The Healing Power of Minerals and Trace Elements

by Paul Bergner

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Dedication

To Weston and Florence Price, for their courage on their world travels and sceintific endeavors, and to Monica Price and the volunteer directors of the Price-Pottenger Nutrition Foundation for preserving their work.

Disclaimer

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Introduction

The Alchemy of minerals

The European alchemists of the Middle Ages worked and experimented extensively with minerals. They strove to complete the "Great Work" — to turn lead into gold. The alchemist's labors consisted of acquiring their minerals — many more than just lead and gold — purifying them chemically, and combining them in various ways, seeking to discover the science of their transformation. Alchemy is portrayed as ignorance today in basic chemistry texts, but it ultimately gave birth to the modern sciences of chemistry and nuclear physics.

Alchemy in nature and nutrition

A close look at the universe, at geology, biology, and human nutrition shows that alchemical transformation of minerals not only occurs, it is the hidden secret behind the way Nature works. In the radioactive turmoil of the sun, hydrogen is transmuted into all the natural elements in the universe — seventy-five of them minerals. The process continues in the hot magma deep in the earth, and the minerals rise to be diffused throughout the earths crust and dissolved in the sea in the form of salts. Sea plants selectively assimilate minerals and concentrate them in the balance and proportions necessary for the food of animals. In the earths crust and soil, bacteria and other microorganisms ingest and transform the minerals into a form suitable for the food of land plants. The plants assimilate them to make suitable foods for the animals. Animals, including humans, eat the plants or other animals. We'll see in chapters 2 and 6 that a diet rich in *both* plant and animal foods provides optimum nutrition for the human being. In the human body, the minerals act as catalysts, participating in enzyme systems that allow the transformation of food and the air we breathe into energy, vibrant health, and consciousness.

Alchemy gone awry.

Traditional farmer-alchemists throughout the history of agriculture have been careful to return their mineral-rich plant and animals wastes to the soil to preserve the minerals available to the soil bacteria and plants. Traditional peoples, we'll see in Chapter 2, often went to great lengths to obtain mineral-rich foods, and consumed only natural foods. In Chapters 2 and 3, I'll shows how modern food processing and agricultural methods strip the soil and our foods of their mineral content, reducing their availability to the alchemist workshop of our bodies. In Chapters 2, 4, and 5, I'll show the result of the modern diet on the mineral-status of Americans.

Modern medicine, although its documents mineral deficiencies in the population, generally ignores their significance, and employs powerful but inappropriate drugs instead of first respecting the natural alchemy of minerals and health and restoring the optimal mineral nutrition of the body. The secret work of the alchemists of the Middle ages was to turn the lead of the human character into the gold of spirituality. We'll see in Chapter 5 that if the minerals in our body become deficient, we experience fatigue, irritability, depression, and anxiety, and our immune system begins to lose its edge over biological invaders. We end up less able to perform our spiritual work, whether that be service to our families, communities, to nature, to humanity, or to the Creator.

Alchemy and the diet

The alchemist sometimes had to go to great lengths to acquire his metals and the knowledge of how to use them. Today, we have to extend effort, and sometimes money, to seek out and acquire the mineral-rich foods we require in our diet. We may also have to spend time cooking them, rather than eating fast-food. In Chapters 6 through 9, I'll tell how you, as a wise alchemist, can obtain your minerals from our food today, in spite of the general demineralization of the standard American diet and agricultural products, and assimilate them into your body. If we respect the pattern of the alchemy of minerals in nature, and consume mineral-rich foods in their natural forms, our health will improve, and we can go about our Great Work with more vigor, energy, mental clarity, and peace.

Chapter One

From the earth to your body

All flesh is grass Isaiah 40:6

Ninety two naturally-occurring elements appear in nature, all derived from nuclear reactions, either in the sun or deep within the earth. Seven of these are radioactive, and six are inert gasses. These thirteen elements have no important role in living things. Four elements — carbon, hydrogen, oxygen, and nitrogen — are the basic building blocks of organic life. The remaining seventy-five elements are classified as minerals, and their role in health and disease is the subject of this book.

Scientists have either proven or suggested a beneficial role for thirty of these in animal life (See Table 1.1). The remaining forty-five minerals may or may not have a role in health and disease. For the most part, they have not been investigated. These other minerals exist in living things in such a small concentration — parts per million or parts per billion — that analytical equipment has only been available to measure their presence for a few decades. Some of the minerals in Table 1.1 have important biological functions at such tiny concentrations. In the future, the importance of many more of these minerals to life may eventually be identified. Most of them exist in the natural environment of the sea, where life arose, and are present in the rocks and soils of the earth, so it seems reasonable to propose that some of them may have some important role in animal life.

Table 1.1 Thirty minerals beneficial to animal life*

aluminum	fluorine	potassium
arsenic	gallium	selenium
barium	germanium	silicon
boron	iodine	sodium
bromine	iron	sulfur
cadmium	lead	tin
calcium	lithium	vanadium
chlorine	magnesium	zinc
chromium	manganese	
cobalt	molybdenum	
copper	nickel	

*Several of these are beneficial in tiny doses, but poisonous at larger doses.

Minerals as a class of nutrients have three major roles in the body: 1)They provide structural materials for the bones and other connective tissues, 2)They allow electrical impulses to move along the nerves, and 3)They act as catalysts or support the role of enzymes in physiological processes, such as reproduction of the DNA or manufacture of proteins. Catalysts and enzymes promote the transformation of one thing into another. The spark plugs in your car are like catalysts when they allow the transformation of gasoline into energy. Your digestive enzymes promote the transformation of the food you eat into components that can be absorbed in the intestine. This role of the minerals explains the devastating effects that a deficiency of minerals in the body may have on the health. Magnesium participates in more than one hundred enzymatic reactions in the body, and zinc in more than two hundred. A deficiency of these two minerals alone can thus result in three hundred different things going wrong in your body. You would be like a car running without all its spark plugs.

Minerals in nutrition are conventionally divided between the major minerals and the trace elements. The major minerals are those arbitrarily defined by having a daily requirement of more than 100 milligrams. Note that this dose is at the level of parts per million for a 150 pound adult. The major minerals are:

calcium
chlorine
magnesium
phosphorus
potassium
sodium
sulfur

The remaining minerals in Table 1.1 are classified as trace elements. Some of these trace elements are active in the body in daily doses in the range of micrograms — one one-hundredth of a milligram — which falls in the range of parts per billion by weight for an adult human. Perhaps the most well-known of the trace elements is iron, which was first discovered in the seventeenth century to be essential to health, and is added to many of our processed foods today to ensure that we do not develop deficiencies. Iodine is another example. It was discovered to be essential in the nineteenth century, when it was found that iodine supplements can cure or prevent goiter. Iodine is added to table salt to ensure that our public receives a minimum dose.

Some minerals which are essential at tiny doses are extremely poisonous in larger doses. They have been the subject of crime stories, political intrigue, and occupational tragedies, for centuries in Western civilization. Lead poisoning from the water supply has even been proposed as the cause of the fall of the Roman empire. The most important toxic minerals appear below. Mercury is the only one on the list that is not beneficial in tiny doses.

aluminum
arsenic
cadmium
lead
mercury

Most minerals, even calcium, can be toxic if you take too much of them, something that must be remembered when taking them as supplements. I'll discuss supplements in great detail in Section 3.

In section 1. I'll describe how minerals get from the volcanic rock of the earth or the dissolved minerals of the sea to your body. I'll explain how primitive people following a traditional diet usually do not suffer from mineral deficiency diseases, and how natural physician in the past have used whole mineral-rich foods and food-derived multi-mineral supplements to cure disease. I'll show how the food chain can be broken by unwise agricultural techniques and how in fact our food has become radically demineralized in the last century, and show the impact this has had on public health.

From the cosmos to your table

We created man from mud, molded into shape Quran 15:26

Whether we accept the revelations of the scriptures, or the theories of evolutionary scientists, we reach the same conclusion: the human body is molded from the elements of water and earth, from the materials in the earth's crust, and from the elements in the water of the sea, mixed together like "mud" or "clay." Most of the ninety naturally-occurring elements of the earth also exist in the human body, and most or dissolved mineral elements of the sea occur naturally in the human body fluids, and the combination of these elements is essential to life. The healthy human body is a microcosm of the earth: the physical body composed of the elements of the earth and atmosphere and carrying within it an inner sea. Continuing intake of many of these elements is necessary to maintain health and prevent disease. In this chapter I'll show how the mineral elements of the earth and sea were formed and how they rise through the food chain to reach the food on your table.

From sun to earth

The earth was born from the sun. Scientists do not agree exactly how this happened, but the sun spun parts of itself off, either as eruptions from within itself, or as clouds of hot radioactive gasses. These materials cooled to form the planets. In the process of cooling, the radioactive elements of the sun formed many new elements — 92 in all have been identified, including the original constituents of the sun. through the food chain.

Hydrogen building blocks

The heat and radiation of the sun is generated by a massive ongoing nuclear hydrogen explosion. The hydrogen atom of the sun and other stars is the basic building block of all the elements in the universe — minerals, gasses, radioactive, and other elements. Its atom contains a one proton and one electron. If we could freeze it in time would look figuratively like a tiny moon revolving around a much larger planet. All the other elements are manufactured from hydrogen protons and electrons, in the intense nuclear heat of stars, and in the scattering and cooling of star elements when a star explodes in a supernova, as it spins off gasses or parts of itself which cool into planets, or in ongoing nuclear reactions deep within the planets. Six hydrogen atoms combined make up a carbon atom. Eleven make up the sodium in your table salt. Twelve make up magnesium; nineteen potassium, twenty calcium, and ninety-two make up uranium. Besides the ninety-two known to occur naturally on earth, another thirteen have been created in nuclear reactors.

Some of these have very short lives — only tiny fractions of a second — before they degrade into other elements.

The cooling of the earth into layers

The earth cooled from its original matter into a revolving globe of hot liquid radioactive material. As heavier or lighter elements were formed through ongoing nuclear fusion or fission — the combining or splitting of existing elements — the heavy ones sank toward the core of the earth, and the lighter ones rose. In the process of further cooling, hydrogen and oxygen formed the water of the seas, and nitrogen, oxygen, and other gasses rose to form the atmosphere. Today, we can look at the earth and its environment in seven layers: a solid core, a molten outer core; a semi-solid mantle surrounding that, a thin dough-like layer called the Moho, the dry crust, the seas, and the atmosphere — all created from the original radioactive matter of the sun. Table 1.2 shows the size and state of the different layers of the earth.

Table 1.2

The layers of the earth

Layer	State	Size
Inner core	solid	800 miles
Outer core	molten	1350 miles
Mantle	semi-solid	1685 miles
Moho	dough-like	100 miles
Crust	solid	25 miles
Sea	liquid	2.5 miles
Atmosphere	gas	up to 13,000 miles

The layers of the earth

The earth continues to evolve geologically, and the center of activity for this is in the mantle, composed of semi-solid radioactive rock. Within the mantle are nuclear hot-spots called *heaters* by geologists. These heaters act as nuclear reactors, continually generating elements through the fusion of lighter atoms, in the same process that generated the layers of the earth. Due to the intense gravitational pressures of the earth above it, the radioactive elements sometimes reach critical mass, and a nuclear fission explosion — identical in process to that of a nuclear bomb — erupts. The explosion blows some material downward and some upward, and it is this upward force of the explosion which causes the rising and shifting of the land masses on the crust. When the forces of these explosions break through the earths crust, we have a volcano. The upward thrusts also scatter all the elements above them upward toward the crust.

Geologists believe that at one point in the evolution of the planet, volcanic activity predominated, with constant volcanic explosions spreading debris across the earth and into the atmosphere. This debris contains all the elements in the mantle and the layers above it, and in that era settled as mineral-laden dust covering the earth. The dust from a single large volcanic explosion today can affect weather patterns throughout the globe. Imagine the density of the dust-mineral cloud at a time when the surface was dominated by volcanoes. The mixing of the upthrust rocks and the settling volcanic debris has covered the continents and the ocean floor with a well-balanced mixture of all the minerals and other elements essential to life.

The Moho layer — short for the *Mohorovich discontinuity* is significant because of its consistency. Think of it as something like bread dough, with the hot gooey radioactive thinner "batter" of the mantle beneath it, and the dried crust of the earth above. The continents are constantly moving, although much too slow for us to perceive, occurs across this doughy layer of matter beneath them.

The sea contains within it, in solution, most of the minerals of the elements of the crust beneath it, the volcanic dust which has settled in it, and materials washed into it by the rivers of the earth. Life arose in the sea, probably at its floor near the volcanic vents of the heaters below it.

From earth to sea: where life arose

Picture the earth before the continents arose. The globe is covered with a vast ocean, whose waters were much like today's sea water — salty. The ocean then and the ocean today contain much more than the sodium and chloride of common table salt — the water holds sixty-five minerals, all floating in solution (See Tables 1.3 and 1.4). Deep within the sea, at the hot volcanic vents on the ocean floor, the first living molecules were formed — proteins capable of reproducing copies of themselves. These proteins were the precursors of the *deoxyribonucleic acid* (DNA) and *ribonucleic acid* (RNA) in the nucleus of living cells that permit those cells to reproduce and carry on their metabolic functions. Scientist believe that the formation of these proteins required both the heat of the volcanic ocean floor and the minerals in the water. The DNA and RNA in the cells even today require these same minerals for reproduction.

Box 1.1

How small is a part per million

The standard measure of mineral content in rock, water, plants, animals, and human beings is in *parts per million,* the measure I use in the tables in this chapter. A million is too large for most of us to conceive, so here is a little arithmetic. Assume a pinch of salt — sodium chloride — is about the size of a drop of water. Sixteen drops make one milliliter, thirty milliliters makes about one ounce, thirty-two ounces make a quart, and four quarts make a gallon. So a gallon contains a little more than 61,000 drops of water, and a single drop would be one part per million in about sixteen gallons of water. Our pinch of salt is only about a half-pinch each of sodium and chloride, however, so to get one part per million of each, we'd have to put that pinch into about 32 gallons of water. This may seem insignificantly small, but some minerals at such concentrations in plants, animals, and human are absolutely essential to life. Chromium, cobalt, manganese, molybdenum, and nickel — all essential to human life — are found in the body in concentrations of less than one part per million. Some of the minerals in Table 1.3 — those with more than three zeroes after the decimal point — are measures in parts per billion. It would take 32,000 gallons of water to hold a concentration of one part per billion of our pinch of salt.

The mineral-hunger of living cells

Eventually living cells evolved, wrapping these original molecules of life in a membrane. The membrane forms a barrier that allows the cell to selectively take in certain nutrients and minerals and concentrate them, creating an inner environment more favorable to the nuclear proteins in their hunger to reproduce. The intracellular environment of a single-celled sea plant or animal contains most of the elements of the sea itself, but in very different concentrations. Table 1.5 shows how the cells of sea plants concentrate the mineral of the sea, in some cases more than a million times. This table dramatically demonstrates the mineral hunger of living cells. Some of these minerals apparently increase the efficiency of the reproduction of DNA and RNA in the nuclei of plant cells

Table 1.3

Mineral elements in sea water

Mineral	Parts per million
aluminum	0.01
antimony	0.00033
arsenic	0.003
barium	0.03
beryllium	0.0000006
bismuth	0.000017
boron	4.6
bromine	65.0
cadmium	0.00011
calcium	400.0
cerium	0.0004
cesium	0.0005
chlorine	19,000.0
chromium	0.00005
cobalt	0.00027
copper	0.003
fluorine	1.3
gallium	0.00003
germanium	0.00007
gold	0.000011
hafnium	0.000008
iodine	0.06
iron	0.01
lanthanum	0.000012
lead	0.00003
lithium	0.18
magnesium	1350.0
manganese	0.002
mercury	0.00003
molybdenum	0.01
nickel	0.0054
niobium	0.00001
phosphorus	0.07
potassium	0.380
rubidium	0.12
scandium	0.000004
selenium	0.00009
silicon	3.0
silver	0.0003
sodium	10,500.0
strontium	8.1
sulfur	885.0
tantalum	0.0000025
thallium	0.00001
thorium	0.00005
tin	0.003
titanium	0.001
tungsten	0.0001
vanadium	0.002
yttrium	0.0003
zinc	0.01

Table 1.4

Other minerals in the sea

Sea water has not been tested in published research for a number of trace elements. The following minerals do not appear in Table 1.2, but because they have been identified in sea plants and

erbium	Rhenium
europium	Samarium
gadolinium	Tellurium
holmium	Terbium
lutetium	ytterbium
neodymium	
praseodymium	

Table 1.5

How sea plants concentrate sea minerals

Mineral	Sea water (ppm)	Sea plants (avg. ppm.)	Concentration (times)
arsenic	0.003	30.0	10,000
barium	0.03	30.0	1,000
beryllium	.0000006	0.001	1670
bromine	65.0	740.0	11
cadmium	0.00011	0.04	363
calcium	400.0	145,000.0	362
cesium	0.00005	0.07	1,400
chromium	0.00005	1.0	20,000
cobalt	0.00027	0.70	2,592
copper	0.0003	11.0	36,666
fluorine	1.3	4.50	3
gallium	0.00005	0.50	16,666
gold	0.000011	0.01	909
hafnium	0.0000008	0.40	500,000
iodine	0.06	735.0	12,250
iron	0.01	700.0	70,000
lanthanum	0.0000012	10.0	8,333,333
lead	0.00003	8.40	280,000
lithium	0.18	5.0	27
magnesium	1350.0	5200.0	4
manganese	0.0002	29.0	145,000
mercury	0.00003	0.03	1,000
molybdenum	0.01	0.45	45
nickel	0.0054	3.0	555
phosphorus	0.07	3500.0	50,000
potassium	380.0	52,000.0	136
rubidium	0.12	7.40	61
selenium	0.00009	0.80	8,888
silicon	3.0	9250.0	3,083
silver	0.00003	0.25	8,333
sodium	10,500.0	33,000.0	3
strontium	8.1	570.0	70
sulfur	885.0	12,000.0	13
thorium	0.00005	0.0	200
tin	0.003	1.0	333
titanium	0.001	33.0	33,000
vanadium	0.002	2.0	1,000
zinc	0.01	150.0	15,000
zirconium	0.0000022	20.0	909,090

Minerals in the food chain of the sea

The phrase "Big fish eat little fish, little fish eat worms, and worms eat mud," is not accurate. In reality big fish eat little fish, little fish eat sea plants, and sea plants eat minerals and other substances from the sea. Near the bottom of the chain, the smallest fish and animals eat small single or multi-celled plants such as *algae* or *plankton*. At the top of the chain, seals, whales, other sea mammals, and humans eat big fish. Table 1.6 shows how these minerals move up the food chain and concentrate in sea animals. We see in the table how sea animals usually do not further concentrate minerals from the levels present in sea plants, and usually have lower levels than those in the plants. However, the concentration in the animals usually remains many times that in sea water. Sea plants and animals are among the best food sources of minerals and trace elements, which I will discuss further in Chapter 6.

Table 1.6

Some minerals in the food chain of the sea

Mineral	Seawater (ppm)	Sea Plants (ppm)	Sea animals (ppm)
barium	0.03	30.00	2.50
bromine	65.00	740.00	470.00
calcium	400.00	145000.00	9250.00
fluorine	1.30	4.50	2.00
iodine	0.06	735.00	75.00
iron	0.01	700.00	400.00
lanthanum	0.00	10.00	0.01
lithium	0.18	5.00	1.00
magnesium	1350.00	5200.00	5000.00
molybdenum	0.01	0.45	1.25
nickel	0.01	3.00	12.70
phosphorus	0.07	3500.00	7000.00
potassium	380.00	52000.00	12500.00
rubidium	0.12	7.40	20.00
silicon	3.00	9250.00	70000.00
sodium	10500.00	33000.00	22000.00
strontium	8.10	570.00	260.00
sulfur	885.00	12000.00	7000.00
zinc	0.01	150.00	753.00

The inner sea of land animals

When life emerged from the sea onto dry land, it did not leave the sea behind. The land animals then, all animals today, human beings too, carry a replica of that original sea within us in the *extracellular fluid*, that one-fifth of our body fluids that bathes and nourishes every cell in our body. This fluid has a similar mineral composition to the original sea from which life came. The body very strictly maintains the mineral content of the fluid to resemble that of the prehistoric sea — even robbing minerals from the bones or other connective tissue if necessary to do so. This robbing of minerals from tissues to maintain a steady-state of minerals in the body fluids is the source of the pathology of many mineral-deficiency diseases, including osteoporosis. Table 1.7 compares the concentration of minerals in the nuclei of human cells with the concentration in sea plants. Notice that the figures, while not identical, are all of the same order of magnitude. Thus the sea plant's process of concentrating certain minerals from the sea (Table 1.5) set the level in evolution for all future life. These levels remain essential for cell function and reproduction. Sea plants and animals remain an excellent dietary source of minerals, which I will discuss in detail in Chapter 6.

Table 1.7

Minerals in sea plants and in human cellular nuclei (ppm)

	Sea plants	In human cell nuclei
calcium	145,000	13,500
cobalt	0.7	0.46
copper	11	7
iron	700	140
potassium	52,000	20,400
magnesium	5,200	800
manganese	29	1-17
sodium	33,000	6,300
phosphorous	3,500	25,000
sulfur	12,000	1,500
zinc	150	3-140

The food chain of land animals

Humans and other land animals cannot, like sea plants, draw their minerals directly from the sea. Seawater, if drunk in sufficient quantities to get our minerals, will kill a human being. The mineral composition of our body fluids now depends entirely on our diet. Unless we eat seafood, our minerals now have to be taken from the earth's crust.

Of course you cannot eat a piece of granite or other volcanic rock, it must first be transformed into soil. The stages of the land food chain are listed below.

First stage

Volcanic activity from the magma of the earth forms volcanic rock, either thrust up in volcanoes, or pushed up less dramatically in the

The Mineral Content in Rock

Mineral	ppm
aluminum	5,000
antimony	0.2
arsenic	1-8
barium	425
beryllium	2-8
bismuth	0.17
boron	10
bromine	3-5
cadmium	0.2
calcium	41,500
cerium	60
cesium	1
chlorine	130
chromium	100
cobalt	25
copper	55
dysprosium	3
erbium	2.8
europium	1-3
fluorine	625
gadolinium	5.4
gallium	15
germanium	5.4
hafnium	3
holmium	1.2
indium	0.05-1
iodine	0.5
iridium	0.001
iron	56,300
lanthanum	30
lead	12.5
lithium	20
lutetium	0.5
magnesium	23,000
manganese	950
mercury	0.08
molybdenum	1.5
neodymium	28
nickel	75
osmium	0.0015
palladium	0.01
phosphorus	1050
platinum	0.005
polonium	2*10-10
potassium	20,000
praseodymium	8.2
rhenium	0.005
rhodium	0.001
rubidium	90
ruthenium	0.001
samarium	6
scandium	22
selenium	0.05
silicon	281,500
silver	0.07
sodium	23,600
strontium	375
sulfur	260
tantalum	2
tellurium	0.001
terbium	0.9
thallium	0.45
thorium	6-9
thulium	0.48
tin	2
titanium	5,700
tungsten	1.5

upthrusting of the earth's crust. All but two of the mineral elements have found at measurable levels in volcanic rock (See Table 1.8)

Second stage

Weather, geological, oceanic, or bacterial activity is continually breaking rock into smaller pieces and particles, even crushing it into dust. Plants and their roots can also break up rock, as you can see when grass breaks down a cement sidewalk. Life formed more easily in the sea, but, once formed, it had no problem penetrating into the earth's crust. Geologists have found bacteria and other microorganisms at depths thousands of feet below the earth. These also break down and degrade rock. Some rock, such as limestone, is formed by sediments from the sea; minerals from the sea collect to form the rock. Such rock is dispersed in many areas of the earth, which was once entirely submerged in the sea.

Third stage

Bacteria and other soil organisms assimilate minerals from the rock. When the organisms die, the minerals are dispersed in the soil. This stage, which I will discuss in detail in Chapter 3, is absolutely essential to all life on earth, because it provides food for plant roots in an assimilable form. If the bacteria and other organisms in the soil die, the soil itself is dead as far as plant life is concerned, because the plants then starve for lack of nutrients. Table 1.8 shows the result of the bacterial ingestion of rock on the soil content of minerals.

Table 1.8

The mineral content of rock and soil(ppm)

Mineral	Volcanic rock	Soil
bromine	3-5	2-100
calcium	41,500	5
chlorine	130	4,000-50,000
chromium	100	100
copper	55	5-3,000
fluorine	625	2-100
gallium	15	0.4-6
lithium	20	30
magnesium	23,000	5,000
molybdenum	1.5	2
nickel	75	40
potassium	20,000	14,000
sodium	23,600	6,300
sulfur	260	700

tin	2	2-200
zinc	70	50

Fourth stage

Plants assimilate minerals from the soil. The “intestines” of a plant are its roots. The tiny root hairs closely resemble the tiny protrusions in your intestines that allow you to assimilate food. The minerals are dispersed throughout every part of the plant, some of them more concentrated in certain areas. As the plants die, they decompose to leave their minerals on the surface of the soil, enriching the surface soil layer. Plants with deep roots bring minerals from deep within the earth, and, when dying, deposit it on the surface, providing mineral food for smaller plants with shorter roots. Breaking this cycle by harvesting and carrying away the plants eventually causes demineralization of the soil and a loss of fertility. I’ll discuss this problem at length in Chapter 3.

Fifth stage

Animals, including humans, eat the plants. For many animals, plant foods provide the only source of minerals. The elephant, which is vegetarian, acquires all the calcium it needs for the immense bones and tusks in its body from plant sources.

Comparing the food chains of the land and sea

Table 1.9 shows the movement of twenty essential minerals through the food chain from rock through soil and into plants and animals. Compare the movement to that of the food chain of the sea (Table 1.6). In the sea, the plants and animals greatly concentrate the minerals. The opposite is true in the food chain of the land. The concentrations of most of the minerals gradually decline as they move up the chain. In the sea, we start the chain with tiny amounts of minerals in the water. On land, we start with a great abundance of minerals in the earths crust. The soil microorganism take what they need and leave the rest, and so on up the chain. In there sea, we start with a relative deficiency of minerals, as far as life is concerned. But on land we start with great excess.

Table 1.10

Essential Minerals in the food chain of the land (ppm)

Mineral	Rock	Soil	Plants	Animals
arsenic	1-8	6	.2	.2
bromine	3-5	5	15	6
cadmium	.2	.06	.06	.5
calcium	41,500	4000-500000	18000	200-85000
chlorine	130	100	2000	2800
chromium	100	5-3000	.23	.075
copper	55	2-100	14	2-4
fluorine	625	200	5-40	150-500
iodine	.5	5	.42	.43
lead	12.5	10	2.7	2
lithium	20	30	1	.02
magnesium	23000	5000	3200	1000
molybdenum	1.5	2 .	9	.2
nickel	75	40	3	.08
potassium	20000	14000	14000	7400
sodium	23600	6300	1200	4000
sulfur	260	700	3400	5000
tin	2	2-200	.3	.15
zinc	70	50	100	160

This chain is much more fragile than that of the sea. Sea plant can obtain their minerals directly from an inexhaustible supply of them in sea water. Seawater is the soil for the sea plants, already prepared. On land, however, the link from rock to soil is an extra step in the food chain. To maintain an unbroken chain on the land, the soil microorganisms must thrive, and the mineral matter of the plants must be recycled to the soil. Modern industrial agriculture does not to this. Crops are not rotated, fertilizers only contain a handful of essential minerals, and pesticides disrupt and destroy the ecology of soil organisms. This unwise breaking of the mineral food chain and its consequences on the mineral content of your food is the subject matter of Chapter 3.

Conclusion: the last stage of the chain

The final stage of the chain, as far as humans are concerned, is the dinner table. Nature has provided abundant mineral-rich foods for us to eat — enough to provide robust health. Unfortunately, modern food processing removes much of the mineral content of our food, which I will discuss in Section 3. Looking back at Table 1.9, notice that content of minerals is higher in plants in most cases. This high mineral content in whole plants is one of the best arguments for eating a diet rich in plant foods, and contributes to the therapeutic value of such dietary practices as vegetarianism and juicing. Notice also, however, that some minerals, such as zinc, are much higher in animals. People eating plant foods exclusively, unless they eat carefully and consciously, are prone to develop several mineral deficiencies. I'll go into more detail about this in Chapters 5-9.

We'll see in the next chapter how traditional people who eat both plants *and* animals in their naturally-occurring forms generally enjoy a robust health almost unknown in modern society.

Chapter Two

Traditional vs modern foods

Life in all its fullness is Mother Nature obeyed.

Weston Price 1939

In the last chapter I described how minerals move up the food chain from the earth and sea to the foods you eat. Nature delivers us mineral-rich foods, infused with the mineral content, vitamins, fiber, and essential fats that our bodies and spirits need to thrive. In our society, illnesses, and especially low-grade mineral deficiency diseases, are so common that we've lost sight of what true health looks like. In this chapter I'll describe the health of traditional peoples eating their natural diets, and show what happens to them when they start eating the "modern" foods that we now think of as natural.

A landmark in nutrition research

In my opinion, the most significant nutrition book of this century, one which clarifies many questions on diet and health, is *Nutrition and Physical Degeneration*, by Weston Price. This book is a recommended text for my nutrition students at the Rocky Mountain Center for Botanical Studies in Boulder, Colorado. I lecture from it, and use it as the basis for the section of the course on reviewing diets and recommending dietary changes for clients. I recommend that you get a copy, if you want to see solid evidence of how a whole-foods natural diet — including minerals — can improve your health. Price, a dentist, and his wife Florence, traveled the world in the 1930's, visiting more than fourteen cultures from the South Pacific Islands to Africa, Switzerland, and the Outer Hebrides Islands off the coast of Scotland. The people of these cultures were in transition in that decade from their traditional diets to the foods of modern civilization. Price and his wife examined and compared the teeth and bone structure of individuals eating each kind of diet, and recorded the findings with extensive photographic evidence. While their focus was on dental and bone health, they also noted the general physical and mental health of the people, and commented on the types of diseases that began to appear when the modern diet was adopted.

Nutrition and Physical Degeneration was first published in 1938, and reprinted in 1970 and 1989. How many other nutrition books from that era can you imagine are still in print? The Prices' work has become more rather than less important as time passes, because the health of our nation today proves their findings and concepts to be correct. The Prices are in a historical position similar to the of Sir James Lind, who proved that citrus fruits would prevent or cure scurvy in 1753. Only in 1795, after some 100,000 British sailors had died of scurvy over forty-two years, did the British navy begin to provide their sailors with citrus fruits. Similarly, the Prices demonstrated the cause and suggested the cure for many of our degenerative diseases. We are now a society like those British sailors who died of scurvy waiting for public policy to catch up with scientific facts.

Weston and Florence Price

Weston Price was born in 1870 in Southern Ontario, and raised on a traditional farm. He earned undergraduate and Dentistry degrees from University of Michigan in Ann Arbor, and set up a practice in Grand Forks, North Dakota. Within a short time, he developed typhoid fever, and nearly died. To help him recover, his brother-in-law took him to a wilderness lake in Ontario, where they camped and fished, eating fish, small game, and wild foods, and whatever else they brought along, until Price returned to robust health. These two experiences — growing up on a farm and recovering from a serious illness in a natural setting eating natural foods — certainly formed in Price the basis for the insights of his later work. The lakeside setting was so beloved to Price that when he married Florence, they took their honeymoon there, which required a twenty-mile wagon ride and a six mile trip across the lake by boat.

Price set up his dental practice in Cleveland. There he became passionately interested in the cause of the dental problems he saw every day. He theorized that the cause of tooth and gum problems was not a lack of hygiene, but some factor in the diet. He also noted the general decline in the health of the population around him, with the city-born children he saw being in poorer health, both physical and mental, than the mostly farm-raised adults. By 1914 he published a report on growth defects in the teeth of young children (Price, 1914). He published a two-volume work in dental infections in 1924 (Price, 1924). In his study of infection, he theorized that dietary or other factors were responsible in most cases:

> *"The evidence seemed to indicate clearly that the forces that were at work were not to be found in the diseased tissues, but that the undesirable conditions were the result of the absence of something, rather than the presence of something." (Price, 1938)*

Being of a scientific disposition, Price wanted to find a control group of individuals in good dental health, in order to compare them with unhealthy individuals, and discover what difference, if any, was present in their diet and lifestyle. No such groups of healthy people were available in his area, and thus he began searching of the world for such societies. In his own words:

> *"I determined to search out primitive racial stocks that were free from the degenerative process with which we are concerned in order to note what they have that we do not have." (Price, 1938)*

The Prices' travels

Starting in 1931, Weston and Florence Price traveled the world to fourteen different areas, examining the health of traditional people. They met and studied traditional Swiss, Gaelics of the Outer Hebrides Islands, Eskimos, North American Indians, Melanesians, Polynesians, East African Tribes, Australian aborigines, New Zealand Maori, Peruvian Indians, and

Amazon Indians, sometimes studying more than one group in each area. They found these societies in transition, with some villages or areas consuming a traditional diet and others nearby eating modern foods such as sugar, white flour, and canned foods. Thus Price found in each area the ideal conditions for the experiments he sought — closely related groups of the same racial stock who ate different diets. The Prices had to travel by airplane (no joy ride in 1938), boat, wagon, or by foot on trails to reach these people. Florence Price's contributions to the work were substantial. She accompanied Weston on the travels, and Price ultimately dedicated the resulting book to her, saying she had "assisted me so greatly on these difficult expeditions."

