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Ortho- molecular Nutrition

New Lifestyle for Super Good Health

Abram Hoffer, Ph.D., M.D.
and Morton Walker, D.P.M.

Introduction by
Linus Pauling, Ph.D.

"I believe that a really great improvement in health can be achieved through this program . . . the length of the period of well-being of men and women might be increased by 16 to 24 years through improved nutrition and other health measures."



A handwritten signature in black ink that reads "Linus Pauling". The signature is fluid and cursive, with "Linus" on the left and "Pauling" on the right, connected by a flourish.

Q 25

The dramatic discoveries of *Orthomolecular Nutrition*

Arthritis, senility, schizophrenia, ulcers, depression—successfully treated by *diet*? It sounds incredible, yet physicians all over the world are learning to treat a whole range of physical and mental conditions by restoring the correct—"orthomolecular"—balance of nutrients the body demands.

This fascinating introduction to orthomolecular nutrition, by a pioneer in the field and an expert in books on health subjects, tells how junk foods and changing eating habits are actually causing disease and provides full information on the role of all nutrients, vitamins and minerals in promoting health and preventing sickness. In this way, every reader is given the groundwork for a totally new *personal* approach to vibrant good health.

"Dr. Hoffer has had extensive experience in the field of orthomolecular medicine, and I have faith in his judgment and recommendations."

—Linus Pauling

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Keats Publishing, Inc., New Canaan, Connecticut

ORTHOMOLECULAR NUTRITION
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DEDICATED TO

ROSE BEATRICE HOFFER,
practical orthomolecular nutritionist

and

RANDALL SCOTT WALKER,
who makes orthomolecular nutrition his lifestyle.

C O N T E N T S

Introduction	
Preface	
1 CURRENT HEALTH CRISES	1
2 WHAT IS ORTHOMOLECULAR MEDICINE?	10
3 HOW ORTHOMOLECULAR THERAPY WORKS	19
4 ORTHOMOLECULAR PSYCHIATRY	28
5 POOR NUTRITION AND MENTAL DISEASE	41
6 PSYCHOSOMATIC CONDITIONS RESULTING FROM IMPROPER DIET	51
7 ORTHOMOLECULAR NUTRITION	63
PART I THE OPTIMUM DIET	
8 ORTHOMOLECULAR NUTRITION	82
PART II PROTEIN, FAT AND CARBOHYDRATE	
9 ORTHOMOLECULAR NUTRITION	115
PART III VITAMIN SUPPLEMENTATION	
10 ORTHOMOLECULAR NUTRITION	148
PART IV MINERAL NUTRIENTS	
11 BENEFITS OF ORTHOMOLECULAR NUTRITIONAL THERAPY	174
APPENDIX A GLOSSARY	189
APPENDIX B SUGGESTED ADDITIONAL READING	195
INDEX	199

Introduction

Great control over many infectious diseases was achieved about forty years ago. A principal factor in their control was the development of the sulfa drugs and of penicillin and other antibiotics. Many diseases, including cancer, cardiovascular disease, and mental disease, have resisted the efforts toward control, and have continued to constitute a serious cause of human suffering.

Vaccines, antisera, and antibiotics have not been the only factors involved in controlling the infectious diseases. One hundred years ago tuberculosis was a great scourge. It began to diminish in significance before the antibiotics were developed, and it is likely that the control of tuberculosis was achieved largely through the development of better living conditions, including improved nutrition.

The importance of good nutrition to the preservation of health and prevention of disease, especially with respect to the question of the optimum intake of vitamins, has been almost entirely ignored by the authorities in the field of nutrition and of medicine and public health. During the period from about 1935 to 1945, when many vitamins became available in pure form and at reasonably low price, there was considerable interest in the question of whether or not an increased intake of vitamins could be used to prevent or cure various diseases. Positive results were reported by many investigators for many different diseases. Interest in the vita-

ORTHOMOLECULAR NUTRITION

mins then died out. The reason for the decreased interest in vitamins is not clear, but it is likely that the development of the sulfa drugs and antibiotics was mainly responsible. Only during the last few years has the field of orthomolecular medicine attracted much attention. Dr. Abram Hoffer and his former collaborator Dr. Humphry Osmond deserve major credit for initiating the present era of great activity in the megavitamin and orthomolecular field, through their discovery of the value of large doses of niacin or niacinamide in the control of schizophrenia.

I believe that a really great improvement in health can be achieved through the ingestion of the optimum amounts of vitamins and other nutrients, as described in this book by Hoffer and Walker on orthomolecular nutrition. The available evidence indicates that through improved nutrition the age-specific incidence of disease and mortality from disease can be decreased to one quarter of the present value, and that other health measures taken in conjunction with these could lead to a further decrease. The length of the period of well-being of men and women might well be increased by sixteen to twenty-four years through improved nutrition and other health measures. Additional research is needed to determine with reliability the amounts of various nutrients that lead to the best of health. Dr. Hoffer has had extensive experience in the field of orthomolecular medicine, and I have trust in his judgment and recommendations.

Linus Pauling

Linus Pauling Institute of
Science and Medicine
Menlo Park, California

Preface

In 1950, I had completed my education as a physician and was ready to begin my second career. Before becoming a medical student, I had been a research biochemist working in a vitamin control laboratory for a flour mill, and was strongly interested in nutrition. By the time I had interned for a few months at City Hospital, Saskatoon, Saskatchewan, Canada, I had no further interest in nutrition but was very excited by the newer ideas in psychiatry. I found, to my chagrin, that having an M.D. degree had not prepared me for dealing with a large number of patients who were ill without any definite organic syndrome. Psychosomatic medicine became the vogue.

After a few years of intensive study and work in the new psychiatry (analytic and psychosomatic theory), I became convinced that these were not going to improve our understanding or our treatment results. Gradually my earlier interest in human nutrition, which had been so effectively quenched by four years as a medical student, began to return. By a direct route from our double-blind controlled experiments in 1952, which showed that vitamin B-3 was an effective therapy for early schizophrenics, to investigations of carbohydrate metabolism (relative hypoglycemia) in 1966, I came to realize that there was no single chemotherapeutic substance—no single magic bullet. The secret of optimum health lay in the whole broad concept of nutrition,

ORTHOMOLECULAR NUTRITION

as developed by a large number of pioneer nutritionists. I have come full circle, back to my interest in nutrition—but now in clinical nutrition. My main contribution has been to help introduce the concepts developed by these scientists into psychiatry and, more recently, into general medicine.

It is sad to think that, had I remained at the same level of nutritional knowledge which I considered adequate, even advanced, in 1945, I could now be a standard modern nutritionist, a professor of nutrition, a hospital nutritionist, or an advisor to departments of public health, without learning anything beyond a few more details.

ABRAM HOFFER, M.D., Ph.D.

Ten years ago, I turned from the delivery of highly specialized foot treatment to writing about the entire structure of health care: disease prevention, obesity, genetics, emotional disturbances, nutrition, medical education, sexuality, and more. I evolved into a full time freelance medical writer and found the rewards of medical journalism stretching beyond money. Like medicine, it is a helpful and invaluable craft, steeped in the intrigue of techniques and the drama of human beings. Medical journalism has the staying power of service and curiosity. Besides, my writing offers other benefits. I gain personally from the information I disseminate and from the dedicated, intelligent people who supply this information.

Orthomolecular nutrition and its inventor, Dr. Abram Hoffer, are typical of what I mean. Here is a concept, which, when put into daily practice, may allow the full span of 120 years of life human beings are allotted by nature. They will be healthy years, and happiness often accompanies good health. Dr. Abram Hoffer is a living testimonial to the nutritional concept he has developed.

It is our hope that people who read this book will follow the nutritional pathway in order to achieve the best good health their genetic structure will permit. This is important

PREFACE

for everyone, but especially for professional people who are in a much better position to influence the health of many others. We hope it will help nutritionists regain their interest in and enthusiasm for understanding the relationship between good nutrition and good health. For, if they fail to rebuild nutrition as a modern progressive science, they will be bypassed by others who will.

Unless our society adopts the concepts of orthomolecular nutrition, there can be no halt in the progression of chronic physical and mental disease. Bad nutrition has destroyed whole societies, as it is today destroying primitive peoples exposed to "civilized" diets. Perhaps historians of disappearing cultures should be examining the role of technological development in food production. Did Rome deteriorate because the Romans switched from whole grain bread to a whiter bread and used water transported through lead pipes? Bad nutrition, like bad money, drives out the good.

MORTON WALKER, D.P.M.

Current Health Crises

POISONS EVERYWHERE AROUND US

The man, forty-six years old, a prominent West Coast executive, began to suffer three years ago from obscure complaints. They included headaches, backaches, episodes of weakness and tremulousness. His problem was diagnosed as "nerves—business tensions, you know!" He was treated for anxiety-depression by psychotherapists—first with antidepressant drugs and, when they didn't work, with shock treatment, which also didn't work. The depression and other nervous symptoms didn't leave. Later, drifting from one physician's care to another, the man happened to be referred to a doctor who practiced orthomolecular medicine. Among a variety of laboratory tests taken, hair analysis revealed that the patient suffered from mercury poisoning. The poor man had been made miserable almost as much from incorrect treatment rendered without a true diagnosis as he had from the invasion of his body by mercury.

Just four years ago a fourteen-year-old was diagnosed as schizophrenic. He was shy to an extreme. His behavior more often was erratic, coordination lacking, items dropped from his hands recurrently, and he cried without provocation. He was given to talking to himself and to withdrawing into himself. Frequently he did not sleep for days at a stretch.

When he did sleep he often awoke so wet with perspiration that his bed clothes had to be changed. This child was eventually institutionalized when conventional methods failed to solve his problem. Even hospitalization did nothing except to alleviate his symptoms. It appeared that this young man would be lost to society as a perpetually unproductive adult. However, his parents persisted and explored every avenue of care. They brought him finally to an orthomolecular psychiatrist, who treated him with megavitamins and other dietary measures. Today, on the basis of a "no-junk" diet, dietary supplements, and no other treatment, this child is a bright, happy and active young man growing into a well-functioning adult.

What initially caused this child's medical problem and prolonged it until the age of fourteen? The answer may seem oversimplified, but is inescapable: overwhelming changes in our food supply. No pharmaceutical company can introduce a new medicine until it has been shown to be non-toxic for man when used as recommended. But anyone can do anything to food components and market the product with no requirement that it must at least match the nutritional quality of the agricultural products from which it was made. Even more dangerous is that nutritionists are not remotely aware of the dangers of these products. Sugar is added to most processed foods, and this child had been undergoing allergic reactions to sugar. His condition was caused completely and solely by the foods he ate.

Poisons are everywhere around us. They take an infinite variety of forms. For example, the New York State Department of Environmental Conservation finally cancelled a salmon-stocking program scheduled for Lake Ontario because of contamination of its waters with the toxic chemical compound Mirex. The Conservation Commissioner, Peter A. A. Berle, said the department was having second thoughts about building a \$10 million salmon and trout hatchery near the lake because it is "an environmental tragedy of the

first order." Sports fishermen would not be permitted to keep the fish they might catch in the lake. In addition, twenty-five communities that draw drinking water from the Lake or from the Niagara River, which flows into it, or from the St. Lawrence River, which flows out of it, may have their water supplies contaminated. Lake Ontario also is contaminated with Kepone, PCBs, DDT, and other industrial poisons or insecticides. Poisons in food, water, and even air have affected our environment and increased the incidence of degenerative diseases which now constitute our direst health crises.

NUTRITIONAL SCIENCE LACKS RESOURCES

Almost half the population of the United States and Canada is more or less steadily subject to a variety of physical or mental ills. These recurrently sick people fall heir to chronic diseases ranging from learning and behavioral disorders of children to chronic arthritides of aging. Life seems more or less a continuous struggle against disabling conditions until irreversible senility or death frees the sufferer from his burden.

In spite of amazing technological advances over the past thirty years and a huge expenditure of resources, we are experiencing a steady rise in the incidence of degenerative diseases. Medicine, practiced in the traditional sense, has not done much to alter *infiltration degeneration*, the changes that arise from the deposit of abnormal matter within the tissue. Why is this so? Why is there technological pollution of our food supply?

Deterioration has been forced on our population by the creation of artificial foods lacking in natural vitamins and minerals. Processed food manufacturers have dissipated and distorted nature's quality control by removing nutrients and adding artificial substances and flavorings—most notably, and most detrimentally, sugar. Why is this continuing?

Don't we know enough about the poisons in our foods or the processing out of natural nutrients?

The answers to these questions are clear and simple. Nutrition science lacks intellectual resources. Very little brain power is concentrated in this branch of knowledge. The medical profession too often confuses nutrition with dietetics. It does not concern itself sufficiently with the possibility that inadequate nutrition leads to health problems. Only an infinitesimal amount of systematized learning has been gathered about nutritional disease. As a result, a rapidly expanding pandemic of chronic degenerative diseases is occurring, but since the diseases are of a variety, too little alarm has been generated.

Every fourth person in North America is the victim of one or more of these degenerative conditions. Surely, if one-quarter of our population suffered from *one* disease, diabetes for example, there would be a massive public effort to discover the reasons and to develop an effective cure. But when the sick population includes sufferers from senility, cardiovascular conditions, arthritis, schizophrenia, learning and behavioral disorders, cancer of the colon, peptic ulcer, and many other individual problems, society seems not to add them together as one major problem.

Food technologists look upon agricultural produce as a source of raw material from which artifact components are extracted and recombined into foods they can persuade the public to like and eat.¹ The fact that these products are deficient in essential nutrients does not concern them.² For example, the technological change from home ground whole wheat flour to our present commercial white loaf has removed a wholesome food, able by itself to sustain life. The nutritionally valuable bread is replaced with an easily marketable, palatable product which has been designed to be "taste-tempting," not to maintain health by providing sound nutrition. Food technologists may then replace only a few of the multinutritional substances removed and label their product "enriched." This is the same as being held up at

gunpoint on a dark street and ordered to strip naked. The thief takes clothes and valuables, notices your shivering embarrassment, then returns your underwear and fifty cents to take the bus home. Do you then feel enriched?³

Costs of relieving degenerative disease symptoms have risen at an astronomical rate. Every decade a larger share of the gross national product is devoted to health care. Even so, the more health-care expenditure, the unhealthier our people are. Why? The real villain, the catastrophic deterioration in the quality of our food, is ignored. As long as food processing continues to strip out essential nutrients, there will be no letup in the creation of chronic ill health. In 1940 about 20 percent of the food consumed in this country was processed. Today it is close to 75 percent. We consume the elements of our own destruction, with our excessive intake of sugar and unsaturated fats, loss of bulk or fiber, elimination of vitamins and minerals, and the pollution of food with chemicals never demonstrated to be safe.

THE FOSSILIZED NUTRITIONISTS

It may seem hard to believe, but over the past few years I have treated no less than three nutritionists for depression and anxiety arising from *relative hypoglycemia*—a nutritional condition which should have been well within their own competence to deal with. Unhappily, academic nutritionists generally remain fossilized in their thinking at the 1950 level. Government and hospital nutritionists, who are primarily dietitians, seem more interested in the cosmetic aspects of food than in its nutritional quality. The most advanced understanding of clinical nutrition is held by a few far-seeing clinicians and biochemists.

Dr. Roger Williams is one of these productive nutritional biochemists. His work, from 1950 on, has shown that individuality, in all animal life, including the human, is impossible without variability—that is, that genetics, the

6 ORTHOMOLECULAR NUTRITION

psychosocial environment, and the biophysical environment are equally important in contributing to individuality.⁴ We inherit certain determined characteristics from our ancestors. That is *genetics*. A child with a special talent will gravitate or may be encouraged by his family to pursue this talent. That is the *psychosocial environment*. You continually interact with and are shaped by such factors as food, air, heat, toxic chemicals, viruses or bacteria, light, and physical trauma. That is the *biophysical environment*.

The range of variation among individuals is enormous. Some people become violently ill from ingesting foods that are nutritious for others. This truth explodes the myth of the minimum daily requirements (MDR) and recommended dietary allowances (RDA) so loved by government agencies. The need for nutrients will vary by many hundred percent. With sick people the range of need is many times greater. Those who require very large quantities of vitamins are *vitamin dependent*. The fossilized nutritionists tend to disregard this essential variability among people, and stick with the old and useless MDRs and RDAs.

Individuality means that the requirement for nutrients varies much more than most nutritionists believe. It can vary by a factor of a thousand. For example, normally 0.001 milligram (1 microgram) per day of vitamin B-12 is sufficient, but a few subjects require 1 milligram per day by injection. When a person requires an amount of vitamin normally present in a good diet and instead pursues a diet deficient in that vitamin, he will develop a deficiency disease such as pellagra, scurvy, beriberi, or rickets. If, however, the individual is vitamin-dependent, his requirement for a particular vitamin is much greater; and even a good diet will be nutritionally inadequate. There will be a relative deficiency which will cause metabolic havoc in his body. Dependency is ignored by conventionally-minded physicians and nutritionists alike, who fail to realize that

each person must be given the right nutrition, in food and supplements, to meet his needs, whether they are high or low.

NO NUTRIENT WORKS ALONE

Every biochemist interested in nutrition knows that transformation reactions in the body essential for the production of energy and metabolism require a number of enzymes working either together or in sequence. If a reaction requires three vitamins, one is not more important than the other; all are needed. If one is lacking, *it* becomes the important one therapeutically. No nutrient works alone.

Nutrients work together as does an orchestra, to use Dr. Roger Williams' way of putting it. Like instruments playing in harmony, all the nutrients must be available in their optimum amounts. Optimum quantities may be different for each nutrient. Fortunately, we have adapted to a variety of foods which provide nearly optimum nutritional quantities and which are not harmful. They contain protein, fat, and carbohydrate combined with vitamins and minerals packed in complicated living structures—animals and plants used for human consumption.⁵

Human metabolism has not adapted to food artifacts recombined into products designed only to please the palate. The producers of modern foods ignore the fundamental orchestra principle suggested by Williams. Processed foods provide discord in the metabolic harmony: a missing nutrient is like a fiddle with a broken string. This is one of the major objections to many processed foods.

A second objection to synthetic foods is that other accessory factors in unprocessed food are not yet identified. Being unknown, they cannot be used in synthetic processing, and the diet therefore lacks them. Until we can be cer-

tain that *every* natural nutrient has been identified and incorporated in processed foods, it would be very imprudent—even hazardous—to depend solely on such foods.

Finally, processed foods contain additives of various sorts. These are included not to enhance the nutritional quality but rather to increase palatability and storage properties. Additives are part of the poisons that assault us. Some additives have been proven to be downright dangerous to health—even to cause cancer.

Thus modern clinical nutrition must be built around two main concepts: the individuality and variability of human beings and the orchestra-like function of nutrients acting in harmony. Until this is done, modern academic nutrition will continue to drift, completely separated from and unrelated to what is happening to people. The incidence of degenerative diseases will continue to rise. From our current level of 25 percent of the population suffering from them, we will see damaging effects occur among most of us. Predicting this, practitioners of orthomolecular medicine have taken a very considerable departure from the route of conventional medicine. According to a rapidly growing body of reports, orthomolecular nutrition is benefiting tens of thousands—even millions—suffering from varied physical, mental and behavioral disturbances, including many unhelped by other methods. Orthomolecular medicine's very heavy emphasis—often sole emphasis—on nutrition as therapy places it far away from what has been until now the mainstream of professional medical therapeutics. The practice of orthomolecular medicine for individual patient benefit is the subject of our next chapter.

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What Is Orthomolecular Medicine?

THE HONG KONG VETERAN RECOVERS

In 1960, I was investigating what effects nicotinic acid (vitamin B-3) would have in the prevention of senility. My studies took me to a nursing home rendering special care for the elderly, where the home's director agreed to cooperate. Each patient's private physician gave permission as well. A few weeks after the investigation had begun, the director approached me and asked, "Dr. Hoffer, would it be O.K. if I were to take nicotinic acid?"

I wondered why!

He said, "As I hand out nicotinic acid to my elderly patients, I want to be prepared for questions about side effects, if any. Therefore, I want to take it to see what happens."

I answered that it would not harm him and nicotinic acid could be taken if he liked. Remember, he was not my patient, only a colleague in another field.

A few months later the supervisor reported his findings to me. "First, let me tell you my story," he said. "I was a physical education instructor in the Canadian Army in 1939. Along with 2,500 other Canadian soldiers I was sent to Hong Kong to battle against the advance of the Japanese. All of us were promptly captured and spent forty-four months in prisoner-of-war camps. Our food was inadequate

in calories, quality, and essential nutrients. We suffered stress not only from the poor diet but from chronic infections and psycho-social trauma. Treatment under the Japanese was exceedingly harsh and brutal. Twenty-five percent of my group died. Those who were finally rescued had lost approximately one-third of their body weight. I went from superb health as a 195-pound teacher of athletics to a weak and diminished bag of bones weighing 120 pounds. We suffered from multiple vitamin deficiencies—beriberi, scurvy, pellagra, and associated symptoms—diarrhea, infections, and other problems.

"Our rescue brought us hospital care with high doses of vitamins in the form of rice polishings extract. The pure vitamins were not yet available. We seemed to recover and were discharged. Within a few years my fellow veterans and I broke down physically and mentally. We remained chronically ill with a variety of physical or psychiatric problems or both. We formed our own Hong Kong Veterans Association and pleaded for government help out of an inability to earn a living."

Eventually the Canadian government did a study of Hong Kong veterans and their brothers who had served in Europe. The Hong Kong veterans proved to be much sicker with degenerative conditions such as arthritis, cardiovascular disease, blindness and psychiatric diseases. Their death rate was higher. Finally they won a 90 percent disability pension for the rest of their lives.

The nursing home supervisor told the rest of his story. "From the time of my incarceration to now I have suffered constant pain from severely crippling arthritis. My wife had to help each morning to get me out of bed. I could not lift my arms over my shoulders or tolerate cold. I underwent anxiety, tension, and had many irrational fears. To treat these emotional problems, I entered a psychiatric ward in Winnipeg for several weeks. I took barbiturates in quantity at evening time to get sleep, and amphetamines during the day to keep awake. My physicians prescribed them. Psychi-

atrists said I was neurotic. Thus I became reconciled to a life of pain, infirmity, depression, and anxiety.

"To my astonishment," the supervisor continued, "two weeks after taking one gram of nicotinic acid three times a day merely to experience any side effects that other people in this nursing home might have, I have felt no more pain. It has gone entirely. I can move my joints freely. I feel relaxed and at ease too. I am a normal person again. I intend to take nicotinic acid the rest of my life!"

The man later tested the efficacy of nicotinic acid, albeit accidentally, when he went on a two-week camping trip in the Canadian Rocky mountains. His symptoms returned because he forgot to bring along his nicotinic acid pills. He is resolved never to do that again.

That supervising director of a nursing home where I tested out nicotinic acid against senility in 1960 has grown to be famous in Canadian politics. The Queen of England's representative in Canada is the Governor General. The Governor General's representative in each province is the Lieutenant Governor. The man whose story you have just read is George Porteous, the present Lieutenant Governor of the Province of Saskatchewan, Canada.

THE AREA ORTHOMOLECULAR MEDICINE ENCOMPASSES

Lieutenant Governor George Porteous helped himself by using orthomolecular medicine, the science and art of healing with nutrition therapy. Dr. Linus Pauling, Professor of Chemistry at Stanford University and twice winner of the Nobel Prize, coined the term *orthomolecular* and published it in his now-famous report on "Orthomolecular Psychiatry," in *Science* (1968), the journal of the American Association for the Advancement of Science. "Ortho" means *to straighten*. Pauling wanted to convey the basic idea that many mental illnesses could be corrected by straightening out, in effect, the concentrations of specific molecules in the

brain so as to provide the optimum molecular environment for the mind.

Pauling's principles include this: *Orthomolecular therapy consisting of the provision for the individual person of the optimum concentration of important normal constituents of the brain may be the preferred treatment for many mentally ill patients.*¹

Non-traditionally-oriented scientists are adopting that concept and have gone even further with Pauling's principles. They are employing nutrition to combat and prevent many physical illnesses as well. Practitioners of orthomolecular medicine use orthomolecular nutrition, specific diets and food supplements for treatment, which can vary greatly from patient to patient, depending upon individual problems and needs, and use a considerable battery of laboratory tests to help make their diagnoses.

Special tests with which to make evaluations include those for thyroid function, sugar handling, insulin levels, blood levels of vitamins, hair analysis for trace minerals, and others. Orthomolecular doctors look sharply at dietary habits. They take careful histories of any allergic manifestations and of exposure to environmental chemicals. For example, a patient may be tested for cerebral allergy if psychiatric symptoms have developed. Doctors look for a sensitivity to any food, inhalant or environmental chemical, or other poisons or pollutants. During treatment, more laboratory and behavioral tests are taken in order to monitor the results of therapy.

Large doses of vitamins are commonly prescribed. Typically, a daily dosage schedule may include four grams of B-3, four grams of C, 800 milligrams of B-6, 1,000 International Units of E, and other vitamins indicated by the test results. Minerals prescribed may be zinc and manganese and others, depending on what laboratory tests have shown. It is not uncommon to have hormones used when deficiencies are found. Special diets form the real basis of therapy.

Nutrition therapy is not the practice of food faddism. If anything is faddist, it is the current way Americans and Canadians eat. Dr. Richard O. Brennan, Chairman of the Board of Trustees, the International Academy of Preventive Medicine, says, "Most of the food in America today will support life but it won't sustain health."² The area of interest of orthomolecular medical practitioners leads them to alter a junk food diet and change it into one less stimulating to body malfunctionings. Most informed people are moving in that direction.

"Stamp Out Food Faddism," an editorial in *Nutrition Action*, March-April 1975, a newsletter of the Center for Science in the Public Interest, Washington, D.C., and reprinted in *Science*: Vol. 188, 16 May 1975, stated:

Food faddism is indeed a serious problem. But we have to recognize that the guru of food faddism is not Adelle Davis, but Betty Crocker. The true food faddists are not those who eat raw broccoli, wheat germ, and yogurt, but those who start the day on Breakfast Squares, gulp down bottle after bottle of soda pop, and snack on candy and Twinkies.

Food faddism is promoted from birth. Sugar is a major ingredient in baby food desserts. Then come the artificially flavored and colored breakfast cereals, loaded with sugar, followed by soda pop and hot dogs. Meat marbled with fat and alcoholic beverages dominate the diets of many middle-aged people. And, of course, white bread is standard fare throughout life.

This diet—high in fat, sugar, cholesterol, and refined grains—is the prescription for illness; it can contribute to obesity, tooth decay, heart disease, intestinal cancer, and diabetes. And these diseases are, in fact, America's major health problems. So if any diet should be considered faddist, it is the standard one. Our far out diet—almost 20 percent refined sugar and 45 percent

fat—is new to human experience and foreign to all other animal life. . . .

It is incredible that people who eat a junk food diet constitute the norm, while individuals whose diets resemble those of our great-grandparents are labeled deviants. . . .

THE NUTRITIONAL NEEDS OF THE BODY AND MIND

A growing segment of our population has learned it can become master of its own health. Through use of orthomolecular medical principles, providing themselves with the proper biochemical environment, people are building upon their own naturally strong genetic code. They are changing from a way of life that promotes improper eating to a new total life pattern of optimum nutrition.

Every living cell in your body requires a number of chemical nutrients in its immediate environment—the extracellular fluid. Your body's organs, tissues, and cells have two main functions: (1) growth and repair and (2) their specific assignment. For example, the kidney helps rid the blood of chemicals not required; the adrenal gland secretes hormones; the skin repels foreign organisms and excretes wastes; the brain receives impulses, relays them to other portions of the body, and initiates activity. Your brain also perceives, thinks, feels, and controls behavior. Poor nutrition will slow down or stop the functions of these organs, tissues, and cells.

Multicellular animals such as human beings have bodies designed to carry essential nutrients derived from ingested foods to individual cells and to remove the waste products. This is different from plants, which synthesize their own proteins, fats, carbohydrates, vitamins, enzymes, and all other needed chemicals. However, much energy is required for plants to meet their own requirements and no energy is left over for movement as seen in animals. It is more economical for animals to eat than to make nutrients.

For humans, about forty to forty-five nutrients essential to life must be taken in our diet because our bodies do not make them naturally. Vitamin C, for example, is absolutely necessary for life, but we must ingest it because we cannot synthesize it within our bodies.

Your body and mind need vitamins and minerals. They facilitate thousands of essential reactions but are not themselves sources of energy. You need proteins present in meat, fish, poultry, and many vegetable sources. Proteins possess more than twenty amino acids, of which eight are essential. The body can synthesize the remaining twelve from other amino acids. If one of the eight essential amino acids is missing, the others cannot be used efficiently.

You need fats for calories and to form structural elements. Carbohydrates in food consist of starches and sugars used by the body primarily for energy. Small quantities of carbohydrate are used in building tissue as glycoproteins. After a meal rich in carbohydrates there is rapid increase in tryptophan in the brain followed by an increase in serotonin. Serotonin is one of the hormones used by the brain to control functions. By a proper mixture of food, you can elevate, maintain, or lower brain serotonin levels to adjust brain functions including perception, thinking, feeling, and generalized activity.

A balanced diet will provide all the essential nutrients in optimum quantity including minerals such as calcium required in much larger dosage than the ordinary trace elements. A balanced diet delivers nutrients to cells in a steady flow, but an unbalanced diet provides too much or too little of these nutrients.

One does not require extensive nutritional knowledge to obtain a good balanced diet. Man has evolved and adapted to a small number of foods including grain, vegetables, fruits, fish, meat and poultry. As long as these foods are not tampered with, you and I will find our diet balanced.

However, the processed foods so widely available—indeed, almost unavoidable—permit us to avoid starvation, even to

feel well fed and grow fat, while we suffer from malnutrition. The manufacturers of food have become quite skillful. They have developed palatable food substitutes such as soft drinks that provide water, carbon dioxide, and harmful synthetics but no protein, fat, carbohydrate, minerals, or vitamins. Millers have taken apart the wholeness of grains. They separate the endosperm of wheat (white flour) from the germ and bran. Sugar manufacturers give us pure sucrose from beets and sugar cane. Soft drinks, white flour bread, and white sugar are examples of the many foods that provide malnutrition in the form of naked or empty calories.

Empty-calorie foods are deficient in nutrients. They cannot be used in the body without vitamins and minerals and other foodstuffs. If the nutrient factors do not accompany naked-calorie foods, they must be taken from other food. This means that a diet heavy in sugar or other naked calories must inevitably lead to multiple vitamin and mineral deficiencies. Orthomolecular medical scientists know this to be the case.

Over the past three centuries, for instance, the consumption of sugar in this country has increased from five pounds to about one hundred twenty-five pounds per person each year. Excessive sugar consumption leads to an excessive drain on the pancreas for insulin. This is a main factor in the cause of hypoglycemia, one of the members of the master disease caused by refined foods, the *saccharine disease*.

Food manufacturers add an enormous amount of food additives designed to stabilize, color, and increase palatability. They consider nutritional quality minor. Thus too much sugar, salt, coloring, and other chemicals are fed to us in processed foods.

Orthomolecular medicine is concerned with the consequences of eating the typical American and Canadian junk diet, the Western form of malnutrition. The basic treatment consists of removing from a patient's diet food artifacts and synthetics, and restoring to his diet those natural foods which are rich in all the nutritional elements. Although in-

dividuals vary enormously in their needs for the specific substances required to sustain optimum health, the balanced diet could supply those substances if we let it. Deficiencies exist but orthomolecular nutrition can overcome them.

The next chapter will explain what happens when natural laws of proper eating are disobeyed and what you can do to restructure yourself to follow those laws. Our aim is to help you keep your natural good health and perhaps bring it up to a state of superhealth.

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How Orthomolecular Therapy Works

Two years ago a woman was admitted to City Hospital, Saskatoon, Saskatchewan with a diagnosis of self-induced skin gouges, a supposed psychiatric problem. Her immediate history included a broken love affair—which was generally considered the reason why this woman, a nurse, was tearing at her own skin. Invariably I include a nutritional history as part of any patient's entry under my care, and I learned that she had suffered severe malnutrition long ago as a prisoner of a concentration camp in Europe. Now she had a resultant vitamin dependency. Additionally, she was eating a highly processed carbohydrate diet routinely. This was a combination debilitating to her mental health.

This nurse was gouging out portions of herself because of a severe state of anxiety-depression. I treated her psychiatric problem with orthomolecular nutrition (which consisted primarily of a non-refined carbohydrate diet and vitamins) and she became well enough to be discharged from the hospital within two weeks. Her skin damage had ceased altogether. Any other orthodox medical treatment would have placed her under long-term, detailed psychotherapy—perhaps once a week for the next five years. It could not possibly have helped. Her malnutrition of thirty years before had finally caught up with her and caused mental derange-

ment—which was relieved through nutrition according to the principles of orthomolecular therapy.

THE CONSEQUENCES OF CONSUMING A JUNK DIET

Overconsumption of refined food causes the *saccharine disease*. Organ changes from the saccharine disease result in diabetes, peptic ulcer, constipation (and its effects such as varicose veins, hemorrhoids and cancer of the bowel) and other debilitations. Consequently, an orthomolecular therapist will direct primary attention toward changing the patient's diet.

Associated with the saccharine disease, and especially with mental and emotional problems resulting from it, is the condition known as *relative hypoglycemia*. In reality, relative hypoglycemia is not a clinical entity in itself, being a term used to denote a laboratory test result in which a person's blood sugar level decreases more than 20 milligrams per 100 milliliters after being given a "challenge dose" of 100 grams of glucose, constituting a six-hour sugar tolerance test. One can only guess at the proportion of our population who have relative hypoglycemia, but assuredly it is large—perhaps close to a majority.

Of 500 alcoholics that my colleagues and I have tested, almost all suffered a decrease of 20 milligrams or more in blood sugar. About 10 percent of any adult population consumes excessive quantities of alcohol, and it is likely this group suffers from the saccharine disease. And as two-thirds of all neurotics and people with depression have the condition, we may assume that at least 35 to 50 percent of our entire population is victimized by its mental and physical manifestations. It is a result of the average North American ingesting a junk diet.

A JUNK DIET IS:

A junk diet supplies poor quality eating—foods which contain sugar, white flour or polished rice, alcohol and items processed by manufacturers from whole foods. People are allergic to certain foods, and consumption of them can result in disease.

In effect, a junk diet is a disease diet, especially resulting in the so-called degenerative diseases of civilization such as heart problems, and forms of cancer, arthritis and diabetes. Junk foods are artifacts derived from living organisms, either plant or animal. The major plant material which comprises living natural food is the seed of wheat, corn and rice. Seeds are the plant's future progeny. When a wheat kernel is formed, it contains the amount of protein, carbohydrate, fat, vitamins and minerals necessary to launch a new plant. These components must also be present in adequate amounts in the human diet to support a person's nutrition. In processed foods such components are not present. On the other hand, seeds and nuts, which are capable of growing new plants, are nutritious packets of food for us.

The flesh and organs of animals are even closer in composition to our bodies. When they are consumed they provide most of our requirements, provided we do not eat damaged goods of devitalized quality altered during the journey from the animal to our plates.

The components of food in nature's packets are combined in a very intricate relationship. Protein, fat and carbohydrate interlaced with vitamins and minerals must be present. When natural food is consumed, all its components are provided at the same time. The elemental nutrients such as the amino acids, simple sugars and other items, will be delivered via the circulated blood to all the cells together. All the essential amino acids must be present at about the

same time. It does not help the cell to be supplied half the essential amino acids and then to receive the other half twelve hours later. If all the components are not present simultaneously, the cell functions poorly.

People are surprised when they discover that our present diets are generally inferior to the diets of our ancestors. They point to the tremendous advances in the science of nutrition and to our present food technology. It is hard for them to believe that modern foods, which taste so palatable, are so attractively packaged, and are so easy to warm up in a twentieth-century kitchen, can be as harmful as they are. Not uncommonly, people who are burying themselves with their teeth look upon those who are disturbed by our modern diets as food faddists or freaks.

Patients who have recovered from disease by eliminating sugar from their diet sometimes force a test of their eating programs upon themselves. Very often they will expose themselves to several relapses by reverting to the diet that originally made them ill. They then return to orthomolecular physicians for care, while knowing full well what has gone wrong. Although they could overcome recurrence of their symptoms by halting their intake of processed and high-sugar foods, they return for treatment because they need the doctor's reassurance and confirmation that their eating lifestyle is valid, to offset the negative opinions of ignorant consumers of highly refined foods.

THE RESULTS OF EATING JUNK FOOD

Artifact or "junk" foods include such items as white bread, commercial french-fried potatoes, non-dairy creams made of chemicals, and all the foods to which sugar has been added. Pies, pastry, cakes, chocolate, candy, most desserts, jello, and many canned goods such as soups, contain added sugar.

Most children like sweets, and often sugared foods form a staple of their diet. When fed a diet free of processed junk, these children may feel deprived. However, not uncommonly after six months the sugar addiction will be lost, and they can adapt to the various healthier foods substituted. If sugar addiction actually manifests itself as allergy, junk food will produce disease symptoms which become uncomfortable. Any tissue or organ of the body may react.

Allergy to sugar and other components of processed food may react on the skin in the form of hives, rashes, itch, swelling, redness, decreased ability to move because of skin rubbing and tautness, and pain. The urinary bladder may shrink and cause bed wetting. The central nervous system can react, causing a variety of unpleasant symptoms such as tension, anxiety, depression, hallucinations, thought disorder and changes in behavior. The neuroses or psychoneuroses are psychiatric diseases that mainly alter mood. They will be discussed in detail in Chapter Five. Psychosomatic conditions also fall into this category.

