

Our Future Health

by Linus Pauling

I believe that by the year 2000 it will be possible for the American executive and for other people in the United States to be ten times as healthy as they are now.

What I mean by being ten times as healthy is that the incidence of serious disease at each age and the probability of death at this age can be reduced to 1/10th of the present value.

To have at each age only 10% as much illness as now means that the length of the period of well-being would be increased by about 27 years, and the length of life would be increased, on the average, by the same amount.

It has been known for over 100 years that in a population such as in the United States or Great Britain the chance of death doubles with every 8 years increase in age. We see that, in accordance with this rule, if the chance of serious illness and death at a given age were to be reduced to 1/2, the length of the period of well-being and the length of life would be increased by 8 years; if this chance were to be decreased to 1/4, they would be increased by 16 years; and if it were to be decreased to 1/8th, they would be increased to 24 years. ~~1/10th~~ <sup>One-eighth</sup> 0.125, is a little greater than 1/10th, 0.10, and accordingly I can make the estimate of a 27-year increase in the length of ~~the period of~~

the period of well-being and the length of life as a result of the decrease in the incidence of serious disease and of death to 10% of the present value.

During the last 80 years there has been a great increase in life expectancy in the United States, almost entirely because of the control of infectious diseases. Other diseases, especially heart disease and cancer, are now the principal causes of death. Heart disease and related diseases of the circulatory system now cause about 50% of the deaths in the United States. Over one million people die of these diseases each year, and probably more than five million people now living are suffering from them in a significant way. Cancer is the cause of nearly 20% of the deaths at the present time, over four hundred thousand deaths per year. I believe that we now know how to decrease deaths by cardiovascular disease and by cancer very greatly, and also deaths by other diseases such as diabetes. ✓

I doubt that the "wonder drugs" have great promise. In fact, I believe that the control of these diseases can be and will be achieved largely through the adoption of health practices, mainly involving nutrient substances; that is, the diet.

There is no doubt that cardiovascular disease and cancer are related to the diet. Dr. Theodore Cooper, who was then Assistant Secretary for Health ~~and~~ in the Department ✓ of Health, Education, and Welfare, stated in congressional hearings in 1976

that

"While scientists do not yet agree on the specific causal relationships, evidence is mounting and there appears to be general agreement that the kinds and amount of food and beverages we consume and the style of living common in our generally affluent, sedentary society may be the major factors associated with the cause of cancer, cardiovascular disease, and other chronic illnesses."

My own interest in the question of how to achieve good health and well-being began to develop about 25 years ago. I had become interested in nuclear weapons and nuclear warfare, and especially in the damage done to the health of people and unborn children by the radioactive fallout and radioactive carbon-14 liberated into the atmosphere in nuclear weapons tests. In the effort to estimate how much damage was being done by these substances formed in the testing of nuclear weapons I examined the statistics about the causes of death. At that time I learned that cigarette smoking is one of the principal causes of excessive illness and premature death. The average cigarette smoker, smoking one pack of cigarettes per day, has a life expectancy 8 years less than the average non-smoker, and, moreover, before his death he has at each age twice as much serious illness as the non-smoker. In accordance with these facts, we see that a cigarette smoker can improve his health by 100% (decreasing the amount of serious illness and the chance of death at a given age to 1/2) and extend his life expectancy

by several years just by stopping the smoking of cigarettes. To have smoked cigarettes for years or decades does some permanent damage, of course, but it is heartening to know that much of this damage is repaired within a year or so after the cigarette smoking has stopped.

Another cause of poor health and early death is the over-use of medication, including the drugs prescribed by physicians. The physician sometimes needs to prescribe a drug in order to control a serious illness, but only too often the drug is used in larger amounts and for longer times than really needed, and the side effects may be seriously damaging. Essentially all drugs are poisonous to the human body. Even aspirin, which is used in tremendous amounts, is responsible for the death by poisoning of hundreds of people in the United States each year. The fatal dose for an adult is 20 to 30 grams. The ordinary aspirin tablet contains ~~325~~<sup>324</sup> mg, and accordingly 60 to 90 aspirin tablets can kill an adult, and a smaller amount can kill a child. Other drugs that are present in cough medicines available without prescription in drug stores are more poisonous, so poisonous that 1 or 2 grams might cause the death of an adult. In my book, Vitamin C and the Common Cold, published in 1970, I quoted the warning printed on the box of one kind of cough medicine, available without prescription, and reading as follows:

“CAUTION: Children under 12 should use only as directed by a physician. If symptoms persist or are unusually severe, see a physician. Do not exceed recommended dosage. Not for frequent or prolonged use. If excessive dryness of the mouth

occurs, decrease dosage. Discontinue use if rapid pulse, dizziness, skin rash, or blurring of vision occurs. Do not drive or operate machinery as this preparation may cause drowsiness in some persons. Individuals with high blood pressure, heart disease, diabetes, thyroid disease, glaucoma or excessive pressure within the eye, and elderly persons (where undiagnosed glaucoma or excessive pressure within the eye may be present) should use only as directed by physician. Persons with undiagnosed glaucoma may experience eye pain; if this occurs discontinue use and see physician immediately.))

A physician may prescribe a second drug to help control the side effects of the first one, and a third drug to help control the side effects of the second. Moreover, some patients go from one physician to another, and, as each physician prescribes a drug, the patient takes it, together with the drugs prescribed by the earlier physicians.

Diseases that are caused by the drugs prescribed by a physician or by some other action of the physician are called iatrogenic diseases (iatrogenic means caused by the physician). Studies that have been made in the United States have led to the conclusion that between 15% and 30% of all admissions of patients to hospitals are iatrogenic.

Even if the side effects of a drug are not severe enough to cause death, they can and usually do result in damage to the body such as to increase the probability of serious disease in later life and the probability of death. In order to achieve good health it is wise to avoid the use of drugs, as well as of cigarettes, and, of course, also of the narcotic drugs, to as

great an extent as possible.

A friend of mine, Dr. Bernard <sup>Rim</sup>~~Orinland~~, has proposed that ordinary medical practice, involving the use of drugs, should be called ~~toxi~~<sup>i</sup>molecular medicine. This expression can be contrasted with one that I formulated in 1968, orthomolecular medicine. ✓

In 1968 I pointed out that substances that are normally present in the human body, and usually required for life, might be used to improve health and to treat disease. Among these substances are the vitamins, organic compounds that are required in small amounts for life. I pointed out that the molecules of the vitamins and other substances normally present in the human body are the right molecules, whereas the molecules of the toxic drugs are the wrong molecules, so far as good health is concerned. ✓ Orthomolecular medicine consists in the use in the right amounts of the substances normally present in the human body, in order to achieve the best of health, decrease the incidence of disease, and treat disease.

One fact that impressed me greatly, some 15 years ago, when I began studying the vitamins, is that they have astonishing low toxicity. A drug such as 5-FU, given to a cancer patient, is toxic to the malignant cells, but it is also toxic to the normal cells, and a five-fold increase in the amount of the drug taken by the patient would kill him. On the other hand, the vitamin ~~and~~ niacin has physiological activity at an intake of 5 mg per day; this is enough to prevent death by pellagra. Niacin is so lacking in toxicity, ~~how~~ that a person can ingest ✓

50,000 mg of it, nearly two ounces, at one time without serious side effects. Similarly, vitamin C taken at the rate of 5 mg per day is enough to prevent death by scurvy, but ten thousand times this much can be taken by mouth or given by intravenous infusion without serious side effects. The vitamins are powerful substances, and the possibility of changing the concentration in the cells of the body over a very great range raises the question of how to achieve the best of health by using them.

It has become clear in recent years that there are two questions that one can ask about a vitamin, such as vitamin C. The first question is about the amount that needs to be taken each day in order to prevent the corresponding deficiency disease, which for vitamin C is scurvy. During the past 50 years much effort has been made to answer this question, and I believe that the answers are now well-known. It has been found, <sup>as mentioned above,</sup> that for vitamin C an intake of about 5 mg per day is enough to prevent most people from developing signs of scurvy. The recommended dietary allowance (RDA) for vitamin C is now set <sup>by</sup> the ~~Food~~ <sup>F</sup> and ~~Nutrition~~ <sup>N</sup> Board of the National Academy of Sciences-National Research Council <sup>at</sup> 60 mg per day, this somewhat larger number having been selected in order to insure that even those people with a special tendency to develop scurvy will be protected.