Price's findings

What started as a quest to examine dental health ultimately revealed information about the overall health. Price interviewed doctors and hospital staff near the people he studied, and found that tuberculosis, arthritis, gall bladder disease, and conditions requiring surgery were rare among people eating a traditional diet, but common among those consuming the modern foods. It is difficult to describe how dramatic Price's findings were without viewing the many photographs in his book — 134 illustrations showing in black and white the effects of the two diets on the dental health and bone structure (See Appendix E). The typical photos show first a group of people on the traditional diet, with perfect dental health, broad dental arches (no need for an orthodontist), vibrant health, and a peaceful or joyous look on the face. Photos of the people of the same racial stock consuming modern foods show missing teeth, narrow pinched faces, narrow jaws crowding the teeth, and anguished looks on the faces.

I was struck with shock and near-horror after viewing the photos and then walking out among the public in Boulder, Colorado. We are a society of the people from the "after" photos, only we have had our teeth "fixed." The same deficient bony structure and pinched, pained facial expressions as those of the primitive people eating a modern diet shows everywhere on the street. The night after reading Price's book, I noticed that in my class of clinical herbalists — ten women of ages running from the mid twenties to the mid forties — that only one woman has the face and bone structure of the healthy primitive people. She was raised in a chiropractor's family, eating whole foods, and not allowed to eat sugar.

I also recalled a young boy whose house I lived in the 1980s. His mother ate only organic whole foods during his pregnancy, raised him on the same foods, and never allowed him to eat sugar. I watched him once at age five score four goals in a soccer game with children of his age. He was so robust, and they were so run-down looking, that he looked like superman among a group of weaklings — much like the before and after pictures in Price's book. My casual observations supported a point that Price makes in the book and demonstrates with his photographic evidence: he found that the diet during pregnancy and childhood can determine the state of health in adult life, even if an individual begins to eat poorly later on. He found the practice of preparing a mother for pregnancy by feeding her special, nutrient-rich foods widespread among the primitive cultures. Table 2.1 shows the comparative incidence of dental caries in the groups studied.

Table 2.1

Dental cavities in primitive people consuming a traditional or a modern diet

(Percent of teeth affected by cavities)

Nationality	Traditional Diet	Modern Diet
Swiss	4.60	29.8
Gaelics	1.20	30.0
Eskimos	0.09	13.0
Northern Indians	0.16	21.5
Seminole Indians	4.00	40.0
Melanesians	0.38	29.0
Polynesians	0.32	21.9
Africans	0.20	6.8
Australian Aborigines	0.00	70.9
New Zealand Maori	0.01	55.3
Malays	0.09	20.6
Coastal Peruvians	0.04	40.0+
High Andes Indians	0.00	40.0+
Amazon Jungle Indians	0.00	40.0+

The traditional diets

The Prices found a wide variety of diets among the peoples studied (See Table 2.2), and the most common differences with modern foods appear to be vitamins, minerals, and fiber. All but one group ate meat regularly, which may surprise vegetarians today who think theirs is the ideal diet. The meat was not what we find in our groceries today, however, but consisted of wild game, fish, and fowl. Organ meats of these animals were freely consumed, such as fish heads stuffed with liver among the Gaelics; selected organs of sea mammals by the Eskimos; or brains, eyes, bone marrow, and other organs by the Canadian Indians. The Canadian Indians fed the muscle meat of deer to their dogs.

Several East African tribes used (and still use) blood from cattle as a major food. Blood is especially rich in minerals. Other special foods included fish and bird eggs, insects, and medicinal plants. Plant foods included wild roots, greens, fruits, berries, sea vegetables, and grains grown and animals pastured in mineral-rich soils. Plants containing special nutrients were also used as medicine, such as the water hyacinth, which is rich in iodine, to cure goiter in Africa.

Table 2.2

Traditional alpine Swiss, isolated without roads.

Diet: Grains (mostly oats) and dairy products — milk, butter, cream, and cheese. Greens and vegetables only during the summer months.

Special considerations: The dairy cows were grass-fed, feeding in mineral rich wild pastures at the edge of glaciers.

Mineral source: Glacial soil

Isolated Gaelics, Outer Hebrides Islands

Diet: Fish, lobsters, oysters, clams, oats, barley, limited dairy products, very limited vegetables, no fruit.

Special considerations: Organ meats from the seafood, including fish head and cod liver.

Mineral source: The sea.

Isolated Eskimos

Locale: Northern Alaska

Diet: fresh and dried fish, seal oil, fish eggs, caribou, whale and seal organ meats, ground nuts, berries (preserved by freezing), flowers blossoms and sorrel grass (preserved in seal oil), green sea vegetables.

Mineral source: The sea

North American Indians

Locale: Canadian North Woods

Diet: Wild game. Limited vegetable matter in season.

Special considerations: Extensive knowledge of the dietary and medicinal uses of the various internal organs and tissues of the wild game. The muscle meat was fed to dogs.

Mineral source: Forest-fed animals

Locale: Southern Alaska

Diet: Sea foods. Moose and deer meat, limited vegetable food, and dried berries in winter.

Mineral source: Forest fed animals and forest soils

Locale: Florida Everglades

Diet: fish, wild game, wild greens, fruits, and roots.

Mineral source: pristine algae-rich fresh water, forest-fed animals, and forest soils.

Isolated Melanesians, New Caledonia and the Fiji Islands

Diet: fish, shellfish, wild pig, wild plant foods

Mineral Source: The sea and forest soils

Isolated Polynesians; Hawaiian Islands, Tahiti, and nearby islands

Diet: Wild plant foods, supplemented by foods from the sea.

Mineral source: The sea and forest soils

East African Tribes: (three typical diets)

Tribe: Masai

Diet: Milk, blood from cattle, some meat, varying amounts of wild vegetable foods and fruits.

Mineral source: Mineral-rich blood and forest soils

Tribe: Kikuyu

Diet: Sweet potatoes, corn, beans, millet, bananas

(Price noted that the Kikuyu did not thrive as a tribe, and was generally dominated by its neighbors.)

Mineral source: Agricultural soils prone to mineral depletion

Tribe: Buganda

Diet: Fresh water fish, bananas, sweet potatoes, goat's milk

Mineral source: Algae-rich fresh waters, forest soils.

Australian aborigines

Diet: Wide variety of wild foods, wild game, fish, fowl, insects, and plants. For those by the sea: wide variety of sea animals and sea plants.

Mineral source: The sea, wild uncultivated soils

New Zealand Maori

Diet: Shellfish (especially clams), kelp, fern root, grubs, vegetable plants and fruits.

Mineral source: The sea, uncultivated natural soils.

Ancient Peruvians (Archeological records)

Diet: Agricultural grains, meat from livestock, sea foods.

Special considerations: Plants fertilized with the droppings of sea birds

Mineral source: The sea

Peruvian Indians

Diet: Llama, alpaca, wild deer, birds, guinea pigs, dried fish eggs and sea kelp even among the high altitude Indians

Mineral source: The sea; forest-fed animals, uncultivated natural soils.

Amazon Indians

Diet: Fish, wild game, wild birds, wild bird eggs, wild vegetable plants and fruits.

Mineral source: forest-fed game and forest soils.

The modern foods.

The modern foods that wreaked such havoc with the health were the same ones we eat regularly today: sugar, refined flour, canned food, domesticated meats, and cultivated rather than wild vegetables. In each section below, I'll describe the kind of nutrient deficiencies that inevitable follow such a dietary change. I'll also discuss these in more detail in Section III.

Sugar

Sugar presents a number of problems nutritionally. By itself, sugar depresses the immune system (Bernstein 1977, Sanchez et al 1973; Ringsdorf et al 1976). This increases the need for vitamins and minerals that support the immune system, such as vitamins A, B12, C, Folic acid, pantothenic acid, pyridoxine, riboflavin, copper, and zinc (Werbach, 1993). The most devastating problem with sugar, however, is that consuming it as a major source of calories robs the body of the nutrients that would accompany those calories in a whole food. Table 2.3 shows the nutrients that are lost by taking five hundred calories from sugar rather than from whole oats, such as the alpine Swiss that Price studied ate. The loss amounts to from one-half to one third the required daily intake of protein, half the daily healthy intake of fiber, half the required daily intake of iron, and most of the daily intake of magnesium. The body must then metabolize the calories from the sugar, and robs the bones and tissues for the mineral cofactors that are required.

Refined flour

Several of the groups studied ate whole grains, and members became ill when they switched to white flour. The refining of flours removes the tough outer husk of the grain, making them sweeter, but robbing them of much of their nutritional value. Table 3.4 compares the nutrients in a slices of whole wheat and white bread. I've selected the values for enriched white bread, which has minerals and vitamins added, to demonstrate how little such fortification does to offset the losses in refining. The increases in the % change column reflect nutrients added in the enriching process.

Canned foods

Price also noted increasing reliance on canned foods among the groups with declining health. Preparing and canning vegetables and other foods often dramatically reduces their nutrient content. Table 2.5 shows the nutrients lost in the canning of peas. Also relevant to traditional peoples taking canned vegetables is the switch from nutrient-rich wild foods and seaweeds to nutritionally inferior cultivated foods. Table 2.6 compares the nutrients in wild nettle leaves, a common traditional pot herb, and cabbage. Three ounces of nettle leaf alone provides more than the minimum daily requirement of calcium and magnesium. All wild greens are not this rich in calcium, but all are higher than cultivated greens in levels of calcium, magnesium, potassium, and the trace elements.

Table 2.3

Nutrient loss in sugar vs oats for caloric intake (per 500 calories)

Whole oats	Sugar	% Change	
Protein (g)	20.83	0.00	-100.00
Fiber (g)	13.80	0.00	-100.00
Minerals			
Calcium (mg)	67.71	1.29	-98.09
Iron (mg)	5.47	0.08	-98.58
Magnesium (mg)	192.71	0.00	-100.00
Phosphorus (mg)	617.19	2.58	-99.58
Potassium (mg)	455.73	2.58	-99.43
Zinc (mg)	4.00	0.04	-99.03
Copper (mg)	0.45	0.06	-87.56
Manganese (mg)	4.73	0.01	-99.81
Vitamins			
Thiamine (mg)	0.95	0.00	-100.00
Riboflavin (mg)	0.18	0.02	-86.53
Niacin (mg)	1.02	0.00	-100.00
Vitamin B-6 (mg)	0.16	0.00	-100.00
Folate	41.67	0.00	-100.00
Vitamin A (IU)	131.51	0.00	-100.00
Vitamin E (ATE)	0.91	0.00	-100.00

Average nutrient loss: 98.5%

Source: USDA 1997

Table 2.4

Nutrient loss in white vs. whole wheat bread (1 slice)

	Whole wheat		**White, enriched* % Change**
Protein (g)	9.7	8.2	-15.46
Fiber (g)	6.9	2.3	-66.67
Minerals			
Calcium (mg)	72	108	+50.00
Iron (mg)	3.3	3.03	-8.18
Magnesium (mg)	86	24	-72.09
Phosphorus (mg)	229	94	-58.95
Potassium (mg)	252	119	-52.78
Zinc (mg)	1.94	0.62	-68.04
Copper (mg)	0.284	0.126	-55.63
Manganese (mg)	2.32	0.383	-83.49

Vitamins			
Thiamine (mg)	0.351	0.472	+34.47
Riboflavin (mg)	0.205	0.341	+66.34
Niacin (mg)	3.83	3.969	+3.63
Vitamin B-6 (mg)	0.179	0.064	-64.25
Folate (mcg)	50	34	-32.00
Vitamin B-12 (mcg)	0.01	0.02	+100.00
Vitamin E (ATE)	10.4	0.286	-97.25

* Calcium, iron, and B vitamins added

Source: USDA 1997

Table 2.5

Nutrient content in fresh and canned peas (100 g)

	Raw	**Canned***	**% change**
Fiber (g)	5.1	4.1	-19.60
Minerals			
Calcium (mg)	25	20	-20.00
Iron (mg)	1.47	0.95	-35.37
Magnesium (mg)	33	17	-48.48
Phosphorus (mg)	108	67	-37.96
Potassium (mg)	244	173	-29.10
Zinc (mg)	1.24	0.71	-42.74
Copper (mg)	0.176	0.082	-53.41
Manganese (mg)	0.41	0.303	-26.10
Vitamins			
Vitamin C (mg)	40	9.6	-76.00
Thiamine (mg)	0.266	0.121	-54.51
Riboflavin (mg)	0.132	0.078	-40.91
Niacin (mg)	2.09	0.732	-64.98
Vitamin B-6 (mg)	0.104	0.064	-38.46
Folate	0.169	0.064	-62.13
Vitamin A (IU)	65	44.3	-31.85
Vitamin E (ATE)	0.39	0.38	-2.56
	Average nutrient loss: 41.54%		

*drained solids

Source: USDA 1997

Table 2.6

Some minerals in wild vs cultivated greens

	Nettle Leaf	Cabbage	Change
Calcium (mg)	966.67	47	-95.13
Magnesium (mg)	286.67	15	-94.76
Iron (mg)	1.40	0.59	-57.85
Potassium	583.33	246	-57.82
Manganese	0.26	0.159	-38.84
Zinc	0.16	0.18	+14.89

Sources: Pederson 1995, USDA 1997

Wild game vs domestic meat

The final change common to some of the diets that Price found in transition is a switch from wild fish and game to domestic meats. Table 2.7 compares some nutrients in domesticated beef and several species of wild game and fish. Wild game is generally higher in minerals, because the animals can browse the mineral rich plants of the forest or field. Domestic animals are more prone to mineral deficiencies, because their pastures gradually become depleted of minerals. Domestic animals are also much fatter. The same size portion of domesticated meat provides nearly five times as much fat as the game meat or fish. Also important is the composition of that fat. The essential fatty acids linoleic and alpha-linolenic acid perform a number of vital functions in the body, and their percentage as a portion of total fat determines the percentage that ends up in the cell membranes of your body. With the substitution of beef for wild game, the essential fatty acid proportion falls by almost 70%.

Table 2.7

Nutrients in domestic beef vs wild game

	Beef	Deer	Elk	Bison	Salmon	% Change
Fat (g)	19.20	2.42	1.45	1.84	6.34	537.34%
% EFA*	3.59%	15.70%	14.48%	7.61%	7.37%	-68.17%
Iron (mg)	1.85	3.40	2.76	2.60	0.80	-22.59%
Magnesium (mg)	19.00	23.00	23.00	25.00	29.00	-24.00%
Potassium (mg)	297.0	318.0	312.0	343.0	490.0	-18.80%
Zinc (mg)	3.66	2.09	2.40	2.80	0.64	84.62%
Copper (mg)	0.07	0.25	0.12	0.09	0.25	-60.73%
Manganese (mg)	0.01	0.04	0.01	0.01	0.02	-36.84%

* essential fatty acids, linoleic and alpha-linolenic

Source: USDA 1997

What was lost

The four most prominent nutrient losses with the switch to modern foods appear to be: vitamins, minerals, fiber, and essential fatty acids. I will discuss fiber and the fatty acids in greater detail in Section III. It should be evident from these tables what happened to the health of these people when they switched diets. Their bellies may have been full, and they may have gotten enough caloric intake to keep their bodies running, but they were starving for essential nutrients.

In Price's assessment, the increase in sugar and refined flours, and the decrease in vitamins and minerals were the most important changes in the diet. He found that the traditional diets had about four times the mineral content, and ten times the fat soluble vitamins, compared to the modern ones (See Table 26.1). Price did not conclude that fat in the modern diet was a major source of disease, in contrast to current theories, or that meat itself was a source of disease, as modern vegetarians hold. Price felt that the *quality* of fats and meats was important, and that animal fat and marine oils, rich with fat soluble vitamins, were an important component of a healthy diet. He also concluded that the fat-soluble vitamins A, D, and E were necessary for the absorption of the minerals. His opinion is verified by modern diet studies. In third world countries among poor inhabitants do not consume animal products, iron-deficiency anemia is common. There is plenty of iron in the vegetable foods the people eat, but they cannot absorb it in the absence of vitamin A. The addition of Vitamin A to the diets, in the form of cod liver oil, increases iron absorption and cures the anemia. Other studies in animals show that dogs fed primarily on whole grains do not absorb the abundant calcium in the grains until cod liver or butter, both rich in vitamin A, is added.

Modern studies

Although Weston Price presented strong clinical data on the relationship of diet and dental cavities, his most dramatic evidence for his theories lie in his photographs. This kind of information is hard to quantify, and does not satisfy the modern scientist. A large number of more formal studies of the effect of Western diets on primitive societies have been conducted in the last thirty years, and these support Price's theories. Perhaps the best summary of this research appears in *Western Diseases: their emergence and prevention*, by Drs. H.C. Trowell and D.P. Burkitt. Both men had taught and practiced medicine in Uganda (49 teaching-years between them), and had seen the effects of the increasingly Western diet there first hand. Both were in retirement when the text *Diabetes, Coronary Thrombosis and the Saccharine Disease* appeared in 1966 (Cleave and Campbell, 1966) which reported the incidence of these illnesses to increase when sugar is introduced into a society. They were inspired to invite contributions from thirty-four leading researchers in the field of dietary research for a text on the subject. Trowell and Burkitt presented the researchers with a list of twenty-five diseases which scientific studies had suggested were Western diseases — illness that are common in the Western, developed world, rare in primitive societies, but which appear in the primitive societies when individuals begin to consume a Western diet. Table 2.8 lists the diseases the contributors concluded are caused by the diet and lifestyle factors of our civilization.

Table 2.8

Western Diseases, rare or non existent in traditional societies

Diseases*	Associated dietary deficiencies**
Metabolic and Cardiovascular	
essential hypertension	calcium, magnesium, potassium
Obesity	copper, zinc
diabetes (Type II)	chromium, copper, magnesium, manganese, zinc
cholesterol gallstones	fiber, excess sugar
Stroke	calcium, magnesium, potassium
peripheral vascular disease	calcium, chromium, copper, magnesium, selenium
coronary heart disease	calcium, chromium, copper, magnesium, selenium
varicose veins	copper
deep vein thrombosis	essential fatty acids
pulmonary embolism	essential fatty acids
Diseases of the colon	
Constipation	fiber, excess sugar
Appendicitis	fiber
diverticular disease	fiber, excess sugar
Hemorrhoids	fiber
colon cancer and polyps	fiber, calcium
ulcerative colitis	magnesium, zinc
Crohn's disease	magnesium, zinc
Other diseases	
dental caries	calcium, magnesium, zinc
kidney stones	magnesium
pulmonary embolism	essential fatty acids
Gout	vitamin C
Thyrotoxicosis	excess sugar
pernicious anemia	vitamin B12
breast cancer	calcium, magnesium, copper, iodine, magnesium, selenium, and zinc have been associated with a variety of cancers
prostate cancer	"
ovarian cancer	"
rheumatoid arthritis	copper, selenium, sulfur, zinc
Osteoarthritis	boron, selenium, sulfur, zinc

(Appleton, 1996; Trowell and Burkitt, 1981; Werbach, 1993)

Trowell and Burkitt also noted that the diseases appeared in the traditional societies in the same order of emergence that they appear in the lifetimes of Westerners. For instance obesity first becomes widespread, and then is followed by increased incidence of adult-onset diabetes. Cardiovascular diseases appear in the following order: hypertension, stroke, cardiac and renal complications of hypertension, angina pain, and myocardial infarction (heart attack). In Western societies, which have spent the last 10,000 years gradually shedding our traditional diets, the end stages of this appearance are among our leading causes of death.

Risk factors in the Western diet

The risk factors for these diseases that Trowell and Burkitt name are: low fiber, high fat, sugar, and high salt in the diet. They do not discuss mineral deficiencies as causative factors, but most of the above factors are related to mineral nutrition. Plants that are high in fiber are also high in minerals. High sugar intake provides calories without the minerals that would accompany the calories in whole foods. The body then must rob its internal tissue mineral stores to metabolize those calories. The authors association of high fat with Western disease contradicts Price's observation, and has also been criticized by other researchers. Price found some traditional people eating around 35% fat in their diets, about what we consume today, although the traditional fats were mostly high-quality unprocessed animal fats and fish oils, not margarine and refined vegetable oils.

I speculate that the reason the authors and researchers did not discuss the changes in mineral content of primitive and Western diets is that recent discoveries in mineral nutrition had not caught up with them. Table 2.9 shows the year of the discovery of the essential needs for some trace elements. A "Forty-Year Rule" exists in medicine: new medical knowledge takes about forty years to become integrated into standard practice. True to the rule, the cancer-preventing effects of selenium, which was proven essential to life in 1957, are being broadcast as a "breakthrough" in the media as I write in 1997. At the time Trowell, Burkitt, and their associates were writing in the mid-seventies, the knowledge of the essentiality of the minerals lower on the list than the cobalt in vitamin B-12 had probably not filtered into their thinking. Zinc, which was known to be essential in animals in 1934, was not recognized as an essential human nutrient until the 1970s. Besides these known essential trace minerals, others such as arsenic, fluoride, lithium, bromide, germanium, and rubidium are known to have beneficial effects on life at small doses (Nielsen 1996). The depletion of this whole spectrum of trace elements in the Western diet is probably a contributor to the emergence of Western diseases. I'll discuss the individual role of the minerals in health and disease, and their connection to the most common illnesses in our society in Section II.

Table 2.9

Some beneficial trace elements by year of recognition*

iron	17th century
iodine	19th century
copper	1928
manganese	1931
zinc	1934
cobalt	1935
molybdenum	1953
selenium	1957
chromium	1959
tin	1970
vanadium	1971
fluorine	1971
silicon	1972
nickel	1964
arsenic	1975
cadmium	1977
lead	1977
boron	1990
arsenic	1996
lithium	1996

*benefits demonstrated in animals, but not necessarily humans

(Sources: Lenihan, 1988; Nielsen, 1996; Wallach and Lan, 1994)

Conclusion

Weston Price included a chapter in his book on the problem of the agricultural depletion of minerals in the soil and the food that comes from it. He even introduced preliminary data showing a correlation between regional soil mineral depletion and the incidence of heart disease and pneumonia in those areas. In the next chapter, I'll discuss soil depletion and its impact on the mineral content in the foods we eat today. In Chapter 4, I'll show what impact the mineral depletion of our foods is having on our health as a nation.

Chapter Three

The Food Chain Broken

We didn't inherit the land from our fathers. We are borrowing it from our children.

Amish belief

In Chapter 1, I described how minerals move up the food chain. In this chapter, I'll explain how modern agriculture has broken that food chain, and I'll show the impact that has had on the mineral content of your food.

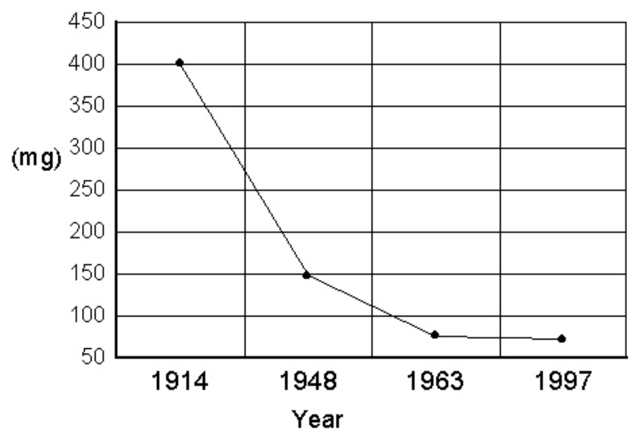
"An apple a day"

The saying "An apple a day keeps the doctor away" was popular in the United States in the early part of this century. The saying is much more ancient than that, and is repeated in many languages and cultures. A contemporary Arabic version is: "An apple a day will keep away a thousand doctors." Growing up as a child in the 1940s and 1950s, I often wondered what was so special about apples. My father was a medical doctor, and hospitals, operations, the extent of illness in the U.S., and the real need for doctors was very familiar to me. It seemed unimaginable than simple apples could prevent illness. I didn't realize the roots of this statement in truth until I began researching mineral nutrient data for this book.

Table 3.1 shows the changes in the mineral content in apples between 1914 and 1992. Table 3.2 shows the decline in vitamin content from 1963 to 1992. Vitamin data is not available for 1914, because most vitamins had not been discovered then. Apples, as they existed when the above sayings were coined, contained significant mineral and vitamin nutrition. An apple in the United States in 1914 contained almost half the minimum daily requirement of iron. Today's apples contain less than one-fiftieth of the requirement — you'd have to eat twenty-six apples to get the same iron nutrition from one apple today. I will describe similar nutrient losses for many foods later in this chapter Graph 3.1 shows the decline in mineral content of a group of vegetables since 1914.

Graph 3.1

Average mineral content in selected vegetables, 1914-1997



Sums of averages of calcium, magnesium, and iron in cabbage, lettuce, tomatoes, and spinach

(Lindlahr, 1914; Hamaker, 1982; USDA, 1963 and 1997)

Table 3.1

Eighty-Year Decline in Mineral Content of Apples

Apples, raw, with skin		1914	1963	1992	Change, 1914-1997
Calcium (mg)	13.5	7	7	-48.15%	
Phosphorus (mg)	45.2	10	7	-84.51%	
Iron (mg)	4.6	0.3	0.18	-96.09%	
Potassium (mg)	117	110	115	-1.71%	
Magnesium (mg)	28.9	8	5	-82.70%	

Table 3.2

Changes in the Vitamin Content of Apples, 1963-1992

	1963	1992	Change
Vitamin A (IU)	90	53	-41.11%
Vitamin C (mg)	4	5.7	+42.50%
Thiamine (mg)	0.03	0.017	-43.33%
Riboflavin (mg)	0.02	0.014	-30.00%
Niacin (mg)	0.1	0.077	-23.00%

Soil mineral depletion

So where did the missing minerals go in eighty years? They disappeared from the soil. In a stable ecosystem, minerals are drawn from the soil into the plants as they grow and bear fruit. When the plant dies, the minerals return to the earth for other plants to use. If the farmer hauls away the plants or their fruits and grains with a harvest, however, the minerals in them are removed from the system. The soil then becomes gradually depleted of its minerals, unless more are added to it in the form of fertilizers. Most soils will only support about ten years of intensive farming before the land becomes so mineral-depleted that it will no longer produce healthy plants.

The knowledge of the problem of soil-depletion is as ancient as agriculture itself. Sometime around ten thousand years ago, hunter-gatherers began to plant food crops, perhaps in cleared areas of the forest. When the land began to fail, they would simply clear a new plot and plant there, letting nature reclaim the original land. Some primitive agricultural people still practice this "slash-and-burn" form of agriculture today. They cut and burn away plots of the forest to grow their crops. The ash from the burned plants acts as a mineral fertilizer to enrich the soil until it eventually gives out.

Methods that maintain the soil

As farmers settled on permanent plots of land, they developed ways to restore the mineral content of the soil. They would use plant or manure fertilizers on the soil to restore some of the nutrients. Plant matter used for fertilizer replaces the plant matter taken away in the crops, keeping a balance in the mineral cycle of the soil. The manure of grazing animals returns some of the minerals from the forage crops where the animals graze. In some cultures, farmers ground up the mineral-rich bones of dead animals to enrich the soil. For centuries in Asia, even up to the present day, farmers have returned even human wastes to the soil. In some areas, such as the Nile River valley, periodic flooding covers the farmland with new mineral-rich soil from upstream. This phenomenon has made the Nile valley a source of highly-nutritious foods in the entire Mediterranean region since ancient times. The love story of Anthony and Cleopatra had as its foundation the Roman conquest of the rich agricultural regions of Egypt after their own farmlands became depleted.

Crop rotation is another method for remineralizing the soil. In the system in Medieval England, farm communities allowed one-third of the crop land to lie fallow each year, and all the manure from the grazing animals was put into the soil of that land. Another third lay fallow the next year, and crops were planted in the soil fertilized the year before. Such a system slows the mineral decline in the soil, but does not stop it completely. Pasture land also eventually becomes mineral-depleted, as the animals use the minerals and as the manure is systematically hauled away. The herd eventually thins, the forage plants become mineral-depleted, and the fallow land ultimately becomes depleted as well. In Britain, the pastures were wasted, the cows became scrawny, and their droppings ceased to fertilize the gardens. This agricultural decline was one of many factors in the movement from the farm to the city in Britain over the last 200 years.

Farmers may also plant special crops on their fallow land, and then plow the crop under. Some farmers today plant alfalfa on the fallow land every four years. Alfalfa has deep roots, which may extend more than twenty feet down into the soil. These roots bring up minerals from the deeper layers of the soil, which then are returned to the top soil when the crop is plowed under. This process also eventually fails, perhaps after centuries, when the deeper layers of the soil themselves become depleted.

These traditional ways of using crop rotation with plant and animal fertilizers are called "organic farming" today. In reality it is traditional farming with the same methods that have sustained farm communities for many centuries while continuing to produce nutrient-rich foods.

Soil decline in American history

With subsistence farming, where the family or community only takes what they need for personal use from the soil, this process of depletion may take hundreds or even thousands of years. With the advent of urbanization and the demand for food crops by city dwellers, commercial rather than subsistence agriculture becomes predominant, more plants are hauled away from the soil, and the soil mineral-loss accelerates. The urbanization of the United States in the last century has contributed greatly to the dramatic soil depletion indicated by the data on apples in Tables 3.1 and 3.2. At the turn of the last century, about 85% of the population lived on farms, grew much of the food they ate, and practiced crop rotation. Today, more than 85% of the population lives in cities and requires food from land that they do not tend or care for, and to which they do not return their wastes. The mineral cycle of the land is completely broken. Instead of being returned to the land to remineralize the soil, as would happen on a family subsistence farm, our mineral wastes now go into landfills and sewers. Plants whose minerals were so carefully guarded and returned to the soil by subsistence farmers for millennia are now shipped overseas at a rate of more than 100,000,000 tons per year (U.S., 1996). Table 3.3, which compares the dollar volume of U.S. food exports between 1970 and 1987 shows the rapid recent acceleration of this process.

Table 3.3

Annual export of food crops from the United States

1970	$7,255,000,000
1980	41,200,000,000
1992	$45,700,000

(U.S.D.C., 1989 and 1994)

The "burned-out-farm" has been a part of American history since well before the first Europeans arrived here. Anthropologists think that soil depletion may have been responsible for the decline or disappearance of some corn-farming communities in the Southwest. Weston Price, who I introduced in Chapter 2, also found anthropological evidence of progressive soil decline in the lands of Southwestern Indians. He examined skeletons from over a thousand year period, and found that progressive generations had increasing amounts of arthritis and tooth decay, and also had a progressive degeneration in bone structure. These communities hunted but also grew corn, and Price speculates that it was the progressive depletion of minerals in the soil — causing decreasing minerals in the corn — that caused the gradual decline in health.

Soil depletion also fueled the historic westward expansion of the United States. As the colonists' land became depleted, they would abandon it and look for new land to the West. This phenomenon also influenced the movement to the cities as farms burned out in this century. A few cultures — those that used wise agricultural methods — did not have to leave their land. In areas of Pennsylvania, German, Amish, and other groups still farm land today that their ancestors settled more than a hundred years ago. These groups have an ethic that the soil they leave their children should be healthier than what they inherited. Some German settlers even took over burned out farms and restored the soil to health (Ebeling, 1979). One practice in farm areas of Pennsylvania is to allow part of the crop from fruit trees to fall naturally and rot on the ground. This not only restores minerals to the soil, it attracts deer, who leave their droppings in the area. I suppose the deer also make easy targets when the farmer needs a little extra meat.