Malnutrition resulting from excessive consumption of processed food in the form of refined carbohydrates is also the major cause of a broad group of neuroses and physical illnesses. Until recently these were looked upon as unrelated diseases with no known etiology, but now the root cause, nutritive deficiency, has become apparent. It may help many people who suffer from these diseases to embrace principles of proper eating. They will become aware immediately, from the reduction of their symptoms, of the reasons why they have been ill.

The mass indictment of refined carbohydrates as the cause of many of the ills of westernized countries today was advanced by Surgeon-Captain T. L. Cleave, M. R. C. P., formerly director of medical research of the Institute of Naval Medicine, Great Britain. In 1956, he designated "the saccharine disease" as the master disease, incorporating diabetes, coronary disease, obesity, peptic ulcer, constipation,

hemorrhoids, varicose veins; *Escherichia coli* infections such as appendicitis, cholecystitis, pyelitis, and diverticulitis; renal calculus, many skin conditions and dental caries.^{1, 2}

The master disorder which is the saccharine disease produces a variety of physical and mental manifestations that derive from the excessive consumption of refined or processed carbohydrates. Primarily, these are sugar and white flour. Highly processed products of this type cause specific physical and psychiatric changes sometimes labeled *psychosomatic* and sometimes considered *idiopathic*. To distinguish them, however, and separate them from "thinking" diseases that arise from an influence of the mind or "unknown" diseases that come from no apparent extrinsic cause, the doctor merely needs to perform a six-hour glucose tolerance test on his patient.

A hypoglycemic curve will result that is just an expression of the disturbance in carbohydrate metabolism. The physical symptoms include peptic ulcer, diabetes, colitis and other troubles. We will discuss these physical manifestations of the saccharine disease in this chapter in the paragraphs that follow. The psychiatric symptoms include headache, depression, nervousness, anxiety, tension, palpitations and other problems. We will discuss these psychiatric manifestations of the saccharine disease in Chapter Five under the subtitle "Psychoneuroses from Improper Nutrition."

Often the diagnosis of the saccharine disease, whether physical or psychiatric, depends upon the orientation of the attending physician. If he is interested only in ulcers, for instance, he is liable to ignore the psychiatric changes and diagnose only peptic ulcer. But all these various changes are aspects of the same disease.

PHYSICAL MANIFESTATIONS OF THE SACCHARINE DISEASE

When normal quantities of fiber (bulk) are consumed, the normal transit time of feces is about twenty-four to forty-

eight hours. People who live on low-fiber diets have a feces transit time forty-eight to ninety-six hours. Today, constipation among populations of the westernized countries is quite common. In Britain, up to 15 percent of the population regularly take laxatives. Malabsorption is the result. Laxative use and malabsorption among the elderly, who have had more time to damage their bowels from defective nutrition, are most common.

Two serious consequences arise from the constipation: diverticulosis and diverticulitis. *Diverticulosis* is a term used to describe the presence of a number of internal pouches or sacs opening from the intestine. It is commonly an occurrence of middle age. Cleave suggests that the slow passage of the colon's contents leads to increased absorption of water from feces and consequently greater viscosity of the contents, necessitating excessive contraction of the bowel. There is a clear association between constipation or diverticulosis, and absence of a diet containing adequate quantities of fiber. *Diverticulitis* is an inflammation of such a pouch or sac opening in the gut. It is ascribed to a combination of the constipation due to the lack of fiber and the deleterious effect of the high sugar intake which accompanies it. There is a pathological effect on the bacterial population of the gut due to the surplus of sugar. Effects may take up to forty years before they are fully manifest.

Another manifestation of the saccharine disease is the irritated colon (simple colitis). Irritable colon is closely related to mood disorders. It is rare to be free of depression, tension and anxiety when the condition is present. In fact, ulcerative colitis, a disease characterized by ulceration of the colon and rectum with bleeding, mucosal crypt abscesses, and inflammatory pseudopolyps, has been considered one of the classic psychosomatic conditions. Ulcerative colitis frequently causes anemia, hypoproteinemia and electrolyte imbalance, and is less frequently complicated by perforation or carcinoma of the colon. Elimination of sugar and an in-

creased intake of fibrous foods can cure the constipated patient and suddenly dispel his anal-retentive characteristics.

Refined food intake leads to unnatural concentration of carbohydrates which deceive the palate and cause overconsumption. This is the sole immediate cause of obesity. Obesity is not the result of a large appetite nor a dislike of exercise. For example, it would be highly unusual for anyone to consume six apples in five minutes. The bulk of this natural food prevents it from happening. It is not unusual, however, to consume an equivalent amount of calories as that in six apples in the form of sugar in one's tea, coffee or soft drink. The large number of so-called diabetics, especially the adult maturity type associated with obesity, do not really have diabetes but one of the variants of relative hypoglycemia. A patient who does not require insulin probably does not suffer from true diabetes.

Peptic ulcer occurs in the alimentary mucosa, usually in the stomach or duodenum, and is exposed to acid gastric secretions. When food reaches the stomach, gastric juices containing hydrochloric acid are secreted to help digest protein, which ordinarily makes up 99 percent of the quantity of man's natural food. Before processed foods were developed, there was no surplus amount of acid lying around the stomach and its inner lining. The mucosa remained intact. Protein buffered the acid's contact with the stomach wall. In today's way of eating, food is very often consumed that contains less protein than in natural diets, and may in fact contain no protein at all. When you drink a bottle of soda pop, you fool the stomach with what appears to be food. There will be the same increased excretion of stomach acid but no protein present to work on. The acid remains free in the stomach. The only protein to buffer the acid is the stomach mucosa itself, and the protein exudates on its surface. Peptic ulcer thus becomes another of those classic psychosomatic diseases incorrectly treated by psychoanalysis.

A patient with peptic ulcer could soon cure his condition

and perhaps his personality problems as well. What he must do is add fiber and remove refined carbohydrates from his diet.

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Orthomolecular Psychiatry

THE ACADEMY OF ORTHOMOLECULAR PSYCHIATRY

Every tissue of the body is affected by nutrition. Under conditions of poor nutrition the kidney stops filtering, the stomach stops digesting, the adrenals stop secreting, and other organs follow suit. Unfortunately, some psychiatrists labor under the false belief that somehow brain function is completely unaffected by nutrition.

Since Dr. Humphry Osmond and I established that the addition of megadoses of vitamin B-3 to a therapeutic program for treatment of the mentally ill is beneficial, I have been continually amazed at the violence of attack from traditionalists in psychiatry. It seems that many psychiatrists and their parapsychiatric colleagues such as psychologists and social workers consider that the brain is not an organ of the body that needs nourishment.

Another, and growing, body of psychiatrists, however, realizes the overwhelming importance of proper cellular metabolism. Foremost among these doctors are the members of the *Academy of Orthomolecular Psychiatry*. They have taken a very considerable departure from conventional psychiatry—and, according to a rapidly growing body of reports, it is benefiting tens of thousands with varied mental

illnesses and behavioral disturbances, including many unassisted by other methods.

Orthomolecular psychiatry involves medical scientists who are interested in nutrition, altered metabolic states, defects in brain chemistry, molecular biology, genetics, research in brain enzymes, and psychiatric treatment based upon altering molecular levels and concentrations of essential substances for optimum brain functioning. It is of particular interest also to scientists concerned with altered states of consciousness.

The unifying concept of orthomolecular psychiatry was formulated by Professor Linus Pauling, who defined it as "the treatment of mental disorders by the provision of the optimum molecular environment for the mind, especially the optimum concentrations of substances normally present in the body."¹

The purpose of the Academy of Orthomolecular Psychiatry is to further and increase scientific knowledge in psychiatry and to serve as a meeting ground for interested professionals so as to extend knowledge in this field. It seeks to make clinical application of orthomolecular psychiatry for the alleviation of mental disorders and to study ways in which optimal mental functioning can be achieved for all citizens, including those without mental disorders.

Physicians seeking training in orthomolecular psychiatry can apply to the Academy of Orthomolecular Psychiatry, 1691 Northern Boulevard, Manhasset, New York 11030; telephone 516-627-7260. To assist outside organizations and individuals seeking treatment, the Academy keeps an active referral list consisting of its Fellows.

A current referral list also is maintained by two other agencies: The Canadian Schizophrenia Foundation, 2135 Albert Street, Regina, Saskatchewan, Canada S4P 2V1 and the Huxley Institute for Biosocial Research, 1114 First Avenue, New York, New York 10021; telephone 212-759-9554. The Huxley offices also are the offices of the American Schizophrenia Association.

In the course of their studies of human biochemistry a growing number of research scientists have uncovered evidence that mental illnesses and other degenerative diseases may be linked by similar metabolic processes dependent upon nutrition. Their investigations have opened the door to discoveries that could help to alleviate widespread suffering and result in the general improvement of health for all mankind.

The Huxley Institute for Biosocial Research believes that we are now on the brink of a biological revolution that can be hastened by the development of orthomolecular medicine. An increasing number of doctors are currently treating schizophrenia, learning disabilities, drug addiction, pellagra, alcoholism and memory loss successfully with varying combinations of megavitamins, drugs and carefully controlled diet. By providing the optimum biochemical and nutritional environment for *every* person, the attainment of individual potential and social betterment can be maximized.

At present, there is no philanthropic organization devoted to the improvement of health principally through this means. Named after biogeneticist Sir Julian Huxley and author Aldous Huxley, and in the spirit of their incalculable contributions to scientific understanding and human ennoblement, the Huxley Institute is launching a major national campaign to stimulate and support biochemical research, to disseminate research findings, and to educate the afflicted regarding the nature of their illnesses and the availability of treatment. With public support for these objectives, progress in health care can be made in the next ten years which might otherwise take fifty years to achieve.

MY HISTORY WITH ORTHOMOLECULAR PSYCHIATRY

During 1951-1952 I was given the task of organizing a research program in psychiatry for the Department of Pub-

lic Health, Psychiatric Services Branch, Saskatchewan, Canada. As a result of my contact with Humphry Osmond, M.R.C.S., D.P.M., who joined us as clinical director of the Saskatchewan Hospital, Weyburn, I became interested in the causes and treatment of schizophrenia.

The treatment of schizophrenia in 1952 was in poor shape. Standard treatments consisted of insulin coma and electroconvulsive therapy. Insulin coma was coming into disfavor because of difficulty of administration and high relapse rate. Electroconvulsive therapy (ECT) fell out of favor some time later. Only barbiturates used in large quantities and the morphine derivatives were reasonably effective as emergency sedatives. Generally, we were reluctant to diagnose schizophrenia, not because this was difficult but because a schizophrenic would have to be committed to one of the old mental hospitals—in effect, sentenced to a living death. The mental hospitals of those days were totally inadequate, and very few schizophrenic patients were ever discharged. As psychiatrists, we suffered with our consciences. The inadequacy of the existing therapeutic approach to schizophrenia was a challenge that impelled us to undertake our research program.

As a result of observing similarities between the effects of hallucinogen use among normal subjects and the schizophrenic experience, we turned our attention to the biochemistry of schizophrenia. We developed the *adrenochrome hypothesis* with use of water soluble vitamins, vitamin B-3 being the most significant. The adrenochrome hypothesis provided a rationale for using vitamin B-3 as a methyl acceptor, which decreased the formation of adrenaline, and for the use of ascorbic acid to oxidate adrenaline to adrenochrome. We established that there might be an excessive conversion of adrenalin into adrenochrome in the schizophrenic body. This was the basis of the major research program that we developed over the years. It then occurred to us that if we could reverse this change, that per-

haps we might have a therapy for schizophrenics. This was one of the reasons for us to begin to look at vitamin B-3. Theoretically, it could cut down the conversion of noradrenalin (NAD) into adrenalin. In this way, it would cut down the production of adrenochrome. There are a number of ways vitamin B-3 can be therapeutic:

1. It eliminates an important vitamin deficiency.
2. It has a cerebrovascular effect.
3. It has a mass action effect on cellular metabolism.
4. It furnishes a psychological placebo effect.
5. It could reduce methyl groups.
6. It restores acetylcholine esterase activity.
7. It inhibits NADase activity.
8. It accelerates the destruction of and acts as a direct antagonist to schizophrenic toxin.
9. It has an anti-allergy effect for some schizophrenics.

PILOT STUDIES

Osmond and I undertook pilot studies of vitamin B-3 in the form of nicotinic acid in the spring of 1952. The study function was to determine a dose range that would not be toxic and would have an effect. The first eight acute or subacute patients treated showed a prompt and sustained response to 3 grams of nicotinic acid per day given over a one-month period.

The Saskatchewan Committee on Schizophrenia Research received Osmond's and my report June 30, 1952. Eight patients had been treated with excellent or good results. They were acute and subacute cases:

1. P. B. was committed to Saskatchewan Hospital diagnosed as suffering from Alzheimer's disease but with behavior more like catatonic schizophrenia. He was prescribed niacinamide, one gram per day. He was well four days later and remained well six weeks later by maintaining his program as did all of the following patients.

2. K. C. was admitted February 1952. He failed to respond to electroconvulsive therapy or to insulin coma. Such a non-response usually meant the patient would have to spend the rest of his life in a mental hospital, and K. C. had been placed in restraint. Then we started the patient on 5 grams of nicotinic acid and 5 grams of ascorbic acid per day May 28, 1952. Four weeks later he was well.

3. Mrs. L., age 50, failed to respond to three series of ECT. In a few weeks she was much better after taking 5 grams each per day of nicotinic acid and ascorbic acid.

4. A twenty-five-year-old woman became psychotic following the birth of her baby. She responded temporarily to a series of ECT but showed no response to 60 insulin comas. However, within two weeks she was well after taking 5 grams daily of nicotinic acid and ascorbic acid.

5. A very seriously disturbed man did not respond to three ECT but was well in three days upon taking these vitamins in the same dosages described.

6. A severely psychotic man was well on the fourth day after starting 10 grams per day of nicotinic acid and ascorbic acid.

7. Mr. F., a World War II veteran, was paranoid. We started him on 0.5 gram nicotinic acid two times per day. After a few weeks this dose was doubled. He was discharged after a month, much improved.

8. Miss G., middle-aged, had failed to respond to several series of ECT and was advancing into chronic schizophrenia. We started her on nicotinic acid, 1 gram per day, later increased to 3 grams per day. She recovered. Over the next five years she discontinued the vitamin B-3 intake on three occasions and each time relapsed within two weeks. When she again took her vitamins she recovered. In 1957, she discontinued taking the vitamin and is still well today.

**THE FIRST DOUBLE-BLIND EXPERIMENTS IN
THE TREATMENT OF SCHIZOPHRENIA**

My group, in the fall of 1952, was the first to undertake double-blind experiments in schizophrenia. Our pioneering use of this double-blind technique, published in the *Menninger Bulletin* 18:147-153, 1954, does not mean that I still look upon the technique as the only valid approach. In truth, I consider double-blind experiments inferior, expensive, and tedious. A double-blind study has a limited role in good clinical research.

Having thus disavowed the value of double-blind techniques, I had better explain what they are. Most patients with disease want to get better, and most investigators have some sort of prejudice about any given drug—usually in wanting to come up with successful results, but at times in the opposite direction. This enthusiasm (or lack of enthusiasm, such as the prejudice displayed by the American Psychiatric Association Task Force in its study “Megavitamins and Orthomolecular Therapy in Psychiatry in 1973”) should be allowed to diffuse itself as equally as possible over the medications under study, which is usually accomplished by the “blind” technique. Usually this is “double blind,” with the patient and observer both unaware of the nature of a particular medication. At times, a “single-blind” technique suffices, if the end point to be determined (such as death) is not particularly amenable to overstatement or understatement, or if the patient records the data himself under circumstances in which the experimenter cannot influence him.

Whether the treatments being compared are active drugs or active drugs and placebos (indifferent substances, in the form of a medicine, given for the suggestive effect), it is necessary for successful deception to have tablets or capsules or injections that are as indistinguishable in physical appearance as possible. The medications are then designated by

code letters or numbers (preferably a different one for each patient) and the code is known only to certain individuals not directly concerned with the performance of the trial.

The double blind, which we originally designated the "double dummy method," works best when it is least needed. Our first experiment had to do with the study of a nucleotide preparation, which turned out to be ineffective. Then we undertook a second double-blind study that was a comparison of nicotinic acid, niacinamide, and a placebo. Our placebo was an inert compound, identical in appearance with the material being tested, and the patient and the physician did not know which was which. Thirty patients were divided by random selection into three groups. One group was given the placebo; the second group was given niacinamide, which was a hidden control since it did not produce the characteristic nicotinic acid flush; the third group was given nicotinic acid, which would be known, since patients regularly flush when they first start on the vitamin.²

This second double-blind study indicated that schizophrenic patients evaluated by their own therapists, treated with or without ECT, placed on nicotinic acid for thirty-three days, reevaluated and discharged, after reevaluation one year later, *doubled the one-year recovery rate*. The re-evaluating worker was not aware of the double-blind code. But by year's end the placebo group had one-third of its patients well and the two vitamin groups, niacinamide and nicotinic acid, had two-thirds of its patients well.³

We ran a third double-blind study, the second with nicotinic acid, among eighty-two patients. It did not include niacinamide control, but we covered for this by informing the staff that it was the same design as the one just completed. The results were the same as our second study. Nicotinic acid added to standard ECT (which about 50 percent of our study patients received) was responsible for the vast improvement of most of these patients.⁴

ORTHOMOLECULAR PSYCHIATRIC CARE TODAY

Our major contribution to orthomolecular therapy was to establish vitamin B-3 as an important ingredient of schizophrenia treatment.⁵ However, present treatment is much more elegant, sophisticated and effective. It resembles the 1952-1953 psychiatric treatment program about as much as a present-day Ford Motors product resembles a Model T Ford. Both run, but few would prefer the Model T for everyday use. It's just a collector's item.

The basic or fundamental rule of orthomolecular psychiatric care today is to depend on optimum doses of nutrients most likely to help the patient recover.⁶ All the other components of modern standard psychiatry are used also. Treatment is individually tailored for each patient. The treatment program is continually modified according to the patient's progress. The aim for every patient is recovery even though not every patient will recover. Mental disease is too serious to take lightly and unless the therapist aims at a complete recovery, he or she will not work hard enough and patiently enough, and the patient may be deprived of a chance for improvement or recovery.⁷

Unfortunately, many traditional psychiatrists do not believe schizophrenics can recover. Some psychiatrists are content merely to achieve a permanent improved state for the people they treat. Their objectives include discharge from hospital and reduction of symptoms to a tolerable behavior pattern but not necessarily recovery.⁸

Why is this archaic thinking persistent in traditional psychiatric concepts? There are a few reasons. First, the work of Sigmund Freud dominated psychiatric thinking in the United States, although not in Europe, throughout much of this century. Many influential intellectuals themselves were psychoanalyzed and in the heyday of analysis, talking of

one's own experiences on the couch was very much a staple of cocktail party chitchat.

Analysis was never a particularly effective form of treatment. It is viewed by many as an educational and research tool today. But formerly, its protagonists applied it hopefully in the treatment of varied and multiple disorders. Freud himself said that psychoanalysis was not suitable for such diseases as schizophrenia and postulated that the cause eventually would be found to be biochemical and that successful treatment would have to deal with that. Still, many analysts tried to treat schizophrenia, alcoholism, and other serious problems, with scant success.

Second, American medicine is drug-oriented—make a diagnosis and prescribe a drug to treat it. The concept seems to be: one disease, one drug or series of drugs. Biologically-oriented psychiatrists increased markedly in the mid-1950s with the advent of tranquilizers. Tranquilizers did help to reduce the number of mentally ill patients in hospitals. They were able to vegetate in a euphoric state at home without being a state burden.

Then, in addition to major and minor tranquilizers, anti-depressant drugs became available. The pharmaceutical companies spend millions of dollars annually to encourage prescription and dispensing of thousands of drugs, tranquilizers and antidepressants among them. Drug manufacturers have persuaded doctors that what is good for one of them is good for both—and for the health of the community. Physicians, prescribing psychiatrists included, are intensely bombarded with pharmaceutical industry propaganda. This does not absolve psychiatrists of their responsibility, but it does explain something of how they have been conditioned to make use of new drugs, dispense samples, try this or that chemical, and write more prescriptions. The drug industry makes next to no money on vitamins, minerals, no-junk diets, and various food supplements, compared to the billions it makes on its pharmaceuticals. Orthomolecular psychia-

trists use ingredients which mainly are not chemicals, but foods.

TURNING AWAY FROM THE MAINSTREAM

Even though the predominant belief, and one still held by many psychiatrists, was that tranquilizers merely made amenable psychotherapy patients who previously had been unapproachable, the tranquilizer era aroused a new interest in brain biochemistry. In 1968, Linus Pauling defined orthomolecular psychiatric therapy as "the treatment of mental disease by the provision of the optimum molecular environment for the mind, especially the optimum concentrations of substances normally present in the human body. . . . The brain provides the molecular environment of the mind. "I use the word *mind*," said Pauling, "as a convenient synonym for the functioning of the brain. The word *ortho-molecular* may be criticized as a Greek-Latin hybrid. I have not, however, found any other word that expresses as well the idea of the right molecules in the right amounts."

This definition and the scientific reasoning behind it have initiated a new direction in psychiatry and in medicine. It signals a turning away from the mainstream, an exclusive preoccupation with tranquilizers, antidepressants, and other psychoactive chemicals for the treatment of mental illnesses. It emphasizes the idea which has been slowly developing over the past century that mental symptoms are the product of central nervous system disorders. In turn, these disorders arise from a variety of metabolic faults such as genetic defects or the inadequate concentration of molecules native to the body. Mental illness arises when the requirement—the right molecules in the right amounts—is not met.

Mental illness does not arise from a deficiency of chlorpromazine or amitriptyline. These are useful drug molecules that do something to restore a more normal brain metabo-

lism, but they are not naturally present in the body or the brain. They are unnatural substances which require an unnatural body and brain reaction.

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Poor Nutrition and Mental Disease

CRITERIA OF MENTAL HEALTH

Disappointment and annoyance are emotions I feel at the number of psychiatrists who remain content to keep their schizophrenic patients heavily and permanently tranquilized. Those patients are perfect consumers of services, support, and every other community resource, but never again are they able to be productive citizens of society. They are being given cruel, ignorant, and inhumane treatment. Keeping them tranquilized holds them in a state of abnormality not reconcilable with the precepts of morality—the science of the good and the nature of the right.

By my criteria, a patient is well or recovered from mental disease as soon as he is free of all signs and symptoms. He returns, or is able to return, to his former occupation or, if he had never worked before, now acquires a useful occupation. He gets on well with his family and with the community.

The basic treatment for mental disease in orthomolecular medicine is the overcoming of the effects of poor nutrition with corrective nutritional therapy. Yet a measure of ignorance of many medical critics of this care is that they hardly ever take nutritional histories of their patients. The most enthusiastic exponents of treatment of mental disease with nu-

trition are physicians who have themselves suffered with psychological manifestations of the saccharine disease. There is nothing as convincing as a personal cure, especially when every other treatment has been ineffective.

An example of what I mean is the result of my treatment of four general physicians who became severely psychotic before entering the study of medicine or who became ill after being in practice. They are now normal and practicing successfully. Two other medical students recovered from mental ills under my care and now are completing their medical training. Medical study, calling for stringent concentration as it does, points up these recoveries as remarkable. I am unaware of other physicians able to recover from psychosis and practice medicine after being treated with standard tranquilizer therapy.

PSYCHONEUROSES FROM IMPROPER NUTRITION

In Chapter Three we described the physical manifestations of the saccharine disease described by T. L. Cleave (*The Saccharine Disease*, Keats Publishing, 1975). Even more common are mood alterations among people from the same cause, an excessive consumption of refined carbohydrates. These changes are quantitatively different from mood changes that are part of people's normal reactions. They are psychiatric diseases classified as neuroses or psychoneuroses. They manifest no perceptual illusions and hallucinations—no thought disorder. Therefore they are not schizophrenic.

We determine the presence of early perceptual changes by the use of perceptual tests. Also, neuroses must be distinguished from the *psychotic depressions*: differences between reactive depression and endogenous depression. A *reactive depression* is present when the feeling of sadness is appropriate to the psychosocial environment. Thus mourning is normal following bereavement. An *endogenous depression*

occurs independent of the environment. It is a subjective judgment made by the diagnosing psychiatrist who decides whether he or she might react to a similar event or series of events. The tendency is to believe depressed patients who find some psychosocial explanation for their depression. They may find ample reason to be depressed even though there is no relationship whatever.

Anxiety and depression may coexist in varying proportions. Depression can be the primary symptom with anxiety super-imposing, or vice versa.

Neuroses are distinguished from psychopathic disorders by behavioral changes. *Psychopaths* are behaviorally inappropriate. They have (1) a failure to learn how to give and take love; (2) an inability to form stable interpersonal relationships; (3) a failure to develop a normal conscience—guilt and remorse may be absent. Psychopaths are very impulsive, overreact emotionally, and often engage in antisocial behavior. Neurotics don't suffer these symptoms. Orthomolecular psychiatry treats the biochemical aspects of both neuroses and psychoses. A main cause of neuroses and psychoneuroses is malnutrition derived from faulty nutrition.

The two most common forms of malnutrition causing anxiety relate to a deficiency of some of the B vitamins and to the excessive consumption of processed and refined foods. Although any vitamin deficiency will produce some form of ill health, the B vitamins seem more closely related to anxiety. B vitamin neuroses will be discussed in Chapter Nine.

The saccharine disease provides a metabolic environment for the carbohydrate neuroses. It is rare to find patients with the physical expression of the saccharine disease who do not also suffer from many of the mood changes typically found in the neuroses. In fact, it is common to find serious mood disorders *without* the physical components. Patients with physical symptoms receive somatic treatment. Patients with psychiatric symptoms may wind up in the traditional psy-

chiatrist's office—where the last thing considered will be a physical cause such as malnutrition.

PSYCHOLOGICAL MANIFESTATIONS OF THE SACCHARINE DISEASE

I have identified relative hypoglycemia (functional insulinism) as a psychological component of the saccharine disease. The basic problems arise from the excessive consumption of refined carbohydrates, chiefly sugar and white flour. In 1924, about one year after insulin came into general use for the treatment of diabetes, Seale Harris, M.D., Professor of Medicine at the University of Alabama, noted that many non-diabetics experienced some symptoms of insulin overdosage, *insulin shock*. He suggested that in some people "hyperinsulinism" occurred; that is, the pancreas overreacted with secretion of too much insulin. Dr. Harris developed the six-hour glucose tolerance test to determine its presence.

However, today relative hypoglycemia is uniformly rejected by the majority of physicians as a valid disease entity or even as the end result of a diagnostic laboratory test. It remains one of the diseases *not* taught in medical schools. Not uncommonly, a forty- or fifty-year gap will occur between medical discovery and application of its knowledge. For example, it took fifty years before the Royal Navy adopted Sir James Lind's discovery that citrus fruits would cure and prevent scurvy. Nevertheless, fifty years have passed since Dr. Harris developed his glucose tolerance test and there still remains a reluctance to accept it on the part of medical traditionalists. Reading about relative hypoglycemia here, you now know that low blood sugar is responsible for a great deal of mental illness. When the sugar content of the blood goes too low all the tissues of the body have alternative sources of energy except the brain. Brain tissue depends primarily upon glucose for its energy.

A consistent association prevails between neuroses and relative hypoglycemia. Symptoms may include depression, insomnia, anxiety, irritability, crying spells, phobias, lack of concentration and confusion. Accompanying these neurotic symptoms may be physical ones: fatigue, sweating, rapid heartbeat, diminished appetite and chronic indigestion. Other main neurologic symptoms may be headache, dizziness, tremor, muscle pain and backache. Hypoglycemic people do have the typical neurotic symptoms. Possibly one-third of people visiting their physicians for various symptoms suffer from this condition. It is one of the most common causes of neuropsychiatric illness, and it occurs because of the poor dietary habits of western civilization.

How might we conquer relative hypoglycemia? That is one topic discussed in Chapter Seven, *Orthomolecular Nutrition: Part I, The Optimum Diet*. For now it is sufficient to know that we should come as close to the diet of primitive man as possible. He ate the meat of small animals, fish and fowl, robbed nests of eggs, dug roots, and picked leafy vegetables, nuts, fruits and berries.

At all costs you should avoid high-carbohydrate drinks containing caffeine and sugar. Don't eat white bread, white crystalline and powdered sugar, cakes, cookies, candy, syrups, jams, jellies and a host of other processed items. Primitive man did not have these modern-day poisons falsely called food. Invariably they elevate the blood sugar level temporarily to give a lift. Then they drop you down suddenly into hypoglycemic despair. These overprocessed items produce disease.

Dr. Seale Harris deduced that his patients were suffering from the effects of too much insulin produced in the body as a reaction to the consumption of sugar. He outlined the concept of low blood sugar or high insulin blood content and reported that modification of the diet removed the condition. The diet he recommended was a sugar-free, frequent-feeding diet. Recent nutritional research has again

demonstrated that frequent eating of small meals is generally healthier than eating one or two meals per day.

SYMPTOMATIC SIMILARITIES BETWEEN NEUROSES AND THE SACCHARINE DISEASE

The relationship between neuroses and the group of diseases known as the saccharine disease becomes even clearer when we examine some of the symptoms which are frequently found in both.

Dizziness: Low blood sugar is found often among patients complaining of dizziness; and conversely dizziness appears regularly among those known to have low blood sugar. My experience has been that a large number of patients with hypoglycemia will now and then suffer so severely from dizziness that they will even lose their balance and fall down. The reason? Low sugar levels in the blood prevent transfer of adequate quantities of glucose into the brain. A constant supply of sugar is needed since the brain uses it as a primary source of energy.

Migraine and Related Vascular Headaches: Of 421 patients suffering from severe migraine and other vascular headaches who had failed to gain relief from standard treatment, relative hypoglycemia was found in 226 when tested by Roberts (1971) with the glucose tolerance test. Another 155 had clinical evidence for hypoglycemia but did not demonstrate it by the sugar test. Clinical symptoms of these patients included (1) typical hypoglycemic attacks occurring two to five hours after eating and (2) their prompt alleviation of attack by ingestion of food or sugar. From this large series Dr. Roberts uncovered the following associated conditions:

Narcolepsy was present in 380 patients (90 percent). The narcoleptic condition was indicated by irresistible drowsiness and pathologic or inappropriate sleep. The patients also experienced hypnagogic hallucination, sleep

paralysis, a family history of these problems, electroencephalographic evidence and a dramatic response to the drugs methylphenidate or pipradol. Consequently, a conclusion may be drawn that low blood sugar can cause pathological drowsiness.

Peripheral neuropathy showed up among 136 of Roberts' patients (32 percent). Peripheral neuropathy is a variety of symptoms affecting the terminal areas of the nerves, such as numbness and tingling in the fingers and toes.

Spontaneous muscle cramps and restless legs troubled 297 (49 percent) of these patients with low blood sugar.

Obesity was apparent among 204 (46 percent). Obesity occurred from too much sugar consumption, forced feeding of only one or two meals a day, narcoleptic hypokinesia (the sudden uncontrollable disposition to sleep occurring at irregular intervals, with or without obvious predisposing or exciting cause), and the lipogenic (fat-producing) action of excessive insulin.

Swelling of a recurrent edema type took place in 234 patients (56 percent).

Angina pectoris and cardiac arrhythmia was found in 65 (15 percent).

Peptic ulcer affected fifty-two (12 percent).

Alcoholism was present in thirty patients (7 percent). It is my experience that almost every alcoholic has relative hypoglycemia.

Psychiatric features, especially anxiety, depression or both were found among 117 of Roberts' patients (28 percent). The patients' various typical symptoms could be aggravated merely by bringing on a hypoglycemic attack. Previous psychiatric treatment for these patients had been unsuccessful, including the use of psychotropic drugs and ECT. After their relative hypoglycemia was treated, psychiatric treatment results were often quite impressive.¹

In his paper, Dr. Roberts referred to another paper by Minot (1923), who wrote: "I wish to emphasize to you that

there occurs a group of patients with periodic headaches and some with chronic persistent headaches in which gastrointestinal symptoms may be absent, slight, or marked, who are benefited by reduction particularly of carbohydrate and occasionally of protein. . . . The ultimate criterion to decide whether carbohydrate is associated with the production of headache rests with the therapeutic effect of diet properly administered and likewise with the production of the symptoms following the intake of a known, excessive amount of carbohydrates." Dr. Minot won the Nobel prize for his work with pernicious anemia. His valuable observation of the relationship between headache and carbohydrate seems to have been overlooked by most physicians.

Thus it is clear that the symptoms that occur so frequently in neuroses also occur as frequently with patients known to have relative hypoglycemia. You can reproduce these symptoms more or less at will. All it takes is the challenge of the involved person's physiology with high doses of sugar or with easily and rapidly hydrolyzed starchy foods. Logically, the medical challenger must conclude that in most cases the dietary pattern is the cause of this typical symptomatology. It has diurnal rhythm and a blood glucose pattern of relative hypoglycemia.

The hypoglycemic experience is an event which can be studied while the person who experiences it will always be aware of its existence. It is perfectly fair to ask: Why does it happen? Why do hypoglycemic symptoms come on?

THE PHYSIOLOGICAL MECHANISM OF HYPOGLYCEMIA

Drs. Buckley and Gellhorn (1969) proposed a central mechanism to account for the total hypoglycemic syndrome. The researchers outlined two quite different physiological mechanisms, one having to do with the blood supply and the other with the experience of hypoglycemia itself.²

When the blood supply is reduced to an area of the body,

the imposition of either hypoglycemia or hypoxia (a decrease in the normal levels of oxygen in the blood or tissues) will cause effects that are similar to those of a further decrease in blood supply. Hypoglycemic symptoms are the result. For example, the patient with coronary artery disease can develop angina pectoris at rest when he experiences a hypoglycemic episode. Yet he may be capable of moderate activity right after a meal. Exercise that is comfortable at sea level may induce angina in the mountains.

The second mechanism of hypoglycemia is the result of the inhibition of the glucoreceptors in the central area of the hypothalamus (an endocrine gland involved in the functions of the autonomic nervous system). Slow inhibition takes place by food deprivation and rapid inhibition occurs from hypoglycemic episodes. In other words, starvation cuts down slowly on involuntary nervous function but elevation of the blood sugar activates this center. When the glucoreceptor area is inhibited by a fall in blood sugar it will release the posterior hypothalamus and activate the sympathetic nervous system. The hypoglycemic experience can best be understood at two levels. First, it can be measured physiologically. Second, it is existential and can be experienced. The measurement and the experience represent different levels of abstraction. You can study hypoglycemia and observe the symptoms in a person, but you have to experience the symptoms to appreciate their subtle discomfort.

A group of peasants in the remote mountain areas of Peru manifests aggressive behavior. Typically, they show mental disease from poor nutrition. According to R. Bolton, who studied this population, they fought because it made them feel better. These peasant Peruvians are a paranoid group. There is a high incidence of theft, rape, arson, homicide and divorce. In one village of 1200, half of the household heads were involved directly or indirectly in homicide. The probable reason: a food supply that is very erratic—low in protein

and high in carbohydrates. They eat mainly barley and oats, consume lots of alcohol and chew much cola. These drugs keep them going. It is obvious that a large proportion of the population must have hypoglycemia. As it turned out, when tested, it was found that half the population *did* have low blood sugars. The irritable and aggressive personality typical of these people was assured by their improper nutrition.³

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Psychosomatic Conditions Resulting From Improper Diet

STOMACH SURGERY PERFORMED WITHOUT CAUSE

Several years ago I was asked to examine an emaciated middle-aged man in the hospital. He was losing weight rapidly as he could not eat or retain the food he managed to get down. He weighed only seventy-five pounds and could not have lost much more without dying. He had suffered from severe ulcer-like pain that had not responded to conservative dietary treatment. A gastric cancer was suspected, and his stomach was scheduled to be removed. At the operation, only half the stomach was taken out, a portion that contained a suspicious thickening of the stomach wall. However, the final pathological examination showed he had not had cancer at all.

He did feel better for two weeks while he recuperated from the surgery. Then his old problem of severe ulcer-like pain returned. Now he could retain no solid food and lived only on milk shakes. When I visited him the man was very weak, tired, depressed and unable even to chew.

My psychiatric examination included an observation for perceptual symptoms, but his thinking was clear. Looking further at the pattern of his symptoms, I concluded that his condition initially came from relative hypoglycemia. Stomach surgery performed without cause now had the patient

in a severe state of inanition due to malnutrition. He was critically ill—potentially on his deathbed—and there was no time to do a five- or six-hour glucose tolerance test. Instead I started him on a liquid food mixture made from milk, bananas and eggs, homogenized together, and a few of the B and C vitamins. My orders were to give him one ounce of mixture every hour he was awake.

The program of nourishment worked. His weight loss stopped and soon he regained enough strength to chew food. After a week, he was gaining one pound a day. On discharge he was placed on the sugar-free hypoglycemic diet this book recommends, and he required no further hospital admission.

Nevertheless, the intern in charge of following my orders, a product typical of present inadequate teaching of nutrition in our medical schools, blurted out, "Why are you depriving him of sugar? We are trying to get him to gain weight!" He was convinced that sugar was an energy food. The intern thought, and almost spoke the words, that I would accelerate the patient's slide downhill by the diet I had prescribed. That unlucky intern was almost totally ignorant of clinical nutrition.

