyze or speed up biological reactions. As genes turn on or off, thereby starting or stopping the synthesis of particular enzymes, the machinery of cells is directed to build up the tissues that become you or a dog or a plant and then to regulate the functions of the finished organism.

You must have dietary protein to build new tissue and to repair damaged tissue. If you are a growing child you need to eat plenty of protein. If you are recovering from serious illness or injury, you need extra protein. If you are a nursing mother, your protein needs are higher than normal. But if you are not in these categories, your protein needs as a normal, healthy adult are not great, even if you are pregnant or engage in strenuous physical activity.

As little as two ounces (sixty grams) of a protein-rich food may be enough to prevent protein deficiency in most of us; four ounces will certainly do it. That means a four-ounce serving of meat or

chicken or fish or cheese or tofu. Most people eat more than four ounces of protein at every meal. A breakfast of bacon and eggs with milk and cereal is already a protein overload at the start of the day.

If you eat more protein than your body needs for growth, repair, and maintenance of tissue, what becomes of it? The body burns it as a fuel. Because of the complexity of protein molecules, the body has to work harder to dismantle them and release their energy. The ration of energy gained to energy expended is not as favorable as for carbohydrate and fat. High-protein diets impose a considerable work-loan on the digestive system and may contribute to feelings of fatigue and lack of energy. A frequent complaint of patients who consult me is lack of energy. If I can convince them to cut down on the amount of protein they eat, increase their intake of starch and vegetables, and do more aerobic exercise, most of them find that they feel better and have more energy.

* The major part of this section if from, ***Natural Health Natural Medicine*****,** by Andrew Weil (1990), published by Houghton Mifflin.

Protein as a fuel does not burn clean. Because of its nitrogen content, protein leaves "ashes" when it burns, toxic nitrogen wastes that must be eliminated from the system. After a high-protein meal, amino-acids flood into the blood-stream. The liver has to work hard to metabolize them to a simple compound, urea, which is poisonous and must be removed by the kidneys. For this to happen, large amounts of water have to be excreted to flush the urea from the blood. In addition to the general workload on the entire digestive system, protein metabolism especially taxes the liver and kidneys.

Although doctors know that patients with serious liver and kidney disease must be maintained on very low protein diets, they often fail to warn patients with mild disorders about the dangers of eating too much protein. One way to keep liver and kidney ailments from getting serious is to spare these organs the extra work of processing the residues of protein metabolism.

The rapid weight loss that occurs with the ever-popular high-protein, no-carbohydrate diets promoted in books, magazines, and tabloids is mostly the result of diuresis - loss of water from the body into the urinary tract. You can lose ten pounds in a week of eating nothing but steak and grapefruit, but most of the weight is water, the consequences of the kidneys' efforts to get rid of urea. The chance of gaining it all back when you resume a normal diet is 100 percent. I have never met anyone who kept weight off by following this sort of regimen. It is also a terrible stress on the system.

The diuretic effect of high protein intake leaches minerals out of the body, including calcium. Loss of calcium from bones can produce osteoporosis, a condition that results eventually in skeletal deformity and fractures, especially of hips. In recent years osteoporosis has become a well-known disease feared by women, who, because of hormonal changes at menopause, become susceptible to it at younger ages than men. Many women today take hormone and calcium supplements to protect their bones, but they continue to eat protein-rich diets that neutralize the protection. Osteoporosis is not caused by calcium deficiency in the diet, nor can it be corrected by taking calcium supplements once it develops. It is caused by heredity (slender, light-boned women being most susceptible), lack of proper exercise (weight-bearing activities such as running, aerobics, and weight lifting increase the uptake of calcium by bones, low levels of sex hormones (as in women after menopause and men in their eighties), and diet. Although biochemists have known for many years that high-protein diets cause bones to lose calcium, this information seems not to get the attention of doctors and patients, most of whom would rather use pills once osteoporosis has developed than try to prevent it by modifying patterns of eating and exercise early in life.