Weston Price noted the general decline of minerals in the soil by 1938:

> *"In correspondence with government officials in practically every state of the United States I find that during the last fifty years there has been a reduction in the capacity of the soil for productivity in many districts, amounting from 25 to 50 percent."*
>
> (Price, 1938)

Price also found a correspondence between soil depletion in specific areas and the increased incidence of heart disease and pneumonia in those areas. I'll discuss that work in detail in the Chapter 4. As Price was writing, the dust bowl hit the burned out farms of the Midwest, displacing the farmers and creating a natural disaster in those areas. During the same period, Adolph Hitler began to plan an eastward expansion in Europe, to capture the rich farmlands of Eastern Europe and Russia, following a decline in productivity of the German farms parallel to that occurring in the United States.

The story of NPK

Soil depletion continues to play an important role in the unfolding history of the family farm in the United States. In the last thirty years, huge tracts of

American farmland have been transferred from the hands of family farmers to those of large corporate concerns — 123,000,000 acres, or about one acre in eight (See Table 3.4). One reason: the corporations have the resources to fertilize large tracts of land with chemical fertilizers. NPK fertilizer — named from the chemical symbols for nitrogen, phosphorus, and potassium — has largely replaced manures, organic plant material, and ground up animal bones as fertilizer on commercial farms. Table 3.5 shows the nutrients required by plants. Of these, the primary nutrients nitrogen, phosphorus, and potassium are most responsible for the growth, size, and productivity of agricultural crops, and thus they are the primary elements of modern fertilizers. The deficiency of a few nutrients — sulfur and iron — will cause discoloration of plants, affecting their marketability (Stewart, 1977). The other elements are less crucial to productivity or appearance, although they are extremely important to the nutritive value of the plants to humans. If the secondary nutrients or trace elements become so depleted that it affects productivity or appearance, they may be added to the soil. For instance iron is often added to fertilizers for commercial potato crops, which rapidly deplete the soil of the iron essential to the growth and appearance of the potato. One of the services of the U.S. Department of Agriculture is to assist farmers in determining if these other nutrients need to be added to soils to support plant growth, productivity, and appearance. The nutritional value of the food is not considered in such analyses, but only the effect of the nutrient on the size, yield, or appearance of the crop. Thus plants remove all these nutrients from the soil, but the corporate farms only add three or four minerals back in. Look forward to Table 3.x, and notice that of the five minerals listed, phosphorus and potassium declined the least in foods since 1963. This is because these two minerals are a standard part of modern fertilizers. NPK fertilizer was developed in the 1830s before the nutritional mineral requirements of either plants or humans was understood. We are thus using a technology from the last century that has not kept abreast of more modern scientific knowledge.

Table 3.4

Total number and acreage of farms in the U.S.

Number of farms

1960	3,963,000
1970	2,949,000
1980	2,433,000
1992	1,925,000
Acreage	
1960	1,176,000,000
1970	1,102,000,000
1980	1,039,000,000
1992	946,000,000

Family vs corporate farms in 1992 (acreage)

Family or partnership farms	757,000,000
Corporate farms	123,000,000

(U.S.D.C., 1989 and 1996)

Table 3.5

Plant nutrient requirements

Nutrients	Source
Organic elements	**Air and water**
hydrogen	
oxygen	
carbon	
Primary nutrients	**Soil**
nitrogen	
phosphorus	
potassium	
Secondary nutrients	**Soil**
magnesium	
calcium	
sulfur	
Trace elements	**Soil**
iron	
zinc	
manganese	
boron	
copper	
molybdenum	
chlorine	

(Donahue, 1970)

Table 3.6

Expenditures for fertilizer and pesticides on U.S. farms (billions of dollars)

Year	Fertilizer	Pesticides
1970	2.4	1.0
1987	6.5	4.6
1994	9.2	7.2

(U.S.D.C., 1989 and 1996)

The effect of these chemical fertilizers is more complex than straightforward mineral loss. The addition of chemical nitrogen depletes both the vitamin C and the iron content of plants that grow from the fertilized soil (Harris, 1975). In addition, the potassium in NPK fertilizer is added in the form of potassium chloride. Thus a ton of chloride is added along with every ton of potassium. The high levels of potassium inhibit plant absorption of magnesium (Ensminger, et al, 1983). Chloride leaches the soil of magnesium, zinc, and calcium. (Hall, 1976). Potassium chloride also alters the mineral balance so that selenium becomes bound in the soil and cannot be absorbed by plants (Ensminger, et al, 1983).

Pesticides and fungicides

The result of decades of farming with NPK fertilizer is plants that look the same as they did generations ago, but which are depleted of the secondary plant nutrients and trace elements. Although the yield is adequate for commercial purposes, these plants are diseased. Plants, like humans, can suffer from mineral deficiency symptoms that affect their immune systems (Salamon, 1974; Fryer, 1984) They are more prone to mold, fungus, and insect infestation, and they require large amounts of pesticides to keep them alive until they reach the market. And thus modern agricultural products, besides being inferior in mineral nutrition, are laced with these potentially poisonous substances. Table 3.6 shows the increasing farm expenditures for fertilizer and pesticides since 1970. During this period, the average units of fertilizer and pesticides per acre of harvested crop land has increased about 25% (U.S., 1989 and 1994)

The ecology of soil microorganisms

We saw in Chapter 1 that soil microorganisms are a key link in the mineralization of soil. They may ingest minerals from rocks in the soil, and also break down the organic matter of dead plants, re-releasing their minerals for use by other plants. Table 3.7 shows the forms of microscopic life in soil that are essential to mineral transformation and retention in soil. Each teaspoon of healthy soil contains a complex microscopic ecology, and the presence of each of the life forms is necessary for the maintenance of soil fertility and mineral transformation. Minerals ingested by fungi and bacteria may not be available to plants, but the tiny predatory protozoa, nematodes and microarthropods eat bacteria, fungi, and each other, and release their nutrients in fecal matter (Ingham, 1985, 1992)

Table 3.7

Beneficial organisms present in a teaspoon of healthy soil.

Organism	Number present
bacteria	360,000+
fungi	60,000
protozoa	100,000

nematodes	500
microarthropods	200,000

(Ingham, 1985, 1992)

One problem with chemical fertilizers and pesticides, other than their hazards to human health, is that they also kill many of these beneficial organisms. The fertilizers provide an unbalanced nutrient supply for these organisms. The fertilizers can produce large plant yields for a while, but they eventually ruin the soil by disrupting the balance of the microorganisms. The bacteria and fungi hold the soil together, so eventually soil erosion carries even more nutrients away into surface or ground water (Hendrix et al, 1986; Coleman et al., 1992).

Pesticides have effects on the soil similar to the effects of overuse of antibiotics in humans. At first these drugs seemed like cure-alls that could control many infectious diseases. It soon became apparent that they also created resistant forms of bacteria, and disrupted the healthy bacteria in the human gut. Pesticides similarly destroy the beneficial organisms in the soil, making way for more organisms that cause disease in the plants. The mineral "digestive system" of the soil is disrupted, and the soil becomes demineralized and subject to erosion. Ingham, 1992)

Early harvesting and nutrient content

Modern agriculture has also developed plant strains and harvesting techniques that allow foods to be harvested before they are ripe. Perhaps the most notorious is the "Red Rock" tomato, developed through genetic research with federal funds in California universities. The Red Rock tomato is especially hard, allowing it to be harvested with machines. It then ripens on the way to market, and while in storage. This tomato, and the many other plants that now ripen after, instead of before, harvesting, no longer have roots in the ground as they ripen. Mineral content in plants such as snap beans, grapes, and many greens rises during ripening if the plant has access to the minerals in the soil. Vitamin content also rises in many plants as they near ripeness (Lee and Chichester, 1974). These nutrients are depleted in the foods when they are harvested before ripeness.

The smoking gun

The above facts about the effect of modern commercial agriculture on the nutrient content of plants has been known for decades. Actual measures of the changes in nutrient content of foods over time is much harder to find, however. In a computer search of articles in the National Library of Medicine, in Bethesda, Maryland, dating back to 1966, I was unable to find a single article measuring such changes. Other references described the problem in general, but none contained comparative data. Tables 3.8 through 3.13 give some comparisons for major categories of farm products. The data in the charts compares U.S. Department of Agriculture data from an out-of-print 1963 book with information now available on the internet from the U.S. Department of Agriculture. The tables list the content of five minerals, and some tables list vitamin content. The minerals are the only ones measured in 1963. Iron was the only trace element measured then, although their current analyses also measure zinc, molybdenum, and copper. The USDA does not measure food levels of the other fifteen essential trace elements, but we must assume that they follow the patterns of the other minerals, because most are not added to commercial fertilizers.

Fruits

Table 3.8 shows the changes in the nutrient value of some fruits. All the nutrients except potassium and vitamin C have declined consistently. Potassium is added to fertilizers. The inconsistent changes in vitamin C may be due to variations in the samples used. The vitamin content of fruits and vegetables varies widely within a season depending on when they are picked. Vitamins are also less susceptible to loss than minerals, because the plant can make its own vitamins, but must take minerals from the soil. Despite this, the vitamin A content in the three fruits declined by 66%. That means you'd have to eat three pieces of these fruits to get the same vitamin a nutrition that you did in 1963. Of the minerals, the trace element iron too the biggest hit, with a 57% decline. This is an ominous sign, because the other eighteen essential trace elements may have followed the same pattern.

Table 3.8

Changes in Mineral and Vitamin Content of Fruits, 1963-1992 (per 100 grams)

	1963	1997	Change
Oranges			
calcium (mg)	41	40	-2.44%
iron (mg)	0.4	0.1	-75.00%
magnesium (mg)	11	10	-9.09%
phosphorus (mg)	20	14	-30.00%
potassium (mg)	200	181	-9.50%
Vitamin A (IU)	200	21	-89.50%
Vitamin C (mg)	50	53	6.00%
Apples			
calcium (mg)	7	7	0%
iron (mg)	0.3	0.18	-40.00%
magnesium (mg)	8	5	-37.50%
phosphorus (mg)	10	7	-30.00%
potassium (mg)	110	115	4.55%

Vitamin A (IU)	90	53	-41.11%
Vitamin C (mg)	4	5.7	42.50%
Bananas			
calcium (mg)	8	6	-25.00%
iron (mg)	0.7	0.31	-55.71%
magnesium (mg)	33	29	-12.12%
phosphorus (mg)	26	20	-23.08%
potassium (mg)	370	396	7.03%
Vitamin A (IU)	190	81	-57.37%
Vitamin C (mg)	10	9.1	-9.00%

Vegetables

The mineral content of vegetables (Table 3.9) also declined, on the average, in all the elements that are not added to fertilizers the only dramatic increases were the phosphorus in apples, the potassium in potatoes, and the iron in potatoes and celery. Phosphorus and potassium are included in all fertilizers, and iron is added to fertilizer for certain soils and crops.

Magnesium content declined the most with a 35% loss.

Table 3.9

Changes in the Mineral Content of Vegetables, 1963-1992 (per 100 grams)

	1963	1997	Change
Carrot, raw, with skin			
calcium (mg)	37	27	-27.03%
iron (mg)	0.7	0.5	-28.57%
magnesium (mg)	23	15	-34.78%
phosphorus (mg)	36	44	22.22%
potassium (mg)	341	323	-5.28%
Potatoes, raw, whole			
calcium (mg)	7	7	0.00%
iron (mg)	0.6	0.76	26.67%
magnesium (mg)	34	21	-38.24%
phosphorus (mg)	53	46	-13.21%
potassium (mg)	407	543	33.42%
Corn, sweet, yellow, raw			
calcium (mg)	3	2	-33.33%
iron (mg)	0.7	0.52	-25.71%
magnesium (mg)	48	37	-22.92%
phosphorus (mg)	111	89	-19.82%
potassium (mg)	280	270	-3.57%

Tomatoes			
calcium (mg)	13	5	-33.33%
iron (mg)	0.5	0.45	-25.71%
magnesium (mg)	14	11	-22.92%
phosphorus (mg)	27	24	-19.82%
potassium (mg)	244	222	-3.57%
Celery			
calcium (mg)	39	40	2.56%
iron (mg)	0.3	0.4	33.33%
magnesium (mg)	22	11	-50.00%
phosphorus (mg)	28	25	-10.71%
potassium (mg)	341	287	-15.84%

Green leafy vegetables

Green leafy vegetables are promoted in virtually every nutrition book as a good source of calcium. They may not be anymore (See Table 3.10). The calcium content of these five greens has dropped by 46.4% in the last generation. If we exclude iceberg lettuce — which is not a very good source of calcium anyway — the average drop is 57%. Collard greens, originally the highest source on the list, has lost more than 85% of its calcium. Again excluding iceberg lettuce, the iron content of the greens has dropped an average of 41.5%, perhaps indicating a similar decline in the other essential trace elements.

Table 3.10

Changes in Mineral Content in Green Leafy Vegetables, 1963-1992 (per 100 grams)

Broccoli, raw	1963	1997	Change (%)
calcium (mg)	103	48	-53.40%
iron (mg)	1.1	0.88	-20.00%
magnesium (mg)	24	25	4.17%
phosphorus (mg)	78	66	-15.38%
potassium (mg)	382	325	-14.92%
Romaine lettuce			
calcium (mg)	68	36	-47.06%
iron (mg)	1.4	1.1	-21.43%
magnesium (mg)	n.a.	6	n.a.
phosphorus (mg)	25	45	80.00%
potassium (mg)	264	290	9.85%
Iceberg lettuce			
calcium (mg)	20	19	-5.00%

iron (mg)	0.5	0.5	0.00%
magnesium (mg)	11	9	-18.18%
phosphorus (mg)	22	20	-9.09%
potassium (mg)	175	158	-9.71%
Collard greens			
calcium (mg)	203	29	-85.71%
iron (mg)	1	0.19	-81.00%
magnesium (mg)	57	9	-84.21%
phosphorus (mg)	63	10	-84.13%
potassium (mg)	401	169	-57.86%
Swiss chard			
calcium (mg)	88	51	-42.05%
iron (mg)	3.2	1.8	-43.75%
magnesium (mg)	65	81	24.62%
phosphorus (mg)	39	46	17.95%
potassium (mg)	550	379	-31.09%

Beans

The mineral content of beans did not decline as severely as that of the fruits and vegetables, perhaps because the bean stalks are plowed back into the earth, reducing the mineral loss in the soil (See Table 3.11). Nevertheless, all the minerals declined except the potassium and phosphorus which is added in fertilizers.

Table 3.11

Changes in the mineral content of some beans, 1963-1992

Pintos	1963	1992	Change (%)
calcium (mg)	135	121	-10.37%
iron (mg)	6.4	5.88	-8.13%
magnesium (mg)	170	159	-6.47%
phosphorus (mg)	457	418	-8.53%
potassium (mg)	984	1328	34.96%
Chickpeas (garbanzos)			
calcium (mg)	150	105	-30.00%
iron (mg)	6.9	6.24	-9.57%
magnesium (mg)	n.a.	115	n.a.
phosphorus (mg)	331	366	10.57%
potassium (mg)	797	875	9.79%

Grains

The mineral content of grains declined less consistently than that in the foods above. Wheat, the most intensively farmed of the grains, saw a loss of all the minerals, even those that are supplied in fertilizers. In the grains listed here, calcium declined the most, with a loss of 46.5%. Grains are less susceptible to mineral loss that some other crops, because the stubble of the grain is plowed back into the earth.

Table 3.12

Changes in the mineral content of grains, 1963-1992

Wheat, hard red winter	1963	1992	Change (%)
calcium (mg)	46	29	-36.96%
phosphorus (mg)	354	288	-18.64%
iron (mg)	3.4	3.19	-6.18%
potassium (mg)	370	363	-1.89%
magnesium (mg)	160	126	-21.25%
Oats, rolled			
calcium (mg)	53	52	-1.89%
phosphorus (mg)	405	474	17.04%
iron (mg)	4.5	4.2	-6.67%
potassium (mg)	352	350	-0.57%
magnesium (mg)	169	148	-12.43%
Buckwheat			
calcium (mg)	114	18	-84.21%
phosphorus (mg)	282	347	23.05%
iron (mg)	3.1	2.2	-29.03%
potassium (mg)	448	460	2.68%
magnesium (mg)	229	231	0.87%
White rice			
calcium (mg)	24	9	-62.50%
phosphorus (mg)	94	108	14.89%
iron (mg)	0.8	0.8	0.00%
potassium (mg)	92	86	-6.52%
magnesium (mg)	28	35	25.00%

Meats

The mineral decline in beef and chicken, the two most frequently consumed meats in the U.S., was not as dramatic as that in plants (See Table 3.13). We would expect some decline, because the animals are fed increasingly mineral-deficient grains. But animals, like people, require minimum amounts of minerals to be healthy, so we would expect more constant levels. The most striking nutrient decline is of vitamin A, disappearing completely from the beef tested by the USDA, and by 70% in chicken. Thiamine, one of the B vitamins, declined by 42%. Of the minerals, iron declined the most at 28%. This may predict a similar decline in the other trace elements that the USDA does not measure. Beef has been recommended as an iron tonic for several centuries, but it appears to be losing that property in our modern agricultural system.

Table 3.13

Changes in Nutrient Content of Beef and Chicken, 1963-1992

Beef, ground	**1963**	**1992**	**Change**
calcium (mg)	10	8	-20.00%
iron (mg)	2.7	1.73	-35.93%
magnesium (mg)	17	16	-5.88%
phosphorus (mg)	156	130	-16.67%
potassium (mg)	236	228	-3.39%
vitamin A (IU)	40	0	-100.00%
thiamine (mg)	0.08	0.038	-52.50%
riboflavin (mg)	0.16	0.151	-5.63%
niacin (mg)	4.3	4.48	4.19%
Chicken			
calcium (mg)	12	10	-16.67%
phosphorus (mg)	203	198	-2.46%
iron (mg)	1.3	1.03	-20.77%
potassium (mg)	285	238	-16.49%
magnesium (mg)	23	23	0.00%
vitamin A (IU)	150	45	-70.00%
thiamine (mg)	0.1	0.069	-31.00%
riboflavin (mg)	0.12	0.134	11.67%
niacin (mg)	7.7	7.87	2.21%

The averages

Notice that some nutrients go up and some go down for some of the foods. The increases can be due to minerals in the fertilizers, to supplements given to animals, or to natural variations in the sampling of the products tested. Foods grown in different soils to have different mineral content. Despite the ups and downs of some of the nutrients, the average for the minerals is a net loss. Table 3.14 shows the average mineral loss for a group of fruits and vegetables. Phosphorus and potassium declined the least, because they are added to fertilizers. Iron declined the most — an ominous sign because the other unmeasured essential trace elements may have followed the same pattern. Calcium and magnesium also declined significantly. This may be due to a combination of mineral loss in the soil and the chemical interactions with the potassium chloride that is a basic constituent of modern chemical fertilizers. As we saw above, potassium inhibits plant absorption of magnesium, and chloride combines with both calcium and magnesium and leaches them from the soil.

Table 3.14

Changes in the mineral content of some fruits and vegetables, 1963-1992

	calcium	iron	magnesium	phosphorus	potassium
oranges	-2.44%	-75.00%	-9.09%	-30.00%	-9.50%
apples	0.00%	-40.00%	-37.50%	-30.00%	4.55%
bananas	-25.00%	-55.71%	-12.12%	-23.08%	7.03%
carrot	-27.03%	-28.57%	-34.78%	22.22%	-5.28%
potatoes	0.00%	26.67%	-38.24%	-13.21%	33.42%
corn	-33.33%	-25.71%	-22.92%	-19.82%	-3.57%
tomatoes	-33.33%	-25.71%	-22.92%	-19.82%	-3.57%
celery	-33.33%	-25.71%	-22.92%	-19.82%	-3.57%
romaine	-47.06%	-21.43%	n.a.	80.00%	9.85%
broccoli	-53.40%	-20.00%	4.17%	-15.38%	-14.92%
iceberg	-5.00%	0.00%	-18.18%	-9.09%	-9.71%
collards	-85.71%	-81.00%	-84.21%	-84.13%	-57.86%
chard	-42.05%	-43.75%	24.62%	17.95%	-31.09%
Totals	-29.82%	-32.00%	-21.08%	-11.09%	-6.48%

USDA Food Composition Data

In the tables in this chapter, I have given the dates for some of the data as 1963 and 1992. The current USDA information may actually include some 1963 data, and other data from the years 1976 through 1992. The “bible” of nutritionists and dieticians since 1963 has been the USDA *Food Handbook No.8*. Although this book was reprinted in 1975, the later book simply copies the 1963 data published twelve years before. Most popular nutrition books today, and even academic nutrition texts from the late 1980s, contain this thirty-four year-old information. Shortly after the publication of the 1975 book, the USDA began publishing supplements to Handbook No.8, as new food analyses were performed, usually on one food group at a time. Twenty-four supplements to the handbook have appeared. Table 3.15 shows the content of these books and their year of publication. These supplements are all now out of print and unavailable. According to the manager of the government printing office in Denver, Colorado, no plans have been announced for reprinting them. The only remaining source of the data is the USDA nutrient database — entitled “SR11" — accessible through the internet. It took me weeks of wrestling with bureaucracies and computer software to obtain the current information. The sources for SR11 include some of the 1963 data, and all the books in Table 3.15, so the 1992 entries in this book — dated for the most recent USDA publication — may actually contain much older data. The food you buy in the store may have nutrient content even lower than the most recent figures in my tables. The data on fruits may come from 1982, on vegetables from 1984, beans from 1986, and so on.

Table 3.15

Updates to the USDA *Food Handbook No. 8*

Year	Content	Publication	Pages
1976	Dairy and Egg Products	Handb. No. 8-1	144 pp.
1979	Poultry Products	Handb. No. 8-5	330 pp.
1982	Fruits and Fruit Juices	Handb. No. 8-9	283 pp.
1984	Vegetables	Handb. No. 8-11	502 pp.
1984	Nut and Seed Products	Handb. No. 8-12	137 pp.
1987	Fish and Shellfish	Handb. No. 8-15	192 pp.
1986	Legumes	Handb. No. 8-16	156 pp.
1988	Fast Foods	Handb. No. 8-21	194 pp.
1989	Lamb, Veal, and Game	Handb. No. 8-17	251 pp.
1989	Cereal Grains and Pasta	Handb. No. 8-20	137 pp.
1990	Beef Products	Handb. No. 8-13	412 pp.
1989-1992	Data summaries	Handb. No. 8	439 pp.
1992	Pork Products	Handb. No. 8-10	223 pp.
1992	Baked Products	Handb. No. 8-18	467 pp.

Trace elements

As I mentioned in the discussions of the food groups above, the USDA did not collect information on any of the trace elements except iron in 1963. We have evidence that twenty-three trace elements may be beneficial to human life. Of these, the 1997 USDA database contains information only on copper, iron, molybdenum, and zinc. I was able to find analytical data on some trace elements in food from 1948. The research was done by Rutgers University professor Firman E. Bear, and his data was reprinted in the 1982 book *The Survival of Civilization*, by John Hamaker. Bear did not take a wide sampling of foods and publish their averages, as the USDA does. Instead, he published the high and low figures from his own and from other published analyses, showing the wide range of these elements that appear in food depending on the soil in which they are grown. Table 3.16 shows his data, and compares it to the 1997 USDA data. For all three trace elements listed, for all five foods, the 1997 levels(from analyses in 1992 or before) are *all near or below the lowest measured in 1948.*

The implications of these data are enormous. First, here is solid evidence that modern chemical agricultural methods are effectively strip-mining essential nutrients from the soil and from the food that we eat. Perhaps more important, if the pattern holds true for the other twenty trace elements recognized to be beneficial to human life, then eating these food products is leading our entire nation down the road to malnutrition and disease.

Table 3.16

The worst of the crop: disappearing trace elements in food, 1948-1992

(milligrams per 100g of food)

	1948 (highest)	1948 (lowest)	1992 (average)
Snap Beans			
iron (mg)	22.7	1	1.04
manganese (mg)	6	0.2	0.214
copper (mg)	6.9	0.3	0.069
Cabbage			
iron (mg)	9.4	2	0.59
manganese (mg)	6	0.2	0.159
copper (mg)	4.8	0.04	0.023
Lettuce			
iron (mg)	51.6	0.9	0.5
manganese (mg)	1.3	0.2	0.151
copper (mg)	6	0.3	0.028
Tomatoes			
iron (mg)	193.8	0.1	0.45
manganese (mg)	9.4	2	0.105
copper (mg)	5.3	0	0.074
Spinach			
iron (mg)	158.4	1.9	2.71
manganese (mg)	51.6	0.9	0.097
copper (mg)	3.2	0.5	0.13

Comparative data from 1914

The only source I could find for the nutrient composition of foods prior to 1948 comes from the writings of Dr. Henry Lindlahr in 1914. Lindlahr was an osteopathic M.D. and naturopath who practiced in Chicago in the first decades of this century. He ran a 200-bed hospital where he treated the full range of human illnesses, including mental illness, using only osteopathic manipulation, homeopathy, exercise, and diet. Lindlahr was convinced of the absolute importance of a healthy, whole foods diet to cure chronic illnesses, and avidly read the scientific literature of his day on nutrition. He published a four volume work on natural therapeutics, the third of which was on dietetics, where his nutrient data appear (Lindlahr, 1914). Lindlahr does not cite a source for the data, so I assume the he, being a very wealthy man, paid to have it done himself. For each of forty-five foods, he gives the content of fats and carbohydrates, and the minerals calcium, chlorine, iron, magnesium, phosphorus, potassium, silicon, sodium, and sulfur. It is astounding to me that Lindlahr would go to such lengths to analyze these nutrients in a era when only a few vitamins and two minerals were known to be essential nutrients.

Naturally we should question the validity of data this old, but basic methods of quantify mineral elements in a substance were well-known at the time. The process, still in widespread use today, had been known in the mid 1800s. I learned it in college in an advanced chemistry class in 1967. The substance is burned to ash, and the mineral content is analyzed using a variety of simple chemical reactions.

Lindlahr's data remain questionable, however, because he or his chemist apparently made a mathematical error in the chart, and his mineral data all appear to be off by a factor of ten. Adjusting for this error, most of the data on minerals fall within or just above the ranges measured by Bear forty years later (Hamaker, 1982). See Table 3.17. Those that are higher than Bear's ranges are consistent with the known mineral declines from 1948 to 1992, if the trend were projected backward in time. Only calcium in Lindlahr's data appear widely out of range of Bear's data. This could be consistent with soil calcium decline due to NPK fertilizer, which strips calcium from the soil. NPK fertilizer was introduced to the U.S. in the first decades of this century, and its use has been growing steadily ever since.

Table 3.17

Decline of mineral content in some vegetables, 1914-1992 (per 100 mg)

	1914	**1948**	**1992**
Cabbage			
Calcium (mg)	248	38.75	47
Magnesium (mg)	66	29.6	15
Iron (mg)	1.5	5.7	0.59
Lettuce			
Calcium (mg)	265.5	38.5	19
Magnesium (mg)	112	31.2	9
Iron (mg)	94	26.25	0.5
Spinach			
Calcium (mg)	227.3	71.75	99
Magnesium (mg)	122	125.4	79
Iron (mg)	64	80.15	2.7

Graph 3.1 shows the trend of mineral decline in several foods. The shape of the curve is a descending parabola, approaching a flat line. We could question whether inaccurately high calcium data from 1914 skew the curve, but the same shaped curve emerges for the sums of any two of the minerals in the chart, even omitting calcium. The 1948, 1963, and 1992 data give the same shape, excluding the 1914 data completely. A similar curve describes the productivity of any resource extraction industry, such as coal mining or oil drilling. Productivity begins at a high level as the first resources are extracted, drops rapidly, and then levels off as the resources become exhausted. Miners and drillers do not put resources back to replace what they take out, the way traditional subsistence farmers have for thousands of years. Modern agriculture, like a mining industry, does not replace most of the minerals it extracts, but in fact exports many of them overseas. This is a mineral extraction industry, gradually exhausting the land.

Organic vegetables

The growing popular appeal of organic foods is mostly due to the absence of pesticides in the plants. Whether organically grown fruits, vegetables, and grains are more nutritious than chemically grown food has been a topic of scientific debate. For a recent review of the scientific literature on the topic, see Hornick, 1997. In general, agricultural studies show little difference, on the average, between the mineral content of organically and commercially grown foods. The analyses are flawed, however, for two reasons. First, they usually only compare major minerals, while excluding the trace elements. Since major minerals are often added with chemical fertilizers, the amounts in commercial produce may be equal or higher than those in organic crops. Second, averages from across the country do not give an accurate picture. In mineral-poor farming areas, the commercial crops will have higher content of the major minerals. In mineral rich soils, with mineral-rich organic fertilizer at hand, the levels in organic crops may be higher. If the data is combined, the two trends cancel each other out, and the two types of food appear to be equivalent in their nutritional value.

Bob L. Smith of Doctor's Data lab in Chicago took another approach to the question in the early 1990s (Smith, 1993). For several years, he purchased organic and conventional foods in supermarkets, carefully pairing up foods of the same variety and size at the same time of year. He than had them analyzed for the content of 26 minerals, including 20 trace elements. Table 3.18 shows the results. On average, the organic foods have about twice the mineral content of the chemically fertilized ones. This data might not hold up if samples were taken in other areas of the country. Chicago probably gets much of it organically grown foods from farms within Illinois and neighboring states, where the crops grow in soils that are mineral-rich from deposits of glaciers that once covered the area. Of the foods, organic corn appears to be the most rich in minerals.

Table 3.18

Nutrients in organic vs commercial foods

Percentage nutrients in organic apples, pears, potatoes, wheat, and corn compared to commercial varieties

	Organic higher (%)	Commercial higher (%)
boron	70.00%	
calcium	63.00%	
chromium	78.00%	
cobalt	0.00%	
copper	48.00%	
iodine	73.00%	
Iron		59.00%
lithium	116.00%	
magnesium	136.00%	
manganese	178.00%	
molybdenum	68.00%	
nickel	66.00%	
phosphorus	91.00%	
potassium	125.00%	
Rubidium		28.00%
selenium	390.00%	
silicon	86.00%	
sodium	159.00%	
strontium	133.00%	
sulfur	20.00%	
vanadium	80.00%	
Zinc		60.00%
Toxic trace elements*		
Aluminum		40.00%
cadmium	5.00%	
Lead		29.00%
Mercury		25.00%

* less is better

What can be done for the soil?

Table 3.18 shows that organic farm products may contain about twice the mineral content of chemically-grown foods. This is presumably because minerals from organic fertilizers, which by necessity contain a broad spectrum of mineral nutrients, return to the soil to replace those taken out at harvest. Organic farming also avoids the highly-concentrated chemical fertilizers and pesticides that disrupt the soil microorganism balance and leach out minerals like calcium and magnesium. But the table shows that these methods may not be enough to produce the sort of nutritious foods that our grandparents enjoyed in their youth. Twice the level of minerals is not enough to match the levels found in the 1948 data shown in Table 3.16 or the 1914 levels in Table 3.17. Where can we find a balanced, broad-spectrum mineral rich fertilizer to restore what has disappeared in the last century? Stones and gravel may be the answer.

German farmers of the last century used stones, treated with sulfuric acid, as fertilizer (Ebeling, 1979). Most rock contains the full spectrum of minerals that are natural to the soil (See Table 1.8). Stone is a natural link in the food chain of the land (See Chapter 1), and a natural food for soil bacteria. The idea of stone and gravel fertilizers is making a modern comeback with some organic farmers, based on the resurrection of the work of 19th century German agricultural chemist Julius Hensel.

Hensel published his classic work *Bread from Stones* in the 1800s, and it is viewed today as the foundation of the organic agriculture movement. Hensel made his discovery of the fertilizing properties of rock dust as a young man when he worked as a miller. He noticed that small stones in wheat were being ground up, and left a stone dust residue in the bottom of the mill. On a whim, he sprinkled the dust on the soil of his vegetable garden, and to his surprise noted that the plants took on a new vitality and vigorous growth. He repeated the experiment with fruit trees, and found that trees previously only bearing small and wormy fruit began to yield large, insect-free and worm-free produce. Stone dust-fertilized vegetables also soon became free of insect infestations, presumably because the minerals from the rock improved the immunity of the plants. Hensel began to market a “stone-meal” fertilizer in Germany, and criticized the growing use of NPK fertilizer as unscientific. Although the mineral trace elements had not been discovered at his time, he pointed to their existence. He noted that phosphorus and potassium, while being the largest components of plant mineral material remaining after burning the plant to ash, were not the only ones. Other yet-unnamed minerals yielded a significant portion of the plant ash. Hensel theorized that these other minerals provided essential nutrition to plants, and that NPK fertilizer could only eventually destroy soil fertility and produce diseased plants with deficient mineral nutrition for human beings. The food comparison tables in this book more than prove his point.