The patient's physicians and surgical team lacked knowledge of clinical nutrition too. They took out his stomach without cause, simply in response to the man's psychosomatic symptoms as a reaction to hypoglycemia. They lacked that certain "degree of suspicion" that relative hypoglycemia might cause psychosomatic stomach pain. A great deal of psychosomatic mental and physical illness derives from chronic low blood sugar levels prevailing among patients.

I have alluded before to the fact that the brain requires sugar and cannot develop energy from protein or fats as can other tissues. Therefore the brain is the first organ to suffer from a lack of blood sugar and reacts most severely. Permanent brain damage can occur if the hypoglycemia is

severe and prolonged. In a 1975 publication, Halfken, Leichter and Reich described two patients who suffered progressive mental deterioration because of hypoglycemia following removal of their stomachs. These three authors wrote: "We suggest that clinicians consider alimentary hypoglycemia as a possible cause of seizures, coma, acute confusional states and dementia in patients who have had partial gastrectomies." Often called "dumping syndrome," it has been my misfortune to observe other patients who have fallen into hypoglycemia following gastrectomy (stomach surgery).¹

I would suggest even more strongly that this hypoglycemic condition be examined for in each patient prior to performing any gastric surgery. Look for low blood sugar. A lot of stomachs may be saved from removal that way. Some studies have shown that 16 to 65 percent (an average of 40 percent) of all cases of peptic ulcers come from hypoglycemia. Peptic ulcers also have been labeled as derived from psychosomatic causes. We should put cause and effect together.

WHAT IS PSYCHOSOMATIC DISEASE?

The original term *psychosomatic* referred to the interrelation between the psyche and the soma—between the mind and the body. It was coined in an attempt to bridge the gap in thinking between two types of scientist, the pure somatist and the pure psychologist. Psychosomatic disease works both ways. Pathology in the body can cause mental symptoms and problems in the mind can cause physical symptoms.

In practice, the term was soon taken over by the psycho-dynamic or psychological school. Psychologists believe that it is the psyche that predominates for a series of psychosomatic conditions such as peptic ulcer, ulcerative colitis, hyperthyroidism, arthritis, and other conditions. Gradually,

psychosomatic has become a one-way term. The role of physiological factors in producing disease of the mind is being almost totally ignored in favor of a series of psychological ideas based primarily upon psychoanalytic theory in one form or another.

Over time, the term is falling into disuse. Now it serves no practical purpose because it no longer has any real meaning. This is unfortunate, since hypoglycemia is a fine example of psychosomatic disease in which the main problem is in the individual's nutrition. The soma causes a resultant reaction of the psyche.

What we have said here about neuroses and neurotic symptoms applies equally well to the psychosomatic conditions. Perhaps if the psychoanalysts of twenty-five years ago had been aware of the relationship of food to disease, they might have had more luck defining a characteristic personality profile for each psychosomatic condition. An astonishing amount of research went to this problem but very little has been published. There is no characteristic profile.

In 1951, I visited Dr. F. Alexander's analytic institute in Chicago. He invited me to participate during one of the luncheon research meetings at the institute. The training residents and staff had been given a verbatim recording of an interview with a patient who was possessed of one of seven psychosomatic conditions. Any reference to the disease was deleted. From listening to the interview, each participant had to guess which condition it was. That day, out of twenty professional people present, *none* were correct in diagnosing the patient's condition. Even by chance, one of the seven psychosomatic conditions should have been chosen, but it was not. My conclusion from this and many other observations is that the chance of accurately predicting psychosomatic disease by such methods is virtually nil.

One of the physiological components in psychosomatic disease is being ignored. Diseases such as peptic ulcer and ulcerative colitis are related to a certain type of saccharine disease. Relative hypoglycemia is a definite component. Dy-

namic psychological explorations for psychosomatic disease so common a decade ago deserve very low priority now.

Even the Bible, Genesis 25:29-33, knew better about nutrition having something to do with behavior. Esau is the first recorded case of psychosomatic disease and personality disorder from relative hypoglycemia:

And Jacob sod pottage: and Esau came from the field and he was faint: And Esau said to Jacob, Feed me, I pray thee, with that same red pottage; for I am faint. . . .: And Jacob said, Sell me this day thy birthright. And Esau said, Behold I am at the point to die; and what profit shall this birthright do to me? . . . and he sold his birthright unto Jacob.

Then Jacob gave Esau bread and pottage of lentiles; and he did eat and drink and rose up and went his way. Thus Esau despised his birthright.

OUR PSYCHOSOCIAL COMPUTER PERSONALITY

Esau probably suffered from severe hypoglycemia and knew that a protein-rich soup made from lentils (beans) would restore him to health. His feeling that he would die was motive enough to force him to sell his birthright. He wanted to live. This is an excellent account of the powerful drive in people, when they have hypoglycemia, to consume what will elevate their blood sugar levels.

Indeed, psychosomatic disease is a product of our biochemical environment. Few people seem to be aware of this fact; our psychosocial environment seems to overshadow in importance consideration of our biophysical environment. The relationship of the individual to the psychosocial environment—prenatal influences, interaction with parents, family and community, social and economic class, education and life experiences—produces a personality which can instructively be compared to a modern computer.

A computer has four basic functions: (1) receive information or input; (2) do something with that information—get at it when necessary—use it; (3) receive orders about what it should do with the information (the *program*); (4) display the results of the operation. In summary, therefore, the computer in response to a program does certain operations on data stored and fed in. Then it displays the results on a panel or on paper or on tape. The program is called the *software*. The rest of the computer apparatus is referred to as the *hardware*.

A person—any living animal—has the same four basic functions. Your input comes to you via the sensory apparatus. Our eyes, ears, nose, taste, sense of touch obtain information for us about the environment. Complexity of input varies with animal species, and man is very complex. Even a one-celled animal can sense the presence of an undesirable chemical. Input in animals is called *perception*, and there are two major types: *exteroception* deals with the relationship between individual and environment; *interoception* relates to the brain's reception of essential information from muscles, bones, joints, organs and other tissues. The brain is intimately connected to the rest of the body by motor and sensory nerves. In fact, the brain is part of the body and becomes affected by anything that causes change in the body.

The brain carries on “thinking” that depends upon memory and one’s ability to learn. Your thinking is analogous to the operation of the computer, but infinitely more complex. Reasoning is the most complex human function, something computers have not yet been able to do, even though the ability not to repeat errors is being built into them.

People are programmed by life instead of, as are computers, by a detailed set of instructions, the *software*. Life experiences are our software with the term *education* denoting those experiences. Our education begins at birth and never ceases. If you gain new ideas or change concepts from

reading this book, the book will have *reprogrammed* you. You will have been re-educated.

Personality, the way we react to events or ideas, is a result of a given genetic program molded by the psychosocial environment. This molding determines why we react to our perception the way we do. The end result of the programming will be motor or speech activity. For instance, the popular pocket electronic calculator can be said to have a personality. When we add two and two, we punch or press key 2. This is the input and the *two* registers somewhere in the calculator's memory bank. We then program the machine by pressing the "add" button. This orders the calculator to add the *two* to the next number pressed, the 2 key again. Now the calculator is ready to operate. Press the = button and the number 4 flashes on the little display panel. The operation is over. The computer has reacted to the environment in the only way it can by working with numbers.

INSANITY OR COMPUTER MISPERCEPTION

The computer may be defective. It may react incorrectly. When we order it to add two and two it may give us six. Theoretically, errors are possible in each of the various functions. Perhaps the input is wrong so that when *two* is pressed the calculator records *three*, or else it programs badly to add improperly. It may respond at random. Or the electronic circuits may be disarranged. The display panel may be faulty and report *six* instead of *four*, even though other functions were correct. A society of computers would judge this computer to be different—insane or criminal—sick or willfully bad. It would need to be sent to a computer physician to determine what is wrong.

In the same way, the *human* computer may be incorrect. Error may arise from any one or more of the four functions. John Conolly, M.D., an English physician practicing 150

years ago, gave this sort of explanation for strange or psychotic behavior. Of course, he knew nothing about computers then, but he defined insanity as a disease of perception combined with an inability to tell whether these misperceptions were real or not. This extremely important concept for modern psychiatry is slowly coming back into vogue. It had been submerged for nearly seventy years by the popularity of psychoanalysis.²

Human computer misperception occurred to a highly respected and moral man years ago. He was brought to the psychiatric ward against his will because he suddenly began to chase a young woman along the main street. When I examined him he told me that God suddenly appeared out of the heavens and said, "You have syphilis and the only cure is to have intercourse with a virgin!" He had been brought up to believe in God and to obey Him. Therefore, he began to chase the girl. His reaction, racing after the girl, was the end result of the misperception, his judgment of it, and his response. The problem was that he suffered from two major perceptual changes, a visual and an auditory hallucination. Two senses reported something had happened. He saw God emerge from heaven and heard Him speak. Not knowing that he had been schizophrenic for some time, he thought the perceptual phenomena were real. Thus he behaved in a way he thought appropriate. To his surprise the man found himself locked into a psychiatric ward.

The perception was *real* to my patient. Had he decided he had seen and heard an hallucination, he would not have behaved in a way that society judged abnormal. I placed the man on nicotinic acid, 1 gram three times per day, and he recovered. Luckily, tranquilizers had not as yet come into use at that time. Now, twenty-three years later, the man is still well and has been promoted to high office in his organization.

Had my patient experienced only a visual hallucination or had he only heard a voice, it is doubtful that he would have

run after the girl, for he is a moral person. What he believed to be an urgent message from God made him do what he did. Any perceptual distortion can produce an unusual reaction. As opposed to an illusion where an object is seen in the usual way, an hallucination causes the person to see an object as others do not see it. Hallucinations can affect all the senses. They may be judged real by the hallucinator if they are present for a long time. If more than one of the senses provides coherent information, it is even more difficult to ignore the hallucination as unreal. A few strong-willed persons may mistrust the evidence from two senses, but it is highly unlikely that evidence from three senses would be so judged and not acted upon. If a person had a visual hallucination of an angel, heard him speak, and felt his hand upon his shoulder (visual, auditory and touch senses), he would undoubtedly conclude this was a real angel and not a three-dimensional apparition who could speak.

TABLE I

PERCEPTION, JUDGMENT AND REACTION POSSIBILITIES

Perceptual Change	Judged	Reaction
Everyone is watching me	False	none
	True	increased sensitivity, paranoid ideas
Hearing voices	False	see a doctor
	True	the devil is speaking to me
Food tastes bitter	False	worry
	True	poison in food

Imagine yourself having a variety of perceptual changes and decide how you would react if you decided these changes were true, or if you believed them false. The exercise will amaze you.

PSYCHOSOMATIC REACTION TO ENVIRONMENT

Psychosomaticism is a reaction between the person and his psychosocial or biophysical environment. If the senses are normal and only have minor variations in interpretation of what is experienced, that individual will react in a normal way with the environment. Nevertheless, a person with a normal sensory apparatus (input) may react abnormally to his environment. His program may be faulty. If a person is brought up in a culture where it is considered normal to be hostile, to rob and steal, and if he is transported into another psychosocial environment where this sort of behavior is not tolerated, he will behave abnormally until he is reprogrammed.

Also, a person's muscular apparatus—lack of coordination—may make it impossible for him to behave in a normal way. Thus, if your speech is garbled and distorted by a muscular abnormality, you would have great difficulty behaving normally. You would be unable to communicate with others.

The interreaction between the biophysical environment and the individual is equally complex. We react directly to our environment. We react differently in the dark than we do in daylight, for example. Even more subtle is the impact of this environment on our perception of the psychosocial environment.

Chronic malnutrition and cerebral allergy are producers of misperception. They alter perception and thinking. Consequently, the relationship of an individual to the psychoso-

cial environment will change. My patient who chased the girl suffered from perceptual changes owing to his need for extra quantities of nicotinic acid, vitamin B-3. Giving him the needed vitamin cured his perceptual changes; a change in nutrition restored his previously normal behavior.

All of us react to two environments: psychosocial and biophysical. Our response to the psychosocial environment is mediated by the senses. The biophysical environment is both a cause and effect. It influences our reaction to both environments.

If disease, ill health, or discomfort arise out of any cause relating to psychosocial environmental factors—in other words, from a disharmony between the physically normal individual and the environment—they must be dealt with by psychosocial techniques. Biochemical treatment won't work. Conversely, if the error is in the biochemistry of the brain, there is little point in trying to correct it by psychosocial techniques alone. The correct treatment is to restore the normal biochemistry.

To return to the computer analogy, the computer's hardware is the machine which senses, operates and reports. The software is the program. If the computer is defective because of a problem in the hardware, no amount of software tinkering will correct its operation. If the error is in the software, no amount of hardware tinkering will correct the error. So it is with human beings. Their psychosomatic ills arise from one of two environments. Treatment and cure of them will take place by finding the error in either software or hardware: programming or physical malfunction. The next chapter describes orthomolecular treatment for the latter.

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ORTHOMOLECULAR NUTRITION—PART I

The Optimum Diet

ORTHOMOLECULAR NUTRITION DEFINED

You will enjoy super good health when you are in harmony with the environment. Then you sense the surroundings, perceive them as most normal people do, experience clear thinking, act alert, feel in tune with the general thought of the day (but not necessarily in agreement with it), show a normally cheerful mood, sometimes feel appropriately depressed and sometimes ecstatic, and can perform physical activities desired with adequate energy and enthusiasm. Not every person will reach this state of superhealth. Everyone should try for it, however. A large number of people will be happily surprised if they do make the effort. Will you be one of them?

Super good health can be reached through the application of orthomolecular nutrition. *Orthomolecular nutrition is the ingestion of the optimum level of each nutrient for each individual.* Its concept is founded upon the recognition that no living organism lives within a perfect environment. For example, if yeast cells, which grow exceedingly rapidly, were supplied with the ideal environment, they would in a short period use up all the nutrients on Earth. Nature has evolved a complicated set of checks and balances so that

such a quick-growing organism runs into the reality of a limited environment.

If rabbits find too perfect an environment, they will over-populate. Eventually there will be so much rabbit meat available for their predators that the predators will in turn multiply. Then the rabbit population will be brought into balance. A perfect environment for one species not only is impossible, it would be intolerable for other species and eventually for the one species temporarily enjoying that environment. Dr. Roger Williams has been instrumental in making us aware of these factors. They apply as well to the cells of a multi-cellular animal. The environment of every animal is imperfect. It follows that the cells within the animal also must live in an imperfect environment.

Each cell in the body is surrounded by a thin layer of water which contains the nutrients, hormones, waste products, and other substances essential for its function. Ideally, all the forty-five nutrients required by the cell should be present in optimum quantities which must vary from time to time. In actuality, this hardly ever occurs, as the cells must compete with others for their share of the limited supply of nutrients. There is an enormous range in need.

For example, the range in need for lysine is 700 percent from subjects requiring the least amount to those requiring the most for optimum function. The need for vitamins is even greater if the range is considered for those who are vitamin-dependent individuals. *Orthomolecular nutrition is nutrition which strives to provide these optimum quantities for the cells of the body and takes into account the enormous individuality of persons and the variations caused by time and stress.*

Orthomolecular nutrition offers a program for each of the following categories of individuals:

(1) People who are very healthy now but would like to increase the probability that they will remain the rest of their lives in super good health.

(2) People who need to change their pattern of living

and eating in order to gain a much better state of health—good health.

(3) People who are already in the throes of serious physical and psychiatric disability.

People in category 3 will use orthomolecular nutrition as a treatment program. Categories 1 and 2 are preventive and maintenance programs.

NUTRITIOUS FOODS

The best foods are whole foods to which Man has adapted in the course of his evolution. They are the opposite of junk foods. They contain the protein, fat and carbohydrate fractions of the food in combination with the vitamins and minerals.

When the wheat kernel is growing, the vitamins and minerals used in synthesizing its chemical components are deposited and left there. Following the milky stage, when the green kernel is full of a milk-like liquid, the kernel begins to harden. Once it is full, little additional material is made and the water present is lost from the kernel by evaporation through the bran. The movement of the liquid through the bran translocates some of the vitamins and minerals toward the outer coats. The important part of the kernel, the germ, which will grow into a new plant, is for this reason very rich in all the nutrients essential for growth. If all the vital nutrients of the kernel were isolated and fed simultaneously, this would be as nutritious as eating the whole kernel, provided that in the process of extracting all these nutrients they remained undamaged by the chemical process used—which is not possible. In addition, we cannot assume that every essential nutrient has already been identified; surely others remain to be discovered. For these reasons, given our present state of technology, *there is no way to process a food into as nutritious a product as the original food which was the starting point.*

The kernel is fractionated by current bakery technologists into white flour (called endosperm), germ, and bran. Then only the white flour is fed to people as loaves of bread. The people, as a result, are being cheated of proper nutrition. They are being deprived of most of the vitamins and minerals used by the plant to make its own food. Plants manufacture food with which to feed themselves; people do not. People eat and digest food to release essential nutrients and make them available to the body. The body, in turn, metabolizes the food into energy or into structural components. In the absence of nutrient-rich components, there is an immediate imbalance in the human body. White flour cannot be metabolized unless vitamins and minerals are present. When white flour fails to carry the correct amount of nutrients, the body must get them from other food stuffs.

In modern society you are being robbed of nutrients by use of junk foods. These are packaged parasites, the sneak thieves of essential micronutrients from all other foods you eat. By eating them, you are participating in the food technology conspiracy to line manufacturers' pockets with your silver at the expense of your bodily and mental health.

None of the processed foods carry their optimum quota of essential micronutrients, but some are much worse and more lacking than others. There is only one safe rule to follow. **USE WHOLE FOODS WHENEVER POSSIBLE.** Eat an orange rather than its juice—whole wheat and not white flour—brown rice instead of polished rice—an entire potato in place of instant mashed potatoes. Furthermore, whole foods provide one other major health advantage. They are packaged by nature in fibrous material which provides bulk to the body. Digestion without bulk becomes very difficult. Another excellent rule: **IF MANMADE, DON'T EAT IT!**

Perhaps someday, food manufacturers really will enrich our good foods to provide nutrients that are in short supply. After all, seeds are originally designed to grow new plants and not to provide us with food. The needs of growing

plants are not identical with ours, but seeds are the finest natural food that farming manufacturers can provide to date.

RAW FOODS

Since cooking involves altering the nutrient characteristics of foods through the action of heat or the dissolving effect of water, it is wise to eat uncooked or raw food whenever possible. Certain foods must be cooked in order to digest them or to protect ourselves from bacterial or parasitic invasion. Foods like pork and poultry should be cooked well. Some others such as fish and beef may be cooked lightly. Various vegetables like carrots, turnips and celery might best be consumed raw. No vitamins and minerals will be wasted in this way. Of course, clean your food of chemicals first. Chemical contamination in no way enhances its nutritional quality and may even make it unsafe to eat. Insecticides, parasiticides and other pesticides are often poisonous to people.

Some foods eaten raw are said to pack purifying properties. They act as antidotes against poisonous additives if inadvertently ingested. A list of these foods follows:

Alfalfa tea	Dandelion root	Herbs including—
Apples	& leaves	Angelica
Apricots	Grapefruit	Borage
Asparagus	Horseradish	Fennel
Beet tops	Lemons	Horehound
Blackberries	Oranges	Juniper
Blueberries	Mustard greens	Marjoram
Carrot juice	Peaches	Rue
Cauliflower	Raspberries	Sarsaparilla
Celery juice	Turnip tops	Slippery elm
Clover	Watercress	Southernwood
Cranberries		

NOTE: Vitamin C (ascorbic acid) is known as "the anti-pollution vitamin" and protects in part against toxic poisons and gamma rays.

Bone meal contains calcium, which is quoted in the *Science News Letter* (March 31, 1962) as influencing an individual's immunity to cancer and as a protection against radiation.

BALANCED NUTRITION

"Balanced meal" has been a favorite term used by nutritionists for many years. It means that the optimum proportion (a balance) of all the food components is provided—an excellent idea in theory. But the term has come to mean something else too. In the name of a balanced meal, many nutritionists have compromised their knowledge and accepted that even large quantities of sucrose in a meal are fine provided that it is balanced against some protein, fat and the essential vitamins and minerals. This has led to the preposterous statement that junk cereal and milk are nutritious whereas in reality that cereal has diluted the nutritional quality of the milk. Remember? A few paragraphs back we said: "In modern society you are being robbed of nutrients by use of the junk foods." They are "the sneak thieves of essential micronutrients from all other foods you eat." *Again we emphasize that statement!*

Some nutritionists have said that the super doughnut made from white flour, oil, and sugar, plus a tiny quantity of added vitamins is a good food. They suggest that a balanced meal is provided by eating a couple of super doughnuts and drinking a glass of milk. How nonsensical! Yet there has even been backup by the United States Department of Agriculture for this kind of suggestion. Of course, white flour and milk are agricultural products, which suggests an inappropriate bias on the part of the government agency.

The concept of balance thus was useful originally, but it has been corrupted by the industries devoted to food technology, and no longer serves any valid purpose. Since no better description of proper eating exists though, we will continue to use "balance" here—in its original sense. In effect, "balanced nutrition" and "orthomolecular nutrition" are similar terms because they both denote *the importance of using optimum quantities of all the essential nutrients*. This is best achieved by obtaining these nutrients from a variety of foods. Variety is more apt to satisfy our needs than is dependence upon any one food.

Of itself, food should be balanced for each meal and over an entire day. The best way to ensure such balance is to use whole foods that nature has already balanced. Eat several items from different groups such as meats, fresh vegetables, fresh fruits, fresh fish, poultry, dairy products, nuts and seeds. Ensure total daily balance by attempting orthomolecular nutrition every time you eat. Snacks may not be included in this admonition since they seldom are made from a variety of foods and comprise only a minor component of our diet. Even so, it is very important to make sure that snacks are whole foods and not of the refined carbohydrate type such as doughnuts, chips, pretzels, chocolate bars and other junk. This junk steals the good out of meal balancing and leaves you with empty calories.

Balanced nutrition demands that you follow a series of dietary rules. Primitive man followed them naturally without realizing that they were rules for healthy living. He did what came naturally, making use of what was available. All he had was healthy food.

SPECIFIC DIETARY RULES

Following a set of general rules will ensure an adequate diet for most people. Yet the individuality of people suggested by Dr. Williams does mean that some will have widely vary-

ing requirements. Consequently, a few special rules offered here are designed to meet those individual requirements. Follow them and you will be doing what is best for your body and mind.

A. *Eat an optimum amount of protein*, either vegetable, animal or both. You will have to determine what amount is optimum for you. The best way to accomplish that is by trial and error. First start with a lower level of intake, then increase it slowly while you judge what effect your form of eating is having.

Use of the word *protein* here refers to protein-rich foods, not to any protein powder or other protein supplement. You may feel a sense of well-being as your protein intake increases; assume then that more is a better level. Don't push onto others what you find is an optimum level for yourself. People, being individual, have different optimum requirements. "Do your thing" and let others do theirs. If they ask for advice, give it, of course.

While testing yourself for optimum protein intake, keep the fat and carbohydrate levels about the same as usual. Otherwise you may find it difficult to decide what makes you feel better. This is a therapeutic preventive and maintenance program being recommended for those described in categories 1 and 2 set out at the beginning of this chapter. Finding the correct levels of protein, fat and carbohydrate is a course designed for people who are healthy now and wish to stay that way or who desire super good health. Also this method will help those who have let themselves deteriorate and need to change their pattern of living to gain a somewhat healthier state. If this is to be achieved, the type of protein consumed should have enough of the essential amino acids.

B. *Eat an optimum amount of fat (lipids)*. Proceed to work out what this is the same way you did with protein.

C. *Eat an optimum amount of unprocessed carbohydrates*. These should be from fresh vegetables and fruits.

We've already discovered that the optimum quantity of processed or refined carbohydrates such as sugar, white flour, alcohol, polished rice and some other edibles is zero. Every increment above zero of these ultrarefined food artifacts decreases the quality of your diet. In other words, the more you eat of these zero edibles, the more you are stealing nutrient value from good foodstuffs. You dilute your intake of nutrition that way and detract from your overall health. Why accept anything less than the optimum diet when it is available?

THE OPTIMUM DIET

A diet that provides orthomolecular nutrition, *the optimum diet*, will consist of the necessary protein, fat and carbohydrate increments from natural foods. Over thousands of years mankind has adapted to these during his evolution. These elements are mingled with each other and with other essential nutrient factors such as vitamins and minerals. Extra supplementation may be required by certain people whose optimum requirements can't be met by even the best program of nutrition. Self-experimentation with vitamins and minerals is something you can engage in to determine whether or not you need this supplementation program. Chapter Nine discusses vitamin supplementation. Chapter Ten explains about mineral nutrients.

Keep in mind that vitamins are not drugs; they are foods. Many physicians do not look at vitamins and minerals that way. They put this form of food supplementation in the same category as tranquilizers and other unnatural synthetics. They believe that food supplements should remain under prescription control as are antibiotics or other potent medication. Why do they hold this erroneous belief? Because physicians are trained to recognize deficiency diseases, and they are taught that in modern society the majority of people are not suffering from any deficiency.

This is true in the sense that patients are not dropping on the streets with disease symptoms. But that is the only truth that doctors are taught about vitamin deficiency.

Physicians enter practice trained in the germ theory of disease, and look for illness arising from that cause and not from the lack of vitamin and mineral nutrition, and therefore take for granted that people should not need any more minerals and vitamins. Doctors recognize that some of their patients do require supplementation, especially when specific deficiency diseases are present. They do administer vitamin B-12 for pernicious anemia; vitamin D for rickets, and other therapeutic vitamins for other individual problems that appear. They equate vitamins used in this way with drug treatment, which often involves the possibility of serious toxic reaction. Physicians bolster this position with dire warnings. Doctors are correct when they point out that it requires medical expertise to recognize the deficiency diseases. But, considering that vitamins and minerals properly should be classed as nutrients, the situation becomes altogether different.

Let's face it! The typical deficiency diseases are uncommon. They can be identified easily by any person interested in nutrition. Many people, possibly you among them, are very keen to learn all they can about nutrition and the diseases proper nutrition prevents. People want to know how to keep themselves healthy. The popular literature is well endowed with this information, but it seems difficult for medical students and some doctors to find it. They insist on remaining disease- and illness-oriented rather than becoming person- and health-oriented. Doctors *treat* crises and tend not to prevent them.

Knowing what is the optimum diet for yourself is of great advantage. To find that out does take experimentation of a controlled nature. The concept of controlled experiments in nutrition is not very novel, either. You can and should do it for yourself. However, nutrition scientists would prefer to hold onto the reins of research themselves. Some modern

research workers would have us believe that controlled clinical experiments are difficult and very recent, going back perhaps two or three decades. Yet in the Bible, *The Book of Daniel*, Chapter 1 verses 3 to 16, we find the following account of what may have been one of the earliest recorded controlled clinical experiments.

Then the king [Nebuchadnezzar] commended Ashpenaz, his chief Eunuch, to bring some of the people of Israel, both of the royal family of the nobility, youths without blemish, handsome and skillful in all wisdom, endowed with knowledge, understanding, learning, and competent to serve in the king's palace, and to teach them the letters and language of the Chaldeans. The king assigned them a daily portion of the rich food which the king ate, and of the wine which he drank. They were to be educated for three years, and at the end of that time they were to stand before the king. Among these were Daniel. . . .

But Daniel resolved that he would not defile himself with the king's food, or with the wine which he drank, and therefore he asked the chief of the Eunuchs to allow him not to defile himself. And God gave Daniel favor and compassion in the sight of the chief of the Eunuchs, and the chief of the Eunuchs said to Daniel: "I fear lest my lord the king, who appointed your food and your drink should see that you were in poorer condition than the youths who are of your own age. So you would endanger my head with the king."

Then Daniel said to the steward:

"Test your servants for ten days. Let us be given pulse to eat and water to drink. Then let our appearance, the appearance of the youths who eat of the king's rich food be observed by you, and according to what you see deal with your servants."

So he harkened to them in this matter, and tested them for ten days. At the end of ten days it was seen that they were in better appearance and fatter in flesh than all the youths who ate of the king's rich food. So the steward took away the rich food and wine they were to drink, and gave them pulse.

ANTI-ALLERGY NUTRITION

An anxious and depressed man consulted me in 1967. He had been following a typical high-carbohydrate, processed-food program of eating and had the usual diurnal rhythm of symptoms in response. My treatment included his adoption of the hypoglycemic diet with inclusion of plenty of protein. He returned two years later with assurances that he had followed my recommendations faithfully and seriously for months. He ate beef at each meal and avoided all junk food. Yet, he became steadily worse; more depressed than ever. Eventually he found his way to an allergist who discovered that the man was allergic to beef. When he eliminated beef from his diet, he promptly recovered from all mental symptoms. My recommendations had worsened him by increasing his consumption of a food to which he was allergic.

This points up the very real existence of nutritional allergies. Many people are allergic to some of the protein-rich foods. Neither they nor their doctors are aware of this. Increasing the intake of these allergy foods may make mental and/or physical symptoms come on even stronger. When I first began to diagnose and treat relative hypoglycemia, I placed all of these patients on the usual high protein, sugar- and processed-carbohydrate-free, frequent feeding program. This was very effective for a large proportion of patients, but eventually I discovered that some who had been well for up to a year noted the return of severe depression, anxiety, and

other symptoms, as had been the case with this patient allergic to beef.

You may gather from this that the main nutritional problems are not single-vitamin deficiencies. Rather, they are usually multiple subclinical deficiencies or allergies. This means that the symptoms are vague and diffuse. A sick person will no doubt have something wrong, but there is little specificity about what it is. It is only before death is likely to occur that the fully developed symptoms appear. There is no guide to what is wrong with a person possessed of a nutritional problem. Even with their medical expertise, physicians are not more skillful in concluding which subclinical deficiency or allergy is present. The intelligent lay person is just as adept at detecting the source of the problem.

However, physicians do have access to laboratory tests and know better how to use them and how to interpret them. A physician knowledgeable about nutrition is a desirable individual to know and consult. When such a physician can't be found, you, the lay person will have to go ahead alone.

What should you do to help yourself or someone you love? Since symptoms are not too helpful, except that they indicate something definitely is wrong, there is no alternative to trial and response techniques.

Seek out anti-allergy nutrition. Don't accept symptoms as being psychosomatic or allow yourself to be branded as neurotic simply because the complaints do not fit in with any well-known physical problem. A physician may not be able to find anything wrong. All his tests could well be negative. I have seen ailing people undergo dozens of tests, receive over a thousand dollars worth of investigatory examinations, and end with being labeled "neurotic." Yet, for these so-called neurotics, nutritional tests or allergy tests were prominent by their absence from the whole battery of those administered. Neuroses must never be diagnosed simply by excluding well-known syndromes.

One more bit of knowledge you should have: there are

two basic reasons for organic pathology: (1) anatomical and/or histological changes in the body such as actual wounds, tumors, blockages, and other such physical difficulties; (2) biochemical physiological changes which may not show as anatomical-histological changes, at least in the beginning. The second type of changes probably won't be readily diagnosed by physical examination nor even by the usual laboratory tests. The first type of changes produces easily recognized diseases such as pneumonia, heart disease, jaundice, and the like. The second kind produces equally serious illnesses, but not other physical changes.

Both symptoms and signs will be apparent in the first set of conditions, but not in the second set—only symptoms, as the physician seldom is experienced enough to recognize biochemical signs. Note that *a symptom is the patient's complaint; a sign is evidence of malfunction elicited by the physician either in the history or by appropriate laboratory tests*. Nobody should accept the diagnosis of neurosis (that it's all in your mind; you're imagining it; you have psychological problems, etc.) unless certain conditions have been fulfilled first. There should be clear evidence that psychological problems or conflicts prevailed which preceded the illness, or there should have been a complete examination, including a nutritional investigation, allergy tests, and a six-hour glucose tolerance test.

THE DIETARY TREATMENT FOR HYPOGLYCEMIA

Hypoglycemic treatment is primarily dietary. For allergy-free people who suffer from low blood sugar, the diet should exclude all junk. The uncompromising rule: all foods which contain added sugar, are highly refined, and/or are vigorously processed should be considered so much packaged garbage.

The pattern of eating may be variable for some hypoglycemics. A three-meals-a-day pattern will be suitable for

most, but others do require additional snacks between meals. Even though these people are free of allergies, an allergy could develop, and it should be watched for. To reduce the chance of triggering an allergic response, it is best not to rely too much on eating any one food. Vary the diet as much as possible. Leave a gap of several days for a repeat consumption of the same edible.

If you or a member of your family is allergic and hypoglycemic at the same time—hypoglycemic because of the allergy, or whose hypoglycemia is aggravated by the allergy—rigorously avoid those allergy foods. If the allergy is a *fixed* one, it will *always* produce the allergic response and should not be excited by eating what brings it on. Otherwise, after six months to a year, the foods you have omitted from your diet may be reintroduced in small quantities at infrequent intervals.

If you are hypoglycemic and allergic simultaneously, there may be some foods that cause an allergic response and should not be eaten. If that is the case, you may find it impossible to avoid them. Then your diet may have to be one of rotation, going from one such food to another. If other allergies are present, such as allergy to dust, pollen, or fumes, these should be eliminated from the environment as much as possible. Also you may be desensitized by properly prepared vaccination. Decreasing the intensity of these allergic reactions will decrease the intensity of the hypoglycemic reaction.

In addition to dietary treatment for hypoglycemia, it is desirable to use vitamin supplementation. The important B vitamins, vitamin C and mineral supplements may be needed in quantity. Laboratory techniques such as hair analyses for trace minerals and blood assays for zinc and copper will be helpful in deciding which minerals ought to be added to the program. The necessary B vitamins are B-3, B-6, and sometimes B-1. Important minerals probably are chromium, zinc, manganese and magnesium.

Other adjuncts have been used during the initial stages of

hypoglycemic treatment. These include a soluble calcium preparation called "Calphosan" given by intramuscular injection. Orthomolecular therapists have used an adrenal cortical extract, ACE, intravenously in a series of injections. Others seldom if ever inject these preparations. The idea of using ACE is to replace some of the hormones which a tired adrenal cortex is not preparing. Supplemental injections allow the gland to rest.

Those orthomolecular physicians who began their practice using megavitamin therapy have tended not to use ACE very much. Those who depended less on vitamin supplementation generally inject more ACE. It is possible that the use of megavitamins restores adrenal cortex function. This may explain why orthomolecular physicians who prescribe vitamin supplements do not use ACE injections as treatment nearly as often as the others.

Allergic hypoglycemics are aided by antihistamines and parasympathetic drugs such as bellargal.

Treatment of the hypoglycemic condition was divided by Ross (1975) into three stages.¹ During the *first stage* of hypoglycemia care the patient may feel worse with symptoms. He experiences an increased craving for sweets and starchy foods, a craving similar to the withdrawal phase after eliminating any addictive drug. A non-addicted hypoglycemic may have less severe symptoms. Depression does appear, though, and only faith in the doctor's diagnostic skill and therapeutic wisdom sustains the patient. Occasionally depression becomes so severe that it requires antidepressant medication and, occasionally, admission to the hospital.

During the *second stage*, patients suffer from recurrent episodes of their typical hypoglycemic symptoms interposed with episodes of well-being. Each relapse brings back depression, but the enjoyable good periods come more and more frequently and last longer. Patients soon learn that dietary indiscretions precipitate the resurgence of symptoms. This is a valuable lesson, for it brings into play an evolutionary device which has allowed animals to learn which foods

they can eat safely and which should be avoided. Humans being animals—though priding themselves on being the highest order thereof—will have an evolutionary instinct come into play.

Naturalists have shown that when an animal becomes ill within a few hours after eating a particular food, it will no longer have an interest in that food. Rats fed poisoned bait which does not succeed in killing them will avoid that bait again. A coyote fed rabbit meat containing sublethal amounts of lithium salts will become violently nauseated and vomit. Then it shuns that rabbit meat altogether. In one case a coyote shown a *live* lamb turned away and vomited because previously it had been made ill by lamb meat containing lithium. This is the way predators could be conditioned not to kill livestock. People, too, will find a certain food repulsive if it has made them sick and they are aware of the cause-and-effect relationship.

It is too bad that the sweet tastes added to processed foods fool us into not tying hypoglycemia to symptoms of illness. Nature gives us no mechanism with which to deal with good-tasting foods that make us sick even after eating them for many years. People won't be persuaded that the deliciousness of junk pastries, pies, candies, and cold cereals is bad for them when the result of their consumption doesn't show up for a long time. Food habits are extraordinarily difficult to change. We have to resort to reason to demonstrate the relationship between junk consumption and disease at a general level first, and at a personal level later. That is what we are attempting with this book—demonstration at least at the general level.

Personal demonstration is possible after you abstain from eating junk for a time. As long as you eat poorly every day, you will be ill in a low-grade way and not notice any immediate effect. After being off junk for several weeks, eating the stuff again will cause a resurgence of typical hypoglycemic symptoms. This shows the cause-and-effect relationship clearly, and is an especially valuable lesson for children.

If your child resents being put on the no-junk diet and resists your direction, it may seem sadistic, but here is a method for making your point clear: persuade your son or daughter to eat *only* junk for one full day a week, usually Saturday. Let the child eat all that is desired of cold cereal coated with sugar, ice cream, chocolate bars, doughnuts with icing, etc. Feed junk food for breakfast, lunch, and dinner. Most of the time the youngster will become ill and will quickly associate sweets with sickness. Now and then there will be a retest required to prove the cause-and-effect relationship. If a *lot* of refined carbohydrate is consumed in one particular period, the lesson will be made clear.

