Orthomolecular Psychiatry

Linus Pauling, Ph.D.

Linus Pauling has been deeply concerned with the alleviation of human suffering, and he has brought his scientific knowledge to bear on such problems as the causes of genetic mutation, the transmission of aberrant genes, and the deleterious effects of protein molecules with abnormal structure. On occasions, his views have led him to take strong public positions—some decidedly unpopular or unpolitic—against cigarette smoking, against the testing, proliferation and use of atomic and nuclear weapons, and against war in general

His achievements in science, medicine, and the promotion of human welfare have brought him countless honors, such as the Phillips Medal of the American College of Physicians for his contributions in internal medicine, the Gold Medal of the French Academy of Medicine, the Baxter Award in anesthesiology, the Rudolf Virchow Medal, the Thomas Addis Medal of the American Nephrosis Foundation, the Modern Medicine Award, the Humanist of the Year Award, and many others including dozens of honorary degrees and election to membership in twenty scientific societies in twelve countries. He has been awarded two Nobel Prizes: the 1954 Nobel Prize for Chemistry and the 1962 Nobel Prize for Peace.

Doctor Pauling's principal research at present is on the molecular basis of disease, including mental disease.

Mr. Chairman, ladies and gentlemen: I am very much encouraged by the papers this morning, and by the activity of the American Schizophrenia Association in having called this meeting and in having made plans for further meetings in which the possibilities of Orthomolecular therapy in controlling mental disease will be discussed further.

I feel that the use of substances normally present in the human body for improving health of human beings, and especially their mental health, has been unjustifiably ignored by the medical profession for some 30 or 35 years now and that the possibilities of improvement in the health of the American people and of other people in the world by improved nutrition are truly great. It is astounding to me that the medical profession has paid so little attention to these possibilities during the last few decades.

It is difficult for me to understand why this has come about. There was enthusiasm about vitamins and about nutrition for a rather short period of time, beginning about 1910, when vitamins were first clearly recognized and when it was generally accepted that diseases such as scurvy and beri beri are not the result of the presence of a toxic substance of some sort in certain foods, which could be neutralized by other foods, but are rather the result of the absence in certain foods of vital substances, the vitamins.

The essential amino acids also were discovered to be vital substances of this sort, required for life and health.

The enthusiasm about vitamins may have been overly great for awhile and the failure of vitamin therapy in some cases may have caused a disenchantment that really was not justified.

My friend Dr. Albert Szent-Gyorgyi, who in 1928 prepared it for the first time, isolated vitamin C from natural sources, as a substance that he named hexuronic acid; later he changed the name to ascorbic acid.

Dr. Szent-Gyorgyi has said in a letter to me that he felt that it was a great mistake for the medical profession to have concentrated on the antiascorbutic properties of vitamin C, the property of preventing death by scurvy. Scurvy is the final stage; he •called it a "pre-mortal syndrome."

Death by scurvy can be prevented by a small amount of vitamin C; Dr. Szent-Gyorgyi said that we do not yet know the optimum rate of intake of this vitamin. He said that he himself had been taking 1,000 mg. a day for many years, but that he did not know whether or not this was the optimum amount for him and did not know about other people—what their optimum requirements are. He went on to say that one thing is perfectly clear, that any amount can be taken without danger.

I think that this is essentially true, not only for vitamin C, but also for the other water-soluble vitamins and for vitamin E. These substances have important physiological properties and are substances to which the human body is accustomed, because everyone requires these substances for life and good health and there has been a weeding-out process. The human germ plasm has been affected by the process of evolution in such a way as to give rise to the human race that now exists, consisting of people who can tolerate these important substances.