Hensel’s attacks drew the wrath of the chemical fertilizer industry in Germany, which was already an established multi-million dollar a year industry as the turn of the century approached. He was driven out of business, and his book was withdrawn from publication and removed from library shelves. A copy was translated into English and published in the U.S. in 1894 (Hensel, 1894). It soon went out of print, but when the copyright expired, and the organic farming movement was in full bloom, several small U.S. publishers began reprinting it (Hensel, 1977 and 1991).

A testimonial from a German newspaper reprinted in the book shows the kind of results typical of stone fertilizer:

> *Results in the field show that the much-abused Stone Meal cannot be without its excellent points. Mr. Kircher here has raised on various fields manured with this material barley and wheat, which must absolutely convince even the most skeptical of the usefulness of this manure. First, not only are the stalks considerable higher and stronger than those from fields manured with other material, but the grains are on the average one-third longer and grains considerably more perfect. Mr Kircher has left in the editorial room of this paper several wheat and barley grains from his fields to show the difference, and also some from neighboring fields which have not been manured with Hensel's fertilizer. Whoever is interested in this matter, and every farmer should be so, may inspect the ears in our office. (Hensel, 1991)*

Every farmer, including you if you grow vegetables in a back-yard garden, should be interested, indeed. The plants above grew stronger and healthier because they had a higher mineral content. Such plants are also more nutritious, and should be of interest today as our society faces a growing famine in mineral nutrition.

USDA research

U.S. Department of Agriculture scientists conducted studies into the effects of stone fertilizers in the 1950s and 1960s, and reported strong positive results (Whitaker et al, 1959 and 1963). Their studies compared cement kiln dust, which contains the full spectrum of minerals and trace elements, to agricultural limestone fertilizers, which are high in calcium. They found the cement dust superior to the conventional limestone on yields of alfalfa. They also noted that the cement supplied sixteen times the calcium, three times the magnesium, six times the sulfur, and nine times the potassium compared to the limestone. The authors noted:

> *Use of cement kiln dusts for soil liming is not a new idea, but it seems to have received little attention and the relative merits of the dust of conventional liming materials have not been well-studied. The large amount of dust potentially available and the distribution of cement plants throughout much of the humid regions, where the dust could be applied to the soil without shipping great distances, make this byproduct of special interest (Whittaker et al, 1963).*

Other researchers noted the effect of cement kiln dust on animals. Some farmers in Georgia, who were using the dust on their crop land, dumped some of it into the cattle feed on impulse. The ranchers were "astonished" at the results, and reported them to the USDA Researchers there added 3.5 percent lime kiln dust to the feed of a test group of cattle, and found that they after three months, the dust fed animals had gained 28 percent more weight while consuming twenty-one percent less feed than a control group of cows. The extra weight of the dust-fed cattle was "all meat." Similar results were reported for other cattle, lambs, and mice (Maugh, 1978).

John Hamaker

Writer and social commentator John Hamaker performed experiments with gravel dust on his burned-out farm in Michigan in the late 1970s. His land was so mineral-poor that it would not produce ears on corn grown in the soil. He began adding various amounts and diameters of gravel dust to portions of his ten-acre farm in 1974. The next year, his fields were producing more that twice the corn per acre as those of his neighbors who were using chemical fertilizers. In 1977, he had the corn analyzed for its mineral and protein content. It contained 57% more phosphorus, 90 percent more potassium, 47 percent more calcium, and 60 percent more magnesium that local chemically-grown crops. It also contained as much as 50% more protein. Hamaker's work was frustrated by repeated droughts and late freezes in his area in the 1970s, but he estimates that gravel dust fertilizers can increase crop yields by as much as four times, with an end product that is much more nutritious.

The proper kind of rock will be necessary if you want to try this yourself. Some rocks apparently provide no benefit, and others may cause imbalances in the soil (Hamaker, 1982). Hensel recommended granite, but this is difficult to grind to grind to dust. Cement itself won't work, but the dust from the cement kilns, which is produced in great quantities, worked fine in the USDA experiments. The geographic location of the cement plant may be a factor, because of variations in the content of rocks. Hamaker's experiments with gravel from glaciated regions and river beds was also successful. Hamaker recommends obtaining discarded fine rock from a gravel quarry, in a previously-glaciated region, and grinding that to fine dust.

Conclusion

The information above documents the declining mineral content of our foods, due to modern agricultural methods. Our diet today — even a healthy one with plenty of fruits and vegetables — can no longer supply the mineral and vitamin nutrients that were available to our grandparents. Several minerals have declined by 20-30% in the last thirty years. To understand the impact this has on our health, consider how you would feel if you cut your calories 20-30%, or your protein, or other key nutrients. A similar drop in key mineral nutrients is certain to have an adverse effect on your health. Perhaps the most dramatic information above, Table 3.16, shows the tremendous decline in trace elements which are all essential to maintain health. In the next chapter, I'll show recent trends in the incidence of diseases that are linked to mineral nutrition, and explain why modern medicine is doing nothing to address the causes of these illnesses.

Chapter Four

Trouble at the top of the food chain

In the last chapter, I described how modern agricultural methods demineralize the soil, resulting in mineral-deficient foods on your table. The plants we saw are depressed, fatigued, with depleted immune systems, overly vulnerable, and kept alive with artificial food (chemical fertilizers) and drugs (pesticides). And so are we. In this chapter, I'll show the impact this had had on the health of the nation, and show why modern medicine is not prepared to address the resulting health crisis.

The Surgeon General's blind spot

In 1988, U.S. Surgeon General Elliot Koop issued a historic report on nutrition and health, the first major document by the modern medical establishment acknowledging the impact of nutrition on disease (Koop, 1988). The report described a historic change in the health of Americans the last quarter century. According to Koop and his advisors: "Our major health problems are no longer infectious diseases or diseases associated with malnutrition, but are now those associated with dietary excesses and imbalances." The report was based on the emerging medical paradigm of "Western diseases," described in the work of Trowell and Burkitt in Chapter 2. The "excesses and imbalances" he describes are excess fat, salt, and refined carbohydrates, and low fiber. The diseases of "malnutrition" he says we have outgrown are illnesses such as scurvy, caused by a gross vitamin C deficiency, or goiter, caused by too little iodine. Although Koop does recommend supplementation with calcium, his report mostly overlooks mineral and trace element nutrition, and omits information, already documented in the scientific literature at the time, that the nation is suffering from a plague of mineral malnutrition. True to the "forty year rule" in medicine described in Chapter 2, Koop ushered U.S. health care policy from the scientific understanding of the 1930s, when gross malnutrition diseases were being recognized by science, to that of the 1940s, the decade after Weston Price first so dramatically demonstrated the relationship of the Western diet to Western diseases. Koop ignored the importance of at least fifteen essential mineral and trace elements (See Table 2.9), and ignored evidence of general malnutrition in mineral status for most Americans. Thus, in the years since, U.S. Health Care policy has been directed to such factors as fat and fiber in the diet, and has missed the boat on the importance of the deficient mineral content our diet.

The mineral status of Americans

While the USDA has not specifically publicized the nutrient loss in American farm products, its public reports may take those losses into account. The USDA regularly surveys Americans to determine the nutrient composition of the diet for different groups in the population. Researchers then analyze the diets for nutritional content, using the most current USDA data. Research articles based on these surveys began appearing in the scientific literature in the 1980s. Some of the results appear below.

Calcium

- An observational study based on a 1977-1998 food consumption survey by the USDA found that the majority of the U.S. population did not consume the RDA for calcium. Adult women, on the average, were the most calcium-poor group (Morgan et al, 1985).
- A review of calcium status by the National Institutes of Health in 1984 showed that the typical American diet supplies about 450-550 mg of calcium daily, about half the recommended dietary allowance (NIH 1984).
- Average diet contains 40-50% of the RDA (Pizzorno, 1996)

Chromium

- Deficiency is common in Western diets (Anderson and Kozlovsky, 1985; Kumpulainen, 1979; Schroeder, 1968)
- 90% of diets are deficient (Pizzorno, 1996)

Copper

- The typical Western diet supplies only 1.0-1.5 mg of copper, significantly less than the 1.5-3.0 mg recommended dietary allowance (Schoenemann et al, 1990)
- 75% of diets are deficient. The average diet contains 50% of the RDA (Pizzorno, 1996)

Iron

-]Iron is the most common nutrient deficiency in American children, and is frequently deficient in adolescents (Worthington-Roberts, 1981; Armstrong, 1989)

Magnesium

- The typical American diet provides only one-half to two-thirds of the 400 mg RDA for magnesium, while raising the magnesium requirement to 500-800 mg due its high content of other nutritional factors. (Seelig, 1980).

- A survey of 27,000 Americans showed that only 25% had a dietary intake of magnesium that exceeded the RDA (Webster, 1987)
- Magnesium intake based on the U.S.D.A.s 1977-1978 National Food Consumption Survey were below the RDA for all ages and sex classes except children under five years old (Morgan et al, 1985)
- Pregnant women often have inadequate dietary intake (Franz, 1987).
- 75-85% of diets are deficient. The average diet contains 50-60% of the RDA (Pizzorno, 1996)

Potassium

- Intake is often deficient in the elderly (Abdulla et al, 1975; Touitou et al, 1987)
- Deficiency is common in hospitalized patients (Surawicz et al, 1957).

Selenium

- Intake is often inadequate in Western diets (Tolonen, 1989)
- The typical selenium consumption in the U.S. is about 100 mcg. 200-300 mcg a day can prevent many cancers (Hochman, 1988; Wasowicz, 1994).
- Average diet contains 50% of the RDA (Pizzorno, 1996)

Zinc

- Intake is commonly inadequate in a typical Western diet (Prasad, 1991; Singh et al, 1989)
- Deficiencies are especially common in children, teenagers, and pregnant women (Sanstead, 1973; Hambridge,et al 1983)
- 68% of Americans do not consume the RDA in their diets (Pizzorno, 1996)

Other trace elements

The USDA does not survey for most of the essential trace elements in American diet. Because minerals tend to be consumed as a group, rather than singly, in foods, we can assume that these other nutrients, like the minerals and trace elements above, are deficient in significant portions of the population.

Scientific flaws in the USDA diet surveys

Many of the above studies are based on the diet surveys conducted by the USDA Some are conducted by phone, like an opinion poll, and ask individuals to recall what they have eaten in the last twenty-four hours. Others are based on three-day diet diaries. While these may be the only practical methods to use, they often provide inaccurate information. Respondents are notorious for overstating the “good” foods in their diets, and understating the “bad” ones. I confront this problem every week at our clinic in Boulder, Colorado. I usually ask each client to recall what they have eaten for the last three meals. Then I ask them to keep a four-day diet diary before the return visit. Invariably, the “ideal” diet they have reported on intake is much better than what shows when they record exactly what they eat. But even the diet diary rarely gives the whole picture. Clients are often on their best behavior while recording their diet, and may even fail to list items they might find embarrassing. My standard interview question after reviewing the diary is: “What do you eat when you don’t eat like this.” I want to find out how they eat when they are in a hurry, or their routine is disrupted, or they are under stress, or it is a special occasion. They will usually mention something like pizza, ice cream, or binging on sweets. I then ask them how often they go off their routine and eat this way, and it is usually as often a once a week. The USDA surveys probably follow the same pattern, are not accurate from a scientific point of view.

The U.S.D.A.s recent data on soft drink consumption illustrates this point. According to their 1989-1991 survey of American diets, the average individual consumes about two-thirds of one soft drink a day, based on phone polls (USDA, 1992d). Another branch of the USDA, the Economic Research Service, records per-capita consumption of foods based on sales in stores. That branch reported a 1990 per capita consumption of soft drinks a little more than double what the diet surveys showed (USDA, 1996). Either people are throwing away half the soft drinks they buy, or there are under reporting consumption to the USDA I assume, then, that the actual diets of Americans are probably less nutritious than reported by the USDA, and that the actual mineral status of Americans is probably worse than the statistics above indicate.

Some current data

The reports on mineral malnutrition above are based on reports from the 1980s. Current evaluations do not show the situation improving. The most recent information available from the USDA food surveys shows major mineral malnutrition for most Americans (USDA, 1997). Adult females failed to meet the RDAs for calcium, magnesium, iron, and zinc. The average adult male was deficient in magnesium and zinc. Most of the other essential trace elements are not measured in the surveys.

Medical education of physicians

How the Surgeon General, a prominent physician, could conclude, in the face of the common mineral nutrient deficiencies above, that we have passed away from an era when malnutrition was a serious medical problem would at first seem an unsolvable mystery. He was in a position similar to that of the chief physician of the British Navy described in Chapter 2 who ignored data proving the vitamin C could save lives. We may find the answer in a review of the nutrition education of medical doctors.

The average physician has received only about twenty classroom hours in clinical nutrition. Most of this comes in basic science courses in the first years of medical school, and the content steadily declines in the later years and during residency and internship training. Table 4.1 shows the findings of a 1985 National Academy of Sciences review of the nutrition education in U.S. medical schools. The classroom hour totals include all portions of any course. Most nutrition education in medical schools comes in biochemistry, physiology, and pharmacology courses. A review of medical school curricula in 1992 shows little increased attention to clinical nutrition seven years later (Burros, 1992). Even if the situation has changed in the last five years, much time will pass before this translates into the introduction of clinical nutrition into general medical practice. Doctors entering medical school in 1992 are, for the most part, not in practice yet. Medical doctors, despite their extensive education in anatomy, physiology, pharmacology, and conventional medical techniques, are not qualified to comment on nutrition and health, unless they have pursued studies outside their medical education. If you don't believe this, ask your doctor about the average magnesium status of Americans, and ask him or her to name five symptoms or diseases that might be associated with magnesium deficiency.

Table 4.1

Some Facts About Nutrition Education in U.S. Medical Schools

Fewer than a third of medical schools have separate nutrition course. Nutrition education overall is inadequate.

Only 21 classroom hours, on average, are devoted to any aspect of nutrition.

Sixty percent of schools surveyed provided less than twenty hours in nutrition instruction

Thirty percent teach less than ten hours.

Only 30% teach more than thirty hours.

Fifteen percent of schools do not teach recommended dietary allowances for nutrients.

More than 40% do not teach the role of trace minerals in nutrition.

More than half do not teach anything about nutrient-drug interactions.

Half do not teach anything about the relationship of diet to hypertension.

One third teach nothing about nutritional requirements during pregnancy and lactation.

Half teach nothing about changing nutritional requirements of the elderly.

More than 20% teach nothing about the relationship of nutrition to cardiovascular disease.

More than 40% teach nothing about the relationship of diet to gastrointestinal disease.

More than 70% teach nothing about the relationship of diet to immune response.

(NAS, 1985)

Registered Dieticians

In general, conventional doctors defer questions on nutrition and diets to Registered Dieticians (R.D.), who supervise hospital diets and patient education on nutrition. R.D.s receive significantly more nutrition education than M.D.s. (See Table 4.2). The table includes basic science courses because these are essential to understanding how nutrition works, and counseling courses because they are essential to patient education about dietary changes. Most of the nutrition education for RDs is focused on basic nutrition rather than clinical nutrition topics such as nutritional interventions in disease. Although R.D.s have a significant internship requirement, the entire internship may be spent in food management training rather than clinical nutrition. I've included the training of licensed naturopathic physicians in the chart because I believe it to be a good model for physician-level training in clinical nutrition.

The education of R.D.s may also be criticized because it is very conservative in its approach to nutritional science. Scientific evidence may be approached in several ways. The most conservative is to wait until something has been proven to be absolutely true, and has been accepted by formal scientific policy-making bodies such as the National Academy of Science. Another approach is to accept a scientific hypothesis as soon as the weight of published evidence tends to support it. The second approach makes the most sense, as long as the potential toxicity of a therapy is not an issue. The American Dietetic Association, which represents R.D.s, take the first approach. Several years ago I heard a radio interview with a representative of the ADA stating the association's policy that no need exists for most Americans to take vitamin or mineral supplements. This was at least a decade after the publication of the scientific articles above showing general mineral malnutrition in the American public.

Table 4.2

Classroom and Clinic Hours in nutrition and counseling

	Naturopathic Physician	Registered Dietician	Medical Doctor
Biochemistry and physiology	345	120	398
Basic nutrition, nutrition assessment and interpretation	72	108	21
Diet and disease; Therapeutic diets	128	72	0 [1]
Counseling	150	36	0 [2]
Internship	1300[3]	900[4]	0[5]
National/State Exams	yes	yes	no [6]
Totals [7]	1995	1236	419

Notes:

1. Not taught in most schools.
2. MD's receive about 96 hours of pharmacologically oriented psychiatric clerkship, not likely to include behaviorally-oriented counseling.
3. Consists of dietary evaluation or treatment of most patients.
4. May be performed in a food management rather than clinical setting.
5. Medical internship does not normally include training in diet and disease.
6. Less than 4% of tests are in nutritional areas, mostly in biochemistry, physiology, and pediatrics.
7. Naturopathic Physicians, Registered Dieticians or Medical Doctors may take nutrition electives above and beyond this core curriculum.

Sources:

The 1987 Curricula of Bastyr College, Seattle, and National College of Naturopathic Medicine, Portland, Oregon.

The American Dietetic Association.

Medical school hours are averages of Johns Hopkins, Mayo, Yale and Stanford medical schools, 1987 curricula.

Mineral malnutrition and disease

Let's look briefly here at the consequences of the common mineral deficiencies in the foods in the Chapter 3 and the scientific surveys above (See Tables 4.3, 4.4, and 4.5). Table 4.4 shows an increase in several chronic diseases during the period that minerals have been declining in our food. Notice that magnesium deficiency is associated with each of them. We saw in Chapter three that a group of plants had lost about 20% of their magnesium content between 1963 and 1992, during the period when the diseases in Table 4.4 were increasing and the USDA was recording widespread magnesium deficiencies in the diets of Americans. Graph 4.1 correlates the declining magnesium in our food supply with the increased incidence of these five magnesium deficiency diseases. Table 4.4 and Graph 4.1 may be criticized as "bad science," and I would be the first to agree that they would not pass muster in a peer-reviewed journal. The increased incidence of the diseases could be because of more efficient reporting, and the links between magnesium deficiencies and the diseases are not iron-clad by scientific standards. To pursue this material more methodically would probably require several years of statistical research. If the trends in the graph are correct, however, our country is headed for serious trouble. The chart may indicate the beginnings of a mineral famine which will only get worse in the coming decades.

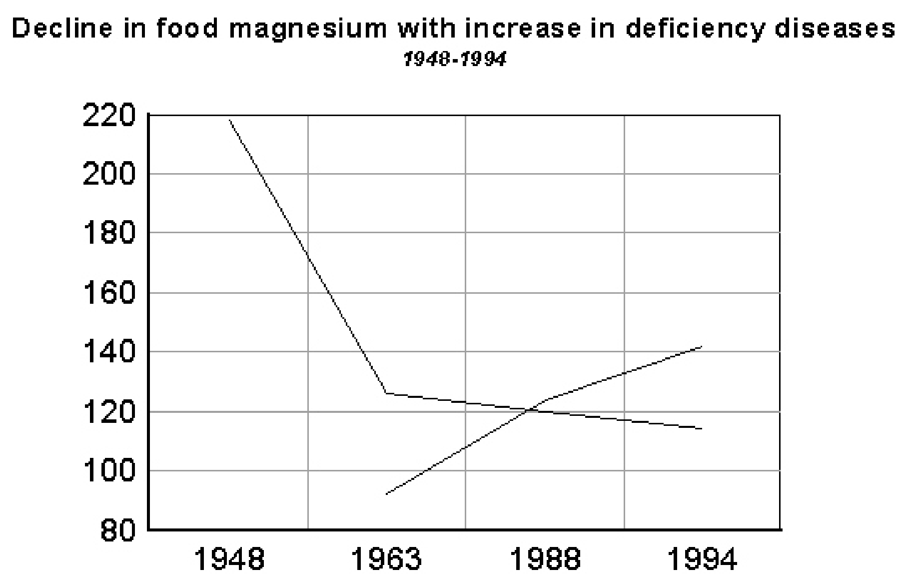
Table 4.3

Some symptoms and illnesses that may be caused by common mineral deficiencies.

Mineral	Symptoms
Calcium	Brittle nails, cramps, delusions, depression, insomnia, irritability, osteoporosis, palpitations, periodontal disease, rickets, tooth decay.
Chromium	Anxiety, fatigue, glucose intolerance, adult-onset diabetes
Copper	Anemia, arterial damage, depression, diarrhea, fatigue, fragile bones, hair loss, hypothyroidism, weakness.
Iron	Anemia, brittle nails, confusion, constipation, depression, dizziness, fatigue, headaches, inflamed tongue, mouth lesions
Magnesium	Anxiety, confusion, heart attack, hyperactivity, insomnia, nervousness, muscular irritability, restlessness, weakness.
Selenium	Growth impairment, high cholesterol, cancer, pancreatic insufficiency, immune impairment, liver impairment, male sterility.
Zinc	Acne, amnesia, apathy, brittle nails, delayed sexual maturity, depression, diarrhea, eczema, fatigue, growth impairment, hair loss, high cholesterol, immune impairment, impotence, irritability, lethargy, loss of appetite, loss of sense of taste, low stomach acid, male infertility, memory impairment, night blindness, paranoia, white spots on nails, impaired wound healing

(Pizzorno, 1996)

Graph 4.1



Top line: *Sums of magnesium content in 100g of tomatoes, lettuce, cabbage, and spinach (mg)*

Bottom line: *Incidence of magnesium deficiency diseases; heart conditions, asthma, bronchitic, tinnitus, and orthopedic deformities (per 500 population)*

(Hamaker, 1982; U.S, 1989 and 1994; USDA, 1963 and 1997; Werbach, 1993)

Table 4.4

Minerals go down, disease goes up

Changes in the rates of selected reported chronic diseases, 1980-1994.

(Per 1000 in U.S. population)

	1980	1994	Increase	Associated mineral deficiencies
Heart conditions	75.40	89.47	18.67%	magnesium, potassium, chromium, selenium, copper
Chronic bronchitis	36.10	56.30	55.98%	magnesium, zinc, iron, copper, iodine, selenium
Asthma	31.20	58.48	87.44%	magnesium
Tinnitus	22.60	28.24	24.98%	calcium, magnesium, zinc
Bone Deformities	84.90	124.7	46.96%	calcium, magnesium, copper, flouride

(USDC, 1996; Werbach, 1993)

Graph 4.1

Table 4.5

Minerals and the leading causes of death in the U.S.

Disease	**Associated minerals**
Heart Disease	magnesium, potassium, chromium, selenium, copper
Cancers	calcium, copper, germanium, iodine, magnesium, selenium, zinc
Stroke	calcium, magnesium, potassium

(Werbach, 1993)

Conclusion

So far in the book, we've seen how minerals moving up the food chain provide food that will prevent and cure some of the most common diseases of our society, how food processing and modern agriculture strips the soil and food of its nutrients, and the impact this has on our health. By this point, you may already be planning to head to the health food store and pick up a vitamin and mineral supplement. In Chapters 5-9 I'll suggest dietary changes you can make to take in more minerals, and I'll try to help you sort your way through the over marketing and occasional outright fraud of the supplement industry.

Chapter 5

Minerals and disease

In this chapter, I'll show the progression of the pathology of a deficiency of the mineral as a group rather than singly. I'll also list the groups of mineral deficiencies that are associated with some specific illnesses.

The conventional model of a deficiency disease

The conventional scientific approach to mineral deficiency diseases is modeled on the germ theory of disease. A single germ causes a single disease, according to that theory. Thus medical scientists require proof that the deficiency of a single mineral causes a single deficiency. See the discussion in the introduction to Section II. That model, however, does not fit the reality of human diet and nutrition, especially for the minerals. Minerals elements do not exist alone in foods. In natural foods, they come as a group, which includes the essential minerals, and dozens of other trace elements. Minerals in a natural diet are also accompanied by vitamins, essential fatty acids and other beneficial fats, fiber, and dozens of other beneficial constituents in animal and plant foods. The minerals, vitamins, fiber, and fatty acids, have complex interactions. Trying to isolate the effect of a single nutrient is like trying to take one color from the rainbow. When we develop deficiencies, we develop them as a group. Most of the Western disease are associated with multiple deficiencies, not deficiencies of a single nutrient (See Table 2.8.)

Conventional medical scientists also often refuse to recognize the early stages and symptoms of a mineral or vitamin deficiency. They wait until a fully developed organic disease occurs, such as anemia, osteoporosis, or goiter. The normal pathology of a mineral deficiency disease is:

- 1)Deficient intake in the diet
- 2)Levels drop in the blood and extracellular fluid.
- 3)The body robs the bones and tissues in order to maintain steady levels in the fluids.
- 4)Deficiencies in the tissues result first in functional diseases, because the cells cannot perform their roles at an optimum level.
- 5)Eventually, the tissues themselves become deformed or deranged, and organic disease results

For example, a calcium deficiency in the diet cause a loss of calcium in the bones, nerves, and other tissues, while blood levels remain steady. The first symptoms may be insomnia, anxiety, and muscle cramps. Eventually, high blood pressure may develop, and finally, osteoporosis. Of the above, medical scientists identify only osteoporosis as a calcium deficiency disease, although some kinds of high blood pressure are an organic disease of the arteries. In a similar process, when a magnesium deficiency occurs in the diet, the body robs the tissues of their stored magnesium. Muscle weakness, fatigue, nervousness, and irritability are the first functional diseases to appear. Eventually, as the body out of necessity loots the magnesium stores in the heart muscle, the heart's function is impaired. Ultimately, the magnesium deficiency causes an excess of calcium in the blood, and kidney stones — an organic rather than functional disease may appear. Although some scientific studies show the correlation between magnesium deficiency and anxiety, muscle weakness, fatigue, and functional heart disease, the conventional scientific bodies do not label these as deficiency disease. Magnesium is not the only thing that causes or contributes to these conditions, so they do not fit the requirements of a deficiency disease.

This overly strict standard for proof of a deficiency disease — that a single nutrient causes a single organic deficiency disease — is partly responsible for the medical establishment's shocking lack of insight into the contribution of minerals to our most common and deadly illnesses.

The pathology of multiple mineral deficiencies

Trowell and Burkitt described the pathology of organic Western diseases (See Chapter 2). Obesity, an organic disease, appears first, followed by diabetes. Hypertension, an organic disease of the arteries, appears first, followed by stroke, kidney damage, and finally heart attacks. The full pathology of the Western deficiency diseases should include the functional diseases which appear first. In the following subheadings, I will present my view of this pathological progression. You will see that, in reality, deficiency diseases do not progress the way they would in a laboratory, but are complicated by the side effects of addictive substances in foods, of prescription and non-prescription drugs, and of surgery.

The deficient diet

In Chapter 2, I described the most important dietary changes that apparently cause or contribute to the development of the Western diseases. The most important are: sugar, refined flour, canned foods, and meat that is deficient in essential fatty acids. Table 5.1 shows the top ten sources of calories in the American diet. It should be clear, from the discussion in Chapter 2, that these caloric sources are at the root of our Western diseases today. I will discuss milk, margarine, and cheese in Chapter 6.

Table 5.1

The top ten sources of calories in the American diet.

1. Whole milk
2. Cola
3. Margarine
4. White Bread
5. Rolls, ready to serve
6. Sugar
7. 2% Milk
8. Ground Beef
9. Wheat flour (white)
10. Pasteurized Process American Cheese

First stage: functional diseases

The first effects of broad-spectrum deficiency diseases are usually felt in the emotional life and energy level. Depression, anxiety, insomnia, mental imbalance, and fatigue are all associated with multiple deficiencies. See Table 5.2. The source for this information is Nutritional Influences on Mental Illness, by Dr. Melvyn Werbach. The book is a compilation of summaries of scientific studies. While scientific consensus may not be present for the associations with each of the nutrient deficiencies in the table, at least one peer-reviewed scientific article has appeared for each. I've also included the nutrient deficiencies associated with immuno-depression and allergies, first-stage functional diseases characterized by frequent colds, flu, and heightened allergic responses. This information comes from Werbach's other book of scientific abstracts, Nutritional Influences on Illness (Werbach, 1993). Review the tables in Chapter 2 that show the nutrient losses that accompany modern foods, and you will find many of the same nutrients associated with these functional illnesses. Table 4.3 also includes functional symptoms associated with deficiencies of some of the minerals.

Table 5.2

Nutrients associated with functional deficiency diseases

Condition	Minerals	Vitamins	Other
Aggressive behavior	iron lithium	thiamine vitamin C	high sugar high cow's milk
Allergies	calcium Magnesium Zinc	niacin pantothenic acid vitamin B12 vitamin C vitamin E	essential fatty acids

Anxiety	calcium	pyridoxine	excess calcium
	Magnesium	niacin	excess sugar
		Thiamine	excess caffeine
		excess alcohol	
			deficient essential fatty acids
Depression	calcium	biotin	excess caffeine
	Copper	folic acid	excess sugar
	Iron	pyridoxine	
	Lithium	riboflavin	
	Magnesium	thiamine	
	Potassium	vitamin B12	
	Rubidium	vitamin C	
Fatigue	iron	folic acid	excess sugar
	Magnesium	pantothenic acid	excess caffeine
	Potassium	pyridoxine	
	Zinc	vitamin B12	
		vitamin C	
		vitamin E	
Hyperactivity	calcium	niacin	high sugar
	Copper	pyridoxine	
	Iron	thiamine	
	magnesium		
	zinc		
	high aluminum		
	high lead		
Immuno-depression	copper	vitamin a	high sugar
	Germanium	folic acid	
	Iodine	pantothenic acid	
	Iron	riboflavin	
	Magnesium	vitamin B6	
	Manganese	vitamin B12	
	Selenium	vitamin C	
	Zinc	vitamin D	
		vitamin E	
Insomnia	copper		high caffeine
	Iron		high alcohol
	magnesium		
	high aluminum		

Second stage: Self medication with foods and drugs

With the onset of these conditions, individuals usually self medicate with stimulants, sedatives, and/or recreational drugs. Table 5.3 shows the top ten selling items in U.S. grocery stores in 1990. Seven of the ten items contain drugs: nicotine, caffeine, or alcohol. Three contain sugar, which Table 5.2 also ranks as the sixth leading source of calories for Americans. Sugar is an "energy drug" giving a brief burst of energy and mental stimulation. The mental and emotional discomfort of nutrient deficiencies can also drive some individuals to use recreational drugs, such as marijuana. In addition to these, individuals consume over-the-counter stimulants, sedatives, pain and cold medications by the hundreds of tons annually. Per capita expenditures on non-prescription drugs rose from about $120 a year in 1986 to more than $160 in 1995 (figures adjusted for inflation, in 1982 dollars,) for total annual sales approaching $40 billion (U.S.D.C., 1989, 1996).

Nutrient deficiencies underlie or contribute to many addictions. Improvement of the diet can assist greatly in recovery, presumably by removing mental and emotional functional diseases accompanying the addiction. In a clinical trial in an alcohol recovery center, two groups of chronic alcoholics were given the identical therapy, except that one group received nutrition education. Classes included basic nutrition, and how to shop and prepare healthy foods. At the end of a year, more than 70% of the group receiving nutrition education were still in recovery, while about 80% of the control group had returned to drinking (Beasley, 1992).

Table 5.3

The top ten selling items in U.S. grocery stores, 1990

1. Marlboro cigarettes
2. Coca Cola Classic
3. Pepsi Cola
4. Kraft Processed Cheese
5. Diet Coke
6. Campbell's Soup
7. Budweiser Beer
8. Tide Detergent
9. Folger's Coffee
10. Winston Cigarettes

Case study #1

A fifty year-old man complained on intake of mental confusion and memory loss. The mental confusion resulted in his frequently losing study items necessary for a course of higher education he was pursuing, and had just resulted in his being fired from a job. a review of his diet showed a typical

Western diet containing almost no nutritious foods in their natural state. On questioning, he revealed that his underlying problem was insomnia, from which he had suffered for more than ten years. For nine of those years, he had taken an over-the-counter sleep medication every night to go to sleep. His severe mental confusion was a side effect of the drug.

Case study #2

A 42 year-old woman initially complained of blurred vision and ringing in the ears. During the interview, she revealed that she also suffered from severe heartburn, and that a sprained knee was healing only very slowly. The blurred vision, ringing in the ears, and heartburn were side effects to an over-the-counter pain medication she was taking regularly. Her diet was typically American, and the resulting deficiencies, as well as the drug side effects, were probably contributing to the slow healing of her knee (anti-inflammatory medications that suppress pain also suppress healing.)