Two periods during the year are critically dangerous to hypoglycemic people. After the Christmas and Easter holidays, there is a marked lowering of patients' blood sugar from the tremendous upsurge in eating candy and cookies. A fair number of people revisit their orthomolecular physicians then. They *had* been well, tried junk over the holidays, became ill again, and will, under the physician's direction, return to the usual junk-free diet, and once more recover.

A period that is dangerous for children is the summer hiatus from school. It becomes difficult to control a child's intake of junk, and parents usually give up until school begins again. Relatives, especially grandparents who don't understand the causal relationship, often play a pernicious part by feeding sweets to grandchildren surreptitiously. It is extremely difficult to counter the pervasive, almost ubiquitous drive in our society for junk food. Well-meaning but ignorant friends and associates continually urge patients to eat sweets. However, many determined hypoglycemics, once they are well, become full of missionary zeal and convert friends, relatives, and neighbors to the junk-free way of life.

The *third stage* of hypoglycemia care is one of steady recovery from the condition. It occurs because by now you or a responsible family member has mastered the dietary measures required. Confidence with your manner of eating

progresses steadily. Over time, a relapse can occur, and then you should immediately investigate for the presence of allergies which could have developed. When these are found and eliminated you will have recovered from hypoglycemia completely.

REFERENCES FOR CHAPTER SEVEN

1. Ross, H. 1975. *Fighting Depression*. New York: Larchmont Books.

ORTHOMOLECULAR NUTRITION—PART II

Protein, Fat and Carbohydrate

THE EFFECT OF AN ARTIFACT-RICH DIET ON HEALTH

A dictum of orthomolecular nutrition is that most unprocessed foods contain a blend of all the nutrients. When digested in the gastrointestinal tract the nutrients are released more or less simultaneously. They become available for absorption into the blood. Distribution takes place among the various tissues, and the cells then have access to these nutrients for energy and growth.

There is a wide variation in the nutrient composition of foods. The range extends from foods very rich in protein such as meat, fish, poultry and seeds to those quite low in protein like apples and salad. Fats and carbohydrates vary in a similar way in their content within foods. This natural variation has been widely extended by processors who remove the food artifacts in their pure form. Pure protein, pure fat, pure starch or a variety of sugars are extracted and made available. These pure forms are *artifacts*—something created by human work, a modification from nature, produced artificially.

Textured protein sold as a meat substitute, ice cream and commercial pastry—a blend of pure fat, carbohydrate and sugar—are some of the readily available food artifacts.

A diet rich in such artifacts presents a complete imbal-

ance, with no natural controls on the amount consumed of the nutrients—it is easy to consume too much or too little of any of the vital substances, to say nothing of the other nutritional losses, referred to earlier, caused by processing. You would be much less susceptible to an imbalance of nutrients if eating unprocessed foods.

PROTEIN

Protein-rich foods have been classified as high quality and low quality, depending upon the quantity and variety of essential amino acids present. Amino acids of a certain type are called *essential* because they cannot be made by the body and must be provided by food. The remaining amino acids are, of course, also essential for body metabolism, but they can be made by the body through conversion from other amino acids. As the body discontinues to make certain amino acids during the course of human evolution, as in the case of ascorbic acid, perhaps an increasing number of amino acids will become *essential*. It would be pleasant to think that the extra energy gained by omitting one of the metabolic functions may provide human beings with improved intelligence, more creativity, or a greater ability to solve pressing problems.

A high-protein diet has advantages for many people, especially for those who have had relative hypoglycemia for many years. The glucose from protein is released slowly and does not overstimulate the production of insulin. Many find that a breakfast rich in protein prevents the occurrence of worries or tension, irritability, fatigue, and sleepiness during the day. It provides for a moderate elevation of blood glucose, which is sustained.

Generally it is easiest to obtain high-quality protein from animals and fish, but it can be obtained also from vegetarian sources. A vegetarian must be highly knowledgeable about food values. Indeed, an uninformed vegetarian is

more apt to find himself in nutritional difficulty than an uninformed meat eater. Some vegetarians turn naturally away from meat because they feel better subsisting on non-animal foods. They may not be aware that possibly they are allergic to only one or two animal protein foods and really should avoid just these. Frequently they do not know that feeling healthier by avoidance is simply an allergy problem. Thus they avoid everything pertaining to animal foods. These are personal reactions, no different in principle than the effects of eliminating wheat or corn or some other cause of allergy.

An explanation is needed here about how to test yourself if you believe you are allergic to an animal protein or some other foodstuff. Anyone can determine whether an allergy is present by depriving himself of the particular food suspected for two weeks. Then reintroduce this item into your diet. If you feel well after doing without the food, and worse after you've reintroduced it, this would throw strong suspicion on that food as your particular allergen. Do the test again. If the same thing happens a few times, you have proved the food culprit as a cause of your discomfort.

A diet high in protein-rich foods to which an individual is not allergic cannot be harmful and may well be very helpful. You should aim for an optimum quantity. The guidelines available are crude and rough-figured. They are averages that are too high for a large number of the population and too low for an even larger section. Each person has to determine his own optimum amount. Then aim for something just above the optimum when eating only whole, unprocessed foods. It is safer to eat more protein than less.

CAN YOU EAT TOO MUCH PROTEIN?

You certainly can eat too much protein if you include artifacts as sources. Natural food is unlikely to present a problem, simply because it contains other essential components,

and its sheer bulk, eaten in quantity, makes it difficult to take in too much. But with the recent availability of almost pure protein, as present in textured protein meat substitutes, it will be possible to consume an overabundance. Too much protein intake throws an unnecessary burden on the body. This is undesirable and dangerous, for it will displace other essential foods and produce an imbalance.

In most cases, the high cost of protein will prevent an overabundant intake. Some people for personal reasons may consume protein artifacts to excess. These would not be foods naturally rich in the substance but foods made from protein artifacts such as gelatin desserts. This artifact fails as a good food in that it does not contain an adequate balance of the ten essential amino acids.

We interject a warning: dairy products, natural high-protein food, can cause allergy, especially since they are readily available and are used as high-protein snacks. A large number of my patients have reacted badly to increased consumption of dairy products. As a result, my policy now is to insist on a diet free of junk but without any emphasis on a high protein diet. I no longer place special emphasis on the hypoglycemic diet. My views of the efficacy of this diet have been changing since I have found a fair number of people who, when following the hypoglycemic diet, develop allergies to the proteins it calls for. My new advice is not to increase the intake of protein or to call for frequent feeding, but simply to take *all* the refined foods away. This allows each person more individuality in the preparation of food, which they appreciate. Those are some of the reasons you won't see a specific hypoglycemic diet in this book.

My advice also is to be careful about foods which are liked or disliked excessively. Liking a food, you may eat too much of it. Disliking a food may be based on a long forgotten bad reaction to it. Yes, the dislike will linger on but the reason for it may not be remembered.

Even so, patients do train themselves to eat foods they dislike if they are advised to eat them. Having disliked milk,

but told by me or some other doctor to eat milk products, patients will begin to consume milk in large quantities and so become worse. This may so intensify an allergy that small quantities, which in the past caused no difficulty, now cause severe reactions. Foods overly liked, on the other hand, may have an allergic-based addiction connected with them, which provides the basis for the excessive passion.

HAZARDS OF EATING TOO LITTLE PROTEIN

All the structural material of your body is built out of protein. Every reaction—nervous, circulatory, digestive, muscular, cerebral—is dependent in one way or another on protein or on the amino acids of protein. For this reason, too little protein present in the body is extremely serious. When its intake is deficient, all those reactions mentioned will slow down or stop altogether. Consequently, protein deficiency is much more pathological when protein requirements are high. For instance, children require high protein to build their bodies and surgical patients to repair wounds.

Once a structure or tissue has been developed by the body, it does not mean that it no longer needs protein. A human organ is not like an electric motor or other manmade object. Although a motor will operate until it wears out or breaks down, it is not continually rebuilt as it functions. Living tissue is rebuilt. It remains in a constant state of repair. Amino acids, the building blocks of all tissues, are constantly exchanged for new amino acids in the blood. If there is too little amino acid in blood, it will leach protein out of a tissue and may not leave enough to maintain that tissue in a healthy state.

Not every tissue suffers equal leaching. Vital organs hold onto their amino acids more tenaciously. Our major protein storehouse in the body is muscle. Muscles will lose protein first, become wasted, lose power, grow thin, and provide the emaciated appearance observed in a starved person. During

starvation, when the caloric content of the diet is too low, protein will be taken to create energy too. That is the ultimate leaching process at work. It is what happens when incorrect fad fasting is undertaken for weight loss.

An underabundance of protein will affect an infant. Infants grow rapidly and therefore require relatively more protein than in slower growth phases. If an infant is deprived of high quality protein, it will be permanently impaired. The brain may be affected, causing less intelligence, less adaptiveness, and other developmental troubles. The baby may grow small in stature and body weight, a natural defense mechanism instituted by the survival instinct to spare protein for the brain to develop properly. The law of evolution dictates that the brain must be preserved at the expense of height, breadth, muscular strength, and other body developments.

Adults need protein for repair and metabolic reactions. If high-quality protein is missing, the adult body will suffer from a lack of building blocks. For example, if a bricklayer requires three different types of brick, he will not be inconvenienced if he has too much of each kind. However, one kind of brick being missing may stop his work. In the same way, the cells of the body are not harmed by an excess of quality amino acid molecules floating in the cell fluid. The cell can take in what it requires of each amino acid and leave what it does not need. Lack of quality protein is serious, a state that the functioning body will not long endure without showing deficiency symptoms.

The only time a very great excess of amino acid could be harmful to the cell would be from the presence of a large number of molecules that might displace other essential molecules. The cell could be inconvenienced in the same way a person may be inconvenienced by the jostling of friends. A cell surrounded by a fluid medium containing inadequate quantities of amino acids would be much more seriously affected. Then it would have to shut down many reactions. It

could not construct protein and might surrender its own limited supply of amino acids to other tissues in the body.

Your palate is an effective mechanism for determining your optimum needs. The appetite-regulating mechanism in the brain (called the *appestat* by the late Norman Jolliffe, M.D., Director of the New York City Department of Health's Bureau of Nutrition from 1949 to 1961) and the taste buds combine to tell your palate what you need and want, provided it is not perverted by a nutrient alteration or deficiency in food. High-protein foods are generally more palatable, and most people will consume enough if they are available. Yet, you can fool your palate with corrupters—sugar and salt—and most people use them to excess.¹

FATS AND FATTY ACIDS

The arctic explorer Stefansson lived for several years on the typical Eskimo diet and remained well. Stefansson found that the amount of meat he ate was unimportant as long as he ate enough fat, in the form of blubber, with it. On several occasions during a famine when game or fish was scarce or quite lean, he became weak and ill. But within a few days of eating blubber, Stefansson was well again. This illustrates the importance of fat in the Eskimo diet for maintenance in the cold North environment. In fact, Eskimos remain healthy as long as they follow their own diet uncontaminated by processed foods furnished by "civilization."²

Fats, or lipids, are foodstuffs that contain no nitrogen. The length of their molecular chains determines whether they will be solid or liquid at room temperature. The degree of chain saturation with molecules also determines this. Short chain molecules form liquid fats, as do highly unsaturated long chain molecules. The hardest fats are long chain, fully saturated ones. Fat molecules may contain less hydrogen and have double bonds. When hydrogen is added, these double bonds are destroyed and the fat be-

comes a saturated fatty acid. It holds more hydrogen but is not capable of absorbing any more hydrogen than it has up to that point. Liquid fats are thus made more solid by the addition of hydrogen. This can alter the fat's melting point and is called *hydrogenation*.

Fatty acids combine with a three-carbon molecule to form *triglycerides*. A fatty acid may have a right or left twist at one or more of its double bonds. Our body enzymes are so specific that an enzyme can react with a molecule that has a lefthanded twist and not react with one having a righthanded twist. The biological value of a fatty acid is determined by the length of its chain, the number of double bonds, and the type of twist at these double bonds.

Certain long chain fatty acids such as arachidonic acid are said to be *essential fatty acids*. They can't be made in the body. Other fatty acids, especially the short chain ones, can be made easily in the body from carbohydrates or proteins. Some fatty substances, such as lecithins, are present along with the particular fats in which the nervous tissue is rich.

Fats build structures in the sheaths of nerves; they participate in most body reactions; they store energy. Each fat gram contains nine calories of energy compared to four calories for protein and four for carbohydrate. When calorie consumption exceeds calories used, the extra ones are stored in fat storage sites. An obese person demonstrates where those storage sites usually are located on the human frame.

When intake is less than utilization, the storage fat is slowly drawn upon by the rest of the body. This is a marvelous device for providing ourselves with a constant source of energy. Our primitive ancestors at infrequent intervals probably fasted involuntarily for many days. If carbohydrate rather than fat were the means for storing our energy (as it is for plants such as the potato) our storage sites would be nine-fourths, or 225 percent, as bulky as they are now. We would be at least as wide as we are tall, and obesity would be a more severe problem than it is already. Obe-

sity nowadays is more often caused by overconsumption of processed carbohydrates than by too much intake of protein and fat.

CAN WE TAKE IN TOO MUCH FAT?

On the other hand, it definitely is possible to eat too much fat, inasmuch as fat artifacts are so readily available in the form of butter, cream cheese, oil, margarine and other items. With sugar mixed into the fat in the form of ice cream and rich pastries, the danger of excessive fat intake becomes all too apparent. Then the sweet taste of sugar perverts your palate. You can experience a hypoglycemic rebound by its consumption. Fat mixed with sugar is one of the combinations of artifacts which cause cerebral reactions. Furthermore, excessive desire for sweets encourages excessive consumption of fat—a vicious cycle, and the obvious reason for some people to be ice-cream addicts.

A good example of fat and sugar artifacts in combination is the cruller or doughnut. It is made from fat, white flour, sucrose, and frequently is surrounded by a variety of confectionery sugars or glazings. Crullers represent the pinnacle of poor eating, the ultimate in processed food poisoning.

You would find it difficult to overconsume pure fat artifacts by themselves. Fat quickly satiates your appetite, and the sensation of having eaten—fullness—stays much longer. Fatty foods are bulkier and require more time to be eaten as well.

Too much fat ingestion finally causes obesity. In addition, for some people, overabundant fat intake increases cholesterol and triglyceride blood levels. This is much less apt to occur if there is an adequate ingestion of plant fiber and lecithin along with the fat. Lecithin increases the capacity of the bile salts to remove cholesterol. Nicotinic acid speeds cholesterol oxidation to its degradation products also. In gen-

eral, it is quite difficult to overconsume foods rich in fat unless you make a studious effort to do so.

The attitude of the public has changed over the last few years, and fat consumption has gone down. There has been a significant drift from saturated to unsaturated fat artifacts as well. This anti-fat attitude has been motivated by the widely publicized information that fats, by elevating blood lipid and cholesterol, are principal causative factors in heart disease, mainly coronary thrombosis. Adequate scientific data does not support this fats-and-heart-trouble relationship altogether, but since the notion is widely accepted, an examination of the reality of the belief is needed.

The assumption that the fat portion of our food is responsible for elevated blood fats has been challenged, and is contradicted by a large amount of experimental evidence. There are two basic hypotheses behind the anti-fat publicity:

1. That fat in our food causes elevated blood fats.
2. That elevated blood fats cause coronary thrombosis.

DOES FOOD FAT CAUSE HEART DISEASE?

Food fat by itself does not bring on heart disease. Populations around the world eat very high-fat diets and do not have abnormal levels of heart disease. In addition, there has been a steady increase in coronary thrombosis in North America even though over the past twenty years dietary fat consumption has decreased by about one-third. At the same time, the amount of polyunsaturated fats in the diet has increased substantially, from 2 percent in 1950 to 6 percent in 1970. Total calories have decreased from 3,570 to 3,180 per day.

There is no general relationship between fat in our food and an elevation of blood fats. There is no general relationship between cholesterol and fat content of the diet and heart disease. Many people continually eat large quantities

of fat with no increase in heart disease. The Somalis and the Samburus are examples. These people are sheep and goat herders and eat mostly milk, blood, and meat. Their diet is about two-thirds saturated animal fat. According to the cholesterol hypothesis, they should have high incidence of heart disease; but they do not.

A variety of nutrient deficiencies can interfere with fat metabolism. An elevation of blood fat levels may result from any one or any combination of deficiencies. For instance, faulty fat metabolism resulting in an elevation of blood lipids can be caused by a deficiency of ascorbic acid, pyridoxine, lecithin, and perhaps of other factors whose role is still uncertain. Doses of nicotinic acid greater than one gram taken three times a day lower cholesterol and triglyceride levels; a deficiency would increase them. Blood fats are also elevated by a deficiency of fiber. A diet rich in sucrose must eventually cause a deficiency of most nutrients and is associated with a deficiency of fiber.

Any person seeking advice on how to reorder his or her life to decrease the possibility of heart disease would be told to exercise, stop smoking, relax more, and reduce fat intake. Accordingly, exercising restores muscle tone, uses up calories, and improves your sense of well being. Smoking certainly is an abomination that causes a wide variety of diseases both physical and mental. The smoke not only affects the smoking addict but also anyone nearby forced to inhale the toxic organic chemicals and minerals. As for relaxing—well, everyone needs to relax at appropriate times to take stress from the heart and mind. Fat intake should be moderate because excessive fat consumption will lead to obesity, especially when combined fat is added to excessive sugar consumption. By itself though, fat consumption will *not* elevate blood cholesterol and triglyceride levels and is *not* a direct cause of heart disease.

Because of their isolation and history, the entire population of St. Helena, the island in the South Atlantic Ocean, 1200 miles west of Africa, already follows the four anti-

heart-disease precepts. Their landscape is hilly and, as cars are not permitted on the island, the people get a lot of exercise. By tradition very few smoke. They lead relaxed lives for the most part. The population normally consumes a diet not excessive in fat. Yet they suffer from the same pandemic of heart disease as do other western countries. Why? It may be that the St. Helena populace illustrates the destructive quality of sugar. Since 1900 their consumption of sugar has increased to the English level of about 120 pounds per year. Thus, in spite of practicing the four recommended ways of preventing coronary disease, this island group of people by overconsuming sugar has the modern high level of heart disease.³

PREVENTIVE NUTRITION AGAINST HEART DISEASE

The *ideal diet* for preventing heart disease will be totally junk-free. It will contain optimum quantities of all the nutrients but will be particularly rich in niacin (vitamin B-3), pyridoxine (vitamin B-6), ascorbic acid (vitamin C) and vitamin E. It will contain optimum quantities of chromium, zinc and selenium and be rich enough in vegetable fiber to prevent any manifestation of the saccharine disease. Combined with this optimum diet will be a program of exercise, freedom from smoking, and a stress balance struck between tension and relaxation. The optimum diet will induce relaxation since the individual is following a healthy lifestyle.

When this preventive nutrition program against heart disease is followed, normal cholesterol will be available from food. The body will need to make less cholesterol on its own behalf. Extra energy for such body synthesizing will be applied for other reactions. Ordinarily, the optimum cholesterol amount provided from food is equal to the quantity normally produced in your body. If you deprive yourself of eggs merely to lower cholesterol, your liver will simply make more cholesterol for body metabolism. Eggs also contain

lecithin, which assists in balancing cholesterol intake. I suspect that disease syndromes due to inadequate cholesterol ingestion will soon be described in the literature as a consequence of the increased demand on the body to make more of its own. The low cholesterol artifacts have not been tested for long term toxicity.

To assure optimum preventive nutrition against heart disease you will have to arrive at the appropriate diet on your own by trial and error. Depend on your taste and avoid highly refined adulterated foods that have industrial sugars added. Keep your weight at its ideal poundage for your body type by adhering to a trustworthy height, weight, and body-build chart.

PROBLEMS ASSOCIATED WITH LOW-FAT DIETS

Few people voluntarily or spontaneously follow low-fat diets. However, as a large number are trying to reduce weight or avoid coronary occlusion, their diets may, as a result, contain a high proportion of unsaturated fats. There are several problems associated with such an unsaturated fat diet.

Low-fat diets are unpalatable for most people. There must be a certain enjoyment in eating which is hard to achieve with near-total avoidance of fats. Also, consuming little fat will leave a person feeling unsatiated, and the satisfaction of eating will last for a much shorter time. Some low-fat eaters remain hungry all day long, and this situation can generate a continuous low-grade irritability. Even worse, these hungry people will often greatly increase their consumption of carbohydrates of the refined variety to get enough calories to maintain normal weight. The lack of a feeling of satiety plus the increased irritability make it difficult to remain on the low-fat or unsaturated fat diet. Within the framework of modern clinical nutrition, a low-fat diet is theoretically unsound and generally ineffective.

Furthermore, the increased difficulty in absorbing fat-soluble vitamins become apparent with a low-fat diet. Fat-soluble vitamins are ordinarily provided by fatty foods. Also the body has a minimum requirement for cholesterol. It uses the substance to build body structure, for certain reactions, and as a material from which it makes hormones and the precursor of vitamin D-3. The diet low in fat that does not provide such cholesterol intake increases the body's need to manufacture the substance itself, with consequent risk of symptoms due to its deficiency.

THE CHEMISTRY OF CARBOHYDRATES

There is a common belief that all carbohydrates are the same. Also it is thought that all sugars are the same, since carbohydrates eventually break down into simple sugars such as glucose and fructose. What is overlooked in these incorrect assumptions is the importance of food bulk, the presence of other essential nutrients, the rate of sugar release in the digestive tract, and the absorption rate into the blood. Artifacts such as refined table sugar (sucrose) are not absorbed and metabolized as are the complex carbohydrates.

Carbohydrates consist of complex long chain carbohydrates and short chain carbohydrates. The latter are sugars. Each carbohydrate has a large number of molecules with five or six carbon atoms attached in the chain. Glucose, fructose, and galactose are monosaccharides, a sugar of individual molecules which are attached to each other in a chemical bond. Glucose, the sugar usually given in 100-gram amounts before the common sugar tolerance test is done, is the main sugar in the blood and body tissues. It is an essential body sugar but is not essential as a pure substance in our food. All the cells, the brain cells more than the rest, depend upon glucose. The body makes it by split-

ting complex sugars or carbohydrates into their basic units, mostly sugar.

Conversion of carbohydrates into basic sugar units begins in the mouth when saliva is chewed into our food. Saliva contains enzymes which split (hydrolyze) carbohydrates into simpler sugars. Conversion continues in the stomach until the process is inhibited by the acidity of the stomach contents. It begins again in the small intestine, especially after the pancreatic juices are mixed with it.

Glucose is the energy sugar. The food industry advertises a false impression that sucrose, common table sugar made from beets or sugar cane, is a good source of energy. Such advertising is completely misleading. The truth is that a number of physical diseases, depressions, anxiety states, alcoholism, and other addictions are the end product of quantity ingestion of sucrose. Table sugar and other refined carbohydrates bring on the saccharine diseases.

Paradoxically, glucose, needed by the body, but provided in pure form, could be dangerous also. Only slow release of glucose from food in conjunction with the release of other nutrients is safe; but pure glucose, an artifact devoid of other nutrients, is nearly as harmful as sucrose. Some violent reactions may be experienced among patients taking pure sugar for a glucose tolerance test. Symptoms are severe such as nausea, vomiting, headache, and other unpleasant reactions.

Present in fruit is another monosaccharide, fructose. Fructose is somewhat less toxic than glucose or sucrose. It tastes sweeter weight for weight and less will be used for the same sweetness satiation. It does not stimulate the pancreas to release insulin. However, consumed in large quantities, fructose can be as bad as the other pure sugars because of the lack of a normal quota of nutrients. Fructose, like glucose, is a useful source of energy when released in the body from food such as fresh fruit. No physiological need exists for free fructose from any external sources.

Present chiefly as one of the components of milk sugar

(lactose), galactose is less sweet than the others. It is also a monosaccharide.

Sugars which have two monosaccharides linked to each other are called disaccharides. Two common disaccharides are comprised of sucrose made with glucose and fructose, and lactose made with glucose and galactose. These are all hooked together. They are more complex sugars and must be split into monosaccharides before they are absorbed into the blood. Not splitting, they remain in the bowel as calories for bacteria to grow on. The body has enzymes to hydrolyze these double sugars.

To find out how much sucrose, the most common sugar, is consumed by any nation's individual citizen, merely divide the country's total sugar tonnage consumed by its total population. Tonnage will include sugar used in confectionery, soft drinks, breakfast foods, bakery products, canned soups, and in crystalline form. On the average, every man, woman and child in the English-speaking countries of the West consumes 125 pounds per person per year; of course, some consume much more and some much less.

Consumed sucrose is rapidly hydrolyzed, absorbed, shunted into the liver, and converted into triglycerides. Triglycerides are then released into the blood and stored as fat deposits. When released into the blood too quickly without other nutrients present, sucrose is a highly toxic substance. Therefore, while sucrose in natural food is not toxic, the commercial or household form is.

Pure sucrose should be barred from human use and converted into alcohol as fuel for automobiles. Feed the leftover protein of sugar beets and sugar cane to livestock for its vitamin and mineral content. Sucrose is not fit for human consumption, since it creates ill health by its poisonous infiltration into the heart and mind of its user. At the very least the Surgeon General should print on sugar packages: "Use of this product may be hazardous to your health."

Beekeepers even contaminate honey with sucrose. In the spring, when insufficient pollen remains for foraging bees,

they are fed sucrose syrup. This sugar poison is then deposited in the honey. Someone allergic to beet or cane sugar would be just as reactive to this contaminated honey as to sugar in the pure state. For this reason, late summer and fall honey is preferable, since less sucrose is fed to bees during those times of the year. Even with some contamination, honey is a worthwhile replacement for sugar because its fructose content is sweeter and less is needed. Used in the same quantity as sucrose, honey would be just as toxic.

Polysaccharides are complex saccharides in very long chains of glucose molecules. Among them are shorter chained carbohydrates such as glycogen and long chained fibrous foods such as bran. They taste bland, are not easily dissolved in water, and have structural properties not found in simple sugars. They are much less toxic. Because of bulk, polysaccharides are eaten more slowly, hydrolyze slowly in the digestive system, and enter slowly into the blood as glucose.

Natural, unrefined, or unprocessed carbohydrates are surrounded and mixed with protein, fat, vitamins and minerals. Naturally occurring carbohydrates are good foods, contrary to processed carbohydrates such as starch. Starch is toxic but not quite as bad as the mono- and disaccharides. The degree of toxicity for a carbohydrate depends upon the degree of refinement. For example, whole wheat is non-toxic unless you are allergic to it. But during processing the wheat is cracked, ground, and the central portion, the endosperm, gets sifted out. The outer coats of bran and germ and the coats next to them are taken away for other uses. When the whole kernel is used the flour is called a "100 percent extraction flour." If the middle or inner endosperm is used, it is called a "60 or 70 percent extraction." Thus the higher percentage extraction, the more germ and bran is present and the more nutritious the wheat flour. It is logical that if the wheat kernel's main function is to grow a new plant, the essential nutrients will be as close to the germ as possible.

DANGERS OF CONSUMING TOO MUCH CARBOHYDRATE

Excessive consumption of *unprocessed* foods almost exclusively carbohydrate in content such as rice, wheat and potatoes will cause obesity and produce a metabolic imbalance. Intake of too much carbohydrate will be associated with an inadequate ingestion of protein and fat. Dangers of excess intake are similar to dangers with taking too much of any food that is deficient in various essential nutrients. But unprocessed carbohydrates aren't likely to cause too much trouble, simply because of their bulk. It is difficult to over-consume too much of an unrefined carbohydrate at one time.

Processed carbohydrates present an altogether different situation. These include all the food products rich in added sugar or prepared in a way that has dissipated a large proportion of other essential nutrients. Processed carbohydrates consist of such foods as polished rice, white flour and a variety of substances made from them. They can almost be branded as legalized poisons. The best use white flour can be put to is as paste for hanging wallpaper.

Excessive consumption of refined or processed carbohydrates is the major cause of a broad group of neuroses and a great number of physical illnesses. Until recently, these mental and physical sicknesses were looked upon as unrelated diseases with no known cause, but we know today that they arise from malnutrition. Amazing as it may seem to the person who has never had education in nutrition, eating an excess of processed carbohydrates is tantamount to condemning oneself to malnutrition.

The human body has not evolved over the centuries on a diet consisting of any of the simple sugars. Sucrose was not a staple in our diet until the last one hundred years. Our metabolism is ill-prepared to accept sucrose, and consuming it has severely undesirable effects. It is an empty food that

supplies naked calories. It displaces true foods rich in essentials so that we create an artificial build-up in demand by the body for increases in ingestion of vitamins and minerals. Sucrose and other refined carbohydrates are a major cause of diabetes mellitus and hypoglycemia.⁴ The conclusion of Cheraskin and Ringsdorf (1974) is that "the ideal daily refined carbohydrate intake may actually be zero."⁵

Refined sugar is particularly insidious since it produces addiction as severe as any drug addiction. The only difference between heroin addiction and sugar addiction is that sugar doesn't need injection, is readily consumable because of its availability, and isn't considered a social evil. However, the strength of sugar addiction is just as strong as heroin addiction. One of my patients, a seven-year-old boy, exemplifies sugar addiction. He would sneak into the kitchen at three a.m. to steal handfuls of white crystalline sugar. Many adolescents grab for sweets even though they notice their behavior is normal when they avoid sugar and pathological when they consume it. Another of my patients drank three forty-ounce bottles of sweetened soft drink daily just to keep herself going. Otherwise, acute onset of hypoglycemia would drop her into depression and despair if even thirty minutes passed without a drink of sugar water.

Sugar addiction provides typical addiction withdrawal symptoms as severe as those accompanying withdrawal from drugs. During the withdrawal any food could activate symptoms. Too quick a withdrawal will see the patient develop severe depression or anxiety. I treated sugar addiction withdrawal with electroconvulsive therapy (ECT) years ago. Now my treatment includes assessment of the degree of addiction and if it is great, I taper off the patient from sugar slowly.

Sir Frederick Banting, who discovered insulin, noted while traveling through Panama that cane cutters consumed large amounts of carbohydrate by chewing sugar cane but contracted few cases of diabetes. Conversely, their Spanish employers, eating as much pure sucrose as their workers ate

cane, had a very high rate of diabetes. The native workers got their sugar slowly and with vitamins and minerals included. The pure sugar that their employers ate was stripped of all its nutrients, and they consumed only naked calories. Also the cane cutters did not eat large quantities of other refined carbohydrates as did the employers.

Campbell (1966) has concluded that eating refined sugar is addictive, but eating the native sugar cane is not. He developed three sucrose rules which explain the relationship of sugar to man. (1) The *rule of twenty years* says that an individual can resist the ravages of sugar consumption for twenty years, then diabetes appears. (2) The *rule of 70 pounds* suggests that a nation may consume 70 pounds of sugar per person per year before showing major physiological break-down among its population. (3) The *rule of 20 percent* points out that in any population whole caloric intake is less than 2400 calories, except where diabetes is common. The sucrose intake *with* the presence of diabetes will be more than 20 percent of the total calories. A nation's population that consumes less than 35 pounds of total sugar per person per year would be a lot healthier than one consuming notably more.

Yudkin (1969,⁸ 1972⁷) states that sucrose consumption is one of the leading causes of atherosclerosis and coronary heart disease. It also markedly increases dental caries and periodontal disease, relates to dyspepsia, and causes seborrheic dermatitis. Surprisingly, no experiments have been carried out to give laboratory animals huge quantities of sucrose to test its carcinogenic potential as was done with sacaryl and saccharin. Again let us reiterate that we agree with Yudkin that sugar should be banned from the market. This may take enforcement of the Delaney Act. The Delaney Clause against cancer-causing foods is a part of the basic FDA statute passed in 1958.

NUTRITIVE VALUES OF THE EDIBLE PART OF FOODS*

Dashes show that no basis could be found for computing a value although there was some reason to believe that a measurable amount of the constituent might be present.

Food, approximate measure, and weight (in grams)	Approx. Measure	Grams	Water %	Calories	Protein* gm.	Fat* (Total lipid) gm.	Carbo- hydrate gm.	Vitamin A I.U.	Thia- mine mg.	Ribo- flavin mg.	Niacin mg.	Ascor- bic Acid mg.
MILK, CREAM, CHEESE; RELATED PRODUCTS												
Milk, cow's:												
Fluid, whole (3.7% fat)	1 cup	244	87	161	9	9	12	366	.07	.41	.2	2
Fluid, nonfat (skim)	1 cup	246	90	88	9	Trace	12	Trace	.10	.44	.2	2
Cheese:												
Cheddar	1 oz. slice	28	37	113	7	9	1	372	Trace	.13	Trace	0
Cottage creamed	1 cup	225	78	239	31	10	7	383	.07	.56	.2	0
Ice cream, vanilla	1 scoop	71	62	147	3	9	15	369	.03	.13	.1	1
EGGS												
Raw, whole	1 med	50	74	78	6	6	Trace	562	.04	.12	Trace	0

MEAT, POULTRY, FISH, SHELLFISH;
RELATED PRODUCTS

Beef, cooked:

Rump Roast; Choice grade
Lean and fat 4 oz 113 48
Lean only 4 oz 113 60

(visible fat removed at table)
268 18 21 0 39 .05 .14 3.6 0
120 17 6 0 11 .04 .13 3.0 0

Sirloin Steak, Choice grade, broiled
Lean and fat 4 oz 113 38
Lean only 4 oz 113 56

(visible fat removed at table)
382 23 32 0 50 .06 .18 4.6 0
135 21 5 0 7 .06 .17 4.2 0

Hamburger, broiled
Regular grind 3 oz 85 54
Ground round 3 oz 85 61

Corned beef, med. fat 3 oz 85 44
316 19 26 0 — .08 .18 4.6 0

Pork, cooked:

Ham, baked
Lean and fat 4 oz 113 54
Lean only 4 oz 113 62

(visible fat removed at table)
250 18 17 0 0 .40 .15 3.1 0
135 18 7 0 0 .42 .16 3.2 0

Roast Pork
Lean only
Loin chop

4 oz 113 55 155 18 8 0 0 .65 .19 3.9 0
1 thin slice 68 55 113 13 6 0 0 .48 .14 2.9 0

Lamb, cooked:

Roast leg, choice grade 4 oz 113 54 206 19 14 0 0 .11 .20 4.0 0

Food, approximate measure, and weight (in grams)	Approx. Measure	Grams	Water %	Calories	Protein* gm.	Fat* (Total lipid) gm.	Carbo*-hydrate gm.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Veal, cooked: Cutlet, medium fat	3 oz . . .	85	60	235	28	13	0	0	.10	.27	5.4	0
Chicken, cooked: Fryer, $\frac{1}{4}$ whole, med.	85	54	255	38	10	0	215	.08	.45	12	0	
Fish, cooked: Swordfish, broiled	3½ oz . . .	100	65	174	28	6	0	2,050	.04	.05	10.9	0
Tuna, packed in oil	¾ cup . . .	115	61	223	33	9	0	91	.05	.13	13	—
Shrimp	4 oz . . .	113	70	132	28	1	Trace	68	.01	.03	2.0	—
Bacon, broiled or fried	2 slices . . .	14	8	96	4	7	Trace	0	.08	.04	.8	0
Frankfurter, cooked	1 med . . .	51	58	152	6	14	1	—	.08	.10	1.3	—
Liver, calf, broiled	4 oz . . .	113	51	221	33	7	4	37,114	.27	4.73	19	42
VEGETABLES AND VEGETABLE PRODUCTS												
Asparagus, cooked	1 cup . . .	181	94	36	4	Trace	7	1,629	.29	.33	2.5	47
Beans:												
Lima, cooked	1 cup	166	71	164	10	Trace	32	382	.12	.08	1.7	28
Snap, green, cooked	1 cup	125	92	31	2	Trace	7	675	.09	.11	.6	15
Baked, with tomato, molasses	1 cup . . .	187	76	309	14	8	45	148	.16	.09	1.4	2

Beets, cooked	1 cup	167	91	52	2	Trace	12	33	.05	.07	.5	10
Broccoli, cooked	1 cup	164	91	43	5	1	7	4,100	.15	.33	1.3	148
Cabbage:												
Coleslaw, raw	1 cup	120	83	119	1	9	10	180	.06	.06	.4	35
Cooked	1 cup	146	94	29	2	Trace	6	190	.06	.06	.4	48
Carrots, cooked, diced	1 cup	160	91	50	1	Trace	11	16,800	.08	.08	.8	10
Cauliflower, cooked	1 cup	125	93	28	3	Trace	5	75	.11	.10	.8	69
Celery, raw	1 stalk	40	94	5	Trace	Trace	1	72	.01	.01	.1	3
Corn, sweet												
Cooked	1 ear	100	73	91	3	1	21	400	.12	.10	1.4	9
Canned	1 cup	169	81	140	5	2	32	676	.19	.17	2.2	12
Cucumbers, raw, whole	1 small	100	96	15	1	Trace	3	250	.03	.04	.2	11
Lettuce, leaf	1 med	10	94	2	Trace	Trace	1	59	.01	.01	.1	1
Mushrooms, canned	1 cup	161	93	31	2	Trace	6	Trace	.03	.39	3.2	—
Onions, cooked	1 cup	197	92	57	2	Trace	13	79	.06	.06	.4	14
Parsnips, cooked	1 cup	211	82	139	3	1	31	63	.15	.17	.2	21
Peas, cooked	1 cup	160	82	114	9	1	20	1,002	.45	.15	2.8	22
Peppers, sweet, green	1 shell	62	93	13	1	Trace	3	239	.05	.05	.3	73