We do not know how much we need of these various vital substances in order to be in the best of health. There is good evidence that different people need different amounts, as has been pointed out by Professor Roger J. Williams. One of our speakers referred to the recent statements by Dr. Rosenberg, who has been working on the inborn errors of metabolism, the diseases that result from the failure of an individual to manufacture a particular enzyme in the right amount or with the right activity. It is possible to cure some of these inborn errors of metabolism by the administration of amounts of vitamins, such as vitamin B_6 or vitamin B_{12}, in amounts as great as 1,000 times the amounts that seem to be essentially satisfactory for other human beings.

I would like to know how to find out what the optimum rate of intake of these vital substances is.

Professor Williams has reported studies made with guinea pigs showing that for optimum growth the amounts of vitamin C required by different guinea pigs varied by as much as twenty-fold. He has said that surely human beings are more heterogeneous and the range of requirements of human beings for vitamin C is greater than over a factor of twenty. I feel that we can say the same thing about vitamin B_3, a very important substance which has many functions in the human body, and also vitamin B_6, which is known to serve as a coenzyme in many enzyme systems. I feel

sure that the needs for vitamin B_3 in different human beings are different.

I have decided, on the basis of the evidence presented by Irwin Stone, that there is very strong evidence now that most human beings are suffering from hypoascorbemia, a mild sort of deficiency of ascorbic acid in the blood—perhaps it is wrong for me to call it a *mild* sort. The point that I call to your attention is that I believe that for all or almost all human beings the amount of vitamin C that is contained in the food is less than the optimum amount and that the state of health of almost all human beings is not so good as it would be if they were to ingest a larger amount.

The evidence that I have been able to gather so far about vitamin B_3 is not so clear on this point. It suggests, rather, that for many human beings the amount of vitamin B_3 that is usually recommended and that is contained in a good balanced diet, even a modern diet of processed foods of one sort or another, is not too far off from the optimum rate of intake.

Nevertheless, it may be that I am wrong on that point and that for vitamin B_3 also the optimum rate of intake for almost all human beings would be considerably larger than the 17 mg. per day that is recommended by the Food and Nutrition Board of the U. S. National Research Council and National Academy of Sciences.

In the course of time we shall be able to answer this question and other related questions. In the meantime, there is the evidence, some of which has been presented this morning, that many people with mental disease of one sort or another, including many children who show abnormal behavior, benefit by receiving large daily intakes of these important foods, vitamin B_3 (niacin and niacinamide), vitamin C and vitamin B_6.

What are we going to do about this

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problem in the future—the problem of finding out what the needs are of individual human beings for these important foods?

At the present time, I feel that it is essential that empirical methods be used.

I feel that the evidence that exists now about the benefits to many people of an increased intake of vitamins, such as the many people who are suffering from mental disease, justifies the trial of these substances on every person who shows abnormality in behavior such as to require that he be given some sort of treatment.

The situation is not the same as that with the phenothiazines, i.e., synthetic drugs to which the human body is not accustomed, substances that are foreign to the human body and for which there might be expected possible very severe side effects of one sort or another that could produce damage.

We know the human body is accustomed to every one of the vitamin substances, that we have evolved in such a way as to be able to tolerate it. And we know by observation that for most of the vitamins, all except vitamin A and vitamin D, very large quantities may be ingested without producing symptoms of toxicity or serious side reactions.

We know that these substances have physiological activity, that many of them are involved in the functioning of the brain,

that they cause biochemical reactions to take place in the human body such as to change the molecular environment of the mind; and we know by observation, from the reports that we have heard today and from others that have been published, that often these changes in the molecular environment of the mind are such as to lead to improved behavior.

I feel, accordingly, that it is the duty of every psychiatrist to add megavitamin therapy, Orthomolecular methods, to his armamentarium and to make use of these vitamins; to try them out in proper amounts, not just doubling the recommended daily allowance, but in the proper amounts as discussed by Dr. Hoffer and others here as having been found to be effective for many patients.