Stage 3: Prescription drugs for functional diseases

Eventually, self-medication with the above substances fails to resolve the symptoms and discomfort of the functional diseases. In this stage, prescription drugs, such as antibiotics, antidepressants, and sedatives, replace or supplement the substances already in use. This stage is characterized by the addition of the side effects of the drugs to the already existing deficiencies. In 1984, the per capita annual expenditure for prescription drugs was $1200. By 1995, the figure was $2820 in 1984 dollars — more than double — or $4117 in real dollars (U.S.D.C., 1996). Much of this is paid for by health insurance, medicare, and other third-party payers.

Case #3

A 46 year-old woman complained of depression and loss of sex drive. She was a vegetarian, and ate many modern foods, including sugar and white flour. The resulting deficiencies contributed to her depression. A prescription antidepressant drug was causing the loss of libido, which did not appear until a few months after she started taking the drug.

Case #4

A 22 year-old woman had suffered from attacks of systemic lupus for two years. Her current diet contained some nutritious foods, but also included fast foods such as pizza. The beneficial foods in the diet had been a recent addition. A review of her complete medical history showed steroid prescriptions for fungal infections and eczema as an infant, frequent antibiotic prescriptions of upper respiratory infections as a young child, multiple antibiotic and antifungal prescriptions later in childhood and teenage years of urinary tract infections. A review of the diet suggested a lifelong allergy to dairy, and her most serious lupus symptoms stopped with removal of that food. She also had pain and discomfort in every level of the digestive tract. The repeated antibiotic medications had damaged the lining of her gut, allowing bowel bacteria and foods to flow into the system, initiating or exacerbating the complex immune reactions of the lupus.

Stage 4: The onset of chronic organic disease

Because the initial nutrient deficiencies have not been addressed, the diseases progress to the organic stage. The first to appear is usually obesity. Since 1980, the percentage of the population classified as obese has increased from 25% to 33%. Other common early-stage organic diseases due to the Western diet are: arthritis, atherosclerosis, autoimmune diseases, hypertension, skin conditions, and ulcerative diseases. See Table 2.8 for some of the nutrients associated with these conditions. In addition to the conditions listed there, peptic ulcers have been associated with deficiencies of calcium, magnesium, and zinc, three of the most common deficiencies in our society. At this stage, even more prescription drugs are consumed, on a permanent basis, with more side effects. Americans over sixty are, on the average, at this stage of pathology. See Tables 5.4-5.6. You might suppose that these drugs are necessary for older Americans. For an alternative opinion, based on medical expert testimony and advice, see the book Worst Pills, Best Pills II, by Dr. Sidney Wolfe and pharmacist rose-Ellen Hope. The authors conclude that about two-thirds of these drugs are either not necessary or are inappropriately prescribed. Because I'm including data on older Americans here, do not think that we wait until our elder years to experience chronic organic disease. Many children suffer from obesity and other early-stage organic diseases before they are old enough to enter school.

Table 5.4

Prescription drugs in older Americans (over 60)*

Average prescriptions filled per year	15.4
Percent with five or more prescriptions	37%
Percent with seven or more prescriptions	19%
Percent taking a cardiovascular drug	65%
Percent taking an antidepressant or sedative	33%
Percent taking a gastrointestinal drug (constipation, ulcers, colitis)	24%

*Does not include our elders in nursing homes

(Wolfe and Hope, 1993)

Table 5.5

The most common side effects to prescription drugs

constipation
depression
sexual dysfunction
memory loss
hallucinations
insomnia
Parkinsonism
(Wolfe and Hope, 1993)

Table 5.6

Numbers of older American with adverse drug reactions

Parkinsonism	61,000
Hip fractures (drug-induced falls)	32,000
Deaths (drug-induced falls)	1,500
Injuries (drug-induced accidents)	16,000
Memory loss	163,000
Hospitalization	659,000
Hospitalization for medication-induced ulcers	41,000
Deaths from medication-induced ulcers	3,300
Adverse reactions to heart medications	28,000

(Wolfe and Hope, 1993)

Case 5.

A seventy-two year-old woman had simultaneous diagnoses of psoriasis, psoriatic arthritis, rheumatoid arthritis, ulcerative colitis, liver cancer, and lung cancer. She was on more than seven drug prescriptions, including two chemotherapy agents. She had been prescribed a powerful drug — methotrexate — for the psoriasis and arthritis, and had taken it for more than seven years. These are Western diseases, presumably with nutritional components. According to her own doctors, the methotrexate had caused the liver and lung cancers. According to standard pharmaceutical references, it can also cause ulcerative diseases of the intestines, which, in her case, appeared only after taking the drug.

Stage 5: Life-threatening or fatal organic disease

The leading causes of death in our society come from the end stages of organic Western diseases — heart disease, cancer, and stroke. See Tables 2.8, 4.4, and 4.5 for some nutrients association with these diseases. At this stage, the health is complicated by more drugs, surgical procedures, and organ removal.

Conclusion

We saw in Chapter 2 that most of the above conditions can be attributed to the Western diet. They do not appear in primitive people consuming their traditional diet, and begin to appear when those people begin to consume Western foods. I cannot say that genetics, environment factors, and other things beyond our control do not contribute to these conditions. Yet the evidence remains from anthropological studies that diet is the primary cause. In the next section, I will discuss dietary changes that may improve these conditions. In the case of chronic organic diseases complicated by drug side effects, it may be too late for a complete cure. However, most people at any stage start to feel much better when they switch to a natural whole-foods diet. The "cure" usually progresses in the same order as the disease pathology, with functional illnesses such as depression, anxiety, insomnia, and fatigue clearing up first. You may feel better, happier, sleep better, have more energy, suffer fewer infections and allergic symptoms, and so on. In most of the cases I've seen, people who begin to eat this way with dedication begin to feel a whole lot better within about ten days.

Chapter 6

Getting the minerals you need

In this Section I will describe some mineral-rich foods available today, criticize some of the fad diets in vogue now, including the low-fat diet, and tell you how to shop for and use supplements.

The recommendations I make in this section are based first of all on my own clinical experience within the tradition of nature cure. Over the last twenty-five years, I have also personally modified my diet a number of times, including trials of various fad diets, and currently practice what I preach in this section. My experience, both personally and in a practitioner-client setting, did not come out of thin air. I've constantly read the literature on clinical nutrition — both traditional and scientific — and modified my own diet and what I recommend for others, based on that study. These recommendations result from answers I've found, both in study and in clinical experience, to four great questions in nutrition:

Why do primitive people eating a traditional diet not suffer from the Western diseases?

Why do the Japanese have the longest life expectancy and the lowest rate of heart disease of all the developed countries?

Why do the French, who eat plenty of red meat and slather their foods with butter, cream, eggs, and rich pates, live almost as long as the Japanese, and have the second lowest heart attack rate in the world?

Why did our ancestors in the year 1900 suffer from a very low rate of heart disease, when it is our number on killer today.

Traditional diets

I discussed the primitive diets at length in Chapter 2. The most important factors in these diets seem to be: no sugar, no processed foods, a high intake of minerals and trace elements, and a high intake — more than ten times what we take in today — of the fat soluble vitamins, A, D, and E. Table 6.1, from research by Weston Price, shows the mineral and vitamin density of some these diets.

Table 6.1

Percentage of nutrients in traditional diets compared to 20th century Western diets (%)

	Calcium	Phosphorus	Magnesium	Iron	Fat soluble vitamins
Eskimos	540	500	790	150	1000+
Swiss	370	220	250	310	1000+
Gaelics	210	230	130	100	1000+
Australian Aborigines	460	620	170	5060	1000+
New Zealand Maori	620	690	2340	5830	1000+
Melanesians	570	640	2640	2240	1000+
Polynesians	560	720	2850	1860	1000+
Peruvian Indians	660	550	1360	510	1000+
Africans(cattle) (Cattle raising)	750	820	1910	1660	1000+
Africans (agricultural)	350	410	540	1660	1000+

(Price, 1938)

Japanese diets

The Japanese, on the average, live about four years longer than Americans. They also have dramatically lower rates of heart attacks and some cancers. Table 6.2 compares the rates of heart attacks and breast cancer in Japan and the U.S. If you want to cut your risk of heart attack by 80%, and of breast cancer by 70%, you might want to start eating like the Japanese. I'll describe how in the next chapter. Important factors in their diet may be: high consumption of fish and other sea animals, high consumption of soy products, the regular consumption of mineral-rich sea vegetables, and low consumption of sugar and processed foods.

Table 6.2

Deaths per 100,000 in 1996

	Heart attacks	Breast cancer
France	58.6	28.1
Japan	34	9.2
United States	169.9	31.6

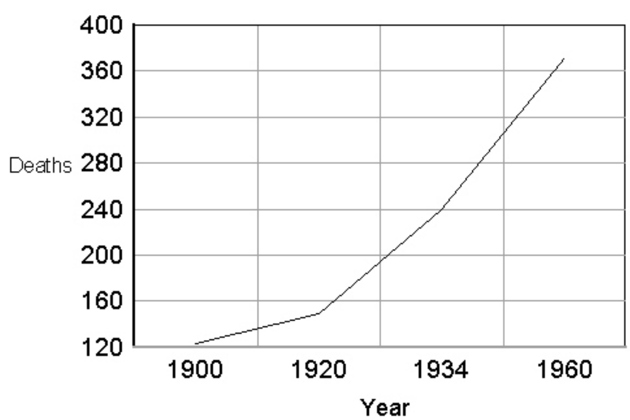
The French Paradox

Some writers attribute the low rate of heart attacks in Japan — the lowest in the world — solely to the low-fat, high-fish diet there. France has about 80% more heart attacks per capita than the Japanese, but about a third as many as the U.S. In the region of Gascony in France, where goose and duck liver are dietary staples, the figure drops to that of the Japanese (Fallon, 1995). Researchers have dubbed this phenomenon the “French Paradox.” Several dietary theories have been put forward to explain it. Current investigation is into substances contained in red wine. I’ve been unable to find a single researcher who has suggested the obvious — that refined vegetable oils, which disrupt the balance of essential fatty acids and give the blood an increased tendency to clot, are more destructive than the fat-soluble vitamin-rich animal fats that have been an integral part of our diet since the dawn of humanity. The French also eat more sugar and refined foods than the Japanese. If you want to cut your heart attack risk by two-thirds, start eating like the French, but omit the sugar and refined foods.

The diet in 1900

Heart attacks as a major cause of death is a twentieth century development. Our great-grandparents may have died of heart disease in their elder years, but it was more often not a heart attack due to the blockage of the coronary arteries. So rare were heart attacks in 1900 that physicians at the turn of the century often had never observed one in their entire careers. Since the turn of the century, however, all forms of heart disease have risen dramatically. They became the leading cause of death only in the 1950s. The figure below charts this dramatic rise in the first half of this century. The rates of deaths from heart disease had tripled from 1900 levels by 1960. If you want to reduce your risk of death from heart disease by two-thirds, eat the way your ancestors did. People in 1900 — 85% of the population lived on farms then — ate plenty of cholesterol, butter, eggs, and meat. They also ate farm fresh vegetables, fresh-cracked grains, fresh-pressed oils, all of it unprocessed and what we would call “organic” today.

Deaths from heart disease per 100,000 U.S. population
1900-1960



(Price, 1938; USDC, 1997)

Whatever caused this dramatic rise has come from changes in our society and diet between 1900 and 1948. The most important are: a rise in sugar consumption; the introduction of refined white flour on a large scale; the introduction of refined processed vegetable oils, margarine, and other hydrogenated oils; the industrialization of livestock production; and the demineralization of our soil and food (See Chapter 3.)

It is my conclusion, from the evidence of the diets above, that the most important common health-giving factors are mineral density, richness in the fat soluble vitamins, and a balanced proportion of the essential fatty acids. Low-Fiber, high total fat content, saturated fat, and cholesterol — the dietary factors emphasized as "negative" by the medical establishment today — may be important if you are eating a standard American diet, but fall away as disease-causing factors if you eat traditional whole foods, including high quality meat, eggs, butter, and unprocessed organic whole grains, vegetables, and oils. I will discuss more about the myth of the benefits of the low-fat diet in Chapter 7.

Chapter 6 The optimum mineral-rich diet

Can dietary changes cure disease? Although scientific evidence is plentiful for the ill effects of our modern foods on health, such evidence is scanty at best for the effects of returning to a more healthy diet. Modern medicine, the driving force behind scientific medical research, does not employ diet therapy. Research scientists today are busy instead investigating drugs, and the drug-like effects of single nutrients or, occasionally, single herbs. The standard of proof for modern medical science — the double blind clinical trial — is impossible to conduct with total diet changes. The patient who makes sweeping changes in their diet will automatically know that they did not receive a placebo. The contemporary scientific model also demands that a single controlled factor be studied. However, each individual making dietary changes will naturally select a somewhat different diet according to taste and preference. Although the new diet will have common factors — the addition of whole foods in their natural state and the removal of refined sugar, oils, and flours — neither the starting diet nor the new diet will be identical. Thus we are left with epidemiological surveys and trials of single substances as our standard of science. Epidemiological studies and clinical trials of single foods or nutrients produce weak evidence at best, because they do not take into account interactions of the single nutrients with the rest of the diet. A high fat diet in one society, composed of one type of fats and oils taken along with highly processed foods may have an completely different effect than a high-fat diet from natural fats and oils taken with whole foods in their natural state. It is thus impossible to prove, using modern scientific standards, that a nutrient-rich diet of foods in their natural state will cure disease. The best we can do is look at the general health of people and societies who consume such a diet, as Weston Price did in the 1930s, and try to model it. Even then, we cannot *prove* that adopting that diet will cure disease.

I have studied nature cure, and to some extent, formal naturopathic medicine, since 1973. During that time I have seen at least a thousand people who, after changing to a whole foods diet, felt that they had been "raised from the dead." Some were not that sick to begin with. Others have had serious illnesses such as autoimmune diseases and cancer. Most of the cancer patients had already undergone some conventional treatment, and modified their diets to prevent a recurrence, or to avoid the chemotherapy the often follows surgical treatment. I have *never* seen a client who was willing to move toward a whole foods diet whose health did not improve. My experience matches that of nature cure practitioners in Western countries for at least the last 150 years. Within this healing tradition, the evidence is anecdotal — based on a large number of unique cases. Such evidence, if collected within a medical tradition, is not necessarily unscientific. It is, in fact, similar to the scientific support for modern surgical procedures. Surgical operations cannot be measured by double-blind methods either. No federal regulatory body requires proof of either safety or efficacy of surgical procedures. Instead, the body of knowledge of surgery is developed within the profession, based on anecdotal evidence and professional collaboration and communication, just like the diet therapies in nature cure.

Making changes

Among my clients I find three attitudes toward dietary changes. Some individuals are ready to make a radical overhaul of their diets. Other are willing to make only gradual changes, or to change a few items in their diet. And some are unwilling to make any changes at all. I tell those in the last group that I will work with them, using mainly herbal remedies, but that I won't be able to help them much in the long run, unless they improve their diets. I include mineral-rich beverage teas in their treatments. Fortunately, many of these, after feeling some improvements from the herbal treatments, are then willing to make some dietary changes. Most of my clients are in the second group, and usually make long-term progress only in proportion to the dietary changes they make. Those in the first group invariably do best provided they have a *genuine desire* for the dietary overhaul. If not, they usually soon feel deprived. If they can persist with the changes for six or eight weeks, they usually feel so much better that they will not return to their old ways of eating. Here are some tips for making changes:

First stage: Start with healthy additions, without taking away anything that you currently enjoy.

Second stage: Make some substitutions, such as healthy, mineral-rich sweeteners instead of sugar; home-made soups instead of canned soup; fresh-cooked grains and vegetables instead of processed ones; high-quality meats, organ meats, and fish instead of conventional supermarket meats.

Third: Eliminate some unhealthy foods and addictions. This will be a lot easier if you have already made some of the above changes and are feeling their benefits.

Fourth: Don't be fanatic. The 19th century German naturopath Heinrich Lahmann stated: "It's not what you eat on Sunday that matters, it's what you eat the other six days." He would prepare nice feasts of "stimulating" foods for the patients in his spa one day a week. Our physiology can handle feasting as long as it is not every day. And our spirits demand it occasionally.

Sugar

Weston Price, and Burkitt and Trowell after him, identified sugar as a major culprit in the development of Western diseases. Slow dietary changes, with healthy additions and substitutions, are a wise course, but one food you can eliminate immediately to boost your health is refined sugar in all its forms (See Table 6.3). Table 6.4 shows some of the detrimental effects of sugar. You will probably have to eliminate most canned and processed foods and soft drinks to do so. Most of the sugar we consume — about 85% — comes from sugar hidden in food. Ketchup contains about 50% sugar. MacDonald's french fries contain about 20% sugar. Even cigarettes have 17% sugar in them.

Table 6.3

Hidden sugar in your food

The following are some of the names for sugars that may appear on the labels of processed foods. All are immuno-suppressive in the amounts consumed by the average American.

Barley malt
Beet sugar
Brown sugar
Cane sugar
Corn syrup
Date sugar
Dextrose
Fructose
High-fructose corn syrup
Honey
Invert sugar
Lactose
Levulose

- Maltose
- Milk sugar
- Rice syrup
- Succinate
- Sucrose
- Turbinado sugar

Table 6.4

Some of the adverse effects of sugar:

- Suppression of the immune system
- Reduction of absorption of calcium and magnesium
- Exhaustion of the body's supplies of chromium
- Depletion of bones and tissues of other minerals necessary to metabolize its calories
- Reduction of HDL cholesterol (the "good" cholesterol)
- Elevation of LDL cholesterol ("bad" cholesterol)
- Elevation of serum triglycerides
- Tooth and gum disease.
- Contribution to many of the Western diseases in Table 2.8

(Appleton, 1997)

In one scientific study, three ounces of sucrose at one sitting reduced the ability of white blood cells to engulf bacteria and other invaders by about 40%. The effect started within a half an hour and lasted more than five hours (Sanchez et al 1973; Ringsdorf et al 1976). Another trial showed that only two ounces of glucose suppressed the activity of B- and T-lymphocytes, key components of immunity (Bernstein 1977). Fructose, which was touted in the 1980's as a "healthy" sugar, actually depresses immunity even more (Appleton, 1997.) Our 150 pounds of sugar per year adds up to more than six ounces a day — three times the level necessary to depress the immune system.

A clinical trial into the relationship of sugar to cavities demonstrates the devastating systemic effects of sugar. Researchers fed people sugar through a tube so it would bypass their teeth and mouth. They found that the flow of a saliva-like liquid from the gums, which normally washes food particles away from the teeth, reversed its flow, and began sucking food particles against the border of the gums and teeth instead (Appleton, 1997). The tooth-rotting effects of sugar are not from the direct effects of sugar on the teeth, but from system-wide effects. Virtually every tissue in the body is adversely affected. For an exhaustive review of the scientific literature on sugar, see the book *Lick the Sugar Habit* by Nancy Appleton. Appleton spent more than ten years reviewing the scientific literature on sugar before writing the book, and includes complete scientific references on its adverse effects. Appleton concludes that sugar has a addictive drug-like effect on some people, and she gives tips for quitting the habit.

Consumption

The average American consumes about 150 lbs of sugar and corn syrup a year (U.S.D.C., 1996), with about 26 lbs of that coming in soft drinks. A typical soft drink contains about fifteen tablespoons of sugar. See 6.5 for recent trends in soft drink consumption in the U.S. Thus Americans, on the average, consume the weight of a typical adult body in sugar each year. This figure includes all the little babies, and all the people who eat less sugar, so some of us double or triple our body weight annually with a substance that depresses the immune system, promotes atherosclerosis, heart attacks and strokes, and strips the bones and tissues of their minerals.

Table 6.5

U.S. per capita soft drink consumption, 1970-1994

Year	Gallons	12 oz cans
1930	4.68	50
1950	14.1	115
1970	24.3	259
1975	28.2	300
1980	35.1	374
1985	35.7	380
1990	46.3	494
1991	47.9	511
1992	48.5	517
1993	50.2	535
1994	52.2	557

(Beasley, 1989, U.S.D.C., 1996)

Substitutes

Sugar cane, the source of refined white sugar, is a mineral-rich plant. It has deep roots — up to fifteen feet — which extract minerals and trace elements from the soil. It contains high amounts of chromium, the mineral most closely associated with sugar metabolism. Another sweetener — molasses — is made from the residue left after refinement, and it contains most of those minerals that accompany sugar in its natural state. A small amount of molasses added to the sugar makes brown sugar. Blackstrap molasses is highly concentrated sugar cane juice, and tastes nowhere near as sweet as sugar. Table 6.6 shows the comparative mineral value of these derivatives of sugar cane. I've included honey in the chart to show how closely it resembles white sugar. Many people eat honey instead of sugar, thinking that it is "healthy," when actually it contains less mineral nutrition than even brown sugar. Although honey does contain more of a few trace elements than white or brown sugar, it is a mineral-depleting food. Eat it the way traditional people did — on special occasions.

Blackstrap molasses may not taste so sweet, but it is one of the best mineral supplements we have. A tablespoon of it — three times the amount shown in Table 6.6, contains up to a third of the minimum daily requirement of some of the minerals and trace elements. British natural healer Cyril Scott used blackstrap molasses to cure a wide variety of mineral-deficiencies earlier in this century. His classic work Crude Black Molasses was reprinted by Benedict Lust Publications in 1980, and is still available in book stores today. Keep molasses, and especially blackstrap molasses, on your table, and use it in place of sugars, jellies, and jams. Add it to soups, breads, juices, and other drinks.

Table 6.6

Minerals in food products from sugar cane, and in honey (tsp.)

	White sugar	honey	brown sugar	regular molasses	Blackstrap molasses
calcium (mg)	0.042	0.38	3.91	13.66	57.33
iron (mg)	0.003	0.27	0.088	0.315	1.17
magnesium (mg)	0	0.13	1.3	16.13	14.33
phosphorus (mg)	0.084	0.25	1.0	2.17	2.67
potassium (mg)	0.084	3.27	15.9	97.6	166
zinc (mg)	0.001	0.14	0.008	0.019	0.067
copper (mg)	0.002	0.002	0.014	0.032	0.136
manganese (mg)	0	0.005	0.015	0.101	0.174

Red Meat

Now that I've told you to take something out of your diet, let's look at a food category you can keep. Contemporary nutritionists advise that we reduce the intake of our red meat. Yet Weston Price observed that many traditional societies ate red meat and enjoyed near-perfect health. Our ancestors in 1900 also ate plenty of it, and suffered far fewer heart attacks than we do today. Red meat is a *healthy* food, if taken in the context of an otherwise mineral- and vitamin-rich whole foods diet, and not taken in great excess. The saturated fats in red meat may cause problems in the absence of the mineral and vitamin antioxidants and essential fatty acids frequently missing from our diets.

Beef

Red meat itself is not a "bad" food, but the beef we find it in our stores today may be unhealthy. Our cattle have been bred for their fatness. The cattle of the Masai and related tribes in Africa are lean, with a fat profile resembling that of the wild game animals in Table 2.8 (Erasmus, 1993). Selectively-bred cattle in the U.S. today have four to ten times the fat content of beef as it naturally occurs. Most cattle in America today are also raised in feedlots. They are not allowed to graze on their natural diet of grasses, but are fed prepared foods and grains to fatten them up. Many become so sickly that they need antibiotics to stay alive, and these antibiotic residues can remain in the meat. Cattle also often receive steroid drugs in order to make them gain weight. Changes in cattle breeding and feeding have also eliminated the vitamin A content in beef in the last thirty years (See Table 3.6). Plenty of vitamin A remains in beef organ meats, which I'll discuss below.

You may not be able to get wild African beef in America today, but you can get the sort of beef that our ancestors in 1900 ate. Many larger natural food stores now carry meat from grass-fed cows and other animals that are allowed to roam their pastures and rangeland and eat their natural diets. The meat is also free of antibiotics and steroid hormones. I've been unable to find nutrient analyses on such meats, but the animals are surely healthier, their essential fatty acids (which come from eating green plants) higher, and their minerals and trace elements higher than animals fed mineral-depleted corn. You may also buy sides of beef directly from a farmer, and freeze it.

Lamb

The contemporary scientific studies that show red meat to be bad for you invariably lump feedlot-raised beef and pork together with lamb together in a single category. The way these animals are raised, however, is very different. Most of the lamb meat you buy in stores today comes from animals that are grass-fed, rather than artificially fed with fattening, mineral-deficient foods and drugs in feedlots. Table 6.7 shows a comparison of nutrients in beef and lamb. The lamb has almost 20% less fat, and about 15% less sodium, both positive changes for the American public. The fat content in lamb is also much higher in essential fatty acids than beef, with lamb having a similar percentage of EFA to that in bison (See table 2.7). Its omega-3 fat content, which is responsible for some of the health benefits of fish and wild game, is in the same range as that of some fish (See Table in chapter 6). Although it contains slightly less iron, it contains about 17% more of the trace elements measured. Presumably this increase applies to other essential trace elements as well. The lamb also contains 70% more vitamins of the B-complex. Lamb may not be as high quality a meat as wild game, but is much healthier than beef.

I would not suggest eating lamb or other red meat every day, and I recommend against eating any supermarket beef at all, but you don't need to red meat completely to stay healthy.

Table 6.7

Nutrients in ground beef vs lamb (per 100 grams)

	Beef	Lamb	Difference
Protein (g)	16.62	16.88	1.56%
Fat (g)	26.55	21.59	-18.68%
% EFA	3.50%	7.55%	215.7%
% Omega-3	0.60%	1.81%	300.0%
Calcium (mg)	8	12	50.00%
Iron (mg)	1.73	1.57	-9.25%
Magnesium (mg)	16	22	37.50%
Phosphorus (mg)	130	160	23.08%
Potassium (mg)	228	230	0.88%
Sodium (mg)	68	58	-14.71%
Zinc (mg)	3.55	3.33	-6.20%
Copper (mg)	0.062	0.104	67.74%
Manganese (mg)	0.017	0.019	11.76%
Total minerals			17.87%
Total trace elements			16.02%
Thiamine (mg)	0.038	0.12	215.79%
Riboflavin (mg)	0.151	0.22	45.70%
Niacin (mg)	4.48	6.1	36.16%
Pantothenic acid (mg)	0.346	0.67	93.64%
Vitamin B-6 (mg)	0.24	0.13	-45.83%
Folate (mg)	7	18	157.14%
Vitamin B-12 (mg)	2.65	2.39	-9.81%
Average B-complex (%)			70.40%

Organ meats

Healthy meat eaters of the past — both traditional peoples and our more recent European ancestors — did not eat the muscle meat of animals alone. They also ate the organ meats. Some peoples considered them the choicest part of the animal. Weston Price found that Northern Canadian Indians ate the internal organs and bone marrow of deer, and fed the muscle meat to their dogs. The Hebrides Islanders favorite dish was fish head (complete with the brains) stuffed with fish livers. This trend was found in most of the traditional peoples Price studied. Organ meats are also a traditional food of many of our European ancestors. As I was growing up in a family of mostly Irish extraction, we had liver once a week. A friend of Italian extraction tells me that her grandparents still eat brains once a week. Table 6.8 shows the nutrient values of some of today's supermarket organ meats. Liver contains huge amounts of the trace elements and the fat soluble vitamins. You don't need to eat these foods every day. A once-a-week serving provides a good boost to the nutrition. If you are not used to organ meats, you'll have to develop a taste for them. I recommend the book *Nourishing Traditions* by Sally Fallon, which contains a number of recipes and shopping tips for organ meats. The book contains more than 700 recipes for a variety of foods, based in part on the work of Weston Price. The organ meats of grass-fed, hormone and antibiotic-free animals are available in many natural food stores today.

Table 6.8

Nutrients in some organ meats (100 g)

	Beef liver	Chicken liver	Beef kidney
Protein (g)	20	17.97	16.88
Fat (g)	3.85	3.86	21.95
Calcium (mg)	6	11	12
Iron (mg)	6.82	8.56	1.57
Magnesium (mg)	19	20	22
Phosphorus (mg)	318	272	160
Potassium (mg)	323	228	230
Sodium (mg)	73	79	58
Zinc (mg)	3.92	3.07	3.33
Copper (mg)	3.339	0.395	0.104
Manganese (mg)	0.264	0.258	0.019
Vitamin C (mg)	22	33.8	0
Thiamin (mg)	0.26	0.138	0.12
Riboflavin (mg)	2.78	1.963	0.22
Niacin (mg)	12.78	9.25	6.1
Pantothenic acid (mg)	7.62	6.184	0.67
Vitamin B-6 (mg)	0.94	0.76	0.13
Folate (mcg)	248	738	18
Vitamin B-12 (mcg)	69.19	22.98	2.39
Vitamin A (IU)	35346	20549	0
Vitamin E (ATE)	0.67	1.44	0.21

(U.S.D.A., 1997)

Fish

If you had to pick only one meat to add to your diet to improve your health, it would be fish. Hundreds of clinical studies have shown that fish and fish oil can improve cardiovascular health and reduce inflammation in chronic diseases. One of the reasons the Japanese are healthier than the people of other developed countries is that the Japanese eat a lot of fish. Probably the most beneficial substance in fish is the omega-3 fatty acid called eicosapentaenoic acid, or EPA. EPA, which reduces both inflammation and the tendency of the blood to form clots, also occurs abundantly in wild game such as deer and elk. Table 6.9 shows a nutrient comparison of the omega-3 fatty acids and other nutrients in fish and a variety of meats. Notice that all fish do not have a high percentage of omega-3 fatty acids. Cod, canned tuna, and bass fall near the bottom of the list. Notice also that farmed salmon falls in between retail cuts of beef and ground beef. Farmed fish are kept in a pool — the equivalent of the cattle feedlots — and fed prepared foods. They are not allowed to roam the seas or streams and eat the natural omega-3-rich green foods that make up their natural diet. Their fat profile then resembles that of beef raised and fed in a similar manner. Much of the fish available in supermarkets today is farmed fish, and does not have the health benefits of wild varieties. If you find "Atlantic salmon" in a store today, it is probably farmed in the fisheries of New England. If you select your meats from bison — the lowest of the game meats in the table — and above, you will be imitating the natural diets of the primitive people that Weston Price studied. Notice that although lamb falls within that range, the fish at the top of the list have more than three times the percentage of omega-3 oils.

Table 6.9

Percentage of omega-3 fatty acids in the fats of fish and meats (100g)

	Total fat (g)	% Omega-3 fatty acids
Salmon (wild)	6.34	4.65%
Salmon (cooked)	8.13	4.60%
Sardine (canned)	11.45	4.35%
Trout	3.46	3.44%
Halibut	2.29	2.84%
Deer	2.42	2.89%
Elk	1.45	2.76%
Catfish	2.82	2.52%
Lamb	21.59	1.81%
Bison (wild)	1.84	1.63%
Beef (retail cuts)	19.2	1.19%
Salmon (canned)	6.05	0.95%
Chicken	15.06	0.93%
Salmon (farmed)	10.85	0.87%
Shrimp	1.73	0.81%
Beefalo	4.8	0.80%
Bass	2.33	0.64%
Pork (retail cuts)	14.95	0.60%
Beef (ground)	26.55	0.60%
Clams	0.97	0.41%

Snapper	1.34	0.30%
Tuna (canned)	0.82	0.20%
Shrimp (fast food)	15.1	0.17%
Cod	0.67	0.15%

Many traditional people, and the contemporary Japanese, consume their fish raw. Sushi bars are sprouting across the country, and raw fish is now considered a delicacy in the U.S. Cooking the fish — especially steaming or baking it — does not radically alter its nutrient content. Table 6.10 compares the nutrients in several species of fish cooked and raw. Notice that most of the nutrients go up. This is because cooking the fish removes much of the water weight, concentrating the nutrients. The percentages of omega-3 fatty acids remains the same. Frying the fish — especially deep frying it — may give the same oil content, but the oils become oxidized, and create harmful free-radicals in the body. Notice that fish, whether raw or cooked, provides significant amounts of minerals — especially potassium — and vitamin A.