Food, approximate measure, and weight (in grams)	Approx. Measure	Grams	Water %	Calories	Protein* gm.	Fat* (Total lipid) gm.	Carbo* hydrate gm.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Potatoes, medium:												
Baked, peeled	1 potato	99	75	93	3	Trace	21	Trace	.10	.04	1.7	20
Peeled, boiled	1 potato	122	83	79	2	Trace	18	Trace	.11	.04	1.5	20
French-fried	10 pieces	57	45	156	2	8	21	Trace	.07	.05	1.8	12
Mashed with milk and margarine	1 cup	195	80	183	4	8	24	332	.16	.10	2.0	18
Potato chips	10 med	20	2	114	1	8	10	Trace	.04	.01	-1.0	3
Pumpkin, canned	1 cup	228	90	75	2	1	18	14,590	.07	.11	1.4	11
Radishes	4 small	40	94	7	Trace	Trace	1	4	.01	.01	.1	10
Sauerkraut, canned	1 cup	188	93	34	2	Trace	8	94	.06	.08	.4	26
Spinach, cooked	1 cup	180	92	46	6	1	7	16,200	.14	.28	1.0	56
Squash, summer, cooked, diced	1 cup	136	96	19	1	Trace	4	530	.07	.11	1.1	14
Sweet potatoes, baked	1 potato	110	64	169	3	1	39	9,720	.11	.08	.8	26
Tomatoes, raw	1 med	120	94	25	1	Trace	5	1,021	.07	.05	.8	26
Tomato juice, canned	1 cup	242	94	47	2	Trace	11	1,976	.12	.07	2.0	40
Tomato catsup	1 tbsp	17	69	18	Trace	Trace	4	238	.02	.01	.3	3
Turnips, cooked, diced	1 cup	196	94	40	1	Trace	9	Trace	.05	.09	.8	48

FRUITS AND FRUIT PRODUCTS

Apples, raw	1 med	150	85	64	Trace	1	16	99	.03	.02	.1	4
Apple juice	1 cup	249	88	116	Trace	Trace	29	—	.02	.05	.2	2
Apricots												
Raw	1 med	40	85	21	Trace	Trace	5	1,134	.01	.02	.3	4
Canned	4 halves; 2 tbsp. syrup	122	77	103	1	Trace	26	2,777	.03	.03	.6	6
Avocados, raw, cubed	¾ cup	38	74	59	1	6	4	103	.04	.07	.6	5
Bananas, raw	1 med	150	76	88	1	Trace	23	196	.05	.06	.7	10
Blackberries, raw	1 cup	144	84	84	2	1	19	288	.04	.06	.6	30
Cantaloupe	¾ med	385	91	56	1	Trace	14	6,290	.08	.06	1.1	61
Cherries, raw, sweet	1 cup	130	80	108	2	1	27	169	.08	.09	.6	15
Cranberry juice	1 cup	250	83	161	Trace	Trace	41	Trace	.02	.02	Trace	99
Fruit cocktail, canned	1 cup	229	80	137	1	Trace	36	321	.05	.02	1.1	5
Grapefruit, raw:												
Pink or red	¾ cup	285	89	52	1	Trace	14	590	.05	.03	.3	48
Sections, white	1 cup	194	89	80	1	Trace	21	20	.08	.04	.4	74
Grapefruit juice, fresh	1 cup	246	90	116	1	Trace	24	25	.07	.02	.5	82

Food, approximate measure, and weight (in grams)	Approx. Measure	Grams	Water %	Calories	Protein* gm.	Fat (Total lipid) gm.	Carbo-hydrate gm.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic mg.
Grapes, raw:												
Adherent skin	1 cup	153	82	60	1	1	14	87	.04	.03	.3	3
Grape juice	1 cup	254	83	163	1	Trace	41	—	.10	.05	.5	Trace
Lemon	1 med	106	90	.21	1	Trace	7	16	.03	.02	.1	42
Lemonade, sweetened	1 cup	240	86	101	Trace	Trace	26	Trace	Trace	.02	.2	16
Orange	1 med	180	86	100	2	Trace	25	410	.21	.08	.8	110
Orange juice, fresh or canned, unsweetened	1 cup	249	88	111	2	Trace	26	494	.22	.02	.7	103
Peaches, raw:												
Whole	1 med	114	89	35	1	Trace	9	1,210	.02	.05	.9	6
Sliced	1 cup	168	89	70	1	Trace	18	2,447	.04	.09	1.8	13
Pears, raw	1 small	75	83	46	1	Trace	12	15	.02	.03	.1	3
Pineapple:												
Raw, diced	1 cup	140	85	71	1	Trace	19	95	.12	.04	.3	23
Canned, heavy syrup	2 slices	122	80	90	Trace	Trace	24	61	.09	.02	.2	9
Plums, raw	1 plum	60	87	24	Trace	Trace	6	128	.02	.02	.3	3
Raisins, dried	1 sm pkg	18	18	53	1	Trace	14	4	.02	.01	.1	Trace

Raspberries, red, raw	1 cup	123	84	71	2	1	17	163	.04	.11	1.1	31
Rhubarb, cooked with sugar	1 cup	242	63	341	1	Trace	87	194	.05	.12	.7	15
Strawberries, raw	1 cup	144	90	53	1	1	12	86	.04	.10	.9	85
Tangerine	1 med	114	87	45	1	Trace	11	412	.06	.02	.1	30
Watermelon	1 wedge 4"x8"	925	93	108	2	1	27	2,443	.12	.12	.8	29
GRAIN PRODUCTS												
Bread, rolls, etc.												
Biscuit, baking powder	1 (2½" dia.)	... 38	27	129	3	6	16	Trace	.07	.07	.6	Trace
Corn muffin	1 muffin	... 48	33	141	3	5	21	135	.09	.10	.7	Trace
White bread, enr.	1 slice	... 23	36	62	2	1	12	Trace	.06	.05	.6	Trace
Whole wheat bread	1 slice	... 23	45	56	2	1	11	0	.06	.03	.6	0
Rye bread, light	1 slice	... 23	36	56	2	Trace	12	0	.04	.02	.3	0
Plain enriched roll	1 med	... 38	31	113	3	2	20	Trace	.11	.07	.8	Trace
Hard roll	1 med	... 52	25	162	5	2	31	Trace	.14	.12	1.4	Trace
Sweet roll	1 med	... 32	174	5	5	27	39	.04	.08	.08	.4	Trace
Cakes:												
Angel food	1 (2" sector)	40	32	104	2	Trace	24	0	Trace	.04	Trace	0
Chocolate (chocolate frosting)	1 (2" sector)	120	22	407	5	15	70	180	.04	.10	.4	Trace

Food, approximate measure, and weight (in grams)	Approx. Measure	Water %	Grams	Calories	Protein* gm.	Fat* (Total lipid) gm.	Carbo.* hydrate gm.	Ribo- flavin mg.	Thia- mine mg.	Vitamin A I.U.	Niacin mg.	Ascor- bic Acid mg.
Fruitcake, dark	2" sq.	30	18	114	1	5	18	.04	.04	.2	Trace	
Cupcake, plain	1-med	60	24	204	2	7	34	.01	.04	.1	Trace	
Pound cake	1 slice	30	17	123	2	6	16	.01	.03	.1	Trace	
Doughnuts (cake type)	1 med	32	24	125	2	6	16	.05	.05	.4	Trace	
Cookies:												
Plain and assorted	1 cookie	25	3	82	1	3	12	.14	.01	.01	.1	Trace
Bar cookie	1 bar	16	14	60	1	2	10	.19	.01	.01	.1	Trace
Crackers:												
Graham, plain	1 sq.	7	6	27	1	1	5	0	Trace	.01	.1	0
Saltine, 2" sq.	2	8	4	28	1	Trace	5	0	Trace	Trace	Trace	0
Cereals (prepared):												
Bran flakes (40%)	1 cup	38	3	115	4	1	31	0	.15	.06	2.4	0
Corn flakes	1 cup	28	4	108	2	Trace	24	0	.12	.02	.6	0
Corn, wheat, rice flakes	1 cup	22	3	88	1	Trace	20	0	.08	.01	1.2	0
Puffed wheat	1 cup	14	3	51	2	Trace	11	0	.08	.03	1.1	0
Rice krispies	1 cup	28	4	109	1	Trace	25	0	.09	—	1.3	0
Shredded wheat	1 biscuit	28	7	99	3	1	22	0	.06	.03	1.2	0
Wheat flakes	1 cup	28	4	99	3	Trace	23	0	.18	.04	1.4	0
Cereals (cooked):												
Cream of wheat	1 cup	215	90	103	3	Trace	21	0	.12	.07	1.0	0
Oatmeal	1 cup	236	87	132	5	2	23	0	.19	.05	.2	0

Food, approximate measure, and weight (in grams)	Approx. Measure	Grams	Water %	Calories	Protein* gm.	Fat* (Total lipid) gm.	Carbo* hydrate gm.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Salad or Cooking Oils:												
Corn	1 Tbsp . . .	14	0	125	0	14	0	—	0	0	0	0
Cottonseed	1 Tbsp . . .	14	0	125	0	14	0	—	0	0	0	0
Olive	1 Tbsp . . .	14	0	125	0	14	0	—	0	0	0	0
Safflower	1 Tbsp . . .	14	0	125	0	14	0	—	0	0	0	0
Soybean	1 Tbsp . . .	14	0	125	0	14	0	—	0	0	0	0
SUGARS AND SWEETS												
Chocolate, plain	1 oz . . .	28	1	147	2	9	16	77	.02	.10	.1	Trace
Honey	1 Tbsp . . .	21	17	64	Trace	0	17	0	Trace	.01	.1	Trace
Jams, jellies, preserves	1 Tbsp . . .	20	29	55	Trace	Trace	14	Trace	Trace	.01	Trace	1
Syrup	1 Tbsp . . .	20	24	58	0	0	15	0	0	0	0	0
Sugar	1 Tbsp . . .	12	Trace	46	0	0	12	0	0	0	0	0
MISCELLANEOUS ITEMS												
Beer (3.6% alcohol)	1 bottle . . .	340	92	171	2	0	16	0	Trace	.11	.8	0
Carbonated beverages	8 oz . . .	240	90	90	0	0	23	0	0	0	0	0

Nuts:											
Peanuts, roasted	1 oz	28	2	160	8	13	5	—	.07	.04	5.4
Butter	1 Tbsp	16	2	87	4	7	3	—	.02	.02	2.4
Pizza (cheese)	1 (5½" pc)	75	45	184	7	5	27	303	.05	.13	.8
Popcorn with margarine	1 cup	28	3	155	2	12	11	462	—	.02	.3
Soups, canned:											
Noodle type	1 cup	250	93	68	4	2	8	113	.03	.05	1.0
Tomato	1 cup	245	90	88	2	3	16	1,005	.05	.05	Trace
											12

*Prepared from "Table of Food Values," by Jelia Witschi, M.S., Harvard Nutrition Service, Department of Nutrition, 665 Huntington Avenue, Boston, Mass. 02115.

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ORTHOMOLECULAR NUTRITION—PART III

Vitamin Supplementation

THE BATTLE FOR VITAMINS

When Casimir Funk coined the word *vitamine* he paved the way for the new science of vitamins in nutrition. But many battles remained to be waged for acceptance of vitamins as legitimate and necessary additions to the modern diet—and they still are going on. The most classical was Goldberger's war to establish that pellagra was a disease of malnutrition, caused by a deficiency of the amino acid tryptophan, and vitamin B-3 (nicotinic acid).

Dr. Goldberger's discovery was announced in Washington, D.C. on November 11, 1915: "What is believed to be a dietary cure for pellagra has been found in the results of experiments by the Public Health Service—the cause of the disease as well as the remedy, it was officially announced at the Treasury Department today. Assistant Secretary Newton, who has charge of the Public Health Service, spoke of the discovery as one of the greatest achievements of modern science in recent years. . . . It was established that persons whose diets lacked a normal proportion of protein seemed particularly subject to the disease while those whose food contained enough protein seldom were afflicted."

However, one year later, November 19, 1916, the *New York Times* carried a summary of a report from Drs. Thompson and McFadden, who had investigated pellagra

carefully. They concluded there was no connection between nutrition and pellagra, which was, they said, an infectious disease caused by the sting of the stable fly. This monstrous conclusion was finally disputed after Goldberger injected himself with preparations of excrement from pellagrins, mucous from their nasal passages, and scaly drippings from their skin, and did not develop pellagra.

The interest and excitement over vitamins was tremendous between 1925 and 1940. One after another was isolated, named, and identified. There was a race to be first to identify each new vitamin, with perhaps a Nobel Prize for the winner. This vitamin deficiency era reached its peak in 1942 when pellagra was nearly wiped out by the enrichment of flour with vitamin B-3 in its nicotinamide form.

Interest in vitamins and nutrition faded from medical schools after that. They became the exclusive province of nutritionists and dietitians, and nearly every physician assumed there were no more avitaminoses to be treated. Popular writers and lay journalists took over the field of nutrition. The era of myths set in, such as the "one vitamin-one disease" concept. The false concept said that lack of a vitamin accounts for a specific disease and that if the disease isn't present, there is no deficiency and hence no need for extra vitamins. This myth still prevails among some orthodox physicians. Ignored entirely is that the deficiency diseases such as beriberi, pellagra and scurvy are the end result of months or years of severe deficiency and represent the premorbid condition. The false concept ignores entirely the many symptoms suffered during the developmental phase and concentrates on signs of deficiency that strike just before the patient is going to die.

Another silly myth is that the minimal daily requirement (MDR) applies to every individual. The MDR ignores a fact, too—that people are remarkably dissimilar biochemically, physically and psychologically. They don't look alike, nor do they have the same fingerprints; and they *do* have different requirements for various nutrients. Even if 90 per-

cent of any population required only the MDR of vitamins, it would leave huge numbers of people needing 10, 100, or 1000 times as much. The minimal daily requirement, if it has any value at all, might for many do little more than prevent the classical deficiency diseases from appearing.

THEORETICAL BASIS FOR MEGAVITAMINS

About forty-five nutrients are required in optimum quantities. If you tried to take each nutrient in pure form and prepare a diet for each of them, it would be impossible to do. The complexity of the problem would tax the best computer. We are still fairly ignorant of the scientific bases of clinical nutrition. A few synthetic diets are available, true, but no one could trust himself to live on such a diet for any substantial time; some deficiency would surely show itself.

Fortunately, we do not need to plan our diets this way. We have adapted to the environment over millions of years to live on foods derived from plants and animals whose composition is not too different from our own bodies. Such food can readily be broken down into essential nutrients. Nature already has made the computations needed. All we have to do is revert to the whole unprocessed food consumption that we have already adapted to through evolution. Eliminate junk! Give preference to high-quality foods having diverse quantities of fat, protein, carbohydrate, and fiber.

Of course, most of us in western civilization do not consume an unprocessed diet; many *do* eat junk. Not only is it difficult to persuade people to eat what is good for them, but the medical profession plays a damaging role in delaying the applications of vitamin therapy developed by its colleagues. The medical use of vitamins has had to change slowly from prevention and treatment of deficiencies to a newer use of much larger quantities to treat conditions which are not clearly related to vitamin deficiencies. Certain

foods can prevent and cure major diseases. This has been known for hundreds of years, but this knowledge has been narrow in distribution and seldom is applied on any substantial scale.

Any person runs the risk of getting either too much or too little of any essential nutrient. Generally too little of any nutrient is much worse, since it cannot be synthesized in the body. If too much is present, the cells extract what they require and leave the rest in the blood from which it is readily removed for future use by cells or as waste for elimination. Huge quantities of vitamins taken in could be dangerous only in the same way that drinking too much water is dangerous. You get rid of what you don't need. For that reason, many physicians dissuade people from using vitamins by pointing to the economic loss of enriching the sewage with them. This argument has no place in science. Don't confuse clinical utility with economics.

The practice of orthomolecular nutrition recognizes that each person requires optimum quantities of each nutrient. How can you determine the individual quantities you need? So far, orthomolecular medicine is able to recommend only one way—trial and error—self-experimentation. We make this recommendation with the understanding that the majority of any population will benefit by the supplementation of one or more of the essential nutrients and that very few individuals are in complete tune with their daily nutrient requirements.

Dr. Roger Williams and his coworkers emphasize that vitamins work together as a team or orchestra. One plays in unison with the other. For example, pellagra is cured, not by vitamin B-3 alone, but by vitamin B-3 *plus* all the other vitamins we require. In pellagra, B-3 is *relatively* the most deficient, that's all. There is no great drama involved. The same applies to scurvy and vitamin C. That is because organisms rarely live in an environment which is optimal for them. Suppose turtle eggs lived in an optimal medium. They soon would cover the whole surface of the earth because so

many of them are fertilized and laid. Fortunately these optimal conditions will never exist for any species, as we mentioned in an earlier chapter, and life adapts to survive in suboptimal environments. Our own body cells will live with less than optimal nutrition and function at a lower level of efficiency. There is a wide variation of need for each nutrient. Levels adequate for one person will be inadequate for another. In planning nutritional treatment for any individual these relationships must be considered.

MEGADOSE VITAMINS

Because of the need to emphasize that doses recommended were much larger than what was prescribed by the medico-nutritional establishment, the term *megadose* has come into common use. It is not a good term, however, because *mega* meaning *great, large* and *powerful* frightens people and becomes a focus of attack. A better term for vitamins recommended in optimum doses would be *optidose*. Nobody is against optimum health that optimum-dose vitamins would stimulate. The shrill attack against using larger than average doses could be muffled this way. We will continue to refer to megadoses in this book and in orthomolecular medicine, but they should be thought of as optidoses.

Traditional psychiatrists already have accepted megalithium therapy. My colleagues in mainstream psychiatry are not disturbed whatever at using large quantities of lithium therapy, simply because no one has thought of calling it megalithium therapy. This is so even though the difference in the quantities used as compared to the daily intake in a normal diet, which is only 2 mgs. per day, is just as striking for lithium as it is for the vitamins.

In time, every vitamin will probably be found to be useful in megadoses for certain conditions. The number of combinations of vitamins possibly suitable for administration in megadoses is vast. The individuality of the body's needs

and responses makes it unlikely that one pill will ever be devised to do the whole job.

Along with prescription of the no-junk diet, megadosage of vitamins is one of the main components of orthomolecular medicine and orthomolecular psychiatry. Not all vitamins are given in megadoses. When the nutrition is optimum, it is necessary to supplement with only a few. It is impossible to say that one vitamin is more important than another; they work together. Returning to our metaphor of vitamins working in unison as in an orchestra, at times one set of instruments is featured while the rest of the orchestra stays in the background; the same occurs with vitamins.

An imbalance is present when a vitamin is lacking. This is much more common than an imbalance resulting from an excess of any vitamin, which is rare indeed. Water-soluble vitamins are readily excreted if more is present than is required. To ensure an optimum combination, the simplest way is to use slightly more than required for best results. With some vitamins, several grams per day may be required, while others need considerably less than one gram per day as supplementation. Danger of overdose imbalance is rare when the usual orthomolecular doses are used.

Most clinicians intuitively know of the enormous variation in their patients' response to medication. The study of pharmacology and therapeutics teaches this. One patient may develop diarrhea on 250 mg. of ascorbic acid per day while another can consume 40 grams per day with no difficulty. Individuality determines the need for individual care. One patient may not be able to take 25 mg. of a tranquilizer because of a reaction of excessive drowsiness, and others might remain unaffected by 1000 mg. of the same tranquilizer.

Even identical twins are not alike because of unequal division of the fertilized egg. It is inconceivable that each egg would receive an identical allotment of cytoplasm and cytoplasmic particles. A minor variation in any one of the

thousands of enzymes present could produce a major variation in the biochemistry of the body.

It is therefore inconceivable also that every person would require the same daily intake of nutrients, or that any average minimal daily requirement (MDR) would be suitable for everyone. If the figure were set too low, too many who abide by it would suffer from a deficiency; if too high, less harm would be done, but too many foods would be considered inadequate. It will forever be impossible to generalize the nutrient needs of everyone. Set your own optimum intake from the scientific guide we furnish here.

THIAMINE—VITAMIN B-1

Thiamine is the anti-polyneuritis or anti-beriberi vitamin. Water soluble, it is used as an adjunct in the treatment of certain depressions and is specific for Wernicke-Korsakoff disease (Victor, et al., 1971).¹ The megadose (optidose) level ranges up to 3000 mg. per day, but this is rare. The usual megadose range for an average person is from 100 to 3000 mg., most often nearer the lower level.

Thiamine is useful against alcoholism. Cade (1972) reported that alcoholics admitted to his hospital are routinely given intravenous multivitamins containing at least 200 mg. thiamine. They may require this twice a day. In spite of a great increase in the number of alcoholic admissions to the hospital, there has been steady improvement until the death rate has fallen to zero. In 1945-50, before thiamine treatment was used, eighty-six patients died of alcoholism complications. In 1956-60, eight people died, but no deaths have occurred from 1966 to now. Cade concluded "that because the mode of death was identical with that in beriberi, because thiamine deficiency has been demonstrated in a significant proportion of sick alcoholics, because deaths no longer occur when they are given thiamine, and because there have been no other discernible significant changes in

treatment which are likely to have been responsible, thiamine is the therapeutic agent which is literally lifesaving in a significant proportion of patients.”² Thus thiamine—vitamin B-1—has been clearly shown to have saved lives among alcoholics.

Thiamine is also the main component of a multivitamin program for treating multiple sclerosis (MS) and myasthenia gravis. Dr. F. R. Klenner (1973) has been using about 2 grams of vitamin B-1 a day orally in divided doses with additional parenteral administration (by injection) as needed. The clinician reported progress for one parenteral patient in a series of cases. Dale Humphreys, a forty-eight-year-old music teacher, had his first MS attack January, 1973, following influenza. He improved partially with use of ACTH. A second attack one year later practically confined him to bed or a chair and ACTH no longer helped. Dr. Klenner first met Mr. Humphreys in August, 1974 and placed him on a comprehensive megavitamin program. Pain began to ease soon after and by August, 1975, the patient was nearly normal. By year’s end, his physician and his neurologist found he was normal. Dale Humphreys can now engage in all his usual physical activities. Klenner believes this approach should be used for other neurological diseases.³

RIBOFLAVIN—VITAMIN B-2

Riboflavin is a maintenance factor for mucous membranes of the respiratory system and is essential for healthy eye tissue and skin tissue. The largest tablet of this vitamin available is 100 mg., which has not lent itself to megadose levels. The most common multivitamin tablet dose is only 5 mg., a reflection of the current attitude toward riboflavin. Vitamin B-2 is important in the respiratory enzymes and probably has some value for some people in megadoses. My experience has been that there is no toxicity apparent even with 250 mg. per day dosage.

Vitamin B-2 turns the urine bright fluorescent yellow, a property that makes it a good marker to add to tablets to determine if they are absorbed. Bright yellow urine indicates the tablet has disintegrated and its contents taken in by the body. Two properties of riboflavin in doses of 250 mg. per day are evident: it decreases the craving for sugar and it greatly improves vision, especially in elderly people.

ASCORBIC ACID—VITAMIN C

Ascorbic acid is the anti-scorbutic vitamin used in doses of under 50 mg. per day to prevent scurvy. It aids in iron absorption, helps to manufacture adrenal cortical hormones, polysaccharide, and collagen. It forms bones, teeth, cartilage, and keeps up capillary permeability. Also vitamin C prevents oxidation of nutrients within the body, promotes growth and wound healing, and forms white blood cells which fight infection, detoxify drugs and environmental poisons in the system. This important vitamin fights off emotional and environmental stress and protects the circulatory system from fat deposits.

The optimum level for vitamin C is 1000 to 5000 mg. per day, depending upon the condition of the person taking it. Relative to other nutrients, it is one of the safest substances known. Even so, strenuous attempts have been made to frighten people away from ascorbic acid use by referring them to theoretical dangers. So far dangers are unreported as fact anywhere, still there has been reference made to kidney stone possibility and abortion production. If it really were an abortifacient, a boom in the ascorbic acid market would surely have been noted!

The optimum dose must be determined for each individual. It will vary with age, illness, and other circumstances. To reduce the frequency and morbidity of colds, you should use at least 3 grams (3000 mg.) per day, although it has been estimated that an average of 8 grams per day is re-

quired to prevent colds in 95 percent of the population. Most anti-cold studies are defective, since they do not sort out two basic populations: those who seldom get colds and those who frequently have colds. The first group should be excluded, inasmuch as ascorbic acid would not have any effect. The group's inclusion tends to dilute the real anti-cold effect of the vitamin. Pauling (1970) brought worldwide attention to the anti-cold properties of ascorbic acid⁴ and Stone (1972) showed the effects of its megadose usage.⁵ Birch and Parker (1974) reviewed many references to its efficacy.⁶

The relationship between malnutrition and infection is clearly established. Fatality rates from measles are up to 200 times higher in the poorer developing countries than in the industrialized countries. It has been demonstrated that malnutrition and infectious disease interact, each condition making the other more serious than the addictive effect of the two working independently. In a well-nourished person an infectious disease is comparatively powerless.

In 1974, Kalokerinos demonstrated that infantile scurvy was of particular importance in causing infant death among the Australian aborigines. Vaccination during or just before a cold was particularly hazardous in an infant suffering from scurvy. Then babies who were moribund on admission to hospital became almost well in less than an hour after injections of megadoses of ascorbic acid. Using vitamin C supplements, Dr. Kalokerinos reduced the infant mortality rate from close to 500 per 1000 population in some areas to 20 per 1000 in the area where he was their physician. His work is very impressive and leads to the conclusion that high infant mortality rates elsewhere, as among the native people of Canada, may be high for similar reasons.⁷

NICOTINIC ACID (NIACIN)—VITAMIN B-3

Vitamin B-3 was the third B vitamin to be identified. In

the mid-1930s researchers recognized that nicotinic acid was a vitamin. This simple chemical had been known for more than fifty years, but no one had suspected its role in nutrition. There are two chemicals with vitamin B-3 properties, nicotinic acid and niacinamide. Both are converted into coenzyme one or niacinamide adenine dinucleotide (NAD). This is the active anti-pellagra enzyme. Nicotinic acid is often referred to as niacin, and niacinamide as niacinamide.

Both niacin and niacinamide are similar members of the B complex, but niacinamide is more generally used in treatment since the burning, flushing and itching of the skin that frequently accompanies nicotinic acid does not occur. In nature, nicotinic acid and niacinamide are not free, as they are in enriched flour or in tablets, but are usually bound in the mono- or dinucleotide form. Sometimes they are so tightly bound that they are not hydrolyzed by the intestinal enzymes, and are therefore not utilized by the body. The vitamin B-3 in corn is so bound, but can be released by cooking the corn with limestone (calcium). The nicotinic acid (or niacinamide) is therefore digested slowly and absorbed slowly with no substantial elevations in blood levels. Nicotinic acid in natural sources does not produce any vasodilation, but when taken in doses of 1 gram three times per day, it causes a sudden and marked elevation of blood level, producing physiological changes, which is followed by the excretion of large quantities. The use of vitamin B-3 tablets is thus wasteful, even if essential. However, slow-release preparations are coming onto the market and will be more economical in making use of the viable vitamin B-3 nutrient.

I have run preliminary tests on a slow-release nicotinic acid capsule. It contains other factors, such as inositol, and releases its ingredients over an eight-hour period. In this way it more closely reproduces the absorption of the vitamin from food. The slow-release capsule has the following properties compared to pure nicotinic acid in ordinary tablets: it has very weak vasodilatory properties and seldom

produces any gastric intestinal discomfort. One-quarter gram capsules taken four times per day were more effective in lowering cholesterol and triglyceride levels than 1 gram of standard nicotinic acid taken three times per day. This suggests that the optimum dose range for schizophrenics may well be reduced from 2 to 30 grams per day of standard nicotinic acid to 1 to 10 grams of slow-release nicotinic acid per day.

Nicotinic acid has broad-spectrum hypolipidemic properties which have caused it to be examined for its effect in reducing coronary disease. However, one factor hampering work in this and other areas is its status as a member of a group of compounds called "orphan drugs." These are not patented, and no person or company has a financial interest in developing them, since the potential rewards are not commensurate with the costs of development. Orphan drugs have to gain public acceptance on their own merits. Upon taking them, your judgment as to whether or not you feel better or have benefited in any way, will determine whether you want to use them. This has happened with ascorbic acid. Linus Pauling's immense prestige in publicizing vitamin C alerted the public, and the continued large-scale use of the vitamin has been due to general public satisfaction with it. We hope that the same thing will happen to nicotinic acid. Its hypolipidemic effect may become a factor in its popular use, if for no other reason.

But all vitamins used in megadoses are orphan drugs. As time moves on and more people are exposed to orthomolecular nutrition, megadoses of vitamins will become more commonplace. People will recognize their value as protectors against pollution and stress. Then the orphan vitamin products will replace drugs. It is inevitable that physicians will one day come to prefer a nutrient over a non-nutrient for therapy. The body has mechanisms for dealing with nutrients, but must evolve new ones for dealing with foreign chemicals.

Nicotinamide is the form of vitamin B-3 that does not

produce a flush, is alkaline, and induces no acidity in the stomach. However, it can be taken in a dosage that produces a central nausea and vomiting. If one goes above the optimum dose it will produce nausea. David Hawkins, M.D. uses this characteristic as a means of measuring the value of dosage. The dose is increased until nausea ensues, then decreased by 1 gram. The dose range for nicotinamide is 2-6 grams per day.⁸

Vitamin B-3 is a co-enzyme in fat metabolism and helps to control blood fat levels. It is important for the treatment of mental illness because of its effects on complex chemical interactions that affect the working of the nervous system. It has also been described as the anti-rheumatic vitamin; and the nicotinic acid flush is comforting to those who suffer from the symptoms of arthritis. This was described by Kaufman in 1943⁹ and 1949¹⁰, but unfortunately he published his final report about the same time cortisone was being promoted for arthritis and the information was buried.

NICOTINIC ACID TREATMENT FOR SCHIZOPHRENIA

Schizophrenic patients who have been ill one year or less, or whose relapse has been one year or less in duration, fall into what I classify as *Phase I*. This group includes those who may have been ill several times but have been able to recover. They are cooperative patients, able to follow treatment at home or are cared for by a family. I start these people on vitamin B-3, three grams per day. Patients who are under age twenty-one, all women, and those men who, for cosmetic reasons would prefer not to flush in public, are prescribed nicotinamide. Children are intolerant of the flush and there is no point forcing them to experience this unless the nicotinamide does not work. The amount given should be below the nauseant dose level.

If my patients are forewarned, the nicotinic acid flush

causes them very little difficulty. When it comes, however, it can be surprising. An orthomolecular physician in Detroit forgot to warn his patient, and after the fellow took his first gram he developed the flush. Becoming concerned, he phoned the nearest poison control center at a hospital. The intern on duty, hearing what he had taken and how much, exclaimed, "Oh, my God, you have taken a lethal dose. Call an ambulance immediately!" By the time the badly frightened patient arrived at the hospital the flush was nearly gone.

The flush eases with each dose until in most cases it vanishes or remains a minor problem only. If the dose is too low, the flush remains fairly intense. It is necessary to give enough to empty the histamine storage sites to a level, at which there is no time to replenish them by the time the next dose is taken. It may require 6 or 8 grams per day for some people. You can minimize the flush by a variety of procedures:

a) Take 120 mg. of aspirin each day for two days before starting on the nicotinic acid (Kunin, 1976).¹¹

b) Take the vitamin after meals with a cold drink. Anything that reduces the rate of absorption into the blood will decrease the flush.

c) Use nicotinic acid combined with inositol. This is available as a single product, *Lenodil*, in Canada. It was available as *Hexanicotol* in the United States, but FDA policy prevented its development.

d) Use the pelletized slow-release preparations—effective at lower dosages.

A few patients have low thresholds for nicotinamide and nicotinic acid. Nausea may set in with either. They will require smaller doses of both to achieve an adequate vitamin B-3 intake. There is a wide range between patients for the optimum dose, and alteration of dosage may be needed as treatment continues. One of my chronic female patients who is schizophrenic required 30 grams per day for a year. On 24 grams her symptoms came back. For the past seven

years, however, a gradually reduced dosage to 3 grams has been adequate.

For cerebral allergy patients, nicotinic acid helps to control symptoms by depleting the histamine and heparin levels. If the foods to which the patient is allergic are removed, the need for nicotinic acid will drop to about 3 grams per day or perhaps disappear entirely.

Viral infections are critical for schizophrenics and may cause a relapse, which comes on as the infection begins to recede. Therefore, ascorbic acid is advantageous in the dosage of 3 grams per day for decreasing the frequency of infections and colds. It is best to use the crystalline powder form of vitamin C dissolved in water or juice. If it is too acidic, neutralize the supplement with small quantities of baking soda.

There may be indications for using thiamine, riboflavin, pantothenic acid, folic acid, pyridoxine, and cobalamin along with niacin, for some schizophrenic patients. Tranquilizers, antidepressants, and all other drugs used in psychiatry will also be useful if indicated. Usual doses are prescribed. Patients will remain on the vitamin supplementation program for several months or years, depending upon their response. Various medications will have their dosage altered up or down until an optimum program is achieved. When the patient is considered well, he is advised to continue with his supplementation for up to five years. That is the best orthomolecular nutrition practice for schizophrenia. If by that time withdrawal of medication is followed with relapse, the individual may have to continue vitamin supplementation for life.

Failures among Phase I patients, or chronic cases who have been ill for many years in or out of the hospital, fall into my classification of *Phase II*. Phase II schizophrenics often are unable to cooperate. They are prescribed the same chemotherapy as Phase I and additionally receive a series of electroconvulsive therapy (ECT). This may be given in hospital or out-patient. These schizophrenics usually require

larger doses of vitamins, along with mineral medication to increase zinc intake or to reduce copper levels (with penicillamine). After the ECT, chemotherapy is continued as before. A very small proportion of my patients, under 5 percent, require ECT.

Phase I patients are seldom cases of cerebral allergies, but Phase II schizophrenics have cerebral allergies in up to 50 percent of cases. Nonallergenics are treated as described; cerebral allergenics require a specialized approach.

PYRIDOXINE—VITAMIN B-6

Pyridoxine, another one of the water-soluble B complex vitamins, has a coenzyme involved in an enormous number of reactions. Most of them affect the metabolism of amino acids. The conversion of tryptophan into NAD is dependent upon pyridoxine, and it has importance in red blood cell formation and on central nervous system hormones. Fats, carbohydrates, and all proteins metabolize more effectively by means of pyridoxine. In its absence, typical pellagra is produced. It has been used for treating certain forms of learning and behavioral disorders in children, Rimland reported in 1972.¹²

Along with vitamin B-3, Cott (1971) and others have found it useful in the treatment of hyperkinetic children.¹³ Pfeiffer et al. (1972, 1974) has shown that kryptopyrrole (formerly known as the mauve factor) binds pyridoxine.¹⁴ Patients with large quantities of kryptopyrrole will, therefore, exhibit a pyridoxine-deficient state. Pfeiffer has described this syndrome.¹⁵ Hoffer and Osmond (1963) described it clinically, but concluded that vitamin B-3 was the important therapy.¹⁶ Pfeiffer's work suggests that pyridoxine may be even more important. Patients with kryptopyrroluria, according to Pfeiffer, should be treated with megadoses of pyridoxine combined with zinc. The usual megadose level is 250 to 3000 mg. per day of vitamin

B-6 with the mode near the lower level. In a very few cases pyridoxine increases excitability in children.

COBALAMIN—VITAMIN B-12

Cobalamin is used to maintain the health of all body cells by production of nucleic acid. It maintains nerve tissue sheaths, helps in blood formation and the production of genetic material DNA and RNA, and affects protein and fat cells. Studies of vitamin B-12 in megadoses have been infrequent. In 1972¹⁷ and 1975,¹⁸ Newbold suggested that some schizophrenics have low blood levels of the vitamin and improve when it is given to them. Many elderly patients also are low in B-12 supplementation. Since it works together with folic acid, both should be used as cosupplements. The megadose level of cobalamin would range from 1 to 5 mg. per day by injection. Dosage for oral vitamin B-12 is not known.

ALPHA TOCOPHEROL—VITAMIN E

Alpha tocopherol has been recommended as a preventive and treatment for cardiovascular disease, as a protective agent against free radicals in the body, and as an antisenility factor. The latter supposition is based on the hypothesis that free radicals (from oxygen, radiation, etc.) accelerate aging. Four years ago, when I did not know what to expect, I added vitamin E, 800 I.U. per day to my multivitamin program. About one year later my hair, which had been graying, had regained most of its original dark color except the hair on my chest, which remains gray and white.

Vitamin E promotes normal growth and aids the functioning of muscle, blood, and nerve cells. It helps in the absorption of unsaturated fats, fights off stress, and acts as a detoxifying agent. Nair, et al. reported in 1971 on treat-

ment of porphyrinuria with vitamin E for four patients. In all four cases the typical biochemical changes were present, but they were corrected. The orthomolecular doses for vitamin E range from 800 I.U. to 3000 I.U. per day. A normal dose range is 200-800 I.U. daily.¹⁹

I have been puzzled by the violent opposition to vitamin E supplementations from the medical community. There seems to be no hesitation in giving animals extra vitamin E. Have we forgotten that most animals have requirements for vitamins similar to man? The only exception to this general rule is ascorbic acid. As a cardiovascular disease-preventive agent, vitamin E evokes cries of rage from many nutritionists and physicians, yet the evidence shows that thousands of patients have derived great benefit from its use. The evidence has been presented in *The Summary* (1) published by the Shute Foundation for Medical Research, London, Ontario, Canada. For an incisive examination of the psychology of the resistance against vitamin E read Shute and Taub (1969),²⁰ and Shute (1975).²¹

VITAMIN A

Vitamin A is known as the anti-infective or anti-ophthalmic vitamin. It helps to maintain normal growth and bone development, protective sheathing around nerve fibers, and healthy skin, hair and nails. It is quite important for retention of normal vision, since it is used up in the process of seeing. The reason vitamin A is called anti-infective is that it maintains healthy mucous in the respiratory system and thus fights off infection and allergic symptoms.