Little effort has been made <sup>until</sup> recently <sup>to</sup> answer the second question, which deals with the intake of vitamin C and other vitamins that leads to the best of health, the smallest incidence of disease, and the smallest chance of death.

Evidence has been accumulating recently to show that <sup>for</sup> vitamin C in particular and for other vitamins also the intakes that lead to the best of health are considerably greater than the values recommended by the ~~F~~ ~~N~~ ~~B~~ Food and Nutrition Board. Twenty-five years ago an intake of vitamin C of 200 mg per day was considered to be a massive intake. Today it would be considered by most people, I believe, to be a small intake, with perhaps 10,000 or 20,000 mg being a massive intake. ✓

I myself believe that 10,000 mg per day is about the proper intake of vitamin C, the intake required for the best of health. There are several reasons for this belief.

An interesting fact about vitamin C that differentiates it from the other vitamins is that most animals manufacture their own vitamin C, and only man and a few other species of animals are unable to manufacture this substance, and have to rely on food for their supply of it. Animals of different species manufacture vitamin C in amounts approximately proportional to their body weight, with animals the size of a human being making on the average about 10,000 mg per day. I believe that these various species of animals would not continue to manufacture this substance in this amount, generation after generation, unless the substance were required in this amount for the best of health. It is mainly because of this argument that I have been taking 10,000 mg of vitamin C every day for a number of years.

I am also impressed by the epidemiological evidence and other evidence that a high intake of vitamin C decreases the chance of having a heart attack and decreases the chance of



developing cancer.

For about 25 years it has been thought that the most important factors in cardiovascular disease have been the saturated fats, cholesterol, and similar fat-like substances. A tremendous campaign was waged to promote diets with low cholesterol, low saturated fat, and increase polyunsaturated fat. The death rate from cardiovascular disease, however, has remained constant during much of the last 25 years, and <sup>2</sup>begin to decrease only during the last decade, which is the period during which the vitamin C intake had increased greatly. It now seems likely that the assumption that heart disease is caused by high intake of saturated fat and cholesterol is wrong. ✓

Epidemiological studies have shown quite clearly that a diet including fresh fruit and vegetables is beneficial to the health. In several studies it has been found that the death rate from cardiovascular disease and also the death rate from cancer are significantly less for the persons who eat a diet high in vitamin C than for those who eat a diet low in vitamin C.

The relation between cardiovascular disease and cholesterol is a complicated one. Most of the cholesterol in the blood is present in combination with the fat-like substances called low-density lipids, LDL. Part of the cholesterol is combined with other lipids called high-density lipids, HDL. Epidemiologists have long ago observed that people with a high concentration of LDL cholesterol in their blood have an increased mortality from cardiovascular disease. Although some

observations were made 25 years ago, it is only rather recently that it has been clearly recognized that the relationship between cardiovascular disease and HDL cholesterol is different - HDL cholesterol does not cause cardiovascular disease, but seems to protect against it. A striking fact about vitamin C is that a high intake of this vitamin decreases the amount of LDL cholesterol and increases the amount of HDL cholesterol, so that we may well be justified in reachin<sup>g</sup> the conclusion that a high intake of vitamin C protects against cardiovascular disease. In fact, there has been <sup>ob</sup>tain<sup>d</sup> during recent years significant epidemiological evidence showing that people with a high intake of vitamin C have a decreased incidence of and mortality from heart disease.

Similar observations have been made with cancer. A high intake of vitamin C decrease<sup>d</sup> the chance of developing cancer, and of dying from this disease. Indeed, during the last 10 years, significant studies have been made of the use of vitamin C in large amounts as an adjunct in the treatment of cancer. Credit for this development must be given very largely to my colleague Dr. Ewan Cameron, who was for many years chief surgeon of a large hospital in Scotland, Vale of Leven Hospital, Loch Lomondside. In 1966 Dr. Cameron introduced an essentially new idea about cancer. He pointed out that there is evidence that cancer develops more than once in ~~essentially~~ every human being, and is destroyed by the operation of the natural protective mechanisms of the human body. These natural mechanisms give us

immunity against various infectious diseases. The immune mechanisms of protection are complicated ones, involving the production of antibody molecules, molecules of certain proteins called complement, and certain cells, the white cells of the blood, which can attack the marked bacterial cells or cells infected by a virus and destroy them.