Table 6.10

Nutrients in raw vs cooked fish (8 oz. serving)

	Halibut		Trout		Salmon	
	Raw	Cooked	Raw	Cooked	Raw	Cooked
Fat (g)	6.11	7.84	9.23	15.52	16.91	21.68
% EFA	5.68%	5.65%	6.88%	6.43%	9.31%	9.30%
% Omega-3	2.84%	2.82%	3.44%	3.21%	4.65%	4.65%
Calcium (mg)	125.33	160.00	178.67	229.33	32.00	40.00
Iron (mg)	2.24	2.85	1.87	1.01	2.13	2.75
Magnesium (mg)	221.33	285.33	82.67	82.67	77.33	98.67
Phosphorus (mg)	592.00	760.00	722.67	717.33	533.33	682.67
Potassium (mg)	1200.00	1536.00	1282.67	1194.67	1306.67	1674.67
Sodium (mg)	144.00	184.00	82.67	149.33	117.33	149.33
Zinc (mg)	1.12	1.41	2.88	1.36	1.71	2.19
Copper (mg)	0.07	0.09	0.29	0.15	0.67	0.86
Manganese (mg)	0.04	0.05	0.42	0.06	0.04	0.06
Thiamine (mg)	0.16	0.18	0.33	0.41	0.60	0.73
Riboflavin (mg)	0.20	0.24	0.28	0.26	1.01	1.30
Niacin (mg)	15.59	18.99	14.36	15.39	20.96	26.69
Pantothenic acid (mg)	0.88	1.01	2.47	10.84	0.44	5.12
Vitamin B-6 (mg)	0.92	1.06	1.08	0.92	2.18	2.52
Folate (mcg)	32.00	36.80	32.00	50.67	66.67	77.33
Vitamin B-12 (mcg)	3.16	3.64	11.87	16.80	8.48	8.13
Vitamin A (I.U.)	413.33	477.33	165.33	133.33	106.67	117.33
Vitamin E (I.U.)	3.40	4.36	0.80	n.a.	48.00	52.00

Oils

The introduction of refined oils into the American diet in the first decades of this century has probably contributed to our dramatic rise in atherosclerosis and heart disease. The main culprits are refined vegetable oils and margarine and related hydrogenated oils and shortenings. Our ancestors in the last century consumed oils, but they were invariably fresh-pressed oils which easily went rancid, and were marketed as perishable foods like milk or eggs. These oils were rich in many of the nutrients in the original plant being pressed. Table 6.11 shows the steps of refinement of oils today. These refined oils, or even the so-called "unrefined oils" you might find in a health food store, are depleted of the natural vitamins, minerals, and other substances that occur naturally in the plant. Their effects in the body are similar to those of white sugar or white flour. In order to metabolize their calories, the body must rob the bones and tissues of their stored nutrients.

Table 6.11

Steps in the refinement of vegetable oils

Stage	Description	Nutrients
Starting material	Seeds, nuts, beans	oils, protein, minerals, vitamins, fiber
Step one	Clean and hull	No effect
Step two	Add solvent	Lose protein, fiber, vitamins, minerals
Product: "Unrefined oil"		
Step three	Distill and degum	Lose chlorophyll, calcium, magnesium, copper, iron
Byproduct: lecithin		
Step four	Refine	Lose phospholipids, minerals
Step five	Bleach	Lose chlorophyll, beta-carotene, flavor compounds
Step 6	Deodorize	Lose vitamin E
Byproduct: vitamin E		
Step 7	Add preservatives	
Product: supermarket oil		
Step 8	Hydrogenate	Lose essential fatty acids
End product: margarine and shortening.		

(Erasmus, 1993)

Besides their mineral-stripping effects, the massive increase of vegetable oils, margarine, and shortening in our society has created an imbalance in tissue levels of our essential fatty acids. Fatty acid biochemistry is very complex. If you are interested in very thorough information on the subject, I suggest the book *Fats That Heal, Fats That Kill,* by Udo Erasmus, Ph.D. The best brief explanation I've found on the topic, with full scientific references, is contained in the chapter on oils in the *Encyclopedia of Nutritional Supplements* by Michael Murray, N.D. I'll give a capsule summary here.

The two classes of essential fatty acids we require in our diets are omega-3 and omega-6 oils. Most vegetable oils are highest in the omega-6 oils. We must have these oils to maintain our health, and mother's milk contains them. The omega six oils are converted into two different kinds of prostaglandins, hormone like substances with powerful effects on our cells. The series-1 prostaglandins from omega six oils are anti-inflammatory, and have a wide range of other healthy effects. Series-2 prostaglandins, on the other hand, are inflammatory, and increase the tendency of our blood to clot. The body prefers to make series-1 prostaglandins our of dietary omega-6 oils, and, with a healthy natural diet, only makes enough of the series-2 prostaglandins to maintain a healthy inflammatory response to infections and irritants. Drugs like aspirin and corticosteroids act by suppressing the effects of these series-2 prostaglandins. Aspirin also blocks the blood-clot promoting effects of these prostaglandins, which is why doctors tell people who have had heart attacks to take an aspirin every other day.

We also require a third kind of prostaglandin, the series-3 prostaglandins from omega-3 oils, which are also anti-inflammatory and have other healthy benefits. The body, in its wisdom, has the ability to launch an inflammatory response, but has two substances — series-1 and series-3 prostaglandins — that will control and moderate that response so it does not get out of hand. These three substances have to be in balance. If we get our omega-3 oils from fish or wild game, it comes in the form of EPA (See discussion of fish above), which is readily converted into the series-3 prostaglandins. If we don't eat fish or wild game, and eat meat from domesticated livestock which contains only low amounts of these oils, our body has a mechanism to covert alpha-linolenic acid, an omega-3 oil in some plant foods, into EPA. Alpha-linolenic acid is present in small amounts in many oils, but is highest in hemp seed oil, flax seed oil, canola oil, and soy oil (in order of content). Alpha-linolenic acid is contained in green plants, but only in low amounts. This is where the fish and wild game obtain it, and we require such an animal intermediary to concentrate enough from greens to be of use to us.

This conversion from alpha-linolenic to EPA acid is complex and can be blocked by a number of deficiencies or excesses, including:

- Vitamin B-6 deficiency
- Vitamin C deficiency
- Magnesium deficiency
- Zinc deficiency
- Fatty acids from margarine or shortening
- Excess oils containing omega-6 fatty acids.

The fatty acids in margarine and shortening have been chemically manipulated to make an oil that would normally be liquid at room temperature solid. The result is a fat molecule that is completely foreign to the human body. Scientific studies about the effect of these substances on heart disease have been contradictory — margarine-eaters in some societies have more heart disease, and in some have less. This may be due to other factors in the national diets of those countries. However, it makes common sense not to consume such an unnatural substance, especially when it is known to interfere with the normal metabolism of alpha-linolenic acid.

We saw in Chapter 4 that both men and women in the U.S. are, on the average, deficient in magnesium and zinc. Vitamin B-6 and vitamin C are also commonly deficient (Werbach, 1993). We also consume large amounts of margarine and related oils, often hidden in processed foods. And we consume large amounts of the omega-6 containing oils. See Table 26.12 for the results this has on the oil balance in our tissues. When the conversion of alpha-linolenic acid is inhibited through malnutrition, the enzymes that would normally produce EPA from alpha-linolenic acid instead begin to affect the omega-6 pathway in such a way that more inflammatory series-2 prostaglandins are produced. Thus we get an increase of the inflammatory, blood-thickening, series-2 prostaglandins, and a deficiency of the anti-inflammatory prostaglandins of series-3. It is a social formula for inflammatory diseases, heart attacks, and strokes. It is my opinion that the imbalance of our dietary oils, especially the high consumption of vegetable oils and margarine, coupled with the demineralization of our soil and foods, account for the dramatic rise in heart disease in the United States in this century.

Table 6.12

Percent of essential fatty acids in human body fat, 1991-1992

People	Omega-6	Omega-3	Ratio
New Zealand Maoris	2.6	0.93	2.8:1
Japanese	14.8	3.2	4.6:1
American	10.2	0.58	17.6:1

The huge imbalance in the omega-6 to omega-3 ratio in Americans results from 1)low consumption of wild fish and game with corresponding high consumption of EPA-deficient commercial livestock and poultry, 2)high consumption of refined omega-6 oils 3)high consumption of margarine, and 4)common vitamin and mineral deficiencies.

The natural therapeutic diet for this condition would include: 1)Fish, game, and other meats high in EPA, 2) Reduction of refined omega-6 oils such as corn, peanut, and safflower, and eating more corn, safflowers, or peanuts instead, 3)Complete elimination of margarine and shortening, including that contained in processed foods, and 4)Eating whole, unprocessed, mineral and vitamin-rich plant foods. A high quality, broad-spectrum multiple vitamin and mineral supplement makes sense if disease is already present. For decades now, doctors have been telling people to eat margarine and vegetable oils instead of animal fats, but the animal fats are actually better for you because they do not disrupt the essential fatty acid metabolism the way vegetable oils do.

Olive oil

A natural substitute for the omega-6 processed vegetable oils is virgin olive oil. It contains only low levels of omega-3 or omega-6 oils, so it will not interfere with prostaglandin production or balance. No saturated fat appears in virgin oils, so, for cardiovascular health, they are “neutral.” Olive oils also does not oxidize — turn rancid — very easily, and keeps well at room temperature. Virgin olive oil is, by definition, made from high quality olives by simple pressing. [Extra-virgin olive oil is oil that has never even thought about it: this is a joke for the editor. Have a nice day]

Extra-virgin olive oil is made from higher quality olives. The olive-quality standards (but not the pressing method) for virgin oil was reduced in the last decade, so an extra-virgin oil today equals the virgin-quality of the past. These virgin oils contain most of the nutrient elements that you see removed during refining in Table 26.12. Olive oil that is refined, rather than virgin, falls in the same nutrient-deficient category as the other refined oils.

Although the oil content of virgin oil has a neutral effect on cardiovascular health, it also contains a number of other substances, listed in table 26.13, which may be beneficial to the heart. I removed all margarine from my diet and began using olive oils exclusively about twenty years ago, and, at age fifty, have no allergies or other inflammatory conditions (even though the rest of my family of origin is allergy-prone,) and lab tests show a low likelihood of atherosclerosis. I recommend that you purchase the highest quality olive oil you can find, which usually means the most expensive.

Table 6.13

Some beneficial substances in virgin olive oils.

Substance	Effect
Beta-carotene	Antioxidant
Vitamin E	Antioxidant
Chlorophyll (contains magnesium)	Nourishes the heart
Squalene	Protects the heart
Phytosterols	Reduce cholesterol

Eggs

Eggs were unfortunately tagged as a "bad" food several decades ago when the theory that dietary cholesterol causes heart disease was popular among scientists. The simplest refutation of this theory is that heart attacks were rare in 1900, and common today, but dietary cholesterol has remained about constant during that time. Almost all the cholesterol in the body is produced by the liver, and does not come from the diet. Most people who take in more dietary cholesterol simply produce less from their liver to compensate. Even the link between high cholesterol and heart disease has come into question in the last few years. It seems that high cholesterol itself is not the culprit, but rather oxidized cholesterol. The cause of atherosclerosis is whatever initially injures the arteries to initiate plaque formation, whatever oxidizes the cholesterol, and a deficiency of antioxidant vitamins and minerals. Refined and cooked vegetable oils are highly oxidative, and are the logical suspect for the oxidative injuries to the vessels and the oxidation of cholesterol. I will discuss some questionable myths about the value of low-fat diets in Chapter 7. The quality and type of fat is more important than the amount.

Eggs are rich in nutrients, especially the fat soluble vitamins A and D. Table 26.14 shows the nutrients in a cooked, three-egg omelet, with or without cheddar cheese made from whole milk. Organic eggs, from chickens that are allowed to move around and feed on natural grasses, contain omega-6 and omega-3 oils in about a 1:1 ratio — close to the ideal balance. Some supermarket eggs may contain almost twenty times more omega-6 than omega-3 oils (Simopaulus and Salem, 1992). The free-range chicken eggs are much thicker — you have to hit them harder to break them — indicating that the chickens are healthier and have a higher mineral content in their diet.

Table 6.14

Nutrients in a three-egg omelet

	Eggs only	With cheese (whole milk)
Protein (g)	30.99	55.89
Fat (g)	34.32	67.42

Calcium (mg)	76.86	798.16
Potassium (mg)	184.8	553.2
Iron (mg)	2.19	2.87
Zinc (mg)	1.683	4.793
Vitamin A (I.U.)	1197	2256
Vitamin D (mcg.)	1.8	2.7
Vitamin E (I.U.)	2.361	2.601

Milk and milk products

Cow's or goat's milk is a traditional food in some parts of the world, especially in cold climates with long winters, but is not consumed at all in most areas. Many Asians, Africans, and people descended from them cannot tolerate it at all. Digestion of milk sugar requires an enzyme called *lactase*, which some races and individuals lack. Babies naturally produce this enzyme, but is disappears after weaning. Milk protein — called casein — is also difficult to digest, and is perceived by the immune system of some individuals as if it were a bacterium. Those people who can tolerate milk best seem to be those descended from people in cultures that have consumed a lot of it. All traditional people who consume milk also make fermented milk products, such as yogurt and buttermilk. This process predigests the milk protein and makes it easier to assimilate. Cheese contains highly concentrated milk protein, and those who are sensitive to milk should avoid cheese completely. Cooking also makes cheese harder to digest.

Milk allergy is the most common food sensitivity in the U.S., followed by wheat. I once interviewed the head of an Ear, Nose, and Throat department in a major teaching hospital on the topic of childhood ear infections. He received many referrals from general practitioners to surgically place tubes in the children's ears. He told me that he could prevent about 25% of the surgeries by screening for cow's milk allergies. When the children stopped eating milk and milk problems, their ear infections went away. When someone consumed milk, or any other food allergen, it evokes a powerful immune response in the gut. The circulating white blood cells drop by about 40% as they rush to the site of the irritation. This leaves other areas of the body deficient, and infections of the tonsils, sinuses, and ears may set in. My clinical experience with sinus infections is not very extensive, but to date I have never seen chronic sinus infection in an individual who did not drink milk. Many of the infections cleared up by removing milk and cheese from the diet. I had one patient who had suffered lifelong infections and immune disorders, including fungal infection in infancy, childhood eczema, upper respiratory infections, urinary tract infections, and, finally, systemic lupus, an autoimmune disease. She had been fed cow's milk too early in infancy, before her gut could handle it, and the lifelong dairy overload had wreaked havoc on her immune system. Removal of the dairy immediately put a halt to her most serious lupus symptoms. Most individual who are allergic to dairy can eat butter, which does not contain either the casein or the lactose, without repercussions. Very sensitive individuals who can't tolerate even butter can eat ghee (clarified butter), which has all milk solids removed. Beware of inexpensive ghee in imported food stores — it usually contains vegetable oils and margarine that are not listed on the label.

Whole raw milk is delivered by the mother animal in a state that is ideal for its digestion and assimilation. This includes not only vitamins and minerals, but also enzymes that assist in their assimilation. Unfortunately, the modern processes of pasteurization and homogenization destroy these enzymes, and milk processed this way is even more difficult to digest than milk in its natural state. Calves fed pasteurized milk develop joint stiffness and do not thrive. Why should we drink milk that makes a baby cow sick?

Raw milk is still obtainable through health food stores in some states, but other states have banned it as a health hazard, because of occasional outbreaks of salmonella food poisoning. It is ironic that the vast number of salmonella outbreaks, and those mostly dead, have occurred from pasteurized rather than raw milk. One such outbreak in Illinois affected more than 14,000 people, including two who died (Fallon, 1995). Raw goat's milk is also available in many areas, and has a significantly higher concentration of trace elements than commercial cow's milk. See Table 26.15

Table 6.15

Some nutrients in whole cow (pasteurized) vs goat milk

	Cow	Goat	% increase
Protein (g)	8	8.6	7.50%
Fat (g)	8.9	10.1	13.48%
Calcium (g)	290.3	325	11.95%
Potassium (g)	368.4	498	35.18%
Zinc (mg)	0.927	0.732	-21.04%
Copper (mg)	0.024	0.112	366.67%
Manganese (mg)	0.01	0.044	340.00%
Vitamin A (I.U.)	336.7	451.4	34.07%

Milk fat is one of the most nutritious sources of fat available to humans. It is rich in Vitamin A, and its essential fatty acid balance is ideal, about 1:1 omega-6 to omega-3 fatty acids. Unfortunately our society is now in "anti-fat" mode, and sales of butter, whole milk, and cheese have declined dramatically in favor of low-fat varieties. In the process of cutting the fat in milk and related products from about 4% to about 2%, about half the beneficial elements in the fat are also cut. Table 26.16 shows some of the nutrients in butter. If you ate more butter fat and less vegetable oils and margarine, it would shift the essential fatty acid balance in your body toward that of the Japanese and the traditional Australian Aborigines, both unusually healthy peoples (See Table 26.1). High butter consumption among the French, with this balance of fatty acids, may partly explain the French Paradox (See introduction to Section III.) Butter also contains other beneficial constituents (See Table 26.17) I will discuss some of the myths about the benefits of a low-fat diet in Chapter 7. Table 26.18 shows the nutrients that are lost in low-fat cheese compared to whole milk cheese.

Table 6.16

Nutrients in butter (1 tablespoon)

Fat (g)	11.5
Saturated fat (g)	7.1
Essential fatty acids	
omega-6	0.26
omega-3	0.17
% EFA	3.74%
Vitamin A (I.U.)	434
Vitamin D (mcg)	.3

(U.S.D.A., 1997)

Table 6.17 Some beneficial constituents in butter

Wulzen (anti-stiffness) factor	Protects against degenerative arthritis, hardening of the arteries, and cataracts.
Short and medium chain fatty acids	About 15% of butterfat. Absorbed directly by the small intestine without emulsification by the bile. Antimicrobial, anti-tumor, immune stimulating, antifungal.
Conjugated linoleic acid	Anti-cancer.
Glycosphingolipids	Protect against gastrointestinal infections.
Trace minerals	Chromium, iodine, manganese, selenium, and zinc.

(Fallon, 1995)

Table 6.18

Some nutrients in whole vs low-fat cheddar cheese (100g)

	Whole	Low-fat	% loss
Protein (g)	24.9	24.35	-2.21%
Fat (g)	33.1	7	-78.85%
Calcium (g)	721.3	415	-42.46%
Potassium (g)	368.4	66	-82.08%
Iron (g)	0.68	0.42	-38.24%

Zinc (mg)	3.11	1.82	-41.48%
Copper (mg)	0.031	0.021	-32.26%
Manganese (mg)	0.01	0.006	-40.00%
Vitamin A (I.U.)	1059	233	-78.00%
Vitamin E (I.U.)	0.24	0.079	-67.08%
Ess. fatty acids (g)	0.942	0.223	-76.33%

Soy products

Soy products are among the most popular foods in Japan and other parts of Asia, and researchers think that soy consumption contributes to the superior health and longevity of the Japanese. Soy is rich in both minerals and essential fatty acids. It also contains hormone-like substances that can reduce the intensity of menopausal symptoms. Table 26.19 lists some of the nutrients in soy products. Tempeh, my personal favorite soy food, is made from fermented and aged soybeans. Although levels of some of the minerals in tempeh appear lower than those in tofu, the minerals are more bioavailable in tempeh. Tofu and other unfermented soy products, including the cooked beans, contain high levels of phytates, which bind some minerals and make them unavailable. Unfermented soy also contain enzyme-inhibiting substances which can impair digestion of all foods if consumed in large quantities. Another excellent fermented soy product is miso, a paste-like product that will dissolve easily in soups. Season tempeh any way you want, put it in casseroles, stir fries, or traditional dishes such as spaghetti sauce or tacos. Vegetarians who eat tofu alone cannot expect to get the health benefits of the Japanese, who eat it as a secondary food and not as a primary protein source. The Japanese consume their soy products along with fish and fish soup stocks.

Table 6.19

Minerals and essential fatty acids in soy products (per 100 grams)*

	Cooked soybeans	tofu	tempeh
calcium (mg)	102	205	93
iron (mg)	5.14	10.47	2.26
magnesium (mg)	86	94	70
potassium (mg)	515	237	367
zinc (mg)	1.15	1.57	1.81
copper (mg)	0.407	0.378	0.67
manganese (mg)	0.824	1.181	1.43
total fat (g)	8.9	8.72	7.68
% essential fatty acids	56.94%	56.43%	56.41%
% omega-3 fatty acids	6.72%	6.67%	6.67%

*The minerals in cooked soybeans and tofu are bound to plant substances called phytates, which inhibit their absorption. The phytates are destroyed during the fermentation of tempeh.

Grains

We take white wheat flour so much for granted now that we think of it as a natural food. Refined flours, like refined sugar, not only deny you the nutrition available in the whole food, but rob the body of the vitamins and minerals necessary to digest and metabolize them. See Table 2.4 for a comparison of white vs whole wheat bread. In our supermarkets, white flour is almost always combined with sugar as well, making matters worse.

Case study

An elderly woman with multiple heath problems, including constipation, fatigue, and rheumatoid arthritis, was reluctant to change her dietary habits. The simple addition of oatmeal for breakfast, and substitution of whole wheat bread for white bread, completely eliminated her constipation, and improved the other problems, within three weeks. No laxatives were given at

Traditional peoples in many areas of the world consume grains, but not in the forms we do today. Traditional cultures do not eat bread! At least not without preparing the grains first be soaking and/or fermenting them. Our ancestors throughout Europe, Africa, South America, South Asia, and even the European colonists in America prepared their grains this way. Traditional Irish oatmeal is prepared by roasting whole oats, cracking or grinding them, soaking them overnight in water, and finally cooking them in the morning. Traditional Swiss muesli is made from fresh cracked oats or other grains, soaked overnight in water with a little live yogurt culture added, and then cooked. Many traditional breads, including American sourdough bread, are made by letting the dough ferment before baking. This practice of traditional wisdom, in use for countless centuries before minerals were discovered, greatly improves the availability of minerals in grains. All grains, and many beans, contain phytic acid in their outer layers. Phytic acid binds minerals in the intestinal tract — especially zinc — and inhibits their absorption. Soaking grains, especially in a sour acid medium, destroys the phytic acid and frees the minerals for easy absorption. Fermenting grains also helps to predigest their proteins, reducing some of the work of the digestive tract.

Traditional peoples also usually fresh-crack their grains, retaining all the nutrients as they exist in the living seed. You can plant a whole oat and it will grow. Try doing that with the rolled oats in commercial oatmeal, or with a handful of wheat flour. As soon as a grain is cracked, it begins losing nutrients, and any oils present begin to go rancid. Mineral content will remain the same, but vitamins degrade. My first job in the health foods business (in 1973) was as a whole grain baker for a sandwich shop. Each morning I took fresh wheat berries, ground them into flour, and turned them into bread within a few hours of cracking. You have to taste bread or oatmeal prepared this way to believe it. Needless to say, our shop did a booming sandwich business. The fresh-cracked grains have a sweetness and vitality that is missing if the flour is allowed to sit for even twenty-four hours. I still fresh-grind my grains in a flour mill, but now I soak them overnight before making bread, oatmeal, or porridge from them.

Wheat, corn, rye, barley, and oats all contain a protein called gluten. The gluten in kneaded wheat dough makes up the thick matrix that captures the gas from the fermenting yeast and makes wheat bread rise so nicely. Gluten is very hard to digest, and, for some of us, the immune system treats it as a foreign invader and mounts an allergic reaction against it. Infants and young children who are fed gluten-containing bread and grain products often develop a lifelong allergy to it. Wheat allergies are among the most common food allergies in the U.S., second only to cow's milk. Gluten can cause some overt conditions as celiac disease, irritable bowel syndrome, and ulcerative colitis. It can also cause less obvious system complaints such as depression, fatigue, weight gain, edema, and heightened tendency to airborne allergies. If you wonder whether you have a wheat allergy or not, try cutting our all gluten-containing grains for six weeks, and see if any of your health problems go away. One clue that you may have an allergy is if you tend to binge on a food, or do not consider your day complete without it.

Case study:

A forty-four year-old-man had experienced unexplainable weight gains over a period of five years. He exercised moderately and his diet appeared healthy, without sugar or excess fats or oils, but had gained 5-10 pounds a year during that period. The weight tended to come in spurts, sometimes as much a eight pounds in a month, and never went back to the lower weight. His morning body temperature had dropped eight-tenths of a degree during the same period, to 97.8. A hypothyroid condition could cause these symptoms, but his thyroid hormone levels were within normal limits. His diet diary revealed that he ate wheat most days. After six weeks of cutting out all wheat, including that hidden in common processed foods, he had lost five pounds and his morning body temperature had risen a half a degree.

Of the five gluten-containing grains, oats have the lowest amount of gluten, and some individuals who cannot tolerate gluten can take oats without ill effect, especially if fermented with water and a little yogurt overnight. Rice, millet, and buckwheat, which do not contain gluten, are much less likely to cause food allergies. These grains also contain phytic acid, and their mineral nutrients will be more available is soaked overnight. Many Americans who have developed allergies to wheat and corn from being fed those grains too early in infancy tolerate these "foreign" grains quite well. Try putting a cup of brown rice with three cups of water in the top of a double boiler. Put the heat at low-medium, and let it simmer for four or five hours. The result is a very sweet rice with a consistency like white rice.

Fruits and Vegetables

We saw in Table 3.18 that organic fruits and vegetables have, on the average, about twice the mineral content of supermarket varieties. Organic produce is also free of pesticides. Some people balk at the higher average prices for organic produce, but if you figure price-per-nutrient, you're getting a bargain. Organic varieties usually don't cost twice as much as the others. That you have to pay more today not to have poisonous pesticides in your food is an irony of modern life.

Vegetables are a good source of minerals, but the minerals in plants are usually not as available as those in animals, which have already assimilated them and transformed them into bioavailable forms. One of the best ways to release the minerals from plants is to cook them into soups, simmering them for two or three hours. I'll discuss soups in more detail below. The key to getting the most minerals from your vegetables is to retain and drink all the water that they are cooked in, if you boil them, or to stir-fry them without water. Frozen vegetables are usually boiled and drained during processing, stripping away much of the mineral content. See Table 26.20 for a comparison of several fresh vs frozen vegetables.

Table 6.20

Nutrients lost in frozen vegetables (per 100g)

Carrot	Raw	Frozen	Change
calcium (mg)	27	28	3.70%
phosphorus (mg)	44	26	-40.91%
iron (mg)	0.5	0.47	-6.00%
potassium (mg)	323	158	-51.08%
magnesium (mg)	15	10	-33.33%
vitamin A (I.U.)	28129	17702	-37.07%
thiamine (mg)	0.097	0.027	-72.16%
riboflavin (mg)	0.059	0.037	-37.29%
niacin (mg)	0.928	0.438	-52.80%
vitamin C (mg)	9.3	2.8	-69.89%
Broccoli	raw	frozen	change
calcium (mg)	48	51	6.25%
phosphorus (mg)	66	55	-16.67%
iron (mg)	0.88	0.61	-30.68%
potassium (mg)	325	180	-44.62%
magnesium (mg)	25	20	-20.00%
vitamin A (I.U.)	1542	1892	22.70%
thiamine (mg)	0.065	0.055	-15.38%
riboflavin (mg)	0.119	0.081	-31.93%
niacin (mg)	0.638	0.458	-28.21%
vitamin C (mg)	93.2	40	-57.08%

Mineral and vitamin density varies widely within the fruit and vegetable groups. Unfortunately, the vegetables consumed most often by Americans, such as tomatoes, oranges, bananas, potatoes, and corn are among the least nutritious of the category. Table 26.21 lists fruits and vegetables in the order of their nutritional value, and compares it to the most common fruits and vegetables consumed by Americans.

Table 6.21

Eating from the bottom of the list

Nutrient density and consumption of common fruits and vegetables

Nutrient concentration		Nutrient contribution to typical American diet	
Food	Rank	Food	Rank
Broccoli	1	Tomatoes	1
Spinach	2	Oranges	2
Brussels sprouts	3	Potatoes	3
Lima beans	4	Lettuce	4
Peas	5	Sweet corn	5
Asparagus	6	Bananas	6
Artichokes	7	Carrots	7
Cauliflower	8	Cabbage	8
Sweet potatoes	9	Onions	9
Carrots	10	Sweet potatoes	10
Sweet corn	12	Peas	15
Potatoes	14	Spinach	18
Cabbage	15	Broccoli	21
Tomatoes	16	Lima beans	23
Bananas	18	Asparagus	25
Lettuce	26	Cauliflower	30
Onions	31	Brussels Sprouts	34
Oranges	33	Artichokes	36

Soups

We saw in Chapter 5 that canned soup is one of the leading sources of calories in the U.S., and one of the top ten selling items in supermarkets. Table 2.5 shows some of the nutrients lost in the process of processing canned foods. Soups break up cell walls and release minerals that are not available in raw or lightly cooked vegetables. You can supercharge the mineral nutrition of a homemade soup by adding kelp, blackstrap molasses (a good substitute for the hidden sugar in canned soup), and soup bones. Crack the soup bones and scoop the marrow directly into the soup to get all the minerals that feed the growing cells of the immune system. If you are curious, eat the marrow raw, the way the Indian in northern Canada do. It is tasty and slightly sweet. Table 26.22 compares the minerals in canned vs homemade soups, and shows how the addition of a handful of kelp and a spoonful of blackstrap molasses supercharges the mineral nutrition.

Table 6.22

Minerals in 16 oz. of canned vs homemade vegetable soup

	canned*	homemade**	with kelp and molasses
calcium (mg)	9	15	86
iron (mg)	0.45	0.89	1
magnesium (mg)	3	24	51
potassium (mg)	87	571	1152
zinc (mg)	0.19	0.35	0.76
copper (mg)	0.05	0.22	0.44
manganese (mg)	0.19	0.85	1.71

*Canned vegetarian vegetable in equal portion of water

**2 medium potatoes, tomatoes, and carrots simmered to 2 qts of water

** with 5 grams of kelp and 1 Tablespoon of blackstrap molasses

Pickles and sauerkraut

Traditional peoples in both Europe and Asia have pickled their vegetables since the dawn of recorded history. Pickling, which is fermentation with lactic-acid producing bacteria, has benefits similar to those of fermenting milk to make yogurt. The bacteria predigest the plant constituents, freeing up minerals. The sour lactic acid also has health benefits of its own, helping to regulate the normal bacteria in the gut. For some excellent traditional recipes for making pickles and sauerkraut, see the cookbook *Nourishing Traditions,* by Sally Fallon.

The vegetable fast

Fasting is a time-honored method for improving the health. For most Americans today, whose diet and constitution is very different from that of traditional people or robust peasant farmers, any kind of prolonged fast does more harm than good. Rather than a strict fast, I recommend a three-day vegetable fast for many of my clients. Eat as many vegetables as you want, in whatever form you want, for three days. This helps to cleanse the digestive tract and gives the system a rest from digesting fats and proteins, but it also helps to remineralize a run-down body.

Juicing

We saw in Chapter three that some of our fruits and vegetables have lost much of their mineral content during the last eighty years. Certain plants today contain only about one-fifth of the minerals that they did in 1914. You may be able to improve that to one-third by buying organic vegetables, which contain, on the average, about twice the minerals as are present in commercial produce. You can all the minerals back by making fresh juices of organic fruits and vegetables. If you juice three organic carrots, apples, and celery stalks, and have them for a morning drink, you'll be getting most of the minerals that your ancestors did in 1914 when they ate one apple, carrot, and piece of celery.

I recommend a glass of fresh squeezed juice four or five days a week, or even daily if you tolerate it well. I don't recommend overdoing juices, or going on prolonged juice fasts, because juices are very cooling to the system, and can impair digestion. If you find even a single glass of vegetable juices too cooling, try juicing a clove of garlic along with the other items. Large amounts of fruit juices contain large amounts of fruit sugar, which, like refined sugar, can depress the immune system. Let vegetables make up the largest portion of your fresh-squeezed juice.

For an excellent book on juicing, see *The Complete Book of Juicing* by Dr. Michael Murray.

Salt

Animals will travels miles to a salt lick, and humans have gathered salt from seashores or ancient seabeds, and traded in it since the dawn of civilization. Salt was traded during the middle ages with a value about the same as gold. The salt that animals eat at salt licks, and that traded by our ancestors, salt you buy in supermarkets today. Table 6.23 shows the comparison between the minerals in table salt and sea salt. Table salt is almost pure sodium chloride, whereas sea salt contains about 20% of other minerals and trace elements by weight. I will also describe some sea water concentrates in chapter 9, which may be used as substitutes for salt in cooking.