For many years Reich (1971) has treated patients with asthma with a combination of vitamin A, vitamin D-3, and bone meal to supply calcium. Reich's doses of A range from 28,000 to 75,000 I.U. per day, while doses of D range from 5000 to 14,000 I.U. daily. On a very large series of 5000 cases, Reich's results have been favorable. Similarly, my use

of these megadoses for asthma and other allergies has netted good results. This is a simple and safe therapy that, as with megadoses of other vitamins, has met strange resistance on the part of medical traditionalists.²²

THE NON-TOXICITY OF VITAMINS

Many sweeping generalizations have been made about the dangers of hypervitaminosis. Before any statement can be made about toxicity, one should specify the exact vitamin, the toxic dose, and the duration of treatment. Otherwise, when examined in the light of their non-specificity, these statements become meaningless.

Indeed, every chemical, when used in quantities larger than can be disposed of by the body, is toxic. Patients can even suffer from water intoxication. One of my obese schizophrenic patients lost 60 pounds of water in a couple of weeks after he was prevented from spending all day at the water fountain drinking. To discuss intelligently the toxicity of a vitamin, you must have two particular values: the optimum effective dose and the toxic dose of LD 50. This LD 50 is the dose which, given over a specified period of time, will kill half the subjects. For example, if 100 mg. of saccharine fed to thirty rats kills fifteen of them from cancer, the LD 50 is 100.

The toxic dose divided by the therapeutic dose is the *therapeutic index*. If the therapeutic index is low, the compound is toxic; if it is high, it is non-toxic. If 1 gram per day is the optimum dose, and 2 grams per day is the LD 50, the therapeutic index is 2—the optimum dose is only half the amount which would be lethal to 50 percent of those to whom it is administered. Obviously such a drug or supplement would be hazardous to use. Another way to consider the therapeutic index is as the ratio between the amount of a drug which will kill and the amount required to be effective. Using our example above, if 100 mg. of sac-

charine kills half the rats (this is a hypothetical example, *not* a comment on the recent Food and Drug Administration's use of experimental evidence to ban saccharine), but only .02 mg. is required to produce the desired sweetness effect, the therapeutic index is 500, indicating a relatively safe drug.

Insulin may fall into the class of dangerous drugs. It has a low therapeutic index, and users know that insulin has to be used with great caution. Nicotinic acid has a high therapeutic index of 70. This is arrived at in the following manner: the optimum dose of nicotinic acid may be 3 to 30 grams per day for a person. If we use the average of 15 grams per day, we can determine the therapeutic index by first looking at animals. For animals the LD 50 is about 5 grams per kg. For a 70 kg. man this would be 350 grams per day, giving a therapeutic index of 23. But if we substitute the much more common dose of 3 grams per day per person taken instead of 15 grams per day, the therapeutic index becomes 70, indicating a safe product.

Vitamins have more favorable therapeutic indices than chemicals like tranquilizers and antidepressants. Additionally, the sheer bulk of a substance like a vitamin will make it relatively safe. It is difficult to consume large quantities because of this bulk. If three small tablets of an antidepressant is the recommended daily dose, it is a simple matter to commit suicide by swallowing 200 of the tablets. It is doubtful, however, that anyone could swallow 100 grams of any vitamin in tablet form without vomiting. Once, one of my patients, in a fit of anger, swallowed 100 tablets (50 grams) of nicotinic acid. The only result was a very sore abdomen. There is no record of any suicide with vitamins as the medium of death.

AN "AVERAGE" ANTI-STRESS VITAMIN FORMULA

People have often asked me for a single formula of miner-

als and vitamins that they could turn to without going to the bother of self-experimentation. Orthomolecular physicians have avoided suggesting such formulas. An anti-stress formula, it must be remembered, has to be individualized; there is no general prescription for every person, and there is no "average" megadose vitamin and mineral supplementation program.

Yet the clamor goes on. People *want* an "average" anti-stress vitamin formula. So, while urging that you keep in mind that individuals vary greatly in their needs, I have chosen to reveal what I take every day as a means of countering the various pressures of modern life and in order to live the full measure of years allotted *homo sapiens*.

Basically, one should start with good nutrition, which takes into account individual needs, and only after that has been shown not to be effective, does one turn to the use of megadoses of vitamins and mineral supplements. Certainly eat a sugar-free diet under any circumstances. Here is the anti-stress formula I take daily.

TABLE III

Supplement	Dosage
Thiamine, vitamin B-1	100 mg.-300 mg.
Niacin, vitamin B-3	3000 mg.-6000 mg. (people with cholesterol problems should take the nicotinic acid form)
Pantothenic acid	100 mg. 300 mg.
Ascorbic acid, vitamin C	3000 mg.-6000 mg.
Tocopherol, vitamin E	200 I.U.-800 I.U.
Vitamin A }	together in 3-9 cod liver oil capsules
Vitamin D }	
Mineral calcium }	together in 3-6 tablets of Dolomite
Mineral magnesium }	
Zinc gluconate	30 mg.-60 mg.
Chromium	from brewery yeast
Iron	if anemic only, and on doctor's prescription
Avoid copper	

VITAMIN AND MINERAL GUIDE

VITAMIN A

Also known as the anti-infective or anti-ophthalmic vitamin. Usually measured in U.S.P. units.

Natural sources: Colored fruits and vegetables, dairy products, eggs, margarine, fish liver oils, liver.

Functions: Builds resistance to infections, especially of the respiratory tract. Helps maintain a healthy condition of the outer layers of many tissues and organs. Promotes growth and vitality. Permits formation of visual purple in the eye, counteracting night-blindness and weak eye-sight. Promotes healthy skin. Essential for pregnancy and lactation.

Deficiency: May result in night blindness, increased susceptibility to infections, dry and scaly skin, lack of appetite and vigor, defective teeth and gums, retarded growth.

VITAMIN B-1

Thiamine, thiamine chloride. Also known as the anti-neuritic or anti-beriberi vitamin. Generally expressed in milligrams (mg), occasionally in units. 333 units of B-1 equal only 1 mg

Natural sources: Dried yeast, rice husks, whole wheat, oatmeal, peanuts, pork, most vegetables, milk.

Functions: Promotes growth, aids digestion, essential for normal functioning of nerve tissues, muscles and heart, necessary for proper metabolism of carbohydrates and fats.

Deficiency: May lead to loss of appetite, weakness and lassitude, nervous irritability, insomnia, loss of weight, vague aches and pains, mental depression and constipation. In children, a deficiency may cause impaired growth.

VITAMIN C

Ascorbic acid, cevitamic acid. Expressed in milligrams (mg.), occasionally in units. 1 mg. equals 20 units.

Natural sources: Citrus fruits, berries, greens, cabbages, peppers. (Easily destroyed by cooking.)

Functions: Necessary for healthy teeth, gums and bones; strengthens all connective tissue, promotes wound healing, helps promote capillary integrity and prevention of permeability; a very important factor in maintaining sound health and vigor.

Deficiency: May lead to soft gums, tooth decay, loss of appetite, muscular weakness, skin hemorrhages, capillary weakness, anemia.

VITAMIN B-2

Riboflavin or vitamin G. Measured in milligrams (mg.).

Natural sources: Liver, kidney, milk, yeast, cheese and most B-1 sources.

Functions: Improves growth, essential for healthy eyes, skin and mouth, promotes general health.

Deficiency: May result in itching and burning of the eyes, cracking of the corners of the lips, inflammation of the mouth, bloodshot eye, purplish tongue.

VITAMIN B-6

Pyridoxine. Measured in milligrams (mg.). If it is designated in micrograms (mcg.) remember that it requires 1000 micrograms to equal 1 milligram (mg.).

Natural sources: Meat, fish, wheat germ, egg yoke, cantaloupe, cabbage, milk, brewer's yeast.

Functions: Aids in food assimilation and in protein and fat metabolism, prevents various nervous and skin disorders, prevents nausea.

Deficiency: May result in nervousness, insomnia, skin eruptions, loss of muscular control.

VITAMIN B-12

Commonly known as the "red vitamin" cobalomin. Since it is so effective in small dosages, it is the only common vitamin generally expressed in micrograms (mcg.).

Natural sources: Liver, beef, pork, eggs, milk, cheese.

Functions: Helps in the formation and regeneration of red blood cells, thus helping to prevent anemia; promotes growth and increased appetite in children; a general tonic for adults.

Deficiency: May lead to nutritional and pernicious anemias, poor appetite and growth failure in children, tiredness.

VITAMIN D

Viosterol, ergosterol, "sunshine vitamin." Measured in U.S.P. units.

Natural sources: Fish-liver oils, fat, eggs, milk, butter, sunshine.

Functions: Regulates the use of calcium and phosphorus in the body and is therefore necessary for the proper formation of teeth and bones. Very important in infancy and childhood.

Deficiency: May lead to rickets, tooth decay, retarded growth, lack of vigor, muscular weakness.

VITAMIN E

Tocopherol. Available in several different forms. Formerly measured by weight (mg.), now generally designated according to its biological activity in International Units (I.U.).

Natural sources: Wheat germ oil, whole wheat, green leaves, vegetable oils, meat, eggs, whole grain cereals, margarine.

Functions: Exact function in humans is not yet known. Medical articles have been published on its value in helping to prevent sterility; in the treatment of threatened abortion; in muscular dystrophy; in the prevention of calcium deposits in blood vessel walls. Has been used favorably by some doctors in treatment of heart conditions. Much further research needs to be completed before a clear picture of this vitamin will be obtained.

Deficiency: May lead to increased fragility of red blood cells. In experimental animals deficiencies led to loss of reproductive powers and muscular disorders.

VITAMIN K

Menadione.

Natural sources: Alfalfa and other green plants, soybean oil, egg yolks.

Functions: Essential for the production of prothrombin (a substance which aids the blood in clotting): important to liver function.

Deficiency: Hemorrhages resulting from prolonged blood-clotting time.

VITAMIN B-3

Nicotinic acid (niacin)

Niacinamide (nicotinamide)

The functions and deficiency symptoms of these members of the B complex are similar. Niacinamide is more generally used since it minimizes the burning, flushing, and itching of the skin that frequently occurs with nicotinic acid.

Natural sources: Liver, lean meat, whole wheat products, yeast, green vegetables, beans.

Functions: Important for the proper functioning of nervous system. Prevents pellagra. Promotes growth. Maintains normal function of the gastro-intestinal tract. Necessary for metabolism of sugar. Maintains normal skin conditions.

Deficiency: May result in pellagra, whose symptoms include inflammation of the skin, tongue; also gastrointestinal disturbance, nervous system dysfunction, headaches, fatigue,

mental depression, vague aches and pains, irritability, loss of appetite, neuritis, loss of weight, insomnia, general weakness.

CALCIUM PANTOTHENATE

Pantothenic Acid. A member of the B complex family.

Natural sources: Liver, kidney, yeast, wheat, bran, peas, crude molasses.

Functions: Not clearly defined as yet. Helps in the building of body cells and maintaining normal skin, growth, and development of central nervous system. Required for synthesis of antibodies. Necessary for normal digestive processes. Originally believed to be a factor in restoring gray hair to original color. This function has not been substantiated.

Deficiency: May lead to skin abnormalities, retarded growth, painful and burning feet, dizzy spells, digestive disturbances.

FOLIC ACID

A member of the vitamin B complex.

Natural sources: Deep green leafy vegetables, liver, kidney, yeast.

Functions: Essential to the formation of red blood cells through its action on the bone marrow. Aids in protein metabolism and contributes to normal growth.

Deficiency: Nutritional macrocytic anemia.

CHOLINE

A member of the vitamin B complex family. One of the "lipotropic factors."

Natural sources: Egg yolks, brain, heart, green leafy vegetables and legumes, yeast, liver and wheat germ.

Functions: Regulates function of liver; necessary for normal fat metabolism. Minimizes excessive deposits of fat in liver.

Deficiency: May result in cirrhosis and fatty degeneration of liver, hardening of the arteries.

INOSITOL

Another member of the B complex family.

Natural sources: Fruits, nuts, whole grains, milk, meat, yeast.

Functions: Similar to that of choline.

Deficiency: Similar to that of choline.

VITAMIN F

Unsaturated fatty acids, linoleic acid and linolenic acids.

Natural sources: Vegetable oils such as soybean, peanut, safflower, cottonseed, corn and linseed.

Functions: A growth-promoting factor; necessary for healthy skin, hair and glands. Promotes the availability of calcium to the cells. Now considered to be important in lowering blood cholesterol and in combating heart disease.

Deficiency: May lead to skin disorders such as eczema.

METHIONINE

Dl-methionine. One of the essential amino acids.

Natural sources: Meat, eggs, fish, milk, cheese.

Functions: Building new body tissue; helps to remove fat from liver.

Deficiency: May lead to fatty degeneration and cirrhosis of liver.

BIOTIN

One of the newly discovered members of the B complex family.

Natural sources: Brewer's yeast. Present in minute quantities in every living cell.

Functions: Growth-promoting factor. Possibly related to metabolism of fats and in the conversion of certain amino-acids.

Deficiency: May lead to extreme exhaustion, drowsiness, muscle pains and loss of appetite; also a type of anemia complicated by a skin disease.

LYSINE

L-lysine monohydrochloride. One of the essential amino acids.

Natural sources: Meat, eggs, fish, milk, cheese.

Functions: Building new body tissue and also such vital substances as antibodies, hormones, enzymes and body cells.

Deficiency: Not definitely known as yet.

VITAMIN P

Citrus bioflavonoids, bioflavonoid complex, hesperidin.

Natural sources: Peels and pulp of citrus fruit, especially lemon.

Functions: Strengthens walls of capillaries. Prevents vitamin C from being destroyed in body by oxidation. Beneficial in hypertension. Reported to help build resistance in infections and colds.

Deficiency: Capillary fragility. Appearance of purplish spots on skin.

RUTIN

Natural sources: Buckwheat.

Functions: Similar to that of vitamin P.

Deficiency: Similar to that of vitamin P.

PABA

Para amino-benzoic acid. Belongs to the B-complex group.

Natural sources: Brewer's yeast.

Functions: A growth-promoting factor, possibly in conjunction with folic acid. In experimental tests on animals, this vitamin when omitted from foods, caused hair to turn white. When restored to the diet, the white hair turned black.

Deficiency: May cause extreme fatigue, eczema, anemia.

THE IMPORTANT MINERALS

CALCIUM: Builds and maintains bones and teeth; helps blood to clot; aids vitality and endurance; regulates heart rhythm.

COBALT: Stimulant to production of red blood cells; component of vitamin B-12; necessary for normal growth and appetite.

COPPER: Necessary for absorption and utilization of iron and formation of red blood-cells.

FLUORINE: May decrease incidence of dental caries.

IODINE: Necessary for proper function of thyroid gland; essential for proper growth, energy and metabolism.

IRON: Required in manufacture of hemoglobin; helps carry oxygen in the blood.

MAGNESIUM: Necessary for calcium and vitamin C metabolism; essential for normal functioning of nervous and muscular system.

MANGANESE: Activates various enzymes and other minerals; related to proper utilization of vitamins B-1 and E.

MOLYBDENUM: Associated with carbohydrate metabolism.

PHOSPHORUS: Needed for normal bone and tooth structure. Interrelated with action of calcium and vitamin D.

POTASSIUM: Necessary for normal muscle tone, nerves, heart action and enzyme reactions.

SULPHUR: Vital to good skin, hair and nails.

ZINC: Helps normal tissue function, protein and carbohydrate metabolism.

NOTE: The symptoms noted in these pages should occur only when the daily intake of the vitamins mentioned has

been less than the minimum daily requirement over a prolonged period. These non-specific symptoms do not alone prove a nutritional deficiency but may be caused by any of a great number of conditions or may have functional causes. If these symptoms persist, they may indicate a condition other than a vitamin or mineral deficiency.

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ORTHOMOLECULAR NUTRITION—PART IV

Mineral Nutrients

THE SOURCE OF ALL LIFE

Most scientists assume that all life arose out of the sea, a solution rich in minerals that covers 70 percent of the earth. Life is considered to have originated from a mixture of organic and inorganic molecules which organized into chemicals and then interacted. It would be impossible for any living cell to avoid contact with minerals, or to exclude them from its interior—too much energy would be expended for such avoidance. Indeed, any chemist who must prepare pure water, a liquid totally free from metallic ions, can tell you the enormous energy cost required simply to eliminate minute quantities of these elements.

Thus no life could develop if minerals were excluded. They provide structural and functional support, and for each element there exists an optimum quantity that furnishes maximal support for a cell. Nature already furnishes these optimum quantities so that minimal amounts of energy are needed to either increase or decrease amounts inside a cell. Any quantity less than the optimum would eventually lead to a deficiency state, and cellular malfunction might express itself in some obvious manner. For instance, a mineral excess, if it could not be gotten rid of easily, would produce a toxic state.

As nutritional science developed, more elements were seen as being essential to the human organism. Elements needed in larger quantities, such as calcium, phosphorus, sodium, potassium, and magnesium, were recognized relatively early. Other elements, required in such minuscule amounts that it was impossible to measure them accurately by the primitive methods used at the time, were recognized later; they are called *trace elements*.

Trace elements are divided into four categories: (1) those considered *absolutely* essential, such as iron, cobalt, iodine, molybdenum, copper, selenium, zinc, manganese, chromium, and tin; (2) those considered *possibly* essential, such as nickel, fluorine, bromine, arsenic, vanadium, barium, and strontium; (3) those considered *non-essential* such as aluminum, mercury, cadmium, silver, gold, and lead; (4) those elements which in even very low concentrations are *toxic*, probably because they are difficult to eliminate, such as arsenic, lead, cadmium, mercury and bismuth. Possibly every element, including the toxic ones, is essential but in such minute quantities that it is impossible ever to test whether life can exist in their absence.

By forming weak or strongly adherent chemical bonds (such as metalloenzymes), trace elements are involved in nearly every physiological reaction. For example, they carry oxygen in the blood and grow nails and hair. Or an element such as calcium gives structural rigidity to bones and teeth. Often they are associated with the vitamins in enzymes and coenzymes.

Like the vitamins, minerals must act in concert. Any cell deficient in a single mineral nutrient will fail to perform at its best level. As a safety measure, it is generally best to have slightly more of these elements than is necessary, since a cell can exclude much of what it cannot use, and the body can eliminate more. Minerals, however, do not allow for the same spread of safety as do the vitamins. Take as a rule of thumb that any mineral which can be excreted readily, such as zinc, may be considered relatively safe even in

quantity. Those that are excreted slowly, such as mercury, should be considered toxic.

The optimum diet that we have described will provide all the essential elements in about the appropriate quantities. Natural foods in our optimum diet have incorporated elements from their surroundings during the period of growth and development. It is quite presumptuous of Man to think that he can tamper with nature, given our present state of nutritional information. Only our unprocessed foods offer the proper quantities of mineral nutrients.

Mineral requirements vary with the age of a person and his/her special events such as childbirth and disease. Rapid growth of a child demands greater mineral quantities, especially of calcium and magnesium. In separate texts, Williams (1975)¹ and Pfeiffer (1972,² 1975³) listed the amount of mineral nutrients required by a human adult. We have divided the elements into three groups on the basis of these authorities' rough estimates.

Mineral nutrients in *group one* are those for which the daily requirement is 350 milligrams per day or more. These include

sodium	5 grams
potassium	4 grams
phosphorus	2 grams
calcium	1 gram
magnesium	0.35 grams (350 mg)

Mineral nutrients in *group two* are those for which the daily requirement is 2 to 15 milligrams per day. These include

iron	15 mg.
zinc	15 mg.
manganese	5 mg.
copper	2 mg.
chromium	2 mg.

Mineral nutrients in *group three* are those for which the daily requirement is less than 1 milligram per day. These include molybdenum, cobalt, selenium, lithium, and iodine.

Natural foods are the best sources of minerals; and second to those are the foods which have not been damaged by modern food processing. Unlike the vitamins and amino acids, minerals are not destroyed by heat. Water-soluble minerals, however, are easily leached out by any process which exposes the food to solutions. Some minerals may be removed by substances which combine with them, called *chelating agents*. To understand chelated minerals, we will first define the terms involved in detail. For instance, *minerals*, as has been said, are elemental substances, many of which are essential to life, and are involved in many complicated biological activities in the human body. Then there are the amino acids, the building blocks of all protein. By the word *chelation* (pronounced *key-lay-shon* and taken from a Greek word meaning *claw*) we mean the process by which minerals are held, as if by a claw, by amino acids or other organic compounds. Some commercial minerals sold in health food stores have been chelated, that is, bonded in a "claw" with amino acids.

Chelation of a mineral with an amino acid is a natural step in the absorption and use of a mineral by the body. Minerals chelated with amino acids exist in nature. They combine naturally for absorption into our systems via the digestive tract. When non-amino-acid-chelated minerals such as sulfates or gluconates reach the intestine, they are there chelated for absorption, if amino acids are available for a chelate to form. Amino acid-chelated minerals help side-step this part of the digestive process because they are already bonded with amino acids. They are a specific type of complex with a valence (combining capacity) of 2 able to be chelated. However, potassium, with a valence of 1, and phosphorus, with a valence of 3 or 5, can be chelated by complexes. To be chelated, potassium would need a valence of 2, which is similar to having two arms for the amino acid

claw to grab. With three or five arms, phosphorus acts like a negative anion or carrier thus forming a complex or salt. Chelated minerals appear to be more quickly absorbed.

Some commercially prepared foods have lost rich mineral portions discarded because of the vagaries of food technology. Food processors, concerned more with appealing to the public's palate than with serving its nutritional needs, throw out the mineral cooking waters as waste.

Also, when plants are grown on soils which are deficient in various elements, they will have too little of these elements in their structure. Consumption of mineral-deficient foods will eventually lead to an insufficiency state, just as if we ate processed pulp. Certain natural foods in the form of plants may become toxic because they have accumulated too much of an element such as selenium. The concern about mercury in fish not long ago is a good example of contamination. Certain ocean waters were rendered impure by contact with mercury, and the animals living there absorbed the poison, making them unfit to eat.

The best guide to good mineral nutrition is to follow the same principle suggested in the previous discussion of vitamins and processed food: *if the item is manmade, don't eat it.* Be cognizant, though, that some edibles supposedly uninjured by man might still contain too much or too little of mineral nutrients, owing to the inevitable variability of soils, crops, and growing conditions.

Besides books written by Williams and Pfeiffer, two other reference sources for information about minerals are Underwood (1971),⁴ and Newbold (1975).⁵

SODIUM AND POTASSIUM

Both sodium and potassium are intimately involved in the transfer of energy. Sodium tends to remain within the fluid surrounding the cells, while potassium is held within the

cell. Energy is needed to maintain their proper ratios. In vegetables there is a higher ratio of potassium to sodium, but the reverse is true for animals. On the other hand, processed vegetables, especially the canned variety, are higher in sodium. Consumption of only processed food will cause you the risk of accumulating as much sodium as to possibly throw an unnecessary burden on the kidneys, which must excrete it. A physician's concern about kidney and heart disease, the ultimate organ victims of too much sodium, should make him wary of excess sodium in canned food.

However, H. L. Newbold, M.D. found his patients to be sodium *deficient*. One gram a day of sodium supplementation allowed them to improve. Patients with Addison's disease experience severe fatigue partly because of lack of sodium: they do not have enough sodium-retention hormone. Sunstroke will also cause severe sodium loss. Since it is easily gotten rid of, the ideal is to take more sodium than required. Sodium goes out with the sweat and urine. Indeed, sodium deficiency has become an increasing problem in recent years because of the introduction of diuretic drugs that are used for edema resulting from allergy and other causes.

Only if the kidneys are unable to excrete enough waste will there be an excess of potassium present in the body; mental confusion will then be the resulting symptom. More common is potassium deficiency with its accompanying muscular weakness, fatigue, constipation, as well as mental confusion. Junk food tends to be low in potassium. This includes anything overdosed with salt to make it more palatable. Because the manufacturing process removes so much of the natural flavor from food, copious quantities of salt and sugar are added, and become contaminants.

People taking diuretics run into trouble with potassium deficiency. They should take extra potassium in the form of foods naturally rich in the element such as oranges, bananas, and freshly prepared vegetables.

PHOSPHORUS, CALCIUM AND MAGNESIUM

Since phosphorus combines with other substances in most foods, it is difficult to sustain a phosphorus deficiency. The element is used by the body for bones and teeth in combination with calcium. Eighty percent goes for this purpose, and the rest involves itself with energy-transfer reactions. Phosphorus bonds itself with nicotinic acid and calcium to carry on physiological processes.

Calcium is the firming structural agent of bone and teeth, and that is how the element is used 99 percent of the time. Only about 1 percent is free in the body fluids, but a constant calcium level is required in the extracellular fluid and blood. The large reservoir of the mineral maintained in the bones makes this possible. It is transferred from fluid to bone and back again as needed. Calcium ions help clot blood and stimulate the nerves. Surveys have shown that approximately 30 percent of our population is deficient in this element.

Yet the main food sources of calcium consist of the common foods, milk, whole grain cereals, and meat bones. Processed cereals have much of their calcium removed though, and people eating mainly highly processed edibles such as this can develop a calcium deficiency.

Low-protein diets and high-protein diets alter calcium metabolism and require supplementation. Calcium deficiency symptoms may come on with enforced bed rest from illness, an excellent reason to get a patient up and about as soon as possible.

Symptoms of calcium deficiency are muscular irritability; softening of the bones, especially serious in the aged; and rickets in children. Symptoms of too much calcium absorbed into the body consist of interference with blood coagulation, depressed nerve function, and possibly kidney calculae (stones). Kidney stones will not occur unless there is a con-

comitant deficiency of pyridoxine (vitamin B-6) and magnesium.

Calcium and magnesium supplements are needed if you are allergic and unable to consume dairy products. A satisfactory supplement is dolomite in tablets or powder. Dolomite contains roughly two parts of calcium for each part of magnesium. No danger of mineral imbalance will occur with this substance, since it tends to be insoluble, and the amount absorbed will depend upon the acid quantity in the stomach. To increase absorption, additional hydrochloric acid may be needed.

Like calcium, magnesium involves itself with many body reactions. Its deficiency is serious and causes depression, irritability, tremors, irregular heartbeat, sometimes muscle spasms, and, rarely, convulsions. Magnesium deficiency is apt to appear in alcoholics and tends, with the associated deficiencies of thiamine and niacin, to cause delirium tremens. Cirrhosis of the liver and hardening of the arteries are other results of lack of magnesium. Highly processed foods are missing in the mineral, as they are in other essentials. Magnesium supplementation will be required for those who take a lot of thiamine.

Although rare, an excess of magnesium in the body can cause depression of the nervous system. In fact, the element was once used as an anesthetic.

ZINC

Among the most essential components of our diet, zinc has been shown to be deficient in a large proportion of the population. Its recommended daily dose is 15 mg., but from the changes produced in food by modern technology, we are in constant danger of not getting enough. Amazingly, the changeover from galvanized iron pipes to copper pipes in our plumbing has removed one of the valuable sources of zinc. Zinc salts in soil are readily leached away

by rain and take a large amount each year from the food plants that otherwise would accumulate it. In some areas zinc is an important constituent of fertilizer used in otherwise imperfect soils.

Other factors decrease human zinc intake. For instance, preparation of food so purifies it that the fibrous fractions which are richest in zinc and other minerals are removed. Thus white flour contains only eight parts per million of zinc nutrient compared with thirty-five parts per million in the whole wheat. As mentioned before, water in which food is cooked may be thrown away as waste, and this action throws out zinc with the water. According to Carl C. Pfeiffer, Ph.D., M.D., in his book *Mental and Elemental Nutrients* (Keats Publishing, Inc., 1975), even usually adequate diets are liable to be not up to normal standard in zinc.⁶

The richest zinc source is oysters, which contain up to ten times as much as any other good source. Also wheat germ and bran are relatively rich in zinc, but the phytic acid in the wheat product may bind some of it and prevent total utilization.

Zinc insufficiency has been shown to produce various physical changes. Among them are retardation of growth as a result of unpalatability of food; keratogenesis, a particularly severe skin lesion in rats and mice that resembles psoriasis in people; delayed wound healing; interrupted reproduction; diminished learning capacity; and general alteration in protein and carbohydrate metabolism.

Considered an essential component in the action of insulin, zinc appears to be abundant in the islets of Langerhans, and the prostate gland contains the highest concentration in the body. Furthermore, zinc seems related to sexual function, and impotent males so deficient in the element require many months to regain normal potency when given adequate amounts of it. Pfeiffer has presented evidence that growth in adolescent boys may be retarded in some by the meager zinc supply taken up by sex glands and organs. His observation may explain why adolescent boys often are of

smaller stature than girls of the same age who don't have similar zinc requirements for sexual maturation. Only later do the boys increase their body zinc levels, when growth is once more resumed vigorously.⁷

Human skin holds about 20 percent of all the body's zinc. Elasticity of this organ will be the result, and defective zinc content of skin makes stretch marks appear over hips, thighs, abdomen, breasts and the shoulders. Hair and nails won't grow well either, and zinc-defective fingernails and toenails will be brittle and show white opaque spots on them. The hair may lose some of its natural pigment. Some other skin lesions may develop as well. A girl relapsing into schizophrenia, whom I recently examined, had all these skin, hair, and nail changes. She had discontinued her orthomolecular nutrition program and suffered the unfavorable effects.

Alert physicians and surgeons routinely administer zinc to convalescing patients after burns or other trauma. It is used before and after optional surgery too, since the rate of healing will be markedly improved.

Subnormality in zinc also disrupts the sense of taste and smell. Severe malnutrition may ensue as a result. Foods taste flat or become unpalatable, which effectively prevents their consumption, and zinc supplements will have to be taken to correct the problem.

Pyridoxine deficiency and zinc deficiency combined have been proven to be related to mental disease. Several mental problems, including schizophrenia and learning or behavioral disorders in children, are not single homogeneous conditions. Zinc deficiency is one of a number of metabolic faults affecting the function of the brain in each syndrome. It combines with pyridoxine deficiency due to the presence in the body of a substance known as *kryptopyrrole*. Over fifteen years ago, kryptopyrrole was demonstrated for the first time to be present in the urine of schizophrenics by my research group. One of my biochemists, Donald Irvine, later identified its makeup. Pfeiffer and his colleagues at the Brain Bio

Center confirmed the finding and then went further to demonstrate that the substance combined with both pyridoxine and zinc to produce a double deficiency.

Pfeiffer's researchers showed that a close relationship prevails between the amount of kryptopyrrole excreted into the urine and the depletion of zinc in the body. A careful clinical examination of patients who excreted a lot of the substance revealed that they displayed a typical schizophrenic syndrome but also had some clear-cut differences.

In original research with Humphry Osmond, M.B., M.R.C.P., F.R.C. Psych., I had shown that the mental condition of patients not diagnosed as having schizophrenia who excreted large quantities of *mauve factor* (the original term for kryptopyrrole) resembled schizophrenia much more than the neuroses. This was especially apparent when careful examination using tests such as the HOD test were made and comparisons were undertaken with respect to treatment and outcome of treatment. (The HOD test is a written test which was developed by A. Hoffer and H. Osmond as a determinant of schizophrenia, now in general use in orthomolecular psychiatry.) Our findings were generally ignored until Pfeiffer and his colleagues began their studies. They called patients who excrete mauve factor *pyroluriacs*. This is a particularly significant term inasmuch as it draws attention to the essential nature of the disease. The pyroluriac patient tends to have his psychosis activated by stress. He shows neurological symptoms, is unable to remember his dreams, and has the physical characteristics of zinc deficiency described, such as striae and white opaque marks in the nails. Urine examination for kryptopyrrole will confirm the diagnosis—first morning specimen range should be under 20 micrograms per 100 milliliters of urine. Treatment must include large quantities of zinc and pyridoxine. Then treatment response will be satisfactory.

The importance of this kryptopyrrole work should not be underestimated. It is one of those findings where a well-defined relationship is shown between biochemical abnormal-

ity and psychiatric syndrome. When injected into animals, kryptopyrrole has also been shown to be toxic. It produces neurological changes, electroencephalogram changes, and behavioral changes. These are the exact alterations reported by Pfeiffer in his observations of the pyroluriac group. Pyroluriac children may develop any of several learning and behavioral disorders, while adults develop a form of schizophrenia.

According to Pfeiffer, zinc deficiency will probably be found in the following conditions:

- During pregnancy.
- During the first year of life, when the infant has too much copper and requires more zinc to balance and eliminate the copper excess.
- During rapid growth.
- During puberty, especially in the adolescent male.
- During the teen years when considerable premenstrual tension is present in girls. This tension may be stimulated by birth-control medication, which elevates blood copper levels.
- During any severe stress. Note that chronic zinc deficiency and pyridoxine deficiency may predispose toward cancer. Wounds and burns require much zinc for healing, and hypertensives tend to be low in zinc and too high in copper.
- Elderly people may develop confusion that is misdiagnosed as senility simply from defective intake of zinc.
- During excessive intake of copper. Even 2 mg. per day of copper will accumulate and eventually produce toxicity if zinc levels are low. Too many preparations including vitamins contain added copper. There is so much copper in our water that no copper should be added to our pills and tablets, but it is.
- During starvation zinc will be lost. Then both cadmium intake and copper levels will be too high.
- During any serious illness. Chronic leukemia, for ex-

ample, is associated with very low zinc levels. Note that there is no adverse effect by calcium on zinc absorption.

Remarkable safety has been observed with ingestion of zinc salts. In one study, sixteen geriatrics were given 220 mg. of zinc sulfate three times a day. Six patients did develop diarrhea. The plasma zinc increased in four weeks from a normal level of 100 micrograms per 100 ml. to 150 mcg. Beneficial changes took place in patients. I myself have been using zinc dosages at those levels for several years without any adverse side effects other than what one would see with any non-specific intolerance to tablet medications. Pfeiffer reports that he has treated over 1700 patients with zinc with no serious side effects also. Simkin (*The Lancet* 2: 539, 1976) using 220 mg. three times each day found very positive effects in treating patients with rheumatoid arthritis. There were very few side effects.⁸

IRON

Hemoglobin holds most of the body's iron. This complex red substance, derived from the combining of iron and protein, carries oxygen to the tissue cells throughout the bloodstream. Very little iron is present in muscle, but a small quantity is carried in the blood plasma bound to transferrin, a beta globulin substance. If free iron ions were floating in the plasma, the effect would be toxic. Consequently, it is noteworthy that iron deficiency will cause an insufficiency of hemoglobin with resultant anemia.

Pfeiffer believes that iron deficiency anemia is much less of a problem than commercial advertising would have us believe. In disguise, zinc and pyridoxine deficiencies can cause anemia, and that may be the condition attributed to lack of iron. He recommends, therefore, that serum iron levels should be taken for a more accurate diagnosis of iron deficiency anemia. It is more likely to occur where extensive blood loss takes place, as with excessive menstrual flow, a

large loss over a short period or a small loss over a longer period. For this reason, women are more apt to suffer from anemia between puberty and the menopause. Iron deficiency anemia diagnosis must involve a search for the source of the blood loss.

Thomas Sydenham, an English physician, almost driven from his profession and challenged to a duel for finding a better treatment for smallpox resulting in a lower death rate, did research with iron. He reported, three hundred years ago, that simple iron salts were helpful for some cases of chlorosis. Iron is found in the greatest concentration in lean meat, organ meats, dark green leafy vegetables, and whole-grain cereals.

In contrast with zinc, of which it is difficult to accumulate an excess, oversaturation is relatively simple with iron. A variety of factors, when there is no chronic blood loss, will increase the iron absorption. If it continues for many years, too much iron absorption will lead to toxicity. This toxicity may appear in men after age forty; its symptoms will not be specific, and seem to be associated with various forms of malnutrition. In the old days, when iron cooking pots were used extensively, it was possible to obtain too much iron from the action of acidic foods in dissolving iron from the pots; this is no longer a danger because of the widespread use of aluminum, glass and stainless steel vessels.

A recent attempt by the Food and Drug Administration to increase the amount of iron present in food by enriching cereal grains aroused much controversy. Most white flour already contains additional iron, as well as thiamine, riboflavin and nicotinamide. The FDA's move was stalled by a vigorous counterattack of physicians and nutritionists who were concerned about the dangers of further buildup of iron levels in the body.

MANGANESE

As does mineral zinc, manganese decreases the absorption of copper. Zinc and manganese work synergistically to reduce copper levels, and the combination is a valuable treatment for schizophrenia. Like many of the other trace elements, manganese participates in a number of body reactions. It is required for the synthesis of acetylcholine, which is a neurotransmitter, and a deficiency may be causally connected with diabetes mellitus as diabetics seemingly have less manganese in their bodies.

Rarely has manganese toxicity occurred, and then only from industrial accidents, not from food or tablets. Too little manganese is a more likely condition and for the usual reasons of depletion of the soil. The addition of lime to soil binds manganese in a way that greatly decreases the amount present in leafy material grown for food, and food processing also diminishes the content of this mineral. In cereals, manganese, as with most minerals, will be found in the bran and germ which is removed from white flour.