The immune mechanisms are usually thought of as protecting us against infectious diseases, but it is now recognized that they also play a role in protecting us against cancer, by destroying malignant cells.

Dr. Cameron pointed out that a significant control over cancer might be obtained if we could find some way of making our natural protective mechanisms, including the immune mechanism, more effective. In 1971, after having had no success with his testing of some other ideas, he cautiously began the use of large doses of vitamin C in the treatment of patients with advanced cancer. In his work he has usually given patients with cancer about 10,000 mg of vitamin C per day, nearly 200 times the usually recommended intake.

Among the patients in the Vale of Leven Hospital in the fall of 1971 there were many who had reached a stage that in Scottish medical practice is called "untreatable". These patients had been treated by the conventional methods of surgery, high energy radiation, administration of hormones, or, in a few cases, chemotherapy, and they were scheduled only to receive narcotic drugs to control pain, together with good nursing care for the rest of their lives. When vitamin C was tried on the

first patient the patient responded <sup>2</sup> will, with a gain in strength, <sup>2</sup>  
 good appetite, improved energy, and for many ~~for~~ <sup>2</sup> the patients <sup>✓</sup>  
 significant control of the growth of the malignant tumor.

When, some years later, a careful comparison was made of  
 the patients with advanced cancer who had received 10 grams per day  
 of vitamin C and similar cancer patients who did not receive  
 vitamin C, the benefit of vitamin C was found to be striking.  
 In addition to feeling better, most of the patients lived much  
 longer. Some of the apparently hopeless patients have con-  
 tinued to survive. These observations were checked also by  
 studies made in a hospital in Japan, with essentially the same  
 results.

Thousands of patients with cancer have now been receiving  
 vitamin C in large doses, usually ~~in~~ <sup>2</sup> 10 grams per day but sometimes <sup>✓</sup>  
 20, 30 or 40 grams per day, and often with strikingly evident  
 benefit. Also, many cancer patients are beginning the high in-  
 take of vitamin C at the first sign of cancer, along with con-  
 ventional therapy. The treatment with vitamin C is in general to  
 be considered as a supplement to conventional therapy, rather than  
 a replacement for it.

It is possible at the present time to give some general  
 advice about how to prevent cancer and prevent heart disease  
 through keeping in the best of health, with the most effective  
 natural protective mechanisms. I think that for most people  
 a daily intake of vitamin C of between 1 gram and 10 grams per  
 day may lead to the best of health. In addition, a good intake

of vitamin A, vitamin E, the B vitamins, and minerals is valuable. The daily diet should include good amounts of green, yellow, and red vegetables. The intake of sugar should be kept low. The regime should include eating breakfast every day, not eating between meals, and not overeating. An effort should be made to avoid foods and soft drinks containing possibly carcinogenic dyes and additives. Some regular daily exercise is helpful, as is seven or eight hours of sleep per night. The intake of alcoholic drinks should be kept moderate, and smoking should be absolutely banned. It is through health practices such as these, rather than through the development of new drugs or medical procedures, that, I believe, the increase by 27 years in the length of the period of well-being and the length of life can be achieved by the year 2000. I am sure <sup>that</sup> this increase could be achieved, but I am not sure that it will be achieved. The medical profession as a whole has not accepted the facts and arguments presented in the foregoing paragraphs, although I must say that when a physician develops cancer there is a good chance that he will get in touch with Dr. Cameron or me to find out what the latest information is about vitamin C in relation to cancer. Still, I think that the time may be near when the medical profession as a whole will accept the facts about vitamin C, that the use of vitamin C, other <sup>nutrients</sup>, and other health practices will become widespread, and <sup>the</sup> the health of the American people will as a result show significant improvement.