I believe that high-protein diets can irritate the immune system in some people, aggravating allergies and auto immune diseases (such as rheumatoid arthritis and lupus, in which the immune system mistakenly attacks the body's own tissues). Because proteins are the components that make an

organism unique, the immune system reads them to decide whether materials in the body are self or foreign. When the immune system is overactive, as in allergy and auto-immunity, flooding the body with animal and plant protein may confuse if further and make resolution of these conditions less likely. I find that very low protein diets often contribute to improvement in patients with immune-system problems.

If too much protein is not good for us, why do we put such emphasis on it in thinking about food and in planning meals? Most people worry about not getting enough protein; almost no one thinks about getting too much. "Where are you getting your protein? is a common question in our culture, asked often of people who move in the direction of vegetarianism. How many times have you been asked "Where are you getting your fat?" or "Where are you getting your starch?" Most meals revolve around centerpieces of protein-dense foods. Many cooks would not know what to put on the table for dinner if they were told to omit meat, poultry, fish, and cheese. Everyone would be looking around for the main course.

Our love of protein has a simple historical explanation, I think. Our ancestors came from agricultural societies in which poor people ate starch and rich people put meat on the table. Eating meat was a sign of affluence, resonating with subconscious associations to much more distant times when the ultimate success was success at the hunt. The hunter with the most status was the one who could provide meat most often. These cultural and economic prejudices operate very strongly today, bolstered by horrible visual images of protein-deficient children in famine-struck areas of the Third World. In fact, it would be hard to become deficient in protein in our country even if you tried. There is enough protein in green vegetables to supply the needs of a normal adult who eats large portions of them. I have put many patients on very low protein diets and have never seen problems result. The signs of deficiency are clear enough. If you are not getting enough protein, your hair and nails stop growing and wounds do not heal. Without these symptoms, you would do better to worry about getting too much protein than too little.

Our culturally warped view of the value of protein foods naturally is reflected in our nutritional science. At the beginning of this chapter I referred to the Basic Four food groups, that most holy icon of nutritionists. All of us have seen charts telling us we must select foods from each of the groups every day. Three of the four are protein foods: (1) dairy products; (2) meat, fish, poultry, eggs, and legumes; and (3) breads and cereals, which have significant protein in addition to their carbohydrate content. One average serving from group 1 or group 2 would provide enough protein for an entire day. I just received in the mail the current Australian version of this scheme. It creates a fifth basic food group consisting only of butter and margarine - have some extra fat with your excess protein.

Although different protein foods may be better or worse for our health, in considering total intake, protein is protein, whether if comes from animals or vegetables, whether it is beef or tofu. The only advantage of vegetable proteins is that they are less dense, often diluted by carbohydrate and fiber, so you can eat more of them before exceeding your protein needs. Vegetable proteins also differ from animal proteins in their amino acid content. In particular, they are usually low in one or more of the eight essential amino acids, which is why some nutritionist call them "incomplete." Animal products, being more closely related to human tissue, provide all of the amino acids in the right proportions.

If you are a vegetarian, you can compensate for the difference by combining foods in ways that complete their amino acid profiles, by eating grains and beans together, for instance. You have probably heard about "complementary proteins" or "protein combining," and idea that became very popular in recent years as more people became interested in vegetarian diets to improve both their personal health and the ecology of the planet. Although it may be desirable to combine proteins, it is certainly not necessary to do so. The body make complete proteins from incomplete ones; it gets the missing amino acids from the large numbers or microorganism in the intestinal tract and from recycled cells of the lining of that tract. Writers who popularized the concept of protein complementarity left many of us feeling that we could not safely be vegetarians unless we had calculators in our hands at all times. They also reinforced our cultural obsession with protein as the crucial nutrient, the one element of our diet we had to

worry about. My advice is not to worry about protein at all and to eat less of it, whether from animal or vegetable sources.

In summary, most of us can benefit from reducing the amount of protein we eat by cutting down on animal foods, by diluting protein-dense foods with starches and vegetables, as in stir-fries and pasta dishes, and by unlearning our cultural preference for meals organized around centerpieces of meat, poultry, or fish.