Table 6.23

Minerals in salt (part per million)

	Sea salt	Table salt
chloride	490,000	612,262
sodium	310,000	387,400
sulfur	11,200	0
zinc	9,200	.01
magnesium	7,200	10.1
iron	3,800	3.4
potassium	2,900	80.8
manganese	2,600	.01
calcium	2,200	242.5
copper	1,800	.003
silicon	1,100	0
strontium	90	0
boron	80	0
fluorine	40	0
lithium	2	0

rubidium	1.4	0	
phosphorus	1.12	0	
iodine	0.7	0	(unless iodized)
barium	0.2	0	
molybdenum	0.12	0	
nickel	0.8	0	
arsenic	0.037	0	
manganese	0.024	0	
vanadium	0.024	0	
tin	0.009	0	
cobalt	0.004	0	
antimony	0.003	0	
silver	0.003	0	
chromium	0.002	0	
mercury	0.002	0	
cadmium	0.001	0	
selenium	0.001	0	

Note: Sea salt contains the other mineral elements of the sea at levels of parts per billion or parts per trillion, which are insignificant to human.

Sea vegetables

Seaweeds are a treasured foods throughout the world wherever traditional people have access to them. Weston Price found an Indian high in the Andes mountains was carrying kelp and fish eggs in his pack. They had been traded hundreds of miles into the mountains from the sea from which they came. Kelp and other seaweeds were used by the Irish as supplemental foods, as garden fertilizers, and as survival foods during periods of famine. Eskimos are known to go out in the dead of winter storms to break the ice and gather seaweeds. Table 26.24 shows the mineral content of some seaweeds. Kelp — a common name for seaweeds in several seaweed genuses — is by far the richest in minerals. The kelp *Fucus vesiculosus* also called bladderwrack, from the North Atlantic has been used as a nutritional supplement and medicine in coastal areas throughout recorded European history. Kelp can vary between 25% and 50% minerals by dry weight, and a five-gram daily dose (still containing some moisture) may contain a gram or two of minerals. Most of the trace elements are not in the table, because figures are not available for them, but sea plants in general contain most of the mineral elements of the sea, with some of them highly concentrated from sea water (See Table 1.5. As we saw in Chapter 1, the mineral content of sea plants is close to the same proportion as the mineral content in the nuclei of your cells, evidence of the interconnectedness of all life on the cell level. Sea plants are, in general, a better source of minerals than sea salt, because the proportion of minerals are closer to those in the human body. See Table 26.25 for a comparison of the proportions of minerals in kelp, sea salt, and human breast milk. Both kelp and sea salt have substantially more sodium than breast milk, with 280 mg in 5 grams of kelp, 490 mg in one-half teaspoon of sea salt, and only 15 mg in human breast milk — evidence that these should be supplemental rather than primary foods. The upside of sea vegetables for Americans in the 1990s is that harvesting sea vegetables cannot deplete the ocean the way farming does to the soil, and they contain the same rich mineral content that our ancestors valued so highly. Because seaweeds grow in coastal waters, and because our civilization uses those waters as a toilet for human and industrial wastes, it is important to get seaweeds from clean areas of the coasts. I lists several sources in the Appendix section.

Table 6.24

Mineral content of some seaweeds (per 100g)

	kelp*	Irish moss**	wakame**
calcium (mg)	3040	72	150
iron (mg)	1.6	8.9	2.18
magnesium (mg)	867	144	107
potassium (mg)	2110	63	50
zinc (mg)	0.06	1.95	0.38
copper (mg)	0.13	0.149	0.284
manganese (mg)	0.76	0.37	1.4
vitamin A (I.U.)	6600	118	360
folate (mcg)	n.a.	182	196

*Fucus vesiculosus, from Pedersen, 1993
**From U.S.D.A., 1997

Table 6.25

Comparative mineral content of kelp and sea salt to human breast milk

Mineral	5 g. kelp	%*	½ t sea salt	%*	100 ml breast milk	%*
calcium (mg)	8.5	43.93%	35	34.55%	2.2	7.43%
iron (mg)	0.14	0.75%	1	0.99%	3.8	12.84%
magnesium (mg)	6.1	31.64%	4	3.95%	7.2	24.32%
potassium (mg)	4.5	23.27%	57	56.27%	2.9	9.80%
zinc (mg)	0.06	0.32%	4.2	4.15%	9.2	31.08%
copper (mg)	0.00	0.03%	0.04	0.04%	1.8	6.08%
manganese (mg)	0.01	0.05%	0.063	0.06%	2.51	8.48%

* Percent by weight of the seven minerals listed. Kelp and sea salt both contain large amounts of sodium relative to breast milk (See text).

A healthy dose of kelp is 1-3 grams, dried, a day. If you have thyroid disease, you should avoid kelp, however. Kelp contains a large molecular weight carbohydrate called algin, which may bind to the minerals or impair their absorption in the intestine. Algin extracts are sold separately as weight loss products, because they inhibit caloric absorption. It is my opinion that the algin in seaweeds, at 1-3 grams doses, does not effectively inhibit the absorption of minerals, because I have seen so many individuals benefit from the addition of kelp to their diet. Individuals who have trouble digesting it may put it soups the way the Japanese do. Larger doses, with more algin, may begin to inhibit the absorption of other foods, and begin to cause imbalances. Take seaweeds as they are, roast them lightly, grind them up and use them like salt, or cook them in soups. Don't cook them for more than about 30 minutes, however, because this can release toxic heavy metals from plants harvested from polluted waters (Drum, 1997)

Herbs and spices

Traditional herbal medicines and cooking spices contain large amounts of minerals and trace elements. An ounce of many dried herbs contains far higher mineral content than even three ounces of fruits, vegetables, or other plant foods — sometimes more than ten times the amount. Table 26.26 lists the mineral content of some herbs that are traditionally consumed in beverage amounts. To get this kind of mineral content, buy herbs that have been harvested in the wild (or harvest them yourself). Farmed herbs are subject to the same dynamics of soil depletion as other agricultural plants. The best way to get the mineral content from these herbs is to put an ounce each of two or three of them in the bottom of your drip coffee maker. Add water to the back, and let the herbs simmer on the hot plate for a few hours, stirring occasionally, and crushing the plant material from time to time.

Table 26.27 shows the mineral content in a tablespoon of several cooking spices. Even these small amounts of spices contain significant amounts of minerals, especially iron and the trace elements. Add herbs to soups, or to the hot oil in stir fries before adding the vegetables or other foods. You can also knead them into ground meats.

Table 6.26

The Mineral Content of Selected Herbs

Herb		Mineral (mg per ounce)							
	Calc	Chrom	Iron	Mag	Mang	Pot	Sel	Sil	Zinc
Alfalfa	299	0.03	0.87	76	0.08	400	0.00	0.00	0.00
Burdock	244	0.01	4.9	179	0.20	560	0.05	0.75	0.07
Catnip	205	0.09	4.6	69	1.25	783	0.41	0.00	0.00
Chickweed	403	0.04	8.4	176	0.18	280	0.14	0.19	0.17
Comfrey leaf	600	0.06	0.4	23	0.19	566	0.04	0.30	0.00
Horsetail	630	0.01	4.1	145	0.23	520	0.04	1.29	0.00
Kelp	1013	0.02	0.5	289	0.25	703	0.06	0.03	0.02

Licorice	292	0.06	2.9	321	0.16	380	0.00	0.53	0.01
Marshmallow	272	0.05	3.8	172	0.15	403	0.11	0.10	0.00
Nettle Leaf	966	0.13	1.4	286	0.26	583	0.07	0.34	0.16
Oatstraw	476	0.13	0.4	400	0.02	90	0.04	0.61	0.00
Peppermint	540	0.00	2.0	220	0.02	753	0.04	0.00	0.00
Red Clover	436	0.11	0.0	116	0.20	666	0.03	0.04	0.00
Red Rasp.	403	0.04	3.3	106	4.8	446	0.08	0.04	0.00
Skullcap	151	0.02	0.8	37	0.16	726	0.03	0.16	0.29

(Pedersen 1994)

Table 6.27

Minerals in some common cooking spices (per tablespoon)

	Cumin seed	Ground oregano	Paprika	Ground thyme
Calcium (mg)	56	71	12	81
Iron (mg)	4	1.99	1.62	5.3
Magnesium (mg)	22	12.1	12.7	9.5
Potassium (mg)	107	75	161	35
Zinc (mg)	0.29	0.199	0.28	0.266
Copper (mg)	0.05	0.04	0.04	0.04
Manganese (mg)	0.2	0.21	0.058	0.34

(U.S.D.A., 1997)

Summary

The changes above may seem overwhelming, and some of the foods may require some effort to find. Weston Price found that traditional people often went to great lengths to obtain nutritious foods — sometimes walking dozens of miles or breaking ice in a winter storm to get a certain mineral-rich plant. As Americans in the 1990s, we may have to put out effort as well. The foods I recommend here may be more expensive than what you are eating. I contend that they are not more expensive per unit of nutritional value than supermarket foods. An herbalist I know tells her clients: “I you won’t spend time getting well, you’ll spend time being sick.” My corollary to that is: “If you won’t invest in your health, you’ll first spend time feeling sick, tired, anxious, and depressed; then you’ll spend a lot of time and money on your chronic illnesses; and finally, you’ll die sooner.”

In my experience, dietary changes are most difficult in the first six weeks. Our dietary tastes are habits, not ingrained. If you’ll invest some extra effort during the first six weeks, your appetite will gradually change, and you’ll start looking forward to the new more-nutritious foods.

The changes I recommend here are almost all delicious foods. Have a ball and enjoy the food. The nutritional urge is one of the most fundamental, and when your body starts feeling nourished, you will feel like jumping up and dancing. As I described above, I recommend changes in three stages: additions, substitutions, and, finally, eliminations. And you can still eat some "forbidden" foods every week or so, on the occasion of a feast. The following sections summarize the recommendation in this chapter.

First step: Additions

More fruits and vegetables, including homemade pickles and sauerkraut.

Fresh-made vegetable juice.

Wild fish one or two days a week.

Fermented soy products, such as tempeh and miso, one or two days a week

Organic organ meats, such as liver, one day a week.

Soak your grains overnight before cooking them

Extra-virgin olive oil for stir-frying or salad dressings.

Sea vegetables, especially kelp, as a supplementary vegetable or condiment.

Butter, if you've previously removed it from your diet for health reasons.

Blackstrap molasses as a condiment and an addition to cooked foods

Fresh, refrigerated flax seed oil.

Fresh ground organic flax seeds, as a condiment

Herbal teas.

Second step: Substitutions

Fresh vegetables for canned or frozen varieties.

Homemade soups for canned varieties.

Organic fruits and vegetables for supermarket varieties

Lamb or game meat for other red meats.

Wild fish for other meats.

Whole grains for processed varieties.

Fresh-cracked grains for commercial flours and oatmeal.

Porridges from presoaked grains for bread.

Whole raw milk for pasteurized milk

Fermented dairy products, such a yoghurt, for milk.

Molasses for other sweeteners.

Olive oil and butter for refined vegetable oils.

Fresh-made vegetable juices or naturally sweetened herbal teas for soft drinks and sugar-sweetened juices.

Sea salt for table salt.

Third step: Eliminations

All forms of sugar, including hidden sugars in soft drinks and most processed foods.

Deep fried oils.

Refined vegetable oils

Margarine and other hydrogenated oils and shortenings.

Caffeine, nicotine, and alcohol.

Over-the-counter drugs.

Conclusion

I began this chapter asking whether dietary changes can cure disease. I've presented facts throughout the Chapter suggesting that they can. For some graphic photographic evidence, see The five-year-old boy had been suffering from arthritis, rheumatic fever with heart involvement, and severe tooth decay, and had to spend most of his time in bed. Doctors had declared that he would not recover. Weston Price suggested a simple nutritional program that included the elimination of sugar and white flour products and their replacement with fresh-cracked or ground whole wheat. Small amounts of high-vitamin butter from cows pasturing on green wheat were added, along with small doses of vitamin-rich cod liver oil. Liver, fresh raw whole milk, and liberal amounts of green vegetables and fruits were included. Bone marrow was added to stews. These were the only changes that could account for the radiant health of the boy after one year. Six years later, his mother reported that he was taller and heavier than average for his age, and ate and slept well.

If these simple dietary changes, emphasizing vitamin and mineral rich whole foods as they occur in nature, can restore health in such an advanced organic disease as this, it can benefit the many functional diseases that beset us — fatigue, depression, anxiety, immune depression, and so on. Notice that animal foods, including fat, meat, and butter, were key parts of the program. In the Chapter 7, I will question the long-term therapeutic value of both low-fat and vegetarian diets.

Chapter 7

Therapeutic diets

Several diets in the U.S. — low-fat, vegetarian, and macrobiotic — have reputations as “healthy” diets. Although the short term benefits of these diets are well-documented, people who follow them for too long may develop mineral and other deficiencies.

I was fortunate enough in 1979 to meet Dr. Paavo Airola, a naturopath and a popular writer on nutrition in the 1970s and 1980s, before he died. He explained something at the time that clarified many of my questions about diet, and which has stayed with me ever since. He said: “You have to understand the difference between a therapeutic diet and a sustaining diet.” A therapeutic diet can help cure disease, especially the Western diseases. After a time, however, it may cease to sustain health, and begin to cause deficiency syndromes. Many adherents to therapeutic diets initially obtain tremendous health benefits, some even apparently miraculous. They then become almost religiously attached to the diet. If they become too dogmatic, when the deficiencies begin to set in, they will deny that they are due to the diet, and fail to make a transition to a healthy sustaining diet. The modified sustaining diet usually can retain most of the beneficial elements of the therapeutic diet, but requires the reintroduction of foods formerly thought of as “forbidden.” In this chapter, I’ll describe three types of diets that are excellent therapeutic diets, but which may cause problems if adhered to dogmatically for a long time.

Low fat diets

The contemporary therapeutic diet with the most scientific validation is undoubtedly the low-fat diet, urged today to prevent heart disease and some forms of cancer. The Ornish and Pritikin Diet plans, both of which can reverse serious atherosclerosis, employ a radically low-fat diet (less than 10% fat), increase fruits and vegetables, exclude sugar and processed foods and encourages exercise. The fat content of these diets is modeled after that in Japan and many third-world countries where levels of heart disease, cancer, and other Western diseases are low. The problem with multiple dietary changes like this is that the results cannot be attributed to any one of the factors. The benefits may be due entirely to the exclusion of sugar and processed food, the increased fruits, vegetables, and exercise, and have nothing to do with the decreased fat. China and Japan have low fat diets and low incidence of degenerative disease, but so does France, where people consume a high-fat diet. The Chinese and Japanese also have low consumption of sugars and processed foods, which could account for the lower disease rates as well. People in some areas of Mediterranean countries consume 30% fat in their diets — mostly from fish and olive oil — and also have low rates of heart disease and cancer. Weston Price found that many traditional peoples consumed about 35% fat in their diets — all of it from animals yet remained free of Western disease. Other epidemiological evidence suggests that animal fat, in the context of a traditional diet low in processed foods, is actually healthier than fat from oil source:

- A study compared the health of Jews living in Yemen, who consumed only animal fats and no sugar, to that of Jews in Israel, whose diets include vegetable oils and margarine and 25% caloric intake from sugar. The Yemeni Jews had little heart disease, but those in Israel had high levels, as well as more diabetes (Cohen, 1963).
- A similar trial compared groups in northern and southern India. Those in northern India, who consume seventeen times more animal fat, had only one-seventh the risk of heart disease (Malrotha, 1968).

Table 7.1

Heart attacks per 100,000 population

Country	Rate	Fat in the diet
Japan	34	low fat, high fish consumption
France	58.6	high fat, high butter consumption
Italy	94.7	high fat, high olive oil consumption
United States	170	high fat, low fish, butter, and olive oil consumption

(U.S.D.C., 1996)

Table 7.2

Life expectancy and fat consumption

Japan	79.6	Low fat, high fish consumption
Austria	79.4	high fat
Canada	79.1	high fat
France	78.4	high fat, high butter consumption
Greece	78.1	high fat, high fish and olive oil consumption
Sweden	78.1	high fat
Italy	78.0	high fat, high olive oil consumption
United States	76.0	high fat

(U.S.D.C., 1996)

The low-fat dietary dogma also ignores inconsistencies in many contemporary scientific trials. For instance:

- The Framingham Heart Study, initiated in 1848, investigated the diets of about 6,000 people in the town of Framingham, Massachusetts. The health of a group consuming little cholesterol and saturated fat was compared, at five year intervals, with a group who consumed more. This study is often cited as proof of the link between high blood cholesterol and the risk of heart attacks. What most commentators do not mention, however, is that the heart attack risk is inversely correlated with consumption of cholesterol and saturated fat. The current director of the study states: “In Framingham, Mass, the more saturated fat one ate, the more cholesterol one ate, the more calories one ate, the lower the person’s serum cholesterol . . . we found that the people who ate the most cholesterol, ate the most saturated fat, ate the most calories, weighed the least and were the most physically active (Castelli, 1992).”

- A trial in Britain compared the health of a group of men who reduced saturated fat and cholesterol in their diets, quit smoking, and increased their intake of margarine and vegetable oils with another group who did not make these changes. After 12 months, twice as many men on the “good” diet had died, even though the other men continued to smoke (Rose, 1983)
- The U.S. Multiple Risk Factor Intervention Trial compared the diet and mortality of more than 12,000 men. Those who smoked less, and consumed less saturated fat and cholesterol had a slight reduction in heart attacks, but their overall mortality from all causes was higher (JAMA, 1982)

Despite some inconsistencies like these, a positive correlation between total fat and animals fat probably does exist in Western societies. But that correlation does not exist in a vacuum. Low exercise, low consumption of fruits and vegetables, high consumption of sugar and refined foods, high margarine consumption, and progressive demineralization of the soil and foods grown from it also exist. We simply don’t know, scientifically, which of these factors causes the disease. Low fat diets and a reduction of animal fat may make sense if you otherwise continue to eat the Standard American Diet. The need to do so may disappear if you make the kind of dietary changes recommended in the last chapter, and exercise at a reasonable level. Exercise is not the subject of this book, but thirty to forty-five minutes of simple walking a day will cut your risk of heart disease in half, and your risk of cancer by a third, changes which may greatly outweigh any risk that comes from consuming animal fat.

Current research indicates that the best predictor of atherosclerosis is not serum cholesterol, but high levels of the protein metabolite homocysteine. Vitamin B6, vitamin B12, and folic acid, all of which are high in animal products and which are removed in the processing of whole grains, will lower serum homocysteine levels. The antioxidant mineral selenium is also associated with atherosclerosis, and the antioxidant vitamin E will dramatically reduce risks of a heart attack. The consumption of fat, in the presence of adequate levels of these vitamins and minerals, may have no correlation to atherosclerosis at all.

The long term effects of low-fat diets on Americans is not known. My chief concerns about them are:

1) They may also be low in essential fatty acids.

2) They may be low in the fat-soluble vitamins A, D, and E.

3) They may be low in minerals and trace elements.

3) When people binge on fat or oils while otherwise following a low-fat diet, they may consume large amounts of an unhealthy oil.

Case #1

I had a client recovering from surgery for breast cancer who was afraid to eat tofu because it is "high fat." The fat in tofu, however, is about 50% essential fatty acids, and should not be lumped with the deep fried oils in fast food french fries.

Case #2

A forty-six year old man began to develop high cholesterol and triglycerides, and consulted a naturopathic physician for advice. He eliminated wheat (an allergen for him) from his diet, and ate a completely vegan diet — no meat or dairy products — with no added oil of any sort, for a month. At the end of this time his cholesterol had returned to near normal, and he triglycerides had dropped substantially. The doctor discussed publishing the case in a journal as a demonstration of the possible effects of diet on cholesterol in a complaint patient. After another thirty days, the "bad" cholesterol had returned to the normal range, but his triglycerides shot up to four times the high normal level. The doctor decided that he had genetically high triglycerides.

A review of the diet diary showed that the man went to a movie theater once or twice a week and ordered unbuttered popcorn. Even unbuttered popcorn contains large amounts of palm kernel oil, however, and a dietary analysis showed that he was getting 9% of his weekly calories from the two servings of popcorn. The single oil in the diet completely unbalanced his ability to regulate blood lipids. He returned to his normal diet, which was mostly vegetable but included some commercial chicken. The cholesterol remained just above the high normal level, and the triglycerides dropped in half to twice the high-normal levels. A year later he introduced regular fish and organic-only vegetables to his diet, and all blood lipids returned to normal levels.

The original Pritikin diet allowed no added fat or oil at all. Compliance with the diet was poor, and those who could stay with it soon developed fatigue, difficult concentration, depression, weight gain, and various mineral deficiencies (Gittleman, 1980). Pritikin then modified the diet to include about 10% calories from fat. If you are following the Pritikin or Ornish diets, there is no reason, from the point of cardiovascular health, not to add fish to your diet. Fish have a protective effect on the heart and arteries. It remains to be seen whether these diets are healthy sustaining diets. Pritikin died in his early sixties. Proponents of the diet point out that his arteries were free from atherosclerosis, although his coronary arteries had been blocked with it during his forties. Nevertheless, he died of leukemia about a decade earlier than the average life expectancy for men in the U.S.

This section is not an invitation to chow down on hamburgers, or to ignore your level of obesity. But the demonization of animal fat is inconsistent with known epidemiological evidence from traditional societies who were completely free from the Western Diseases now attributed to fat consumption.

Vegetarianism

A vegetarian diet is perhaps the most famous of the “healthy” diets. It is not a natural diet for humans, however. The closest thing to a vegetarian diet that Weston Price found among traditional people was that of the Alpine Swiss. They consumed mostly grains and dairy products, but ate meat about once a week. One set of African tribes ate mostly agricultural foods, but they also consumed some meat from cattle and goats, frogs, insects, and ate insect eggs. The rest of the traditional people studied consumed large amounts of meat, and all groups were free of the most common diseases in the West today.

In our clinic in Boulder, we see a steady stream of sick vegetarians, perhaps forty percent of our clients. They are usually fatigued, depressed or anxious, with low-grade inflammatory conditions, frequent colds, and often try compensate for these problems by smoking too much marijuana. We have dubbed them the “fast food vegetarians,” because, although they refrain from meat, they do *not* refrain from sugar, processed flour and oils, and other mineral-depleting foods, and don’t take the time to cook nutritious meals. A typical breakfast might be a bagel (with white flour and sugar) and cream cheese. No meat, but nothing else nutritious either. As we’ll see below, it may be possible for Americans to maintain health on a vegetarian diet, but they have to work at it, and be even more careful than meat eaters about eating the “foods of civilization.”

I followed a strict vegetarian diet from 1973 until 1986, and was mostly vegetarian for another five years. When I first adopted the diet, I was quite sickly, and the combination of a vegetarian diet, stopping my addictions, and regular exercise restored me to a level of health I did not think possible. For the first twelve years, I was so healthy that I did not take so much as an aspirin for medication, and only rarely took mild medicinal herb teas. Eventually, however, I was forced to start eating meat when I became so run down I couldn't function at my job, and became allergic to many of the foods I ate. My spiritual teacher at the time, from the Hindu tradition, advised that I should not eat meat until I had asked myself a thousand time whether I could maintain a healthy body without participating in the killing of animals. I asked the question of myself for more than a year, and ultimately concluded that I needed the meat. My health improved after I did so. My experience, which may have been caused by the demineralization of our food supply during those years, is not unique. Most of the people I know who were vegetarians in the 1970s now eat at least some meat. The only long-term vegetarians I know today who appear to be in robust health are members of some religious groups who are very careful to avoid sugar and processed foods, who eat only organic fruits and vegetables, and who take the time to cook abundant hearty well-rounded meals.

The roots of American vegetarianism

Vegetarianism as an ideology came to the United States through three main routes: 1) The Seventh Day Adventist movement of the mid-1800s, 2) The Theosophical movement of the late 1800s, which was strongly influenced by Hinduism, and 3) The German naturopathic movement, coming to American at the turn of the century.

Vegetarians in India

The Hindu religion calls for a vegetarian diet. I will not debate this religious point, and I personally have high regard for the Hindu religion and the many saints it has produced. But I also notice that the different religious traditions, revealed in different times and places, have different dietary rules. These may be especially important to the regions in which they arose. In tropical regions, body-heat regulation is essential, especially when the outside temperature rises above the 98.6 degree temperature of the body. At that point, any kind of heat-generating motion, or even a slight breeze, heats the body rather than cools it as it would in a colder climate. The only available ways to cool the body are to sit still, drink liquids that are cooler than body temperature, consume spices that promote sweating, and reduce the intake of "heating" foods such as meat. It is also difficult to maintain meat in a sanitary condition in hot tropical climates. Indians also cook and season their food in a way that optimizes absorption of minerals, which are more difficult to assimilate from plants than from animal foods.

I once spent a week in Calcutta in July, with temperatures average about 115 degrees during the day. I was amazed to see how fast the food spoiled there. The scraps of a leftover lunch would be moldy and decayed by late afternoon. I'm sure that meat goes bad very easily there. I lived almost exclusively on fruits and yoghurt during that week, because they were the only foods I had an appetite for. Finally, for contemplative spiritual purposes, a vegetarian diet calms the mind and cools the passions. Indian yogis traditionally follow a vegetarian diet, which promotes their meditation, but they also spend hours of the day sitting still, and do not work in the world, and thus have reduced nutrient requirements.

Indians may also be better adapted genetically to vegetarianism. We saw in the last chapter that the EPA from fish and wild game is the most easily metabolized of the essential fatty acids. To manufacture EPA from vegetable oil sources (alpha-linolenic acid) requires a complicated pathway involving four enzymes and several vitamins and minerals. It is possible that Indians have developed these pathways efficiently over their many generations of vegetarianism. An active American, descended from fish and game-eating Europeans, leading a busy active life in a cold climate, and not taking the time to cook and season the foods as the Indians do, and eating progressively demineralized American plant foods may well not thrive on a vegetarian diet.

India as a nation is not exclusively vegetarian, but comes closer to it than any other society. Even in India, a vegetarian diet may not be optimum, from a health point of view. The life expectancy in India is less than sixty years. Even adjusted for the high infant mortality rate, it rises only to about sixty-four, more than a decade less than even Americans who eat a poor diet. The vegetarians of southern India have one of the shortest average life spans on earth (Abrams, 1980). Furthermore, even vegetarians in India consume meat in the form of insect and larva contamination of grains. They make a significant enough contribution to the diet that when Indian vegans move to England, where food products have higher standards of cleanliness, their develop higher rates of pernicious anemia, due to a lack of vitamin B-12

Seventh Day Adventists

Several clinical trials have shown that vegetarian Seventh Day Adventists are generally healthier than the average American. These studies are sometimes put forward as proof that vegetarianism is a healthy diet. Adventists have lower rates of atherosclerosis and some kinds of cancer. These benefits may not come from the absence of meat, however, but from the absence of sugar and refined foods, and from other foods they *do* eat. Seventh Day Adventists eat no refined foods, and eat plenty of fruits and vegetables. It is possible that the health benefits are due entirely to these other dietary factors. I tell my clients that if they want to be vegetarian, they should model their diets after the Adventist diet.

The naturopaths

Although the German naturopaths advised and employed vegetarianism as a therapeutic diet, there was no consensus among them that it is a sustainable diet. Vincent Priessnitz, the founder of the German naturopathic movement, fed his patients high quality meat and milk to give them strength to endure the cold-water hydrotherapy treatments he administered. J.H. Rausse, a successor to Priessnitz, lived in America for a time among the Osage Indians, hunting and eating wild fish and game. Vegetarianism was only introduced into the naturopathic movement in Germany by Theodore Hahn, fifty years after Priessnitz had launched it. Hahn, who followed this diet for his entire life, died at age fifty-nine. Influential naturopath Arnold Rikli, who practiced nature cure for the last fifty years of the nineteenth century, then promptly rejected vegetarian diet as a sustainable one. Under Hahn's guidance, Rikli had adopted a vegetarian diet at age thirty-eight. His health thrived for about twelve years, Eventually he developed chronic fatigue, heart palpitations, poor mood, brittle fingernails, and a loss of body heat, all signs of mineral deficiency, and the same set of symptoms I see on long term vegetarians in our clinic today. After two years of eating a small portion of meat each day, all the symptoms disappeared. He concluded that vegetarianism was excellent as a temporary therapy, but not suitable for everyone as a permanent diet. He also stated that a patient's occupation and constitution must be taken into account when deciding the optimal diet: "A diet which may be right for the blacksmith may not be right for the tailor." Rikli lived to be eighty-three years old, outliving the vegetarian Hahn by thirty-four years. The succeeding German naturopaths invariably used a vegetarian diet therapeutically, but did not approach it dogmatically, and most fed their patients meat occasionally and ate it at least occasionally themselves. Heinrich Lahmann, who practiced at the end of the nineteenth century, fed his spa patients a nice feast once a week:

> *It is certainly good for the neurasthenic [chronic fatigue patient], in fact for everybody, to deviate from his ordinary [healthy] diet once every week or two; I even arrange for this in my sanatorium by giving stimulating dishes every now and then. This is not only harmless, but even useful. The important point is, how we feed ourselves the other six days of the week. (Kirchfeld and Boyle, 1994)*

The great American naturopath Henry Lindlahr, who ran a 200-bed inpatient facility in Chicago in the first decades of this century, severely criticized ideological vegetarians for their mental rigidity. He stated that he ate some meat from time to time simply to prevent that sort of thinking from arising in his mind. Lindlahr had a radical turnaround in his health by adopting a vegetarian diet at about age forty. He had been dying of diabetes before that. He maintained this mostly-vegetarian diet for another twenty-two years, until he died at age 62 of a simple infection, presumably from a deficient immune system.

Vegans

A vegan is a vegetarian who eats no animal products at all, omitting even dairy products and eggs. This is an excellent short-term therapeutic diet, especially for someone deficient and poisoned by modern foods. The omission of dairy, a common allergen, helps many people to regain their health. This diet is even a poorer sustaining diet than a broader vegetarian diet, however. The change in my own diet in the mid 1980s that precipitated my general failure of health was eliminating dairy from my already-vegetarian diet. Within two years, I was so run down that I could hardly maintain a job.

Deficiencies in vegetarians.

If Arnold Rikli emphasized that we need to consider constitution and occupation when selecting the diet, we also need to consider time and place. As we saw in Chapter 3, our foods, especially our fruits and vegetables are rapidly losing their mineral content — perhaps 25% of calcium, magnesium, and the trace elements in the last thirty years. Even if strict vegetarian diets still have some short-term therapeutic value for the average American today, they are even less a sustainable diet than they were in Germany a hundred years ago. Vitamins and minerals are more poorly absorbed from plant foods than from meats. The vegetarians I see in our clinic today generally have three or four of the functional deficiency syndromes listed in Table 5.2, as well as chronic allergies, inflammation, and infections. As therapy, I advise them to remove all sugars and other refined foods from their diet, and start eating only organic fruits and vegetables and high-quality, omega-3 rich fish and, if they have a taste for red meat, grass-fed organic lamb. Unfortunately, most are unwilling to change their dogmatic attitudes, and want a magic-bullet herbal treatment for their problems instead.

Table 7.3

Omega-3 fatty acid composition of human breast milk (% of total fat).

People	%
Japanese	2.5
American	1.9
Vegan	1.5

The macrobiotic diet.

The Zen Macrobiotic diet was developed by George Ohsawa in the mid 1900s, and has been widely promoted in the U.S. by his student Mishio Kushi ever since. As a movement, macrobiotics has had a strong influence on the awareness of the value of whole natural foods among the American public ever since the early 1970s. The diet is based on the use of traditional Japanese foods such as rice, soy products, and seaweeds. I classify it as an excellent therapeutic diet for most Americans, but as a sustaining diet, it has severe pitfalls.

The upside of the macrobiotic diet is that it emphasizes whole, organic, unrefined foods along with the consumption of healthy soy products and mineral-rich seaweeds. It thus eliminates virtually all of the "foods of civilization" and provides excellent dietary therapy for many of the Western diseases. The downside is that, although macrobiotics promotes some traditional foods, it is less enthusiastic about one of the most important Japanese food categories: fish and other sea animals. Although macrobiotic adherents are "allowed" to eat some fish, a vegetarian version of the diet is encouraged.

The macrobiotic diet, as promoted in the U.S., is no one's traditional diet, but is a recent theoretical invention. The term macrobiotic was borrowed from the German Julius Hensel, who I discussed in Chapter 3. Ohsawa added a version of the yin and yang theory of Asian philosophy and medicine to Hensel's organic vegetarian dietary model. This version of yin and yang theory differs in some substantial ways from that of traditional Chinese medicine, however. I studied Chinese medicine in a medical school, and find the basis for the macrobiotics version of yin and yang incomprehensible. In traditional Chinese medicine, meat-eating is encouraged, and is in fact prescribed medicinally. The macrobiotic adherents consider most meat to be too yang, and avoid it.