COPPER

Copper has been called the fourth heavy metal intoxicant by Dr. Pfeiffer. Its daily requirement in human nutrition is probably under 2 mg. per day, and this level is so small that it is hardly likely that any diet will contain less. A few infants, fed only a dairy milk diet, have been known to develop a true copper deficiency, but no other cases are known. Among all his patients tested, Pfeiffer found no one in whom blood copper levels were low. The small amount of copper required by the body is necessary for the synthesis of hemoglobin. In animals, lack of the element may occur when they graze on grass growing in copper-deficient soils.

Living in the same area, though, people do not develop any such evidence of insufficiency.

Babies are born with high copper levels in their bodies. From five to fifteen years will pass before a person reaches lower and more normal adult levels.

An excessive ingestion of copper will present health problems. The widespread use of copper pipes in our plumbing systems brings about leaching of the mineral into our water supply. It's a good idea to avoid drinking the first water that comes from the tap. Let it run for perhaps five minutes in order to reduce the copper levels found in water that has lingered for a long time in copper pipes.

The belief that copper deficiency is a problem has become so well entrenched that many vitamin or mineral preparations contain added copper, which is only a contaminant. That is why in the "average" vitamin formula given in Chapter Nine, it is suggested that you avoid taking in any more copper.

Copper levels are increased in the blood by the use of estrogens, as in birth control medication. This is the probable cause of depression arising from this medication's ingestion.

For decades it has been suspected that high blood copper is associated with schizophrenia, and now much evidence to confirm this has been found. Adult psychotic patients have an excess of copper that has apparently produced a schizophrenic syndrome or depression; such an excess is also connected to learning and behavioral disorders in children. Carl Pfeiffer has expressed concern about copper as a cause of senility. He points out that copper supplementation is a definite possibility for senile causation.

Food overdosage with copper offers no danger, and the best sources for the mineral are grains and vegetables. Zinc and manganese decrease copper absorption and decrease copper blood levels. Therefore, zinc and manganese supplements are advantageous as copper diluents. To sum up, evidence exists that both iron and copper excesses are undesirable.

CHROMIUM

First recognized as an essential element in 1957, chromium has been shown to increase glucose tolerance in rats. The glucose tolerance factor (GTF) should be considered a new vitamin, suggests Dr. Pfeiffer. GTF is an essential co-factor in the activity of insulin and contains one atom of chromium, two molecules of nicotinic acid, and several amino acids. When the factor becomes commercially available, it will receive intensive investigation as a treatment for diabetes mellitus and other carbohydrate diseases.

Whether chromium deficiency occurs is dependent upon the amount present in the drinking water, which is variable. However, insufficient chromium is a more common state than excess chromium, since the best sources are thrown away as food waste. As are other mineral nutrients, chromium is present in bran and germ of grains. Whole wheat contains about 1.7 micrograms of chromium per gram, while white flour made into bread contains only .14 micrograms per gram. This mineral is also stripped away from white sugar in the refining process, even though the cane or beets tend to be high in its content. The best sources for chromium are the easily available brewer's yeast, sugar beet molasses, which is harder to get, and such meats as liver and beef.

Early investigations pointed to chromium as a toxic substance rather than an essential element. This probably was thought because so little was needed by the body. As with other elements active in such low quantities, the procedure would be to use too much at first and observe its toxicity, which is what happened. Chromium is *not* toxic, however, and it is impossible to get too much of it from any food source.

SELENIUM

In just over twenty years, selenium has changed from being considered highly toxic to being classed as one of the essential trace elements. It is in the group of minerals required in amounts of less than 1 mg. per day. As with other highly potent elements, it is toxic in high dosages, but these are rarely derived from food sources, as our present diets are apt to contain foods not up to par in selenium. The mineral is very unevenly distributed in the soil, varying from concentrations producing toxicity in plants utilized by grazing animals to total absence.

Nevertheless, selenium's uneven distribution does not preclude its having several important functions. First, it does protect animals against toxic levels of trace poisons such as cadmium and mercury. Second, it greatly increases the efficacy of vitamin E. Third, selenium is a possible inhibitor of cancer. It acts as an antioxidant and prevents chromosome breaks; and it is known that when selenium intake has been low, the cancer rate has been high.

The best food sources for selenium are brewer's yeast, garlic, liver and eggs. Foods from animal sources are richer in the element than are plant foods, and processing greatly decreases its content in food.

LITHIUM

Lithium is used for the treatment of manic-depressive psychosis in large doses (megadoses) ranging around 1000 mg. (1 gram) per day. Some time ago a suggestion was offered that lithium levels in water were related to depression, in that where lithium levels were higher there was less depression. The suggestion was never explored and presents a worthwhile topic for further biochemical research.

Other than as antipsychotic therapy, lithium has no known use in the body, and has been considered one of the neutral or innocuous elements, neither therapeutic nor harmful. An average diet contains about 2 milligrams per day. Its only possible general use as an essential trace element is for mood control. This proposition would be difficult to examine, however, as it would be hard to feed animals a lithium-free diet even if they could describe their moods to us, and it would certainly be impossible to maintain human subjects on diets free of lithium. It occurs naturally in many foods.

Megalithium or megamineral therapy has been readily accepted as orthodox psychiatric treatment, in contradistinction to the opposition confronting megavitamin therapy. Orthomolecular psychiatrists can't say or understand why there is this paradoxical reaction from orthodox psychiatrists. I have been using 300 mg. of lithium per day for a number of patients to improve energy levels, remove fatigue, eliminate depression, and alter mood changes associated with multiple food allergies, and the results have been gratifying.

COBALT

Other than being an essential component of vitamin B-12, cobalt appears to have no role in the body. There has been no evidence of human lack of cobalt, but it has occurred in cattle and sheep in Australia and New Zealand from poor soil. In 1966, an epidemic of cobalt toxicity took place in Canada when the mineral was added to beer to preserve its foamy head. A large number of heavy beer drinkers who had poor nutrition were poisoned.

MOLYBDENUM

Our diets are probably as defective in molybdenum as

they are for reasons similar to those behind our chromium deficiency. Modern food technology removes the mineral nutrients. As a result most people will need orthomolecular nutritional supplementation in the form of unprocessed foods heavy in molybdenum. These include animal organs, shellfish, many vegetables (especially lima beans, lentils, green beans, potatoes and spinach), grains, fruits and sunflower seeds. The mineral may prevent dental caries and may protect against esophageal cancer.

There appears to be an inverse relationship between molybdenum and copper. This is affirmed by sheep grazing on pasture rich in molybdenum, which develop a copper deficiency, and fail to produce pigment in their wool. By alternating between high-molybdenum and high-copper feeding, it is possible to produce wool banded black and white.

TOXIC MINERALS

Various toxic elements are known, and include lead, mercury, cadmium, bismuth, and perhaps aluminum. Paradoxically, they may be required elements but with such low dosages needed it's impossible to determine what the dosages are. There will be no shortage of these minerals, since contamination of our environment provides more than enough abundance. No individual will ever show a minus quantity.

Lead has contaminated our environment through its free use in gasoline, paint, and in the manufacture of common articles. *Mercury* has contaminated lake and river water where industrial waste chemicals have been dumped. It has got into fish flesh and thus poisoned people who ate it. Very rarely has mercury been inhaled in excess from faulty purification of air, as is definitely the case with lead. My own experience with mercury poisoning, though, did involve air impurity; during the past three years, three men have come

under my care for treatment of schizophrenic psychosis produced by the chronic inhalation of pure mercury.

Heavy-metal intoxication will produce hyperactivity in children, the schizophrenic syndrome in adults, and probably some cases of senility. Treatment requires removal of the metal by the use of chelating agents. *Chelates*, as described previously, are substances that combine with toxic minerals and allow their elimination in the urine. Ascorbic acid has chelating properties. The best course of action is to avoid contamination by these toxic metals. Unfortunately, the average person is not aware of the dangers of these common substances and has no idea of how to avoid them. Treatment of trace element toxicity lies in the province of orthomolecular medicine through use of orthomolecular nutrition.

NICKEL

Adult humans consume about 0.5 mg. per day of nickel. It may be essential, and a deficiency in the chick will produce several pathological changes. Nickel is present in higher concentration in ribonucleic acid, (RNA) than in the surrounding material and may play a role in maintaining the configuration of the molecule. It is also thought to play a role in pigmentation in some animals. Vegetables contain more nickel than do animals. Tea and buckwheat seed are particularly rich in it, as are herring and oysters, but it is low in meat, eggs and milk. By itself, nickel is relatively non-toxic, but organic compounds such as nickel carbonyl are very toxic. They produce respiratory changes and are carcinogenic. Cigarette smoke contains nickel carbonyl, and the quantity found in fifteen cigarettes per day smoked for one year has been shown to be carcinogenic. High serum levels of nickel are found after myocardial infarction, strokes, and severe burns while very low levels are found when cirrhosis of the liver is present. Diets which avoid junk foods have adequate amounts of nickel.

TIN

Tin may be another essential trace element in mammals; however, very little is present in newborn infants. It arrives in the body later on. It tends to accumulate with age, especially in the lungs. Because tin is absorbed very poorly, it is relatively non-toxic. The average consumption is about 2 mg. per day. Foods stored in tin cans absorb some tin, even when they are lacquered, but lacquering does reduce solution in the food. High levels of tin intake can cause anemia, but this is prevented by the absence of adequate amounts of iron.

FLUORINE

Flourine is one of the most controversial elements, since it has not yet been shown to be an essential trace element, but it does increase the strength of teeth and bones. It is being used to treat osteoporosis. When present in water at about one part per million, fluorine tends to decrease caries of teeth. If too much is present, mottling of the teeth occurs, and this mottling is irreversible. It does not prevent gum disease caused by bad nutrition, the consumption of junk food, especially sweets. Dean Burk has gathered evidence that there is a positive relationship between the presence of added fluoride to drinking water and the increased incidence of cancer in those communities that add it. There is also evidence that levels of fluoride in drinking water are related to the development of thyroid disease; the higher the fluoride level, whether natural or fortified, the more thyroid problems are found in the community.

Generally, the authors do not favor the compulsory consumption of fluoride. People who wish to treat their teeth with fluoride have every right to have this done by using

topical application of fluoride preparations to their teeth. But they must not be lulled into thinking this means they can continue to eat sweets to their hearts' content. Those who do not wish to ingest fluoride should not be forced to do so. Ideally there should be two sets of water supply giving each householder a choice, if communities are determined by majority vote to obtain their fluorides in this way.

BROMINE

Bromine is not an essential trace element, as far as we know; however, future experiments may demonstrate that it is. It can interchange with chloride in the body. Marine plants are naturally richer than land plants in bromine, and potassium bromate is added to some flours to hasten the maturation of flour. This is another example of adding something to our food for cosmetic reasons even though it has no nutritional value and might be deleterious.

ARSENIC

Arsenic compounds have been favorite poisons of industry and murderers for many years. With the introduction of hair analysis of arsenic, the murderer is much less apt to remain undetected. Arsenic compounds have been used for therapy in the past. For instance, Ehrlich's famous substance 606, "the magic bullet," was the first substance found to be toxic against spirochetes of syphilis. Apparently the pure mineral is not that toxic. In the mountains of central Europe, natives used to eat 1 to 2 grams per day of the mineral arsenic because they believed it helped increase endurance at high elevations, and may still do so.

VANADIUM

Vanadium is essential for rats and chickens and perhaps for people too. It is rapidly used and then excreted as urine. It is present in high concentration in fats and vegetable oils. In such concentration, it lowers cholesterol levels. Vanadium is non-toxic, as it is poorly absorbed; about 2 mg. per day is present in the diet.

STRONTIUM

Strontium is not an essential trace element, unless it is required in such low quantities that it will be difficult to ever establish it as an essential dietary component. Because strontium tends to accumulate in bone, radioactive strontium, one of the products of atomic explosions, is particularly hazardous.

ALUMINUM

Increased quantities of aluminum are apt to be ingested nowadays, compared to past years, because it is used for making cooking utensils. Acid cooking fluid will increase the solution of aluminum. It is also present in baking powders and in antacid preparations. Excess aluminum hydroxide gels will reduce blood phosphate and have an adverse effect on bones. It has no use in the body. About 35 mg. per day of aluminum is normally consumed. Pfeiffer has suggested that excess aluminum may be a factor in the genesis of senility.

GOLD AND SILVER

Gold and silver are not required nutrients. They are probably toxic because of the strong oxidizing properties of their salts. Gold is used for some forms of arthritis when nothing else has worked, but it has to be employed with great care. Orthomolecular physicians prefer to use vitamin B-3, which is probably more effective and non-toxic. Silver was used in the form of a drug, argyrol; it caused some undesirable reactions, and is no longer used in medicine.

IODINE

Iodine deficiency was first suggested in 1830 as an environmental factor causing hypothyroidism. But like many discoveries in medicine, a number of decades were required before the idea was taken seriously. Iodine is a component of the thyroid hormone thyroxin. When there is too little iodine, there is a deficiency of thyroxin. This results in pathological changes in the thyroid gland and in the rest of the body. When this occurs early in life, physical and mental growth is stunted producing cretinism and feeble-mindedness. About 100 to 200 micrograms of iodine per day are required. Foods grown on soils deficient in iodine will contain so little of the element that people living on produce from these soils will develop iodine deficiencies. Large areas of the earth are said to be goitrogenic because of this.

The best food sources for iodine are water, especially in regions where there is enough, in the soil, and from seafood. To be on the safe side, only iodized salt should be used. Those who wish to increase their iodine intake without increasing their salt intake may do so by taking more seafood and by adding products from the sea like kelp in their diets. Increasing iodine intake in this way may even decrease the

tendency for developing cancer of the breast. It so happens that the glandular tissue of the breast bears some similarity to the glandular tissue of the thyroid gland.

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Benefits of Orthomolecular Nutritional Therapy

RECOVERIES FROM DISEASE

Every orthomolecular physician can tell of dramatic recoveries in patients who had previously failed to respond to any other therapy. Each recovery is a sparkling jewel added to the warehouse of precious memories. Recoveries from disease for patients are the doctor's immutable rewards beyond price.

A personal friend living in New England recently sent me a Christmas card expressing gratitude. She reported that her adopted daughter had received a bachelor's degree in special education. Throughout her university training, the young woman had been on the dean's list. My friend's daughter is one of my jeweled memories. I first met her when she was a little girl, seven years old. She was brought to me for treatment advice because at the time she was suffering from several problems. She had a reading disorder, did not speak clearly, still wet her bed, and was developing serious behavioral troubles. The little girl had been born in one of the state's mental hospitals, from which she was adopted. Her biological mother was a chronic schizophrenic and spent most of her time confined in institutions.

I advised the adoptive mother, my friend, to place her

daughter on three grams of nicotinamide a day with treatment to continue until age eighteen. For the first two years progress was slow, but after that the little girl began to improve quickly and has been normal since. She discontinued taking the vitamin just two years ago. Undoubtedly this young woman, now trained as a special education teacher to help children such as she had been, would have had to obtain her education in special schools for the retarded if she had not taken this dramatic turn for the better.

Another case that well represents orthomolecular medicine in practice also offers a reward for me that can't be measured. About three years ago I was invited to see a sixteen-year-old girl confined to the hospital for the previous six months. She had been under the care of another psychiatrist, whose treatment consisted of tranquilizers to which she did not respond. She was typically schizophrenic: saw visions, heard voices, was paranoid, showed hostility toward her parents for no reason, had depression, and spoke of suicide frequently. My treatment program included the full gamut of megavitamins and a sugar-free diet, for a case that I had estimated would not be difficult. I held her in the hospital for a time with the idea that if she failed to respond to orthomolecular nutrition, I would then prescribe a series of shock treatments (ECT). Indeed, she did not improve, and it became necessary to give her seven electroconvulsive treatments.

To my disappointment, the teenager showed no change after the shock treatment either. I realized that I was dealing with a very complicated problem. However, for fear that she would become alienated from her family altogether through such a long hospitalization, I discharged her. She returned home with a heavy megavitamin program and a heavy quantity of tranquilizers required to keep her from committing suicide. Of course, she was fed a diet free of junk foods.

I observed no change in her during monthly visits for

over a year. It made me terribly sad because I sensed that I had failed, and I visualized her future—in and out of mental hospitals, chronically tranquilized, and subject to all the side effects that go with tranquilizers and anti-depressant drugs. The girl realized her dismal future also, for she was very bright when she was not tranquilized.

It was then that I decided to investigate the young woman's allergies, following lines of inquiry suggested by remarks of William Philpot, M.D., Marshall Mandell, M.D., and other orthomolecular physicians at various scientific meetings. My patient agreed to engage in a four-day fast. She said, in fact, that she would agree to anything to get well. I have to admit that I was skeptical that something so simple as not eating for four days would do anything to help the patient with whom I had tried and failed for such a long time.

To my surprise on the fourth day of her fast, my patient appeared absolutely normal, reverted to what her personality had been: cheerful, alert, happy, smiling, adjusted, friendly with her parents; she heard no voices, saw no visions, and was at ease with everyone. I began extensive tests for the young lady's food allergies. As soon as I gave her a glass of milk, the girl became completely psychotic within the hour. Her schizophrenic symptoms returned as before.

Over the next several weeks we tested for other food allergies. I found a host of foods to which she responded adversely. It soon became clear that my patient had so many allergies to food that it was practically impossible for her to eat. At that time the family found it necessary to move to a distant city where their daughter accompanied them. Her symptoms returned and another psychiatrist attended to her. He hospitalized her and rediagnosed the girl as not being psychotic at all but as merely a "bad" person. She was confined to a special school with rigorous controls on her. Eventually she ran away and made her way back to my office almost a year after I had last tested her.

This time I instituted an addition to my orthomolecular nutrition program. I put into use a number of anti-allergy compounds which would decrease my patient's reactivity to the foods she was allergic to. Improvement was again dramatic and, happily, lasting. She returned to having a normal personality and was able also to eat practically everything that was not junk food—with two exceptions.

She knew she was violently allergic to milk. But one evening my patient ate a large quantity of peanut butter and again within the hour turned psychotic. She was rushed to the nearby hospital emergency room. By chance, the medical intern on night duty was a former patient of mine, a recovered schizophrenic, who called me right away. I told him not to let the hospital people do anything to her, just get her home as soon as possible. The intern wrote a strong recommendation that the young woman should be discharged. She was! Now she knows she must avoid milk and peanuts. She has remained well since.

This girl's story illustrates that orthomolecular psychiatry is the practice of internal medicine against mental disease. The case required megadosed vitamins, an anti-allergy approach, anti-depressant drugs, ECT, a junk-free diet, and other elements of an overall approach. The extent of her problem indicates that the orthomolecular physician should never give up on treatment. The secret of success in therapy is to keep trying. The patient will finally get well!

Any competent physician can accomplish therapeutic success with mental disease even with no special training in psychiatry. Naturally we will always need psychiatrists for that small number of patients who require so much time and skill that the average general physician or family practitioner cannot provide it. But I am absolutely convinced that when orthomolecular medicine becomes widely established, we will need a lot fewer psychiatrists than we have today.

The psychiatry of "talk therapy" is going the way of the

dodo. And as people become educated to the incorrectness of the "one disease—one drug" approach currently the rage among medical doctors, they will demand a complex treatment program similar to our orthomolecular nutritional therapy. We use a whole variety of things to help our patients.

EVALUATION OF AN EXPERIMENT

Let us look at the evaluative efforts of those professionals who are part of the fading psychoanalytic therapies. Suppose we were to obtain the cooperation of 100 normal volunteers for an experiment. This would be impossible in reality, but it is fascinating in theory. Let us imagine we can suddenly and simply introduce one biochemical change into the brains of all the volunteers without their knowledge. For example, we might suddenly withdraw enough nicotinamide adenine dinucleotide (NAD) to reproduce biochemical changes identical with those found in severe pellagra. Yes, we will give the 100 volunteers pellagra but leave enough NAD behind to let the essential internal processes of the brain stay intact in order not to kill the individual.

NAD is the coenzyme derived from either the amino acid tryptophan or vitamin B-3. It is essential for a large variety of reactions in the body. Suddenly these 100 normal people will have been made abnormal and converted into idiopathic pellagrins without altering their diets. There is no obvious cause of their abnormalities; that is the meaning of the term *idiopathic*.

Having achieved this impossible situation, we now call in a team of experts to determine what has happened to this otherwise normal group. Our experts include psychologists, psychiatrists, social workers, and others engaged in psychotherapeutics. Their first step will invariably be to examine each patient carefully with the aid of psychological tests.

After the psychotherapists have completed this typical investigation, they will report that the 100 patients fell into a number of psychiatric categories. Each expert will use the usual nomenclature of psychiatry and categorize the poor people. Some will be called neurotic, some labeled depressed, others said to suffer from anxiety; tension will be a favorite label. A number of poor souls will be branded schizophrenic.

In turn, the schizophrenics will be subdivided into paranoid, hebephrenic, simple and catatonic types, and others may remain undifferentiated. A few of the patients might manifest delirium and be diagnosed as having an organic confusional state or an organic psychosis. Names will be given to those developing personality disorders. Any children in the group probably will become known as hyperactive or, less likely, overly passive.

Without question the conclusion by our experts will be that, for reasons unknown, the 100 people have become mentally ill and need to be locked up. No single factor would be uncovered as the cause. If anyone suggested that all these unfortunate patients suffered from a simple vitamin-related disorder, that person would be considered irresponsible or crazy, or called a "quack."

Diagnoses by our experts would be covered by the cloak of a variety of psychoanalytic theories, according to the basic orientation of the various special interest groups. These psychotherapists can be divided into four main groups. There are (1) the perceptual specialists; (2) the thought-disorder specialists; (3) the mood or emotional specialists; (4) the behaviorists. Family therapists might not be included because they do not work within the medical model and consider these conditions reaction formations rather than diseases.

Thus our experts' final description of what they witnessed would be very much like the description of the blind men asked to describe an elephant. The *perceptual specialist*

would see only hallucinosis, children's dyslexia, and other perceptual changes. The *thought disorder specialist* would look for evidence of mental retardation or other alterations in thinking and intelligence. The method would include division of the group on the basis of I.Q. into various sub-normalities. Time would be taken up with the giving of intelligence tests. The *emotional specialist* would find anxiety, euphoria, or depression embodied in every patient. The *behaviorist* would locate a number of changes in areas of conditioning and learning, and formulate reasons for the disorders.

None of the experts could at all agree that they were measuring and describing aspects of the same *singularly caused* condition. Like the blind men examining the part of the elephant nearest to each, our experts would describe only a few aspects of our group of patients. But we know that the volunteers had reacted to but a single biochemical modification in their makeup. Symptoms they show will be in accordance with their personality or according to the lifetime programming to which they had been exposed.

Only we observers can be certain that every one of the hundred will recover. In our hands we hold the NAD for each volunteer. The only correct treatment is to replace that coenzyme. Our whole cure is to give each one of the volunteers quantities of vitamin B-3. Suddenly and miraculously then, every one of our patients recovers his normal state of mind and personality. It would then be apparent even to these prejudiced experts that pellagra produced by some unknown cause had been rampant among the group as a minor epidemic. Or *maybe* it would be apparent. Ingrained prejudice might continue to cloud their thinking.

With the proof set before their eyes, do you think that the treatment recommended by the various experts would be megavitamin therapy with B-3? Not likely! Each expert would remain sculptured by his own preconceptions. The *perceptual expert* would run perceptual motor tests and give perceptual motor training. The *thought disorder*

specialist would recommend special education either at home or in special classes or schools. The *emotional specialist* would be interested in giving psychotherapy or family therapy. The *behaviorist* would be keen to institute dramatic new behavioral modification. None of them is likely to give credence to vitamin B-3, nicotinic acid, as the sole ingredient necessary for returning mental health to our 100 volunteers.

In all fairness, we must confess that people suffering from pellagra do show a multiplicity of complaints. Spies, Aring, Gelperin and Bean said as much in 1938. They wrote about the elimination of symptoms with the use of nicotinic acid in a paper titled "The Mental Symptoms of Pellagra."¹ "Mental changes as a part of the pellagra syndrome have been recognized by many physicians. In areas where the disease is endemic, these symptoms are so common and so striking they have been associated with pellagra even by the lay observers. Various abnormal psychotic states have been described in medical literature on pellagra, and some writers have thought that one or another psychosis was typical of this disease."

Spies and his colleagues continued, "Subclinical pellagrins are noted for the multiplicity of their complaints, among which are many that are usually classified as neurotic. The most common of these symptoms are fatigue, insomnia, vertigo, burning sensation in various parts of the body, numbness, palpitation, nervousness, a feeling of unrest and anxiety, headache, forgetfulness, apprehension, and distractibility. The conduct of the pellagrin may be normal, but he feels incapable of mental or physical effort even though he may be ambulatory."

WE NEED TO TREAT THE WHOLE PERSON

The controversy surrounding orthomolecular treatment goes on unabated. It involves the use of megavitamins and

minerals; the control of diet, especially the intake of sucrose; and, during the initial acute phases of health need, all the conventional remedies to confront crises. Physical and mental diseases are affected by what we put into our mouths—or fail to take in as nourishment.

"The vitamins, as nutrients or medicaments," says Linus Pauling, Ph.D., "pose an interesting question. The question is not, Do we need them? We know that we do need them, in small amounts to stay alive. The real question is, What daily amounts of the various vitamins will lead to the best of health, both physical and mental? This question has been largely ignored by medical and nutritional authorities."²

Authorities in American medicine have a good thing going in iatrochemistry, surgery, and in their powerful union, the AMA. There is no motivation for medicine to focus on hygiene and prevention rather than on illness and cure. Why? You have every right to ask.

Unfortunately, many aspects of today's modern medical practice work against the idea of the healing of the whole person. Current emphasis by traditionalists in medicine seems to be placed on assembly-line efficiency, dependence on technology, specialty practice, and the treatment of body parts rather than the total human being. Where formerly the physician served in the multiple roles of healer, scientist, counselor, friend, and sounding board for his patients, he has now become a victim of our world's increasing complexity.

There is an increasing trend toward specialization in which the physician plays a more limited and sharply defined role. The rapid growth of medical information, both technical and philosophic, has been overwhelming. This has contributed to medical specialization and superspecialization, with the physician knowing more and more about less and less of his patient. In many cases, he does not know the patient at all—only the patient's particular body part. In unconscious protest, perhaps, one of this book's authors, Dr.

Morton Walker, changed course after sixteen years of giving treatment to pairs of feet in favor of furnishing information on super good health to the whole person. Individual body parts are not the source of ill health, although medical people frequently forget that.

The result has been that medicine attempts to isolate illness within certain structures or systems. Treatment is rendered mostly to the target organ. A specific body part may become the central focus of illness, even when effects of the illness are felt in varying degrees throughout the body and mind.

The medical pendulum seems to have swung radically from a focus on the clinical aspects of practice to scientific investigation. An extreme position of hyperanalysis has been adopted. We need now to return to synthesizing *all* of what we know in order to apply it in clinical terms rather than continuing on our march in the direction of analytical methods alone. Certainly medicine has contributed some significant answers in the past half century, particularly in areas of infectious diseases and infant mortality, but the price paid has been forgetfulness of the patient as a whole person.

It should be recognized that when the body is sick, it is sick throughout. A human being is a unit, an integrated organism in which no part functions independently. Abnormal structure or function in one part of the body creates unfavorable changes in other areas. Therefore, the organism is involved as a whole. Invariably involved components consist of the emotional, psychological, physiological, and spiritual influences on illness and health. The entire organism mounts the attack against disorder—not just the body, and certainly not just a *part* of the body. All systems work cojointly to counteract a condition. Recovery comes only when the whole person returns to his normal and harmonious balance.

The practice of medicine that takes into account the entire individual is called *holistic medicine*. A person who

seeks fully integrated treatment or follows a lifestyle that furthers his living the full lifespan of man is applying a program called *holistic health*. You will be hearing more about "holism" in the future.

So it is that orthomolecular nutrition holds such importance in everyday life. It offers you holistic health.

H. L. Newbold, M.D., noted neobehavioral orthomolecular psychiatrist and author of *Mega-Nutrients for Your Nerves* (Peter H. Wyden, 1975), believes that addictions can be precipitated by nutritional deficiencies. Dr. Newbold says that the U.S. has already reached a crisis level in nutrition. "There are a lot of people sick because of what they eat and they are not aware of it. . . . Not only is food a contributing factor to ill health, but environmental pollution, such as air, water, and noise pollution, is contributing to ill health." Dr. Newbold emphatically states that vitamin supplementation, mineral nutrients, and a no-junk diet are necessary throughout an individual's life.³

HOW BLIND CAN ORTHODOX MEDICINE BE?

Orthodox medicine has closed its eyes to the benefits of orthomolecular medicine. The anti-orthomolecular medical authorities suggest that (1) man has evolved for a billion years or so and his biochemical equipment is by now adequate to cope with his environment; (2) the essential levels of vitamins are already established by the Public Health Service and other agencies of government; (3) North Americans eat well enough and get sufficient nutrients in their food; (4) orthomolecular physicians are not prominent enough and fail to back their claims with adequate research and double-blind studies.

All of these objections are easily answered and have been replied to over and over again. The only real question that remains is: How blind can orthodox medicine be?

First, additives and processed foods are new innovations in the evolutionary process—only about a century old—and people do not as yet have body systems able to cope with what we are forcing our digestive tracts to absorb.

Second, the established recommended daily allowances (RDAs) of vitamins are absolutely wrong. They vary from government agency to government agency and from government to government. Besides, they fail to take into account the individuality of each person. There won't be any excessive levels of vitamins simply because the body gets rid of what it can't use.

Third, the so-called adequate average American diet, nutritionally poverty-stricken though it is, is eaten by only about half our country's citizens, reports the *Journal of Nutrition Education*. The *Journal* said, "Except for vitamin C, there was a higher percentage of females than males whose intakes were less than two-thirds RDA for all nutrients. Household studies in widely separated areas and covering a spectrum of socioeconomic levels indicated that half were below RDA in calcium, a fifth in iron, a third in vitamin A, a sixth in thiamine, a third in riboflavin, a sixth in niacin, and over a third were below recommended daily allowances (RDA) in vitamin C."

Fourth, as orthomolecular therapy cures more and more people of various diseases, its advocates will undoubtedly grow in stature and acceptability. In the meantime, research is going on. Controlled experiments may or may not be conducted with the use of double-blind techniques, which themselves induce new difficulties and errors. In view of their wide acceptance as an indispensable tool in therapeutic trials, double-blind techniques should be critically re-examined because their value has never been rigorously tested in the laboratory. They are based upon unacceptable mathematical theory; they diminish the effectiveness of two important variables in any therapeutic situation, the faith of the patient and the doctor in the therapy; they are ethically

questionable; they cannot be used for comparing small heterogeneous groups; they have not led to the development of any useful new therapies in psychiatry.

In 1973, the American Psychiatric Association published a task force report with the title, "Megavitamins and Orthomolecular Therapy in Psychiatry." However, the chosen committee for such an examination failed to contain anyone who was familiar by personal experience with orthomolecular therapy. The committee offered insufficient assurance of objectivity or fairness. Its members did not obtain any evidence from anyone using orthomolecular treatment methods; they accepted double-blind studies only if the study evidence was negative and ignored studies that were positive; the members made false statements, direct and by inference; they took brief sentences out of context from the literature and used them to bolster the committee's pre-conceived negative view.

The American Psychiatric Association's Task Force on Megavitamin and Orthomolecular Therapy in Psychiatry seemed to look for data in such a way as to support the conclusion they wanted to reach in advance. Scientific dishonesty is a serious matter, especially in this case, to the hundreds of thousands—even millions—of people who will be deprived of a chance to recover from disease with orthomolecular medicine.

The report has had a pernicious effect in dampening interest in orthomolecular psychiatry and orthomolecular therapy in general. While this will not hurt any orthomolecular physicians, it will condemn vast numbers of people to a lifetime of tranquilized chronicity or to health problems labeled as psychosomatic or to quite obvious physical symptoms attributed to no known cause and with no known cure.

Recently Hoffer and Osmond prepared a comprehensive reply to the APA Task Force Report. This report also includes a list of scientific reports dealing with orthomolecular therapy and a discussion of the deficiencies inherent in the

double-blind design. This is available from the Huxley Institute for Biosocial Research, 1114 First Avenue, New York, New York 10021 and from the Canadian Schizophrenia Foundation, 2135 Albert Street, Regina, Saskatchewan, Canada S4P 2V1.⁴

There is an answer, however, to the false and harmful conclusion the APA task force has foisted on the medical profession. Fortunately, the number of orthomolecular physicians is increasing rapidly, and acceptance of concepts of orthomolecular nutrition are gaining among the populace. Although familiar ways of eating have a kind of "security" attached to them, people are altering bad old habits. They are seeking information about how to help retain good health, and more doctors are disseminating that knowledge.

Controversy is part of the history of medicine, and is essential to it if medicine is to continue to advance. There will always be promulgation of new ideas, some of which will eventually be proven wrong. There would be much less emotional controversy, however, if physicians followed the basic rule of science, that of following the same procedures and conditions when attempting to corroborate. If this rule were rigorously followed, it would not fall to a single investigatory task force to rule for or against orthomolecular psychiatry or other medical ideas. Each doctor could make his own judgments. Looking at the evidence, that judgment would cause every physician to adapt orthomolecular nutrition as basic armamentarium in medical practice. One can only ask the question over and over again: How blind can orthodox medicine be?

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APPENDIX A

GLOSSARY

ABSORPTION—The process by which nutrients are taken up by the intestines and are passed into the bloodstream.

ACETYLCHOLINE ESTERASE—The enzyme which destroys acetylcholine, the acetic acid ester of choline which causes cardiac inhibition, vasodilation, gastrointestinal peristalsis, and other parasympathetic effects. The esterase splits acetylcholine into acetate and choline.

ACUTE—Having a sudden onset, sharp rise, and short course.

ADRENOCHROME—A red-colored compound resulting from the oxidation of adrenalin.

ALLERGY—A reaction of body tissue to a specific substance.

ALZHEIMERS DISEASE—A disease of the brain. Certain parts of the brain atrophy, and there is a gradual deterioration of all brain function leading to psychosis.

AMINO ACIDS—A class of organic compounds known as the “building blocks” of the protein molecule.

ANTIOXIDANT—A substance capable of protecting other substances from oxidation.

BALANCED MEAL—A meal containing all the essential nutrients.

BIOPHYSICAL ENVIRONMENT—Our physical world, including gravity, radiation, atmosphere, and every other factor known to impinge upon us.

CATATONIC SCHIZOPHRENIA—One of the sub-divisions of schizophrenia characterized by unusual rigidity and posture. Its presence is now quite rare in modern hospitals.

CHOLESTEROL—A fat-like substance found in all animal fats, bile, skin, blood and brain tissue.

CLOROSIS—A term in common use about 100 years ago to indicate a form of anemia.

DEFICIENCY—The lack of a specific nutrient or nutrients.

DEGENERATIVE DISEASES—Diseases which cause permanent deterioration of the tissues such as osteoarthritis, cancer, arteriosclerosis and at least one hundred others.

DIETETICS—The science that deals with food, primarily its preparation. Unfortunately, dietitians spend most of their time blending food for flavor, palatability and color and too little in considering the effect on the consumer of excessive sugar, additives and refined foods.

ECT—Electro convulsive therapy, also known as “shock therapy.”

ESSENTIAL AMINO ACID—An amino acid which cannot be made in the body by the human organism. There are eight essential amino acids (nine for children).

ENZYME—A substance, usually protein in nature and formed in living cells, which brings about chemical changes.

FATTY ACID—One of the components of fats. It is slightly acidic because it has a carboxylic acid group attached to it.

FOOD ADDITIVES—Chemicals added to food to change flavor, palatability, storage properties and so on. In the great majority of cases they do not enhance the nutritional quality of the food.

FOOD ARTIFACTS—Combinations of food components that cause the final product to bear no relationship to any food from which these components were extracted. A perfect example is the doughnut made from refined flour, sugar and cooked in oil.

GENETICS—The study of the inheritance of our bodies and personality.

GLYCOGEN—A substance in which carbohydrates are stored in the body.

HOD TEST—A card sorting test helpful in diagnosing schizophrenia. It is available from: Behavior Science Press, Box AG, University, Alabama 35486.

Hoffer-Osmond Diagnostic Test, a hard-cover book, is available from: Robert E. Kreiger Pub. Co., 645 New York Avenue, Huntington, NY 11743.

HORMONE—A chemical substance that is secreted into body fluids and transported to another organ, where it produces a specific effect on metabolism.

HYDROGENATION—The process of introducing hydrogen into a compound, as when oils are hydrogenated to produce solid fats. This is how margarine is made.

HYPOGLYCEMIA—Blood sugar that is too low.

INSULIN SHOCK—A bad term for insulin coma. This was treatment in which large doses of insulin were given daily. Enough was given to cause a coma.

KRYPTOPYRROLE—The chemical name given to the mauve factor, an abnormal factor excreted in greater frequency in the urine of schizophrenics. It is represented by 2, 4-dimethyl -3 ethylpyrrole.

MALNUTRITION—The condition of a person who does not receive a proper proportion of all essential nutrients.

MEGADOSE—A large dose, often 100 to 1000 times as much as that required to prevent deficiency diseases.

MEGAVITAMIN—The term used to describe massive quantities of a specific nutrient when given for therapeutic purposes.

METABOLISM—The chemical changes in living cells by which energy is produced and new material is assimilated for the repair and replacement of tissues.