Electroshock therapy, which I do not like, seems to me to be closely analogous to a method of treatment of mental disease that I think was used traditionally by primitive man, that of hitting the patient over the head with a club, thus producing a generalized change in the structure of the brain, which had some chance of leading to a significant improvement in behavior. I hope that this crude treatment will be replaced by Orthomolecular methods.

I remember looking, with my wife, at an exhibit of skulls of pre-Columbian Indians, with a piece of bone cut out from the skull. It is thought that this treatment was sometimes used for mental illness, perhaps with some success.

It is evident from the skulls that some of the patients survived the operation and some of them died. For some skulls there was no sign of healing around the square where the piece of bone had been removed but for many of them there were signs of healing.

Primitive men learned so much about diet and even about medicines, the important alkaloids present in plants, that he may well have learned something about the methods of treating mental disease similar to the ones that are now used or analogous to them.

Professor A. B. Robinson, my associate, and our co-workers have been working on the problem of finding out what the molecular structure of a human being is, finding out how he handles vitamins, what happens to the vitamins that he ingests—does he utilize them in the same way as other human beings.

To do this, we have been trying to develop a refined method of analysis such that we can determine quantitatively the amounts of two or three hundred substances in his urine, blood, breath or other body fluid. In the course of time, I feel that this attack will turn out to be of value.

We are now trying to develop an instrument such that it does not take four hours (as it does at present) to determine quantitatively the amounts of two to three hundred substances in a sample but will take only a few seconds.

This is a real possibility: that such an instrument can be developed on the basis of the scientific and technological developments of the last 20 or 30 years and of the technological progress that has occurred, progress in instrumentation and in the handling of results that are obtained by these instruments by use of a computer.

It is possible now to make a new attack on the whole problem of nutrition in relation to the health of human beings and especially of mental health.

We have, in our bodies, the mechanism for helping to protect the brain from the environment. This is the blood-brain barrier, which helps to keep undesirable molecules out of the brain. This barrier may also sometimes operate to keep good molecules out of the brain.

I have thought that it might well be that the value of megavitamin therapy for some patients is the result of their having a blood-brain barrier that is operating too efficiently, in such a way that even though in the peripheral tissues the concentration of vitamins may be essentially optimal, there could still be a local avitaminosis in the brain itself.

It is soon going to be possible to answer this question and many similar questions. It is required only that scientists and physicians, medical investigators, have an open mind about such matters as the value of vitamins, that they not be inhibited by old and false ideas that have been handed on by the past generation of physicians and nutritionists to the present generation.

Fortunately, the younger generation of physicians and of students generally is less gullible than those of earlier times—more open-minded. I think that the attitude of the young physicians and the students of today gives us hope for the future.

I think that there is going to be much progress made in the field of psychiatry during the next decade.

I am grateful to Dr. Mosher and his associates in the National Institute of Mental Health for the support that they have given to me through grants for our work. I have obtained a good bit of information also from them.

It was very interesting to me to have Dr. Katz, who is Chief of the Clinical Research Branch of the National Institute of Mental Health, point out to me that he and Dr. Kubala, some 10 or 12 years ago, conducted a study of the intelligence of school children, as measured by I.Q. tests, in relation to the level of ascorbic acid in the blood.

Their study showed, with statistical significance, an average increase of about four points in I.Q. for an average increase from 1.0 mg. to 1.5 mg. of ascorbic acid per 100 ml. of blood plasma. This increase in performance on intelligence tests was attributed by Drs. Kubala and Katz to an increase in "alertness" and "sharpness" that presumably results from the increased level of ascorbic acid in the blood. This report seems to me to be very important.

I hope that further studies along this line, also involving other vitamins, will be made.

I repeat that it is my conviction that we have for the most part neglected a very important way of improving the health of human beings—neglected it for several decades now—that way being through the ingestion of the optimal amounts of the natural foods, the essential foods, especially the vitamins, vitamin C, vitamin B_3 and other vitamins.

It is heartening to me to see how the interest in these possibilities is now growing.

Thank you.