Mineral and other nutrient deficiencies from long-term macrobiotic diets are well-documented in the scientific literature. The most common deficiencies are of Vitamin D and B12, iron, and protein (A.C.S., 1989, 1993). The progressive demineralization of our vegetable foods may also mean more serious problems for dogmatic macrobiotic practitioners in the future, although their regular consumption of mineral-rich sea vegetables may prevent this.

Conclusion

The apparent benefits of the three diets discusses here can ultimately be the source of problems for adherents of the diets. After experiencing the initial benefits, individuals may develop a kind of religious attachment to the diet. Then, as long term mineral deficiencies begin to develop, it becomes difficult to make the changes. Each of the diets here is composed mainly of plant foods. In the next chapter, I'll briefly discuss factors that affect the assimilation of minerals, including the difficulty of obtaining minerals in a useable form from plants.

Chapter 8

Absorption

"You're not what you eat, you're what you absorb."

Joe Boucher, N.D.

You can eat a mineral-rich diet and still develop deficiencies! As far as the body is concerned, nutrition only happens at the cell level. The foods containing the minerals have to be digested, the minerals transported from the digestive tract to the blood and on to the cells, and then across the cell membranes. In this chapter, I'll discuss the factors that affect the assimilation of the minerals.

Availability in foods

In Chapter 2, I listed the nutrients present in a large number of foods. Don't expect to take in everything on the list. Table 8.1 shows the percent of minerals that are absorbed in a typical diet that includes both plant and animal foods. We absorb, on the average, only about half the mineral nutrients that we eat. Vegetarians consuming exclusively plant foods have even poorer absorption. About 35% of iron from animal sources is absorbed, but only 2.9% of that from plant sources. This is why Table 8.1 shows an average of only 5-15% for individuals who mix plant and animal foods — the plant foods pull the average down. Under the section on grains in Chapter 6, I described how phytic acid in plants also inhibits the absorption of some minerals, especially zinc. A progressive zinc deficiency is common in vegetarians as they persist in the diet over a number of years. The mineral availability in plants can be increased by soaking or fermenting them.

Table 8.1

Net absorption of minerals on diets containing mixtures of plant and animal foods

Mineral	Percent absorption
Calcium	5-40
Chlorine	>95
Chromium	1-3
Cobalt	>50
Copper	25
Fluorine	80-90
Iodine	>50
Iron	5-15
Magnesium	25-50
Manganese	<5

Molybdenum	40-50
Phosphorus	50-60
Potassium	80-90
Selenium	>50
Sodium	>95
Zinc	33

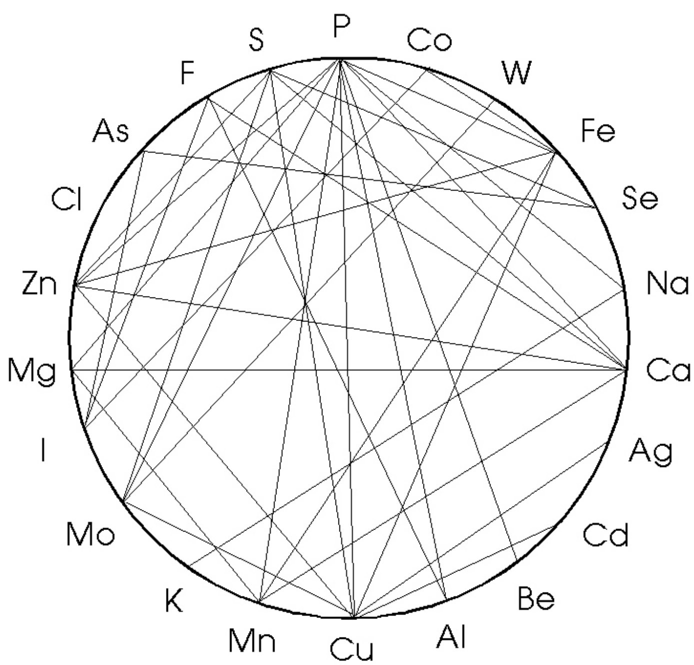
(Braunwald et al, 1987)

Interactions between minerals

Minerals and vitamins must also be taken in a balanced way for optimal absorption. Figure 8.1 diagrams the interactions between just the minerals. Either mineral deficiencies or excesses can inhibit the absorption or metabolism of a number of other minerals. All the minerals in the Table affect or are affected by at least one other mineral, and phosphorus interacts with at least ten of them. If we added more of the trace elements to the chart, including those which are not yet proven to be essential, the interactions would be even more complex.

Figure 8.1

Figure 28.1
Interactions between minerals



Lines indicate that one mineral alters the absorption, metabolism, or excretion of the other.

(Ensminger et al., 1983)

The minerals act together like the musicians in a symphony orchestra. If a few key musicians don’t show up, the whole orchestra fall apart. And if a few of them start playing too loud, hogging the show, the others put down their instruments and quit. These complex interactions can be seen in the pathology of the deficiency disease pellagra:

1)Vitamin B3 becomes deficient.

2)Vitamin B2, B6, and the amino acid tryptophan are also likely to be deficient.

3)The B3 deficiency impairs the absorption of Vitamin C.

4)The vitamin C deficiency impairs the absorption of iron.

5)The iron deficiency causes excess absorption of copper

6)The copper excess inhibits nickel metabolism.

7)The poor nickel metabolism further inhibits iron absorption.

These complex interactions are the best argument to get your minerals from a well balanced diet containing a wide variety of naturally occurring plant and animal foods. They also argue against relying on supplements of single minerals, a topic I will cover in Chapter 9.

According to the U.S. Department of Agriculture, adult men and women in the U.S. are, on the average, deficient in both magnesium and zinc (U.S.D.A., 1997b). From the chart, we see that these deficiencies alter the absorption or metabolism of sulfur, phosphorus, iron, calcium, copper, and manganese. Women are also deficient in calcium and iron, which adds cobalt and fluoride to the list. Thus, the average adult American is walking around with disrupted mineral metabolism because of several common deficiencies.

Digestion

Poor digestion also can affect absorption. Some signs of poor digestion are:

- Flatulence or belching
- Nausea
- Pain anywhere in the digestive tract
- Undigested food in the stool
- Offensive breath
- Constipation (less than one bowel movement per day)
- Lethargy or depression after meals

- Food cravings other than normal hunger
- Lack of satisfaction after meals
- Lack of hunger for breakfast

If you have any of these symptoms chronically, I'd suggest you get a medical checkup, preferably by a naturopathic or other holistic physician. Some referral sources are listed in the Appendix section. If they are minor symptoms that do not accompany any specific disease, I suggest you take the following formula of Western herbs for three to six weeks, and see if your overall health and energy don't improve. Take equal parts of chamomile, peppermint, fennel seed, licorice root, and burdock root. Put a handful of each in a pot and add two quarts of water. Simmer over low heat, with a lid on the pot, for one half hour. Strain and store for future use, in a thermos if you have one. Let this be your beverage, and drink at least three cups a day. A handy way to make this, if you have a drip coffee maker, is to put the herbs in the pot (not the strainer) and add water in the back of the coffee maker. Turn it on. The hot water then flows onto the herbs, and the hot plate keeps the herbs at a good simmering temperature without boiling them. You can heat the tea this way for about an hour (less is fine). Strain and store in a thermos to take to work. You can also put new water onto the used herbs one time, as there will still be plenty of potency left in the once-brewed herbs. It's important to make enough of this in advance that you don't have hassle with brewing the tea each time you want a cup. Otherwise you probably won't keep up the practice long enough to obtain the benefits you want. I have often seen seriously run-down clients regain their health within a month using this or similar formulas. The reason is probably the improved absorption of food and the restoration of mineral nutrition to the cells.

Perhaps the most widespread cause of indigestion in the U.S. today is the habit of eating in stressful or hurried situations. Stress inhibits the secretions of stomach acid and other enzymes which are necessary to digest foods and release their mineral content. I know a naturopathic physician who once cured a woman of her stomach ulcers without any dietary changes, herbs, drugs, enzymes or any other physical treatment. He simply had her sit relaxed in a chair in a dark room, close her eyes, and recite her favorite prayer mentally for fifteen minutes before her evening meal. The resulting relaxation properly prepared her system for the digestion of food, and the ulcers went away.

Low stomach acid can impair the absorption of at least eight of the minerals (See Table 8.2). Low stomach acid may be caused by eating under stress, or by aging. Many individuals over age 60 produce low stomach acid, or even none at all. The resulting lack of mineral absorption contributes to the aging process. If you think you have low stomach acid, consult a naturopathic or other holistic physician. Acid supplements are available in some health food stores, but I do not consider them appropriate for self-medication.

Table 8.2

Minerals which require adequate stomach acid for absorption

Chromium
Copper
Iron
Magnesium
Manganese
Molybdenum
Selenium
zinc
(Schauss, 1996)

Herbs which may promote relaxation *and* the secretion of stomach acid and other digestive enzymes are in a class called *bitter nervines*, including chamomile, scullcap, valerian, and wild yam. These herbs will relax you to varying degrees, and their bitter flavor will promote increased flow of digestive secretions. Take them as warm teas a half hour before mealtime. Chamomile and scullcap are also rich in minerals. If any of these herbs increase your digestive pain, stop taking them right away.

Another category of herbs with a stronger bitter flavor are the *digestive bitters*. These include herbs such as dandelion root, yellow dock, or gentian, in increasing order of bitterness. Gentian preparations have been used as digestive bitters at least since the time of the Greeks. Take digestive bitters if you have poor digestion, flatulence, and a dry tongue (which probably means your stomach is "dry" too.) These may be more effective if taken as alcohol preparations twenty minutes before meals. If you have digestive pain, don't take these stronger bitters, because it can increase the pain. You don't need a large dose. Anywhere from three to ten drops is sufficient. The bitter taste on the tongue triggers the digestive secretions.

Absorption

There is no guarantee that minerals, once extracted from digested food, will ever reach the cells in your body. *Malabsorption syndrome* is a recognized problem both in the Western and Third World countries. It often accompanies general mineral and vitamin malnutrition, because you need some of the nutrients in order to absorb others. Taking large amounts of single vitamin or mineral supplements can also cause this problem. Over-the-counter and prescription drugs can cause digestive malabsorption by disrupting the normal balance of the intestinal bacteria, promoting the overgrowth of yeast in the digestive tract, or injuring the gut wall.

Conclusion

One conclusion from the information in this chapter is that we should eat a well-balanced diet with a wide variety of mineral-rich foods. Another is that, if we take mineral supplements, we should take multivitamins and minerals rather than doses of single nutrients. In the next Chapter, I'll discuss supplementation in more detail.

Chapter 9

Mineral Supplements

As the mineral content of our soil has declined, the general consumption of processed foods has increased, and scientists have uncovered widespread mineral and vitamin deficiencies in the population, the health foods business has boomed. Twenty-five years ago, I helped found the first food cooperative in Louisville, Kentucky, so my friends and I could buy brown rice and other whole grains. They were not for sale anywhere else in town. You can now buy brown rice in any large grocery in the U.S. In the early 1980s, I helped introduce the first organic produce for sale in New Haven, Connecticut at a natural foods grocery I managed. We did more than 40% of our business in produce, but due to poor availability, not more than 2-3% of that was organic. In Boulder, Colorado, where I live now, two stores larger than mine in Connecticut have full produce departments with a majority of organic produce. A local Safeway store has an organic produce section larger than the one in my store in 1984. We only did about 5% of our business in supplements in the 1980s, although for some other stores, the figure was more than 90%. This was a conscious decision, because we felt that fresh produce, and whole grains, nuts, seeds, cheeses and other dairy products were healthier foods than supplements. I still do today. In this chapter, I'll discuss mineral supplements. I'll describe the wisest way to use them and compare some different forms.

Balance is important

Considering the progressive demineralization of our soil and food in the last several generations, it is reasonable to supplement minerals in your diet. Take them in a balanced way, however. Review Figure 8.1 and see the complex interactions between minerals. If you take calcium alone it will affect the absorption or metabolism of phosphorus, sulfur, iron, zinc, magnesium, and manganese. These in turn will affect, directly or indirectly, every mineral in the chart! The best way to take them all in their natural proportions is to get them in food, especially from sea plants and animals, from grass-fed meats, wild game, and wild harvested herbs. The plant and animals worlds have concentrated minerals in the proportions necessary to sustain our lives. But if you want to supplement minerals, use a multi-mineral supplement rather than individual minerals. I described in Chapter 5 how we cannot develop a deficiency of a single mineral. Like boats in the same harbor, they all fall when the tide goes out, that is, when we consume a mineral-poor diet. Taking one or a few minerals is the equivalent of using NPK fertilizer, which contains only two or three minerals, on burned out farm land begging for the whole array of trace elements. A physician of natural medicine might recommend one or several individual mineral supplements for a short time in order to correct an imbalance. If persisted in for too long, however, imbalances will result, and I recommend strongly against self-medication with single minerals. Take your multiminerals or trace elements supplements in the context of a healthy diet, because supplements — no matter how fancy or expensive — are not well-absorbed in the context of general mineral malnutrition. Supplements are the ultimate fast food, and like other fast food, will not nourish by themselves.

Potential harmful effects

Some vitamins may be taken safely in amounts much larger than their recommended dietary allowances. This is not the case with minerals. Many minerals have a toxic range close to the therapeutic range. For instance calcium may be taken safely at a dose of about a gram a day. Two grams can disrupt the functions of the parathyroid gland, which regulates calcium metabolism. A herbalist colleague once treated a man for kidney stones. The doctors had been unable to determine their cause. The herbalist determined that the patient was taking large doses of vitamin-C to support his heavy athletic workouts. The form of vitamin C, called Ester-C, also contains calcium, and the patient was inadvertently consumed 2.5 grams of calcium a day. The removal of the supplement and some accompanying simple herbal treatments resolved the kidney stones (Cabrera, 1993. Table 9.1 shows some of the dangers of supplementing individual minerals above their recommended dose ranges. Dangers besides these documented ones may exist, because doctors do not routinely ask sick patients what supplements they are taking, and do not report adverse effects in the scientific literature, as was the case with the kidney stone patient above.

Table 9.1

Some dangers of mineral supplementation

Calcium

Calcium supplementation usually causes no adverse effects at customary doses. Regular doses of over 2 grams daily can cause hyperparathyroidism (Shaker et al, 1986). Too much calcium intake relative to phosphorus intake (greater than 2:1) results in reduced bone strength and interferes with Vitamin K metabolism.

Copper

Supplementation should be done with caution. Elevated levels, sometimes due to contaminated drinking water, can cause profound mental and physical fatigue, poor memory, depression, and insomnia (Nolan, 1983).

Fluoride

Supplementation, even at therapeutic levels, may damage the lining of the stomach (Spak, et al, 1989. Fluoride may also increase the risk of bone cancer (N.C.T.R., 1991)

Germanium

High doses, inorganic impurities in “organic” germanium, and long term supplementation may be toxic to the kidneys (Schauss, 1991; Matsusaka et al, 1988).

Iron

The most common side effects with supplementation are nausea, vomiting, and stomach pain. Recent research indicates that iron should only be supplemented if it is deficient, because an overload in the tissues may cause a wide variety of conditions ranging from frequent infection to cancer (Gordeuk et al, 1987; Halliday and Powell, 1982; Weinberg, 1984)

Manganese

Chronic manganese toxicity may cause irreversible movement and neurological disorders (Donaldson and Barbeau, 1985). Supplementation may also cause high blood pressure or hypertensive headaches (Pfeiffer and LaMola, 1983).

Selenium

Toxicity from overdose may be associated with hair loss, brittle fingernails, muscular discomfort, skin irritation, nausea, fatigue, immunosuppression, and a garlic odor on the breath (Werbach, 1993)

Zinc

Doses of 100-300 mg a day for several weeks can impair immunity (Chandra, 1984)

Forms

Most minerals today come in one of four forms: mineral salts, chelates, ionic minerals, or colloidal minerals. I'll describe each of these below.

Mineral salts

Most commonly found in supermarkets and drug stores, mineral salts are the least expensive of the forms. They are also more difficult to assimilate than the other forms, and the most likely to cause side effects, such as nausea. They are especially poorly absorbed when the stomach acid is low or other digestive secretions are deficient.

Chelated minerals

A chelated mineral is attached to an organic molecule, such as a protein. Chelation from the Greek word for claw, describing how the mineral grips the larger molecule. Many minerals occur this way in nature, and hundreds of scientific studies, in both humans and animals, demonstrate that they are better absorbed than mineral salts. Chelation does not automatically confer better absorption, however. The absorption may depend on the nature of the organic molecule and the requirement of the body for a particular form of a specific mineral. The minerals in Table 8.2 are best absorbed in their ionic form (Schauss, 1996). A chelate will have to be digested and its mineral released from the organic molecule for maximum absorption. Most the minerals in high-quality multiple supplements are chelated. I recommend to most of my clients that they purchase and use a high quality multiple vitamin and mineral supplement with the minerals in the form of chelates.

Ionized minerals

The minerals in sea water occur in an ionized form, like salt dissolved in water. Both the chelates and the ionized minerals are my favorite forms for mineral supplementation. Ionized minerals do not require stomach acid for absorption because they are not bound together into salts that require dissolution, and are not bound to organic molecules that require digestion. They are ready, as is, for transport across the gut wall, according to the body's needs.

The simplest form of ionized minerals is to put some sea salt in your soup. The salt dissolves in the soup (not in your stomach acid) and is present there in ionic form. Several companies (See Appendix) make concentrated seawater supplements that can also be added to soups, breads, or juices. They are naturally high in sodium, so you don't want to overdo them, but they also contain all the minerals of the sea in at least minute concentrations. I have observed dramatic turnarounds in health in some patients with the simple addition of these seawater supplements to the foods in the diet. I also recommend the addition of 1-3 grams a day of kelp to the diet, along with the seawater supplement. Kelp, like other sea plants, concentrates some minerals to many times the level that they occur in seawater (See Table 1.5)

Colloidal minerals

Colloidal minerals are a new arrival in the mineral marketplace, fueled by a popular tape distributed by multilevel marketing companies distributing them. Colloids are tiny clumps of mineral particles suspended in a liquid. Milk is a familiar example of a colloid, with the particles suspended throughout the water base to make a uniform fluid. Colloidal minerals are controversial, and, in my opinion, are a health hazard.

Promoters of these minerals make two major claims: 1) That colloidal mineral products contain more than seventy minerals and trace elements, and 2) That they are better absorbed than other forms. Neither claim can stand up to the facts. Table 9.2 shows an independent analysis of five leading brands of colloidal minerals, commissioned by Alexander Schauss, Ph.D. The table lists all minerals detected at the level of parts per million. The colloidal companies claim in their literature than many other minerals are present at the level of parts per billion or parts per trillion. According to Schauss, modern analytical equipment cannot accurately detect mineral at those levels. A part per million is the equivalent of about a pinch of salt in thirty-two gallons of water. A part per billion would be that same pinch in 32,000 gallons of water. That would be 32,000,000 gallons for a part per trillion. Accurate measurement at such levels is impossible because of background contamination. A single dust particle falling into a test tube would easily yield parts per billion of contamination.

Of the five brands in the table, two contain parts per million of twenty-four minerals, one contains twelve, and two contain only eight — a far cry from the seventy-plus claimed in the company literature. The two with this highest number of minerals also contains toxic minerals, including high amounts of aluminum. I'll discuss the potential toxicity of aluminum below. Recommended dietary allowances for trace elements other than iron are not present in a one ounce dose of any of the supplements. It is my opinion that the benefits claimed in testimonials of users of these products are due to this iron supplementation, which many Americans, especially women, are deficient in. The majority of these products are essentially aluminum supplements, with some iron and insignificant amounts of a few other of the essential minerals and trace elements. If people want to get parts per billion or per trillion of the other elements, they are all present at those levels in sea salt or sea water supplements.

Table 9.1

Minerals present in five commercial samples of colloidal minerals (parts per million)*

	A	B	C	D	E	RDA**
Calcium	0	505	1180	488	517.6	28070
Lithium	0.218	5.564	0	0	5.7	n.a.
Magnesium	0	500	245	402	694.6	10526
Potassium	97.4	13	339	0	26.4	70175
Sodium	22995.8	81	328	55.3	218.8	17543
Beryllium	0	0.368	0	0	0	n.a.
Boron	18.8	2.31	0	0	8.5	52
Bromide	0	0	0	0	3.4	n.a.
Chromium	0	0.841	0	0	0.0132	4385
Cobalt	0	4.167	0	0	2.1	n.a.
Copper	1.3	2.71	0	2.63	0.554	79
Iodine	0	0	0	0	0.006	5.3
Iron	1.3	958.2	330	329	50.3	350
Manganese	0	12.42	0	0	20.1	122

Molybdenum	0	1.921	0	0	1.3	5.6
Nickel	0	9.044	0	0	2.6	n.a.
Phosphorus	9.7	0	0	0	10.5	28070
Silicon	146.9	23.8	42.2	26.2	2.8	n.a.
Strontium	0.2	1.011	0	0	78297.8	n.a.
Sulphur	98.1	5908	0	0	0	n.a.
Tin	0.002	0	0	0	0.09	n.a.
Vanadium	0	1.232	0	0	0.602	n.a.
Zinc	0	32.81	3.8	27.4	13.7	421
Zirconium	0	0.18	0	0	0	n.a.
Total	11	20	7	7	21	
Toxic minerals						
Aluminum	18.2	2741	338	2290	4339.4	n.a.
Arsenic	0	1.18	0	0	2.2	n.a.
Cadmium	0	0.71	0	0	0	n.a.
Lead	0	0.955	0	0	0.006	n.a.

* Other elements may be present at the level of parts per billion or parts per trillion. Modern analytical equipment cannot measure accurately at these levels, and they are clinically irrelevant to living organisms.

(Schauss, 1995)

**Per one ounce of colloidal minerals

Product literature for the companies claim that their minerals are better absorbed than other forms. I performed a thorough search of the MEDLINE computer database of the National Library of Medicine in Bethesda, Maryland, which catalogues scientific articles as far back as 1966. Many absorption studies appear for other forms of minerals, but I could not find a single trial, using either animals or humans as subjects, which analyzed the absorbability of colloidal minerals. Database searching can sometimes miss topics, but two other researchers have done the same investigation, and came up with the same results (Binder, 1996; Schauss, 1996). The best argument against the need for colloidal minerals comes from the multi-level-marketing tape itself. The lecturer cites many clinical trials to prove that mineral supplementation will cure or prevent many diseases. The vast majority of studies he mentions used mineral salts or chelates.

Most colloidal minerals are made from clay deposits which contain high amounts of aluminum silicate. This explains the high levels of aluminum in the products. Clay is of interest in medicine, both human and veterinary, because it can bind to poisons in the gut, and is sometimes used as an antidote for accidental poisoning (Schell et al, 1993; Unsworth et al, 1989; Merideth and Vale, 1987). In fact, it binds toxins so effectively that, if given along with pharmaceutical drugs, it greatly reduces their availability (Thoma and Lieb). Using clay application externally and taking small amounts of clay orally is an ancient tradition in natural medicine in Europe. I've used clay preparations externally with great success for more than twenty years in my herbal practice. It is useful for some skin irritations, such as poison ivy or oak, and for poisonous insect bites, boils, splinters, infections, and other skin problems. Externally, it is such a powerful drawing agent that it will extract not only poisons, but even objects like splinters from wounds. Colloidal minerals, which have most of the elements in the clay removed, do not have these properties.

The internal use of clay — a naturopathic tradition from Europe, has raised questions about potential aluminum toxicity with long term use. The physician literature of one analytical laboratory that specializes in tissue mineral levels lists the internal use of clay as a leading cause of aluminum accumulation on the body (ARL, 1997). The body normally will only absorb what small amount of aluminum it may need from the intestine. That aluminum is then excreted by the kidneys. If there is any compromise of the gut wall integrity, as may occur in ulcerative conditions or intestinal yeast infections, more aluminum can get into the system. If kidney function is impaired, toxic levels can build up in the body, resulting in toxicity to the nerves. Scientists investigating the possibility that clay products can do this found that aluminum in clay suspensions is not only toxic to the nerves, but it can damage the blood-brain barrier, literally breaking its way into the brain to do its damage. Dementia from aluminum poisoning is widely recognized in medicine, and the experiments shows that aluminum in clay can cause this problem (Murphy et al, 1993a and 1993b). The experiments were done in the test tube rather than in human subjects, for obvious reasons. Patients with kidney disease are routinely warned against taking aluminum-containing antacids, and such patients should also avoid the internal use of clay or colloidal minerals. Unfortunately, many cases of kidney disease are "silent" and undiagnosed until they reach emergency proportions.

Conclusion

Mineral supplementation may have its place in our diets, but I strongly recommend that you do not use them as “fast-food” replacement for an otherwise healthy diet. Mineral-rich foods, such as seaweeds, blackstrap molasses, and wild-harvested herbs, contain their minerals in natural and easily assimilable forms, and in the balance and proportions we need. The addition of a balanced diet of the natural foods in Chapter 6 will provide all the minerals you need.

Closing Note

Spiritual considerations

Traditional peoples throughout the earth consider that the earth is our mother. Look back at chapter 1, and see how we literally must “nurse” from the earth and nature to obtain the minerals our body needs. Our culture, unfortunately, has lost this view, and view the earth an inanimate, dirty object to be exploited. We think we can do better with our technology, our medicines, and our fortified foods. As a society, we are now paying the price for that disrespect of the earth, through the widespread functional mineral deficiencies, organic diseases, and the misery associated with them.

An Islamic sufi tradition says that in the time of Noah, the people ridiculed him by throwing excrement into the ark, completely fouling it. They then developed sores all over their bodies, and found that the only thing that would cure them was the excrement they had put in the ark. They scrubbed the ark clean again to cure their sores. In a similar way, we, as a people have abused and disrespect the earth. We get a better deal than the people of Noah’s time. We don’t have to eat our pesticides, garbage, and toxic waste to regain our health. We only need to return to a diet rich in the minerals of the earth.

The minerals in our body are like precious jewels, rare gifts to us from the Creator. They perform biological functions there that nothing can replace, not conventional or alternative medical therapies, not mind-body medicine, or New Age thinking. To maintain our health, or to regain a higher level of health, we need only turn, open-handed, to receive the gift, in the form of the natural foods the Creator placed it on the earth.

Appendix A

Practitioners

Where to Find a Practitioner of Nutritional Medicine

To find a physician who practices nutritional medicine, try the following referral resources.

American Association of Acupuncture and Oriental Medicine
433 Front St.
Catasauqua, PA 18032
610-433-2448

American Association of Naturopathic Physicians
601 Valley Street, Ste #105
Seattle, WA 98109
206-298-0125 Referral Line

American College of Advancement in Medicine
P.O. Box 3427
Laguna Hills, CA 92654
714-583-7666

Canadian Association of Ayurvedic Medicine
P.O. Box 749 Station B
Ottawa, Ontario
Canada K1P 5P8
Price-Pottenger Nutrition Foundation
P.O. Box 2614
La Mesa, CA 91943
(619) 574-7763

Appendix B

Products

Sourdough breads made with sea salt:
A-dough-B Bakery
113 West Park Street
Livingstone, MT 59047
(406) 222-3617

Whole organic grains
Mountain Ark Traders
P.O. Box 3170
Fayetteville, AR 72702
800-643-8909

Grain Mills
K-Tek
420 N. Geneva Rd
Lindon, UT 84042
(801) 785-3600
Heintzman Farm
1-800-333-5813
golden flax seed, organic
crack fresh and eat.

Unrefined oils, including coconut, walnut, flax, olive, and sunflower oils
Omega Nutrition
6505 Aldrich Road
Bellingham, WA 98226

Sea salt and ionic seawater supplements
Grain and Salt Society
Box DD, Magalia, CA 95954
(916) 873-0294

Ionic seawater-based mineral supplements
Trace Minerals Research
P.O. Box 429
Roy, Utah 84067
801-731-6051

Seaweeds
Ryan Drum
Island Herbs
P.O. Box 25
Waldron Island, WA 98297

Maine Seaweed Company
P.O. Box 57
Stueben, ME 04680
(207) 546-2875

Wild-harvested herbs
Frontier Herb Cooperative
P.O. Box 299
Norway, IA 52318
800-717-4372

Herb seeds
Abundant Life Seed Foundation
P.O. Box 772
Port Townsend, WA 98368

Otto Richter and Sons
Goodwood
Ontario L0C 1A0
Canada

Appendix C

Books

Cholesterol and Health
Chris Mudd
American Lite Co
Mudd reviews the dangers of a low-cholesterol, low-fat diet, with extensive scientific documentation

Enzyme Nutrition
Dr. Edward Howell
Avery Publishing
Describes the important role of food enzymes in raw foods and dairy products.

Lick the Sugar Habit
Nancy Appleton
Avery Press
Appleton reviews the extensive scientific research on the adverse effects of sugar, and present a practical program for those with sugar addictions.

Nourishing Traditions
Sally Fallon
ProMotion Publishing
This book is a treasury both of scientific information and of recipes. Recipes from peoples around the world, with ways to prepare such traditional foods as organ meats and fermented grains and breads, and many more foods.

Nutrition and Physical Degeneration
Weston Price, D.D.S.
Keats Publishing
See chapter 2 for a full discussion of this book.

Saccharine Disease : The Master Disease of Our Time
by T.L. Cleave
Keats Publishing
Cleave was one of the scientists who first scientifically documented the devastating effects of sugar as a regular component of the diet. This 1975 book is still in print.

Appendix D

Information sources

The Price-Pottenger Nutrition Foundation
P.O. Box 2614
La Mesa, CA 91943
(619) 574-7763

The Price-Pottenger Nutrition Foundation was founded in the early 1960s to preserve the nutritional research of Dr. Weston Price and Dr. Francis Pottenger. The foundation maintains a library, publishes a journal, books, and films, maintains a referral list for nutritionally-oriented doctors and offers a number of excellent but hard-to-find books for sale through a catalog. The library and book catalog preserve the works and research of a number of scientists whose nutrition research may otherwise have been forgotten, including, besides Dr. Price:

Dr Francis Pottenger, who demonstrated the importance of raw foods in the diet.

William Albrecht, Ph.D., who demonstrated the ill effects of soil depletion on animal and human nutrition.

Dr. Edward Howell, who established the need for raw food enzymes in the diet.

John Myers, who demonstrated the value of ionic minerals for a wide variety of diseases.

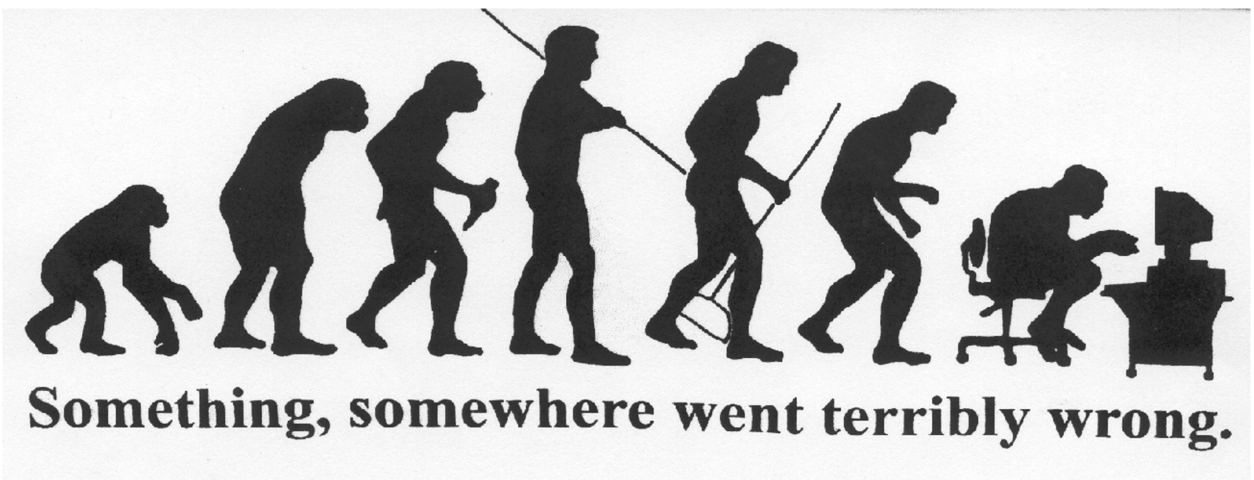
Dr. Melvin Page, who demonstrated the disturbing effects of sugar on the glandular system.

The Foundation is unique among nutrition research organizations in that it is completely free of government, medical, and industrial influences.

The Sea Greens Bulletin
Ted Spencer
P.O. Box 243
Crescent City, CA 95531
(707) 465-6335

Up-to date research and other information on seaweeds.

Appendix E: Photographs



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