METHYL ACCEPTOR—A chemical which accepts and binds with a group called methyl (CH_3).

NAD—Nicotinamide adenine dinucleotide, the enzyme containing vitamin B-3.

NORADRENALIN—The precursor of adrenaline or epinephrine, a hormone given off by the adrenal glands, the potent stimulant that increases heart rate and force of contraction and causes vasoconstriction or vasodilation and other physiological effects.

NUTRIENT—A substance needed by a living thing to maintain life, health and reproduction.

NUTRITION—The science that deals with the relationship between food and our needs for all the nutrients required to nourish the cells of the body, covering the biochemical processes from digestion in the gastrointestinal tract to the needs of individual cells.

OPTIDOSE—The most favorable amount of any nutrient.

OPTIMUM DIET—That diet which will provide all the essential nutrients in a form which can be digested and absorbed without disturbing the body's physiology.

ORTHOMOLECULAR MEDICINE—The practice of medicine which takes into account the nutritional needs of patients.

ORTHOMOLECULAR NUTRITION—Nutrition which recognizes the individuality of each person and recognizes that some people require very large amounts of specific nutrients. It takes into account that nutrients are often synergistic and work in harmony together.

POLYUNSATURATED—The state of an organic compound such as a fatty acid in which there is more than one double bond.

PROCESSED FOODS—Any foods in which there is a major separation of food components so that the final product is nutritionally inferior to the foods from which it is made.

PSYCHOSOCIAL ENVIRONMENT—All psychological and social factors which impinge upon every individual including culture, education, training, experience with diseases and health.

PSYCHOTIC DEPRESSION—A deep depression present for no apparent reason. It also is called endogenous depression.

PYROLURIACS—Patients who have more than 20 micrograms of kryptopyrrole in their urine.

RECOMMENDED DIETARY ALLOWANCE—The amount of nutrients suggested by the National Research Council as being necessary to maintain life processes in most healthy persons.

SATURATED FAT—A fat molecule that has no double bonds. It cannot absorb any hydrogen and does not melt at as low a temperature as unsaturated fats. Saturated fats are harder.

SUPPLEMENT—A nutrient taken in addition to regular food in one of many forms, such as pills, powder or liquid.

SYNTHETIC FOODS—This is a misnomer. Man has not yet learned how to make food. Synthetic foods are in reality food artifacts.

TOXICITY—A poisonous effect produced when a person ingests an amount of a substance that is above his or her level of tolerance.

TRACE MINERAL—An element present in minute quantities which is essential to the life of an organism.

TRIGLYCERIDES—Fats containing a three-carbon molecule and three fatty acids.

UNPROCESSED FOODS—Whole foods such as potatoes, apples, oranges, meat, nuts and everything else grown in nature.

UNSATURATED FAT—A fatty acid containing double bonds.

VITAMIN—An organic substance found in foods which performs specific and vital functions in the cells and tissues of the body.

VITAMIN DEPENDENT—A person whose optimum need for a vitamin is much greater than that need required by the average person. There is no sharp demarcation between vitamin dependency and deficiency.

APPENDIX B

SUGGESTED ADDITIONAL READING

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Index

A

Academy of Orthomolecular Psychiatry, 28-30

Acetylcholine, 162

Acute confusional states, hypoglycemia and, 53

Addiction

drug, 30

and nutritional deficiencies, 184

to sugar, 2, 3, 23, 100, 101

Addison's disease, 153

Additives

food, 8, 17

raw foods as antidotes to, 67

vitamin C and, 68

Adrenal cortical extract (ACE), 78

Adrenal cortical hormones, vitamin C and, 123

Adrenal function, 15, 28

Adrenaline, schizophrenia and, 31, 32

Adrenochrome hypothesis, 31, 32

Aggressive behavior, poor nutrition and, case example, 49-50

Agricultural produce, deficiencies in, 2, 4

Agriculture, Department of (USDA), 68

Alcoholism

minerals and, 155

neuroses, saccharine disease and, 47

and saccharine disease, 20

sugar and, 96

thiamine against, 121-122

treating, 30

Alexander, F., 54

Allergies

anti-allergy nutrition, 74-76

central nervous system and sugar, 23

to dairy products, 85-86

and dietary treatment for hypoglycemia, 77, 78

disease as result of food, 21

misperception and cerebral, 60-61

schizophrenia and, 174-177

as subclinical deficiencies, 75

and sugar addiction, 23

testing for, 84

and vitamin A, 132, 133

vitamin B-3 and cerebral, 129, 130

Alpha tocopherol. See Vitamin E

Alzheimer's disease, 32

Aluminum, 149, 167, 171

American Association for the Advancement of Science, 12

American Medical Association (AMA), 182

American Psychiatric Association Task Force, 34, 186, 187

American Schizophrenia Association, 29

Amino acids, 151

cell function and simultaneous receipt of, 21-22

essential, 16, 83, 143

and underconsumption of proteins, 86-88

Amitriptyline, 38

Anatomical changes (and/or histological changes), organic pathology and, 76

Anemia, 25, 160, 169

nutritional macrocytic, 141

para amino-benzoic acid and, 144

pernicious, 72, 138

vitamins preventing, 137, 138

Angina pectoris, 47, 49

Animal products, 21, 67, 69

high protein quality from, 83

- minerals in, 154, 156, 161, 165, 167, 168, 172
 nutritive value of, table, 103-104
 vitamins in, 136-144
- Animals, food synthesis in, 15
- Antidepressants, 37, 38
- Antihistamines, 78
- Anxiety, 43, 47, 96, 100
- Appendicitis, saccharine disease and, 24
- Appetite-regulating mechanism (appetstat), 88
- Aring, C. D., 181
- Arsenic, 149, 170
- Arteriosclerosis, 155
- Arthritis, 53, 172
 junk food diet and, 21
 rheumatoid, 160
 vitamin B-3 and, 11-12, 172
- Artifacts. *See* Processed foods
- Artificial foods (synthetic foods), 3-4, 7-8, 66, 152
See also Processed foods
- Ascorbic acid (cevitative acid). *See* Vitamin C
- Asthma, 132, 133
- Atherosclerosis, sugar and, 101
- B**
- Balanced diet, 16
 balanced nutrition, 68-69
 and individual variability, 17-18;
see also Individuality
- Banting, Sir Frederick, 100
- Barbiturates in treatment of schizophrenia, 31
- Barium, 149
- Bean, W. B., 181
- Behaviorists, 179-181
- Beriberi, 6, 11, 121
- Berle, Peter A. A., 2
- Biochemical physiological changes, organic pathology and, 76
- Biochemical research, 30
- Bioflavonoid complex (vitamin P), 144
- Biophysical environment, 6
- Biotin, 143
- Birch, G. G., 124
- Bismuth, 167
- Blindness of veterans (World War II), 11
- Blood fat (blood lipids)
 fat in food and elevation of, 91
 heart disease and, 91
 nutrient deficiencies and, 92
- Blood sugar (blood glucose)
 high-protein diet and, 83
See also Low-blood sugar; Hypo-
- glycemia; Relative hypoglycemia; Saccharine disease
- Body and mind, nutritional needs of, 15-18
- Bolton, R., 49
- Bone meal, 68
- Bowel cancer, saccharine disease and, 20
- Brain
 brain function, 15
 and carbohydrate ingestion, 16
 glucose and, 95
 low-blood sugar and severe reaction of, 44, 52-53
 orthomolecular psychiatry and, 29
 poor nutrition and, 28
 thinking function of, 56
 tranquilizers and biochemistry of, 38
 underabundance of protein and, 87
- Brain Bio Center, 157-158
- Brennan, Richard O., 14
- Bromine, 149, 170
- Buckley, R. E., 48
- Burk, Dean, 169
- C**
- Cade, J. F. J., 121
- Cadmium, 135, 149, 159, 165, 167
- Caffeine, avoiding drinks containing, 45
- Calcium, 16, 78, 138, 145, 149, 150, 154-155
- Calcium pantothenate (pantothenic acid), 129, 135, 141
- Calories in diet (1950-1970), 91
- Calphosan, 78
- Campbell, 101
- Canadian Schizophrenia Foundation, 29, 187
- Cancer, 8
 bone meal and, 68
 of colon, 25
 fluorine and, 169
 intestinal, 14
 iodine and breast, 172-173
 junk diet and, 21
 nickel carbonyl as carcinogenic substance, 168
 saccharine disease and bowel, 20
 selenium and, 165
 and zinc and pyridoxine deficiency, 159
- Carbohydrate neuroses, 43-44
- Carbohydrates
 caloric value of, 89
 chemistry of, 95-98
 degree of refinement and toxicity of, 98; *see also* Processed foods

- as energy source, 89
 in foods, table, 102-113
 junk food and metabolism of, 24
 molybdenum in metabolism of, 145
 need for, 16
 optimum amount of, 70-71
 overconsumption of, 99-101
 pure, as artifacts, 82-83
 vitamins for metabolism of, 136
 zinc in metabolism of, 145, 156
- Cardiac arrythmia**, 47
- Cardiovascular diseases**
 in veterans (World War II), 11
 and vitamin E, 131
See also Heart diseases
- Capillary permeability**, 123
- Cartilage**, 123
- Cell function**, simultaneous receipt of amino acids and, 21-22
- Cellular nutrition**, optimum, 64
- Center for Science in the Public Interest**, 14
- Central nervous system**
 mental symptoms and, 38
 sugar allergy and, 38
See also Brain
- Cevitamic acid (ascorbic acid)**. *See Vitamin C*
- Chelated minerals**, 151-152, 168
- Chelating agents**, 151
- Chemical contamination**, 67
- Cheraskin, E.**, 100
- Chlorpromazine**, 38
- Cholecystitis**, saccharine disease and, 24
- Cholesterol**
 and food faddism, 14
 heart disease and, 91, 93
 nicotinic acid and oxidation of, 90
 optimum amount of, 93-94
 vitamin B-3 and, 126
- Choline**, 142
- Chromium**, 77, 93, 135, 149, 150, 164
- Cirrhosis**, 143, 155, 168
- Citrus bioflavonoids (vitamin P)**, 144
- Cleave, T. L.**, 23-25, 42
- Cobalamin**. *See Vitamin B-12*
- Cobalt**, 145, 149, 151, 166
- Colds**, vitamin C and, 123-124
- Colitis**, saccharine disease and, 25
- Collagen**, 123
- Coma**
 hypoglycemia and, 53
 insulin, 31, 32, 44
- Conolly, John**, 57-58
- Constipation**, 25-26
 prevalence of, 25
- and saccharine disease, 20, 23
- Controlled experiments**
 use of, 72-74
See also Double blind experiments
- Copper**, 135, 145, 149, 150, 159, 162-163, 167
- Coronary disease**
 hypoglycemic episode and, 49
 saccharine disease and, 23
 and sugar, 101
 vitamin B-3 and, 126
- Coronary thrombosis**, 91
- Cortisone**, 127
- Cott, A.**, 130
- Crocker, Betty**, 14
- D**
- Dairy products**, 69
 minerals in, 154, 155, 165
 nutritive value of, table, 102
 vitamins in, 136-140, 142, 143
- Davis, Adelle**, 14
- Death rate among veterans (World War II)**, 11
- Deficiencies in specific vitamins**, 136-144
- Degenerative diseases**
 cost of relieving, 5
 environmental pollution and, 3
 incidence of, 4, 8
 junk diet and, 21
 of veterans (World War II), 11
See also Saccharine disease; and specific degenerative diseases
- Delaney Clause (1958)**, 101
- Dementia**, hypoglycemia and, 53
- Dental caries**, 14, 24, 101, 145, 169
- Depression**
 endogenous, defined, 42-43
 lithium and, 165
 minerals and, 155
 neuroses distinguished from psychoses, 42
 reactive, defined, 42
 saccharine disease and, 47
 sugar, 96, 100
 types of, 42-43
 vitamin B-3 and, 141
- Detoxifying agent**, vitamin E as, 131
- Diabetes**
 food faddism and, 14
 junk diet and, 21
 manganese and, 162
 relative hypoglycemia mistaken for, 26
 and saccharine disease, 20, 23, 24
 sucrose rule and, 101
 sugar and, 100-101

- Diarrhea, 11
 Dietary rules, 69-71
 Dietitians, limitations of, 5
 Disaccharides, 97
 Diverticulitis, 24, 25
 Diverticulosis, 25
 Dizziness, neuroses, saccharine disease and, 46
 Double blind experiments, 184-187
 in treatment of schizophrenia, 34-35
 Drug addiction, treatment, 30
 Drug manufacturers, 37
 Drug orientation of U.S. medicine, 37
 Drug therapeutic index, 133-134
 Dumping syndrome, 53
 Dyspepsia, sugar and, 101
- E**
- Education, 56-57
 Ehrlich, 170
 Electrolyte imbalance, 25
 Emotional specialists, 179-181
 Endogenous depression, defined, 42-43
 Energy storage, 89
 Environment, as balancing factor, 63-64
 Ergosterol. *See Vitamin D*
Escherichia coli infections, 24
 Eskimo diet, 88
 Exercise, 92, 93
 Experiments
 use of controlled, 72-74
 See also Double blind experiments
 Exteroception, 56
- F**
- Fasting, 176
 Fats and fatty acids, 88-95
 artifacts of, 90
 biotin in metabolism of, 143
 caloric value of, 89
 essential, 89
 food faddism and, 14-15
 in foods, table, 102-113
 function of fats, 89
 and heart disease, 91-93
 need for, 16
 nutrient deficiencies and metabolism of, 92
 nutritive value of, table, 111-112
 optimum amount of, 70
 overconsumption of, 90-91
 polyunsaturated, 91
 pure, as artifacts, 82-83
 saturated fatty acids, 88-89
- structure of fatty acids, 88-89
 unsaturated fatty acids, 88, 89
 vanadium in, 171
 vitamin B-3 in metabolism of, 127
 vitamin B-12 and, 131
 vitamin E and, 131
 vitamins for metabolism of, 136
 Fiber (bulk) consumption
 and constipation, 25-26
 and feces transit time, 24-25
 and peptic ulcers, 26-27
 vegetable, and saccharine disease, 93
- Fluorine, 145, 149, 169-170
 Folic acid, 129, 131, 141
 Food and Drug Administration (FDA), 128, 134, 161
 Food faddism, 14-15
 See also Processed foods
 Food technologists, 4-5
 Food supply, pollution of, 2, 3
 Freud, Sigmund, 36, 37
 Fructose, 95-98
 Fruits and fruit products
 fresh, 69
 minerals in, 153
 nutritive value of, table, 107-109
 vitamins in, 137, 142
- Functional insulinism. *See Relative hypoglycemia*
 Funk, Casimir, 115
- G**
- Galactose, 96-97
 Gellhorn, E., 48
 Genetics, 6
 Gelperin, N. J., 181
 Glossary, 189-194
 Glucose, 95-98
 See also Blood sugar; Low blood sugar
 Glucose tolerance factor (GTF), chromium and, 164
 Glucose tolerance test, 24
 developed, 44
 Glucoreceptors, hypoglycemia and, 49
 Gold, 149, 172
 Goldberger, 115, 116
 Grains and grain products, 21, 99
 broken wholeness of, 17
 food faddism and refined, 14
 minerals in, 154, 161, 163, 164, 167
 nutritive value of, table, 109-111
 vitamins in, 139
 See also Wheat

- H**
- Halfken, L., 53
 Hallucinations, 58-59
 Harris, Seale, 44, 45
 Hawkins, David, 127
 Headaches, 46-48
 Heart diseases
 fats as cause of, 91-93
 food faddism and, 14
 junk diet and, 21
 preventive nutrition against, 93-94
 vitamin E and, 93, 139
See also specific heart diseases; for example: Angina pectoris; Coronary disease
 Hemorrhoids, saccharine disease and, 20, 24
 Hesperidin (vitamin P), 144
Hexanicotol, 128
 Holistic health, 184
 Holistic medicine, 183-184
 Honey, sucrose contaminated, 97-98
 Hong Kong Veterans Association, 11
 Hydrogenation, 89
 Hyperinsulinism, 44
 Hyperthyroidism, 53
 Hypervitaminosis, 133-134
Hypoglycemia
 dietary treatment of, 76-81
 main factor in cause of, 17
 physiological mechanism of, 48-50
 as psychosomatic disease, 54
 stomach surgery and, 51-53
 sucrose and, 100
 See also Low blood sugar; Relative hypoglycemia
 Hypoproteinemia, 25
 Hypothalamus, 49
 Hypothyroidism, 172
 Hypoxia, 49
 Humphreys, Dale, 122
 Huxley, Aldous, 30
 Huxley, Sir Julian, 30
 Huxley Institute for Biosocial Research, 29, 30, 187
- I**
- Idiopathic disorders, 24
 idiopathic, defined, 178
 Individuality
 "average" anti-stress formula and, 134-135
 balanced diet and variability in, 17-18
 biophysical environment and, 60-61
 dietary rules and, 69-70
 dosage and, 120-121
- variability principle, 5-6, 8, 116-117
 Industrial poisons, 2-3
 Infections
 Escherichia coli, 24
 malnutrition and, 124
 viral, vitamin B-3 and, 129
 vitamin A and, 132
 Infiltration degeneration, defined, 3
 Inositol, 125, 128, 142
 Institute of Naval Medicine, 23
 Insulin, 134
 and excess consumption of sugar, 17
 excess production of, 44, 45
 lipogenic action of, 47
 zinc and, 156
 Insulin coma, 31, 32, 44
 Insulinism, functional. *See Relative hypoglycemia*
 International Academy of Preventive Medicine, 14
 Interoperception, 56
 Intestinal cancer, food faddism, 14
 Iodine, 145, 149, 151, 172-173
 Iron, 123, 135, 145, 149, 150, 160-161
 Irvine, Donald, 157
- J**
- Jolliffe, Norman, 88
Journal of Nutrition Education, 185
 Junk diet. *See Processed foods*
- K**
- Kalokerinos, A., 124
 Kaufman, W., 127
 Kidney function, 15, 28
 Klenner, F. R., 122
 Kryptopyrrole, 157-159
 Kryptopyrroluria, 130-131
 Kunin, R., 128
- L**
- Laboratory tests, use of, 13
 Lactose, 96-97
Lancet (journal), 160
 Laxatives, 25
 Leaching, 86-87
 Lead, 149, 167
 Learning disabilities, treating, 30
 Lecithin, 89
 cholesterol intake and, 93-94
 deficiency in, and blood fat, 92
 function of, 90-91
 Legs, restless, 47
 Leichter, S., 53
Lenodil, 128
 Leukemia, zinc and, 159-160
 Lind, Sir James, 44

Linoleic acid (vitamin F), 142
 Linolenic acid (vitamin F), 142
 Lithium, 151, 165-166
 Low blood sugar
 dizziness and, 46
 mental illness and, 44
 and pathological drowsiness, 47
 severe brain reaction to, 44, 52-53
See also Hypoglycemia; Relative hypoglycemia
 Low-fat diets, problems of, 94-95
 Lysine (L-lysine), 64, 143

M

McFadden, Dr., 115-116
 Magnesium, 77, 135, 145, 149, 150, 154-155
 Malabsorption, 25
 Malnutrition
 infection and, 124
 as main cause of neuroses and psychoneuroses, 43, 44
 misperception and, 60-61
 neuroses and, 23, 43, 44
 physical illnesses from, 23
 pellagra as disease of, 115-116
 psychiatric illness from, case example, 19-20
 Mandell, Marshall, 176
 Manganese, 77, 145, 149, 150, 162
 Manic-depressive psychosis, 165
 Meals, frequent eating of small, 45-46
 Measles, 124
 Megalithium therapy, 119
Mega-Nutrients for Your Nerves (Newbold), 184
 Megavitamins
 megadose, 119-121
 megadose, defined, 119
 theoretical basis for, 117-119
 therapy with, 78
 "Megavitamins and Orthomolecular Therapy in Psychiatry in 1973" (report), 34, 186
 Memory loss, 30
 Menadione (vitamin K), 140
Menninger Bulletin (magazine), 34
 Mental health, criteria for, 41-42
 Mental illness. *See* Psychiatric diseases
Mental and Elemental Nutrients (Pfeiffer), 156
 "Mental Symptoms of Pellagra, The" (Spies, Aring, Gelperin and Bean), 181
 Mercury, 1, 149, 150, 152, 165, 167
 Methionine (D1-methionine), 143
 Methylphenidate (piradol), 47

Migraine headaches, neuroses, saccharine disease and, 46
 Minerals, 148-152
 as not drugs, 71
 guide to, 145
 supplement of, in hypoglycemia treatment, 77
 toxic, 148, 149, 167-168
 Minimum daily requirements (MDR), 6, 116-117, 121
 Minot, 47-48
 Molybdenum, 145, 149, 151, 166
 Monosaccharides, 95-97
 Mood specialists, 179-181
 Morphine derivatives in treatment of schizophrenia, 31
 Multiple sclerosis (MS), 122
 Muscle cramps, spontaneous, neuroses and saccharine disease and, 47
 Myasthenia gravis, 122
 Myocardial infarction, 168

N

Nair, P. P., 131-132
 Narcolepsy, neuroses, saccharine disease and, 46-47
 Narcoleptic hypokinesia, 47
 Neuroses
 carbohydrate, 43-44
 diagnosis of, having excluded well-known syndromes, 75, 76
 from improper nutrition, 42-44
 relative hypoglycemia and, 45
 and saccharine disease, 20, 46-48
 symptomatic similarities between saccharine disease and, 46-48
 New York State Department of Environmental Conservation, 2
New York Times, *The* (newspaper), 115
 Newbold, H. L., 131, 152, 153, 184
 Newton (assistant secretary), 115
 Niacin. *See* Vitamin B-3
 Niacinamide. *See* Vitamin B-3
 Nickel, 149, 168
 Nicotinamide. *See* Vitamin B-3
 Nicotinamide adenine dinucleotide (NAD; coenzyme one), 125, 130, 178-181
 Nicotinic acid. *See* Vitamin B-3
 Noradrenalin, 32
 Nucleic acid, vitamin B-12 and, 131
 Nutrients
 essential, 16
 nutritious foods, 65-67
 nutritive values of edible parts of foods, table, 102-113
 processed foods robbed of, 66, 68, 69, 71; *see also* Processed foods

- working in combination, 7
See also Carbohydrates; Fats and fatty acids; Minerals; Optimum diet; Proteins; Vitamins; *and specific diets*
- Nutrition Action* (newsletter), 14
- Nutrition science, resources lacking, 2, 4
- Nutritional biochemists, 5-7
- Nutritionists, 5-7
- Nuts, 21, 69
 nutritive value of, table, 113
 vitamins in, 136, 142
- O
- Obesity
 cause of, 89-90
 food faddism and, 14
 neuroses, saccharine disease and, 47
 and saccharine disease, 23, 47
 sole immediate cause of, 26
 and unprocessed carbohydrates, 99
- Ontario, Lake, 2-3
- Optidose, defined, 119
- Optimum diet, 63-81
 and anti-allergy nutrition, 74-76
 balanced nutrition and, 68-69
 dietary rules in, 69-71
 and dietary treatment of hypoglycemia, 76-81
 discovering, 118
 elements of, 71-74
 minerals in, 150
 nutritious foods and, 65-67
 orthomolecular nutrition, defined, 63-65
 raw foods in, 67-68
- Organ changes from saccharine disease, 20
- Orphan drugs, 126
- Orthodox medicine, 182-183, 184-187
- Orthomolecular, defined, 12-13
- Orthomolecular medicine, area encompassed by, 12-15
- Orthomolecular nutrition, defined, 63-65
- Osmond, Humphry, 28, 32, 130, 158, 186
- P
- Panama cane cutters' diet, 100-101
- Pantothenic acid (calcium pantothenate), 129, 135, 141
- Para amino-benzoic acid (PABA), 144
- Parasympathetic drugs, 78
- Parker, K., 124
- Pauling, Linus, 12-13, 29, 38, 124, 126, 182
- Pellagra, 11, 130, 140
 inducing symptoms of, 178-181
 treating, 30
 vitamin B-3 and, 115-116, 118
 vitamin B-12 and, 6
- Peptic ulcers, 26-27
 hypoglycemia and, 54
 neuroses, saccharine disease and, 47
 percent of, from hypoglycemia, 53
 as psychosomatic, 53
 and saccharine disease, 20, 23, 24, 47
- Perception, 56
 judgment and reaction possibilities and, table, 59
 misperception, 57-60
- Perceptual specialists, 179-180
- Periodontal disease, sugar and, 101
- Peripheral neuropathy, 47
- Pernicious anemia, 72, 138
- Personality, 55-57
- Peruvian peasants' diet, 49-50
- Pfeiffer, Carl C., 130, 150, 152, 156-160, 162, 163, 171
- Philpot, William, 176
- Phosphorus, 138, 145, 149, 151-152, 154-155
- Pilot studies in treatment of schizophrenia, 32-33
- Plants, food synthesis in, 15
- Polyneuritis, 121
- Polysaccharides, 98, 123
- Porphyriuria, 131-132
- Porteous, George, 10-12
- Potassium, 145, 149-153
- Processed foods
 avoiding, at all costs, 45, 117
 consequences of eating, 20, 22-24
 crullers as ultimate in poisoning from, 90
 diet of, as disease diet, 21-22
 excessive consumption of carbohydrates and, 99-101
 as garbage, 76
 and malnutrition, 16-17
 metabolic disruption in, 7
 minerals lost in, 152-156, 161, 162, 167
 original food and, 65
 palate deception and overconsumption of, 26
 percent of total food consumption as, 5
 return to, and recurring hypoglycemic symptoms, 79, 80

- and robbing nutrients, 66, 68, 69, 71
 synthetic foods as, 3-4, 7-8, 66, 152
- Proteins**, 83-88
 amino acids and underconsumption of, 86-88; *see also Amino acids*
 caloric value of, 89
 consumption of, as artifacts, 85
 folic acid in metabolism of, 141
 in food, table, 102-113
 need for, 16
 optimum amount of, 70
 overconsumption of, 84-86
 as percent of natural food, 26
 pure, as artifacts, 82-83
 underconsumption of, 86-88
 vitamin B-12 and, 131
 zinc in metabolism of, 145, 156
- Prothrombin**, 140
- Psychiatric diseases**
 and idea of orthomolecular medicine, 12-13
 from malnutrition, 19-20
 poor nutrition and, 41-50
 psychiatric features in neuroses and saccharine disease, 47-48
 from saccharine disease, 20, 47-48
 and sugar allergy, 23
 of veterans (World War II), 11
 vitamin B-3 and, 127
 zinc and pyridoxine deficiency and, 157-159
See also specific types of psychiatric diseases
- Psychoanalysis**, 36-37, 54, 178
- Psychoneuroses** from improper nutrition, 42-44
- Psychopathic disorders**, neuroses distinguished from, 43
- Psychosocial environment**, 6, 55-57
- Psychosomatic conditions**, 51-62
 defined, 53-55
 misperception and, 57-60
 peptic ulcers as, 26-27
 as product of psychosocial environment, 55
 psychosomatic reaction to environment, 60-61
 and saccharine disease, 24
 ulcerative colitis as, 25
- Psychotic depressions**, neuroses distinguished from, 42
- Psychoses**. *See Dementia; Manic-depressive; Schizophrenia*
- Public Health, Department of (Psychiatric Services Branch, Saskatchewan, Canada)**, 30-31
- Pyelitis, saccharine disease and**, 24
- Pyridoxine**. *See Vitamin B-6*
- Pyroluriacs**, 158, 159
- R**
- Radiation**, bone meal and, 68
- Raw foods**, 67-68
- Reactive depression**, defined, 42
- Recommended dietary allowances (RDA)**, 6, 185
- Reich, C. J.**, 132
- Reich, T.**, 53
- Relative hypoglycemia (functional insulinism)**, 5
 case example of, 50-53
 defined, 20
 and high-protein diet, 83
 mistaken for diabetes, 26
 neuroses and, 45
 saccharine disease and, 44
- Relaxation**, 92, 93
- Renal calculus**, saccharine disease and, 24
- Rheumatism**, 127
- Riboflavin (vitamin G)**. *See Vitamin B-2*
- Ribonucleic acid (RNA)**, nickel and, 168
- Rickets**, 6, 72, 139, 154
- Rimland, B.**, 130
- Ringsdorf, W. M.**, 100
- Roberts, H. J.**, 46-48
- Ross, H.**, 78
- Rutin**, 144
- S**
- Saccharin**, 101
- Saccharine disease**, 17
 and carbohydrate neuroses, 43
 effects of, 20
 as master disease, 23-24
 physical manifestations of, 24-27
 physicians suffering from, 41-42
 psychological manifestations of, 44-46
 sugar and refined carbohydrates and, 96
 symptomatic similarities between neuroses and, 46-48
See also Relative hypoglycemia
- Saccharine Disease, The (Cleave)**, 42
- St. Helena population**, diet of, 92-93
- Samburu diet**, 92
- Saskatchewan Committee on Schizophrenia Research**, 32
- Science (magazine)**, 12, 14
- Science Newsletter**, 68
- Schizophrenia**
 allergy and, 174-177

- case example of, 1-2
 copper and, 163
 mercury and, 167-168
 tranquilizers for, 37, 38, 41
 treatment of, 30-36
 vitamin B-3 for, 31-33, 35, 36,
 58, 61, 127-130, 174-181
 vitamin B-12 and, 131
 and zinc and manganese, 161
 and zinc and pyridoxine deficiency, 157, 158
- Scurvy**, 11, 44
 vitamin B-12 and, 6
 vitamin C and, 118, 123, 124
- Seborrheic dermatitis**, 101
- Seeds**, 21, 69
- Seizures**, hypoglycemia and, 53
- Selenium**, 93, 149, 151, 152, 165
- Senility**
 aluminum and, 171
 excess copper and, 163
 heavy-metal intoxication and, 168
 vitamin B-3 against, 10, 12
 vitamin E and, 131
 zinc and, 159
- Serotonin**, 16
- Sexual function**, zinc and, 156-157
- Shute**, W. E., 132
- Sign**, defined, 76
- Silver**, 149, 172
- Simkin**, P. A., 160
- Skin**
 and allergy to sugar, 23
 minerals and, 156, 157
 and saccharine disease, 24
 skin function, 15
 vitamin B-2 and, 122
 vitamin B-3 and, 125
 vitamins and, 136, 137, 140-142,
 144
- Slow-release capsules**, 125-126, 128
- Smoking**, 92, 93
 nickel carbonyl and, 168
- Sodium**, 149, 150, 152-153
- Somali diet**, 92
- Special diets**, as basis of therapy, 13
- Spies**, T. D., 181
- "Stamp Out Food Faddism"** (editorial, *Nutrition Action*), 14
- Starch**, pure, as artifact, 82-83
- Starvation**
 involuntary nervous function and,
 49
 zinc and, 159
- Stefansson**, V., 88
- Stomach**
 poor nutrition and, 28
 surgery on, without cause, 51-53
- Stone**, I., 124
- Stress**
 anti-stress vitamin formula, 134-
 135
 vitamin C and, 123
 vitamin E and, 131
- Strokes**, 168
- Strontium**, 149, 171
- Sucaryl**, 101
- Sucrose**, 96-100
Sucrose rules, 101
- Sugar**
 as addictive, 2, 3, 23, 100, 101
 avoiding, 76
 avoiding drinks containing, 45
 carbohydrates and, 95-96
 carcinogenic potential of, 101
 constipation and elimination of,
 25-26
 consumption of, expressed as
 pounds per person, 97
 and diverticulitis, 25
 eating, to establish cause-and-
 effect relationship with sick-
 ness, 80
 effects of, 99-101
 fat mixed with, in artifacts, 90
 food faddism and, 14-15
 growth in consumption of, 17
 heart disease and, 93
 in junk foods, 21-23
 misconception about, as energy
 food, 52
 and multiple vitamin and mineral
 deficiencies, 17
 nutrient deficiencies and diet rich
 in, 92
 nutritive value of, table, 112
 and relative hypoglycemia, 44;
 see also Relative hypoglycemia
 and schizophrenia, 2; *see also*
 Schizophrenia
 three sucrose rules, 101
See also specific sugars
- Sulphur**, 145
- Summary, The**, 132
- Swelling**, neuroses, saccharine dis-
 ease and, 47
- Symptom**, defined, 76
- Syndenham**, Thomas, 161
- Synthetic foods**, 3-4, 7-8, 66, 152
- T**
- Talk therapy**, 177-178
- Taub**, H. J., 132
- Therapeutic index of drugs**, 133
- Thiamine (thiamine chloride)**. *See*
 Vitamin B-1
- Thompson**, Dr., 115-116
- Thought-disorder specialists**, 179,
 180

Thyroxin, 172
 Tin, 149, 169
 Tocopherol. *See* Vitamin E
 Tooth decay, 14, 24, 101, 145, 169
 Trace elements, 149
See also specific minerals
 Tranquilizers, 37, 38, 41
 Triglycerides, 89, 97, 126
 Tryptophan, 16, 115-116, 130, 178

U

Ulcerative colitis, 25
hypoglycemia and, 54
as psychosomatic, 53
 Underwood, E. J., 152
 Unsaturated fat diet, 94-95
 Urinary bladder, sugar allergy and
 shrinkage of, 23

V

Vanadium, 149, 171
 Varicose veins, 20, 24
 Vascular headaches, 46
 Vegetables, 67
fresh, 69
minerals in, 153, 161, 163, 165,
167-170
nutritive value of, table, 104-106
proteins from, 83-84
saccharine disease and fiber of,
93
vitamins in, 136-144

Victor, M., 121
 Viosterol. *See* Vitamin D

Viral infections, vitamin B-3 and,
 129

Vision, 122, 123

Vitamin(s)
anti-stress formula, 134-135
battle for, 115-117
in food, table, 102-113
guide to, 136-144
low-fat diet and fat-soluble, 95
*megadose vitamins, 119-121; see
 also Megavitamins*
non-toxicity of, 133-134
as not drugs, 71, 72
physicians and deficiency in, 71-

72

range in need for, 64
 Vitamin dependency, 6-7
case example of, 19
optimum diet and, 71
 Vitamin A, 132-133
anti-stress dose of, 135
in food, table, 102-113
sources, functions, and results of
deficiency of, 136

Vitamin B-complex
anxiety and deficiency in, 43

hypoglycemia treatment with, 77
neuroses and, 43

See also Biotin; Choline; Folic acid; Inositol; Pantothenic acid; Para amino-benzoic acid; Vitamin B-1; Vitamin B-2; Vitamin B-3; Vitamin B-6; Vitamin B-12

Vitamin B-1 (thiamine; thiamine chloride), 121-122, 129
anti-stress dose of, 135
deficiency of, 137
in food, table, 102-113
in hypoglycemia treatment, 77
sources and functions of, 136
 Vitamin B-2 (riboflavin; vitamin G), 122-123, 129
in food, 102-113
sources, functions and deficiency of, 137

Vitamin B-3 (niacin; niacinamide; nicotinic acid; nicotinamide)
anti-stress dose of, 135
arthritis and, 11-12, 172
cerebral allergy and, 129, 130
cholesterol oxidation and nicotinic acid, 90
deficiency in, and blood fat, 92
in double blind study, 35
flush from nicotinic acid, 127-128
in foods, table, 102-113
heart disease and, 93
in hypoglycemia treatment, 77
mental illness and megadoses of, 28

as nicotinamide, 125-127
as nicotinic acid, 124-127
pellagra and, 115-116, 118
for schizophrenia, 31-33, 35, 36,
58, 61, 127-130, 174-181
against senility, 10, 12
sources, functions and deficiency of, 140-141

Vitamin B-6 (pyridoxine), 92, 129-131
heart disease and, 93
in hypoglycemia treatment, 77
kidney stones and, 155
mental illness and, 157-159
sources, functions and deficiency of, 138

Vitamin B-12 (cobalamin), 72, 129, 131
cobalt as component of, 166
requirements in, 6
sources, functions and deficiency of, 138

Vitamin C (ascorbic acid; cevitamic acid), 123-126
as anti-pollution vitamin, 68

- anti-stress dose of, 135
blood fat and, 92
as chelating agent, 168
as essential nutrient, 16
in foods, table, 102-113
heart disease and, 93
in hypoglycemia treatment, 77
magnesium and, 145
and schizophrenia treatment, 31,
 33
and scurvy, 118, 123, 124
sources, functions and deficiency
 of, 137
and vitamin P, 144
Vitamin D (ergosterol; viosterol),
 72
 in anti-stress dose, 135
phosphorus and, 145
sources, functions and deficiency
 of, 138-139
Vitamin D1-methionine, 143
Vitamin D-3, 95, 132
Vitamin E (alpha tocopherol; toco-
 pherol), 131-132
 anti-stress dose of, 135
heart disease and, 93, 139
selenium and, 165
sources, functions and deficiency
 of, 139
- Vitamin F (linolenic acid; linoleic
 acid), 142
Vitamin G. See Vitamin B-2
Vitamin K (menadione), 140
Vitamin P (bioflavonoid complex;
 citrus bioflavonoids; hesperidin),
 144
- W**
- Wernicke-Korsakoff disease, 121
Wheat
 changes brought to, 4
 minerals in, 164
 as nutritious food, 65, 66
 and saccharine disease, 44, 45
 taking apart wholeness of, 17
 as white bread, 22, 90, 99
 vitamins in, 136-142
 whole, 21, 98, 156
Williams, Roger, 5, 7, 64, 69, 118,
 150, 152
- Y**
- Yudkin**, J., 101
- Z**
- Zinc**, 77, 93, 145, 149-150, 155-160,
 162
Zinc gluconate, 135

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